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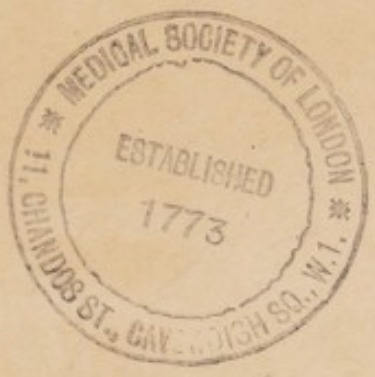
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THE BRAIN
IN HEALTH AND DISEASE

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1773

THE BRAIN IN HEALTH AND DISEASE

BY

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LONDON

EDWARD ARNOLD

1914

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PREFACE

Of late years the majority of the published attempts to elucidate the functions of the brain have left the safe lines of anatomy and physiology and of histological and clinical pathology, and have wandered in various directions in the avowed search for truth, but more often in the actual search after means for the diagnosis and treatment of the mentally afflicted.

For this change of attitude towards the question of cerebral function the rise of bio-chemistry and bacteriology on the one hand, and the fascination exerted by new methods of clinical study and new systems of psychological terminology on the other, are responsible.

The elaborate and accurate methods employed in the study of the higher physiology of the senses, and the ingenious and time-taking investigations in animal psychology, which are now so numerous, appear, at first sight at any rate, to be new and fundamentally sound means of research. The minute differential study of the symptomatology exhibited by the insane, which irresistibly recalls the names of Korsakow and of Kraepelin, has aroused the interest of hosts of previously somewhat supine workers in clinical psychiatry and has been responsible for a new terminology. Quite recently, the psycho-analytical method of Freud, which is in reality a " catch unawares " application of the " confession and absolution " idea to the ordinary sympathetic case-taking of the hysterical and the psychasthenic, has introduced a still newer psychological terminology, but no fundamentally new method. On the other hand, this method has the great fault of appealing, to those unaware of its strictly limited scope, as a new system of universal applicability to cases of mental disease, whereas its field of utility is for practical purposes outside the walls of asylums.

From the aspect of bio-chemistry and bacteriology, it is necessary merely to mention the most recent important event, the introduction of the Wassermann reaction, which has culminated in the discovery of Noguchi.

In all these various directions research has been fruitful, and interest in psychology and psychiatry has been stimulated : and each method has been claimed by its advocates as the long sought for means by which the knowledge of psychology and of psychiatry would at last be advanced.

An attempt to settle the question of cerebral function on the old-

established bases of anatomy and physiology and of histological and clinical pathology would therefore seem foredoomed to failure, in spite of the fact that the method is that which has been employed with success in the past in all the major investigations in the field of medicine.

The present volume is nevertheless the result of such an essay. Whilst due attention, as far as has been judged necessary, has been given to the investigations of others, the work is based on my personal researches during the past eighteen years. The work is divided into two parts, which deal with cerebral function in the normal and the insane brain respectively. The latter portion of the volume is subdivided into sections which deal respectively with cerebral function in the sub-normal or sub-evoluted brain, and in the involuted or dissoluted brain. The work must thus be regarded as a treatise on general cerebral physiology and pathology, and not as in any sense a text-book, monograph or dissertation on mental disease.

To the lay reader, who may not be aware of the truth that our present-day knowledge of the functions of the brain and of the subject of mental disease is at least a century behind that of other branches of physiology and medicine, the need for such a largely personal volume as the present may not seem to be imperative. I feel sure, however, that professional physiologists and alienists will at once see the need, though I hardly dare to hope that in this volume they will find its fulfilment.

As one who upwards of a quarter of a century ago was initiated into the study of psychiatry by my then chief, Dr. W. H. O. Sankey, I can at any rate fairly claim that my experience has had time to mature : and, as this volume is the result of the systematic researches of some eighteen years, I think that I can equally claim that the conclusions contained in it are neither hasty nor ill-considered.

JOSEPH SHAW BOLTON.

West Riding Asylum, Wakefield,
July, 1914.

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Note.—A large number of these illustrations have already been published in *Brain* (Goulstonian Lectures, 1910), and in the *Journal of Mental Science* (Amentia and Dementia, &c., 1905–1908). Permission has been obtained for their reproduction.

PART I

CEREBRAL FUNCTION IN THE NORMAL BRAIN

CHAPTER I

INTRODUCTORY

THIS volume has been written with the object of elaborating a scheme of cerebral function which is based on clinico-histo-pathological proof rather than on speculation, although hypothesis necessarily plays a part in those directions in which the needful evidence is as yet incomplete.

It would in consequence be futile to weary the reader with a dissertation on the innumerable opinions concerning the human cerebral functions which have been promulgated on speculative grounds or through the clinical study of cases of gross lesion of the brain.

In few branches of knowledge, in fact, has the progress of research resulted in such utter chaos as in the subject of cerebral function. An indication of the urgent need of undoubted evidence with regard to a difficult question may be found in even a cursory study of the recent monograph of Brodmann on the histology of the cerebral cortex. This author not only refuses to deduce physiological conclusions from his own anatomical facts, but denies that any proof exists of a correlation between functional significance and histological structure. Such an attitude on the part of a pure anatomist is, in an anatomical sense, to be commended on the ground that simple anatomical data cannot alone afford reliable evidence with regard to functional significance. It is nevertheless to be deplored that such a careful and accurate investigator of histological structure should extend his generalisations beyond his own anatomical province and ignore the combined anatomico-physiological investigations of other workers in the field, on the apparent ground that the wildest of hypotheses have been suggested. To ridicule the notions that an individual cerebral neurone possesses special psychic functions, or that the numerous cell layers of the visuo-sensory cortex bear some relationship to the spectrum, may be permissible, though such are hardly worth the necessary waste of energy. The application of the method of ridicule to conclusions concerning the functional significance of certain cell-laminæ

or of certain histologically differentiated areas of the cortex, which are based on proved facts, is, however, only explicable on the ground that these have not fallen under the notice of this writer, since his *bona fides* is beyond question. That even the simpler processes of cerebral association are of very great complexity cannot be regarded in any sense as proof that the well-defined and constant histological structure of the cerebral cortex is not the anatomical counterpart of such processes. A similar line of argument applied to the bulb and cord would lead to the inevitable conclusion that the neurone complexes in this region of the central nervous system are also without special functional significance.

No excuse is therefore needed for the appearance of the present work, faulty though a preliminary effort to open up new sources of information must of necessity be.

As, however, the employment of a new method necessitates a somewhat unusual mode of treatment of the subject, I must claim the indulgence of the reader in this respect at least. I shall therefore limit the historical descriptions to such recent investigations as bear directly on the purpose I have in view, and shall endeavour to present the general subject matter in such a way that doubt will rarely arise as to whether any particular deduction is based on fact or on hypothesis.

The object of the present chapter is thus two-fold. From the one aspect, I purpose to introduce an *ex cathedrâ* description of the partially proved provisional hypothesis of cerebral function which my personal researches have led me to adopt. From the other the chapter will be found to contain a statement of the more important theses to which I wish to draw the attention, and in which I hope to gain the acquiescence of the reader.

From the former point of view the subject matter may be regarded as a statement of creed liable to future modification, and from the latter as a series of propositions, to each of which later in the volume I purpose adding the *quod erat demonstrandum*.

To draw fine lines between the possible, the probable, and the certain is always an invidious task. In the present instance, however, the difficulty is increased by the impossibility of strictly applying the methods of inductive logic to the evidence I have personally obtained, and by the personal factor which it is not easy to eliminate when making a selection from the evidence adduced by other workers.

I hope therefore to be judged rather by my intention than by my success or failure in this respect.

As a preliminary to the description of the probable mode of evolution of mammalian cerebral function, it is necessary to draw the attention of the reader to certain histological facts of cortical structure.

The cerebral cortex peculiar to the mammalia, for which Elliot Smith

has coined the useful term Neopallium, consists of three primary cell-laminæ which undergo, in different members of the scale and in different regions of the cerebrum, varying degrees of evolution or suppression. These cell-laminæ are the outer or pyramidal, the middle or granule, and the inner or polymorphic, with which last for descriptive purposes may be associated the often sparsely distributed cells lying between the inner and middle cell-laminæ. As has been shown by Turner and by Watson, the neopallium, which roughly consists of the entire cerebral cortex with the exception of the pyriform lobe and the hippocampus, differs from the archipallium, or the remainder of the cortex, in the possession of an outer or pyramidal cell-lamina, the middle and inner cell-laminæ being common features of the whole of the cerebral cortex.

For reasons which will appear later, it may in my opinion be regarded as proved that this outer or pyramidal cell-lamina is the part of the cortex which subserves the associative, psychic or educative, in contra-distinction to the organic and instinctive, functions of the cerebrum. The latter, I may remark, are, as I shall show, subserved by the inner cell-lamina, whereas the receptive functions are performed by the middle cell-lamina.

In the early evolution of the neopallium, certain sensory-projection zones of simple structure exist, together with a rudimentary motor area, the function of which is, I conceive, to fuse the products of the sensory-projection areas and to turn them into motor equivalents. From a careful survey not only of the paper of Watson on the Insectivora but also of his actual specimens, I believe that in this order of mammals the areas which this writer refers to as kinæsthetic, fifth sensory, visual, &c., are simple sensory-receptive spheres of these several senses, whose elementary associative products are fused in the motor area and there transformed into motor equivalents. In conformity with this view is the fact that the remainder of the cortex of these animals is embryonic in structure, and in all probability latent as regards functional activity.

During the ascent of the mammalian scale, the sensory-projection and motor areas increase in complexity of structure (Brodmann, Elliot Smith, Mott, &c.), and advance in grade of functional activity. Until, however, the carnivora are reached (Campbell), there is no indication of the development of histologically differentiable associative zones around or near the sensory-projection areas; and the motor area also shows little advance in evolution. It is probable that, in agreement with the relatively embryonic structure of the rest of the cortex, the functional activity of this is still largely or entirely latent.

To the visual projection zone I many years ago applied the term visuo-sensory, and to the adjacent associative zone that of visuo-psychic (in preference to the cumbrous visual-cerebral-associative).

These terms have since come into common use in this country, and have been extended by Campbell to the other sensory-projection areas, *e.g.* audito-sensory, audito-psychic, &c.

In the case of the motor area I have for some time employed the term psychomotor (cerebral-associative-motor) with regard not merely to the Betz-cell area but to the adjacent (largely excito-motor) cortex, in a strictly homologous manner, in the case of mammals in which the outer or pyramidal cell-lamina has undergone notable evolution.

In the primates, well developed and histologically differentiable zones of association exist around and in the neighbourhood of each of the sensory-projection areas, and similarly developed and differentiable cortex exists in the psychomotor (including Betz-cell) area. The remainder of the cortex, namely the " prefrontal " anterior to the psychomotor area and the post-Rolandic between the various sensory-projection areas, has largely ceased to present embryonic features.

The cerebrum of the higher primates is thus characterised by the evolution of regions of associative cortex posteriorly between the sensory-projection areas, and anteriorly in, and in front of, the Betz-cell area. It is practically certain that the former is concerned with the higher elaboration of the sensorial and the latter with that of the motor aspect of the cerebral functions.

In man the post-Rolandic area of cortex devoted to associational functions is enormously enlarged, and a considerable area of this, which lies between the hall-marked associative or psychic regions, probably subserves the highly complex interassociational processes which have now become evolved. In the pre-Rolandic region the cortex is still more increased in extent by the evolution of a notable prefrontal lobe in front of the psychomotor area, which lobe, as I shall prove, consists of cortex to which the term voluntary-associative may be applied, since this appears to be a still higher psychomotor grade with voluntary-motor and inhibitory functions, including the selection, co-ordination, and control of the processes of lower association performed in the post-Rolandic cortex.

Concurrently with this increase in the zones of association, language has become evolved, from both sensorial and motor aspects, as a complex mechanism for the symbolic integration of the various more or less individually complex products of cerebral association ; and the higher psychic functions, of voluntary selection, and co-ordination into orderly sequence of the processes of lower cerebral association, have been evolved.

Such, in general terms, is the partially proved hypothesis of the mode of evolution of the cerebral functions which my personal researches have led me to adopt. The evidence on this subject which I shall adduce in succeeding chapters—though supported by the work of others on the

cortex of the lower mammals—is based on a study of the mode of evolution of the human cerebral cortex and on the histological structure of the cortex of the subjects of mental disease, investigated by a special method. It therefore behoves me to conclude this chapter by a general description of the more important of the facts, the proof of which I purpose later on to adduce.

As this portion of my subject is largely concerned with the modifications in cerebral function which occur in the insane, it is here necessary to indicate in general terms my position with regard to the anatomical basis of mental disease.

For reasons which will appear in subsequent chapters, I subdivide all cases of mental disease into two categories, namely: (1) cases which, from the macroscopic post-mortem aspect, exhibit abnormal, no abnormal, no morbid, or slight morbid appearances; and (2) cases which exhibit morbid signs of any higher grade of intensity, and, in some instances, abnormal appearances also.

The former group, from the clinical aspect, I class under the term AMENTIA, which I employ to connote *the mental condition of patients suffering from deficient neuronic development;* and the latter under the term DEMENTIA, which I employ to signify *the mental condition of patients who suffer from a permanent psychic disability due to neuronic degeneration following insufficient durability.*

The subjects of amentia, therefore, as I shall suggest from the macroscopic and prove from the microscopic aspect, *suffer from a more or less marked grade of sub-evolution of the cerebrum.* The chief clinical varieties of amentia are low-grade amentia, or idiocy and imbecility of all grades with or without epilepsy, and high-grade amentia, which includes moral, unstable and excited cases, together with cranks and asylum curiosities, recurrent cases of all types, hysteria, epileptic insanity, and true paranoia and allied cases.

Before referring to the question of dementia, a further explanatory description of this mental condition is necessary. The word dementia, and particularly the word demented, are employed by alienists for different purposes. Some speak of demented patients recovering; others regard almost any reasonably quiet chronic case as demented; and others, again, deny the possibility of in any way whatever correlating psychic states and material conditions of the brain, and regard such as a form of confusion of thought. It is therefore necessary, in addition to defining the term, to indicate the commoner symptoms which are presented by patients suffering from dementia.

These, in brief, are as follows:—

General dullness and apathy, a loss of initiative, and an indifference to their surroundings; a marked degree of stereotypism of all the mental

processes, and an inability to learn new acquirements; a mechanical method of performing known acquirements, a general stupidity and inability to understand when an attempt is made at correction of any kind, and a tendency to revert to accustomed modes of speech and action; finally, there is a tendency to the repetition of accustomed actions which often shows that these have been performed in the entire absence of intelligent volition.

This description, I may remark, in certain respects resembles that given by numerous experimental physiologists with regard to the motor exhibitions presented by certain lower vertebrates after removal of the cerebral hemispheres, and by certain higher animals after removal of the frontal lobes.

The subjects of dementia, as I shall indicate both macroscopically and microscopically, *suffer from a more or less marked grade of involution or dissolution of the cerebrum.* I group all such cases into a primarily neuronic class composed of senile, presenile, mature and premature types; into a progressive and secondary class which includes senile and presenile dementia associated with gross degeneration of the cerebral vessels, and general paralysis and kindred pathological conditions; and into a class of special varieties following sense deprivation, epilepsy and cerebral lesions.

This generalisation of amentia and dementia is a gross one, and, as I shall indicate, is based on the fact that cases of mental disease exhibit a lesion of the cortex of the prefrontal region of the cerebrum, which lesion, in the case of amentia, is of the nature of a true sub-evolution, and, in the case of dementia, is of the nature of a true involution or dissolution.

The existence of amentia does not preclude the onset of dementia, the milder grades of which may in fact be regarded as the normal result of cerebral senility in all persons, sane or insane, who survive to the necessary age-period, which, however, varies greatly in accordance with their individual personal cerebral durability. In many idiots, for example, cerebral senility occurs before the age of forty years, and in some normal persons indications of its onset are absent at the age of eighty.

The necessary precursor of dementia, whether this be severe or mild, of rapid or of slow development, is a more or less severe grade of MENTAL CONFUSION, which term I employ to connote, in the broadest sense, *the mental symptoms occurring in association with certain pathological states of the cortical neurones, which may be followed by the recovery, or by a more or less extensive dissolution of these elements.* In the former case, in which the symptomatology is incited by temporary or removable causes —*e.g.* alcoholic excess—complete recovery often occurs. In the latter, a more or less severe grade of dementia ensues. Further, certain clinical

indications are frequently, though not constantly, present which enable a prognosis to be made as to whether a given case which exhibits mental confusion is recoverable or will develop dementia. Again, it is certain that recoverable mental confusion may occur in persons possessing normal cerebra. Lastly, mental confusion followed by dementia more commonly occurs in cases with cerebra of normal or relatively normal development, though probably of deficient neuronic durability, than in cases with cerebra which exhibit some grade of sub-evolution. The generalisation may, in fact, be made that the greater the grade of amentia the less is the tendency to dementia, not through a more normal durability of the cortical neurones of the former, but owing to the fact that cases of amentia so readily suffer from symptoms of mental alienation under any form of stress that as a rule little or no irreparable damage to the cortical neurones results from its influence.

The generalisation of amentia and dementia, I may remark, does not cover the subject of special symptomatology, which, as I hope to indicate, but not yet to fully prove, depends on the degree of evolution of the cortex of the projection spheres and zones of lower association of the cerebrum.

For proof of this general thesis of the nature of mental disease I do not lay stress on the clinico-pathological evidence contained in Chapter X, p. 135, though this is confirmed by the purely pathological researches of Watson. I regard such evidence merely as suggestive, although it gains in importance when added to the definite proof of the thesis which I have obtained during the course of my micrometric studies of the cortex cerebri. The general scope of these investigations, and their bearing on the generalisation of amentia and dementia, is difficult to summarise in the absence of the necessary and somewhat lengthy definitions and descriptions which will appear in their appropriate place, and I must therefore ask the indulgence of the reader if my remarks on this subject are insufficiently lucid.

As a necessary introduction to the micrometric study of the cortex of the insane, I shall describe the mode of development of the normal human cortex and also the appearances presented by this in the normal adult.

The regions which I have dealt with, during the past eighteen years —owing to the impossibility of applying the method to the whole of the cortex during any reasonable period of time—are naturally limited in number, but are, I think, sufficiently representative for my purpose. These are the *visuo-sensory area*, as the best example of the cerebral sensory-projection areas; the *visuo-psychic zone*, as a sample of the hall-marked cerebral-associative regions; the *prefrontal*, or voluntary-cerebral-associative region; and the *psychomotor*, or cerebral-associative-motor area.

The series of cases of mental disease which I have employed range in type from the idiot and imbecile, through various grades of amentia up to the normal, and through various grades of dementia down to the gross dement. Grouping these cases into three series according to the cortical region—*i.e.* visuo-sensory, visuo-psychic and prefrontal—and describing the results of their examination in terms of the three primary cell-laminæ from which the cortex has been evolved, I have obtained certain facts which on the one hand afford evidence of the normal functional significance of these regions, and on the other provide suggestive indications with regard to the nature of mental disease.

The facts which I shall now mention may be grouped under the headings of specialisation of cortical structure, of individual variation in cortical structure, and of true sub-evolution and true dissolution or involution of the laminæ throughout the depth of the cortex.

In the case of the visuo-sensory area, either of the normal or in the subjects of mental disease, the prominent feature of the cortex is specialisation of structure, the middle or receptive cell-lamina being hypertrophied and duplicated, and the outer or psychic and the inner or instinctive cell-laminæ being very deficient in depth. Further, in mental disease, very definite individual variations exist in the degree of development of the later-evolved portions of the cortex, namely, the outer or psychic cell-lamina and the outer part of the middle or receptive cell-lamina. I may add that the specialisation of structure is a common feature of the series of cases, and that the individual variation which occurs bears no relationship whatever to the degree of amentia or dementia presented by the different cases of the series.

In the case of the visuo-psychic zone, specialisation of structure, though evident, is not a prominent feature and is limited to the middle or receptive cell-lamina, whereas the individual variation which exists in the latest evolved portion of the cortex, namely the outer or psychic cell-lamina, is very definite. As in the case of the visuo-sensory area, this individual variation bears no relationship whatever to the degree of amentia or dementia presented by the different cases of the series.

In the case of the prefrontal region neither specialisation nor individual variation is present. The whole of the cell-laminæ, however, in strict accordance with the order of normal development, are sub-evolved according to the degree of amentia which is presented by the several cases, the first lamina to be evolved being the best developed, and the last lamina to be evolved being the least developed. In the case of dementia, the cell-laminæ have undergone dissolution or involution to degrees which vary according to the grade of dementia in the several cases, the last cell-lamina which is normally evolved being the most affected, and the first the least. It may be added that slight but defi-

nitely measurable differences exist in the case of normal brains, which differences conform to the same law of evolution.

To pass for a moment to the subject of the normal development of the cortex, I would remark that I have been able to demonstrate that the visuo-sensory area is evolved earlier than the visuo-psychic zone, and this latter earlier than the prefrontal region. Further, Moyes and myself have shown, using a human fœtus aged eighteen weeks for the purpose, that the cortex of the post-central and pre-central (with Betz-cells) gyri is evolved well before that of the visuo-sensory area, and is in fact the first region of the cerebral cortex to undergo development. This truth is in accord on the one hand with our knowledge of the phylogenetic evolution of the cortex, and on the other with the results of the embryological researches of Flechsig, the Vogts, &c., concerning the period of myelinisation of the different regions of the cortex.

The study of the cortex cerebri of the insane thus affords important evidence with regard to the functional significance of these special sample regions to which I have referred, and enables important conclusions to be drawn with regard to the mechanism of cerebral function.

CHAPTER II

THE GEOGRAPHY OF THE CEREBRAL CORTEX

I DO not propose to enter into a historical retrospect of the investigations of the past forty years, as for our purpose it is sufficient to refer briefly to those of the past fifteen years. With regard to the earlier researches, I would remark that the experimental method of investigation which was introduced by Fritsch and Hitzig and by Ferrier, and continued by numerous workers, from whose names it would be invidious to make a selection, may be considered to have served its purpose with the publication of the researches of Sherrington and Grünbaum. These, by linking together the conclusions arrived at by the experimental and the histological methods, resulted in the belated recognition of the neglected histological investigation of Bevan-Lewis and Henry Clarke on the cortical localisation of the motor area, and gave an impetus to the latter method which has already been followed by a considerable amplification of our knowledge of the structure and functions of the cerebrum.

The last, but not the least important, of the researches to which I must refer before dealing with the published work of the past few years are those of Flechsig on the development of the human brain by a study of the process of myelinisation. The division of the cortex cerebri, by this investigator, into the two great classes of sensory centres and centres of association raised a storm of discussion and dissent which is almost unprecedented in the history of research, and which, but for Flechsig, would have overtaken the workers of the past decade. Though many of the results obtained by Flechsig have failed to obtain credence, largely perhaps through the frequency with which he modified them in successive publications, his broad generalisation has successfully withstood the fire of criticism, and forms the origin, if not entirely the basis, of our present knowledge of cortical localisation by histological methods. In my personal opinion, which is based on my experience of the great differences which exist in the degree of development of fœtal or infantile brains of approximately the same age, Flechsig was injudicious in applying directly to the adult cerebrum the results he appeared to obtain from the investigation of such brains; but it is easy to be wise after the

event, and it is probable that the researches of Flechsig would have attracted less attention had they excited less dissent.

I shall find occasion later to refer in some detail to the conclusions of Flechsig with regard to the order of myelinisation of the cortex. At present it is merely necessary to remark that, far from being superseded by the results of recent research, they possess a permanent value, not only in that they served as a model for the work of others, but also owing to the relatively slight modifications in detail which such have been able to justify. For example, the myelinisation map published by the Vogts, who throughout have been amongst the severest of the critics of Flechsig, differs chiefly from that of the latter in the detail that the several regions shade imperceptibly into one another instead of appearing as sharply marked out areas.

During the past fifteen years numerous publications have appeared on the subject of cortical localisation by histological methods. In these several publications the whole cortex cerebri of man, and in many orders of mammals, has been mapped out into various histologically different regions; and in some instances proof of the functional significance of these has also been adduced. Further, the mode of evolution and functional significance of the different cell-laminæ of the cortex cerebri have been discussed from both the ontogenetic and the phylogenetic aspects.

In view of the purpose of this volume, namely, the attempted elucidation of the functions of the human cerebrum, it is unnecessary to refer, except as occasion serves, to such investigations as concern the cortex of the lower mammals. Amongst the publications which bear on cortical localisation in man, those of two authors stand out prominently—namely, the *Histological Studies* of Campbell and the series of monographs published since the year 1902 by Brodmann and which have recently appeared in book form. These authors have independently mapped out into histologically different areas the whole human cortex cerebri as well as the cortex cerebri of certain orders of mammals.

The human maps of these authors, whilst differing considerably in detail, agree with one another much more than either of them resembles the maps of Flechsig. I have already indicated one reason why the map of Flechsig cannot be applied directly to the adult cerebrum. It is also clear that, owing to the low development in the fœtus of the later evolved spheres of association, the projection areas must of necessity differ considerably in their relative size and distribution in the fœtus and the adult. Further, without going so far as Elliot Smith, who from the point of view of causation closely correlates fissuration and histological differentiation, although these differ very considerably in the adult cerebrum, I certainly regard histological differentiation as one of the causes of fissuration, others being arterial distribution, and probably

also certain mechanical conditions of growth. It is hence not surprising that the projection areas of Flechsig, taking for granted for the moment

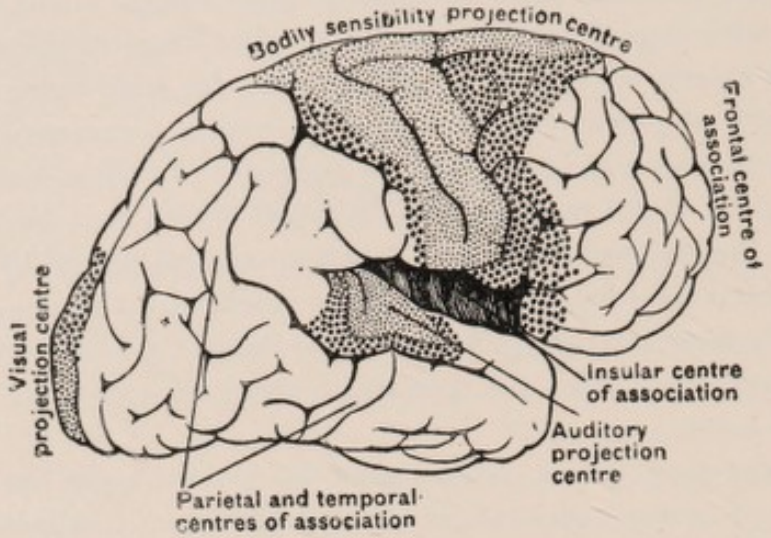


FIG. 1 (AFTER FLECHSIG).

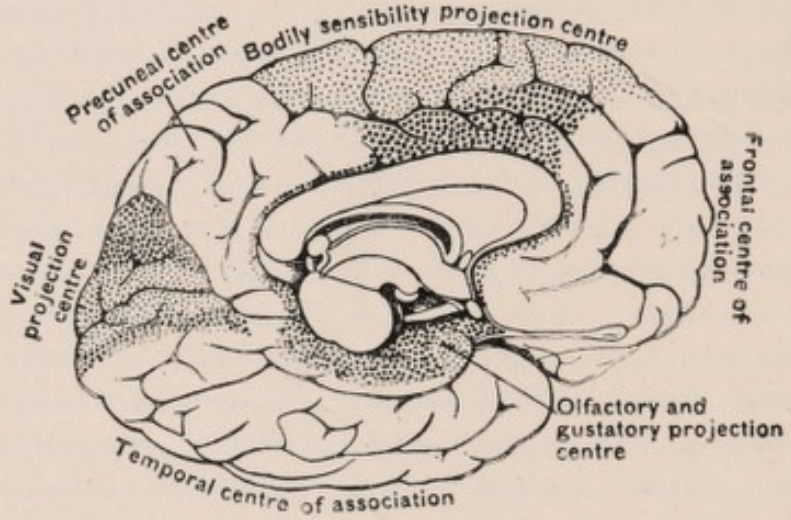


FIG. 2 (AFTER FLECHSIG).

FIG. 1.—OUTER SURFACE OF HEMISPHERE. CENTRES OF PROJECTION AND ASSOCIATION ACCORDING TO FLECHSIG.

FIG. 2.—INNER SURFACE OF HEMISPHERE. CENTRES OF PROJECTION AND ASSOCIATION ACCORDING TO FLECHSIG.

FIGS. 1 and 2.—In these diagrams the "centres of projection" and "centres of association" are mapped out according to Flechsig. The small dots are placed in the chief focus of each centre of projection. Around these chief foci are the regions to which a smaller number of fibres of projection pass; these are indicated by larger dots. These figures, which represent the different cortical spheres, indicated by Flechsig, as the result of his embryological studies, should be compared with Figs. 8–11, and 12 and 13, which illustrate the various areas into which the adult cerebral cortex has been subdivided by Campbell and Brodmann respectively.

their relative correctness in the fœtus, do not bear the same relationship to the main cerebral fissures as do these areas in the adult cerebrum.

Compare the maps of Flechsig (Figs. 1 and 2) with the maps of Camp-

bell and of Brodmann (Figs. 8 to 13). Regarded superficially, the resemblance is remarkable. On descending to detail, it will, however, be noticed that the visuo-sensory area is much larger than in the adult, as is also the bodily sensibility projection centre, which, in the adult, lies entirely behind the fissure of Rolando. Flechsig, however, I may say, expressly states that the majority of the projection fibres pass behind the central fissure. At the period when the experimentally obtained Rolandic area was considered to be both pre- and post-Rolandic, and to be sensori-motor in function, its supposed distribution closely resembled the fœtal bodily sensibility area of Flechsig, and the two were regarded as identical. Now, however, the motor and sensory areas are regarded as separate and as lying on either side of the furrow of Rolando. It is, by the way, necessary to remark in this connection, lest I should appear to disregard a recent article by Horsley, that I intend to refer to this when dealing later with the structure and functions of the psycho-motor area.

It is quite easy to reconcile broadly these apparent differences in the two series of maps, if similarity rather than difference is relied on. I prefer merely to regard the visual projection centre of Flechsig as consisting of a central visuo-sensory area and a surrounding visuo-psychic zone, and, as I shall demonstrate later (pp. 88–89), this is probably a correct interpretation, since the receptive lamina of the latter possesses almost as definite a visual hall-mark as that of the former. A similar interpretation may by analogy be inferred with regard to the " auditory projection centre " of Flechsig.

In the case of the bodily sensibility projection centre of Flechsig, we are confronted by two alternatives. On the one hand it is justifiable to assume that this area may be divisible into four parts, namely, post-Rolandic bodily sensibility and hall-marked associative areas, and pre-Rolandic motor-projection (Betz-cell) and secondary cerebral-associative-motor divisions, the latter two (see pp. 101 and 108) being classifiable under the term psycho-motor as I employ it.

On the other hand, it is permissible to suppose that Flechsig's bodily sensibility projection centre differs markedly in situation in the fœtus and the adult, and that the whole of this, whether subdivisible or not, lies in the adult behind the furrow of Rolando.

The confirmatory diagram of the Vogts would, however, suggest that the former alternative is the correct one, since their researches have not been chiefly confined to the fibre-architecture of the fœtus ; and in the study of myelinisation it is hardly conceivable that efferent and afferent fibres can with certainty be distinguished. Further, in view of the fundamental nature of the pyramidal system, and the very early evolution of the Betz-cells, which, as may be seen in Fig. 6, are well

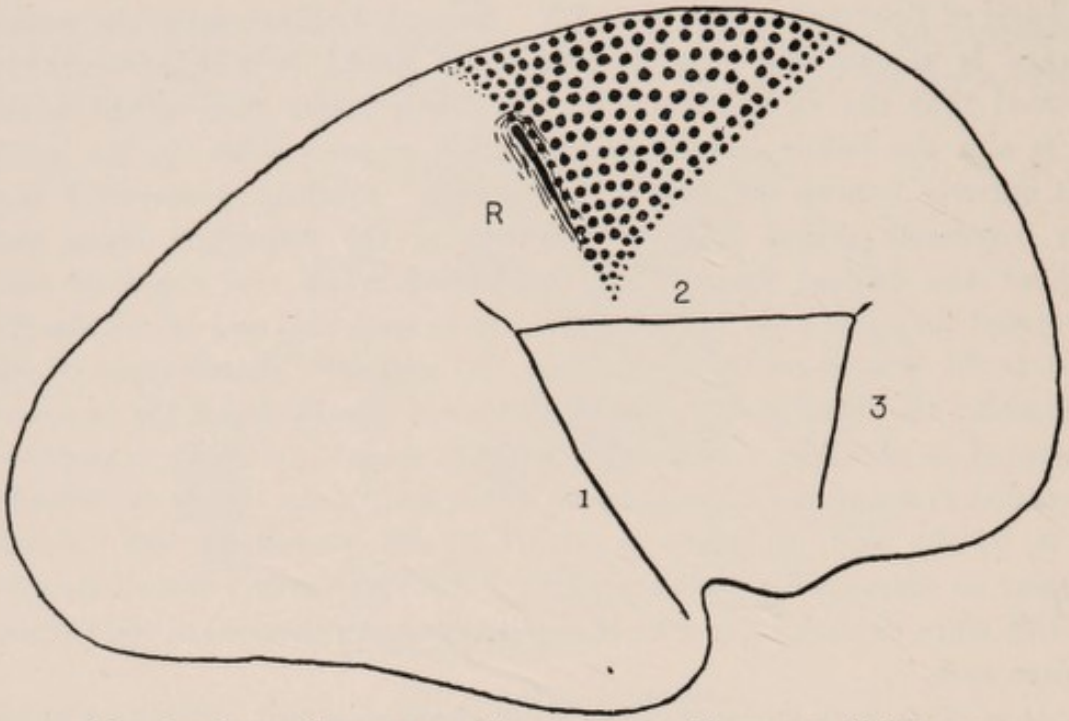


FIG. 3.—OUTER SURFACE OF HEMISPHERE OF FŒTUS OF 18 WEEKS. BETZ-CELL AREA.

Two diameters. Outer surface of right hemisphere. The Betz-cell area is mapped out in dots. The small dots indicate where the area shades into the neighbouring cortex, a sharp line of demarcation existing elsewhere. R., Furrow of Rolando; 1, Temporal operculum; 2, Fronto-parietal (superior frontal and parietal) operculum; 3, (Inferior) frontal operculum.

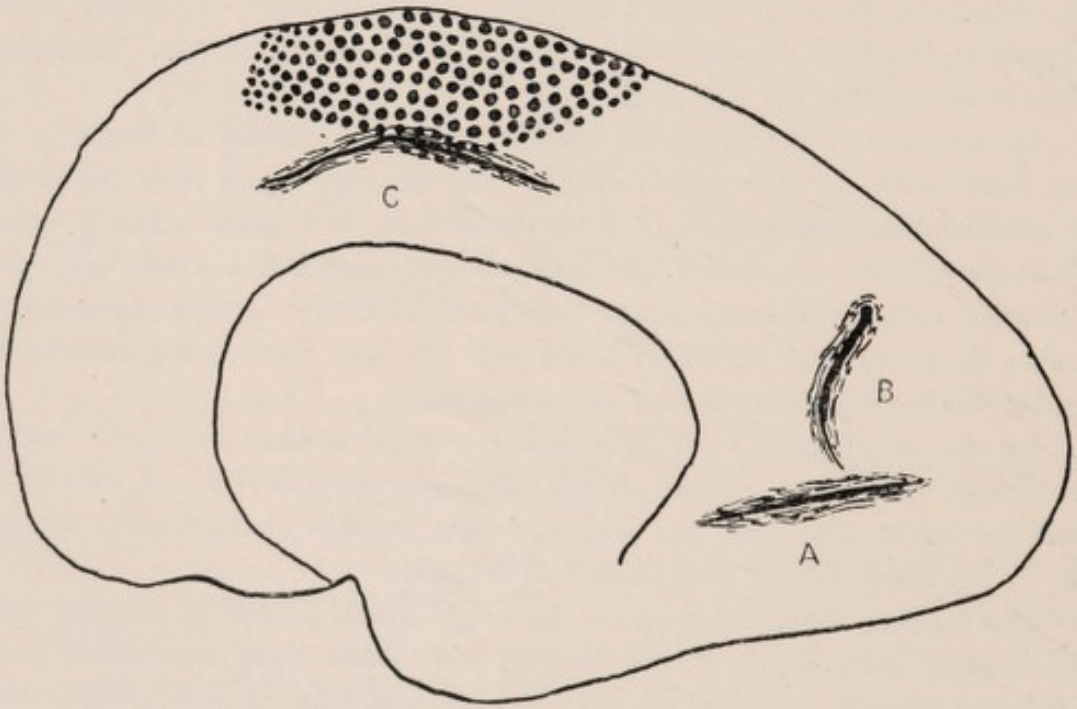


FIG. 4.—INNER SURFACE OF HEMISPHERE OF FŒTUS OF 18 WEEKS. BETZ-CELL AREA.

Two diameters. Inner surface of right hemisphere. The Betz-cell area is mapped out in dots. The small dots indicate where the area shades into the surrounding cortex, a sharp line of demarcation existing elsewhere. A, (Permanent) stem of calcarine fissure; B, Parieto-occipital (temporary) fissure; C, Fissura cinguli.

developed in a fœtus of four and a half months, it is likely that little if any difference in date of myelinisation exists in the cases of the efferent projection tract originating in the Betz-cells and of the afferent projection fibres concerned with bodily sensibility.

This question has recently been settled by the completion of a research conducted by Moyes and myself, in which we have shown that the Betz-cell and visuo-sensory areas in a fœtus of eighteen weeks already occupy, so far as evolution of the fissures has progressed, the exact fissural distribution which exists in the adult. In Figs. 3 and 4 are respectively shown the outer and inner aspects of the right hemisphere

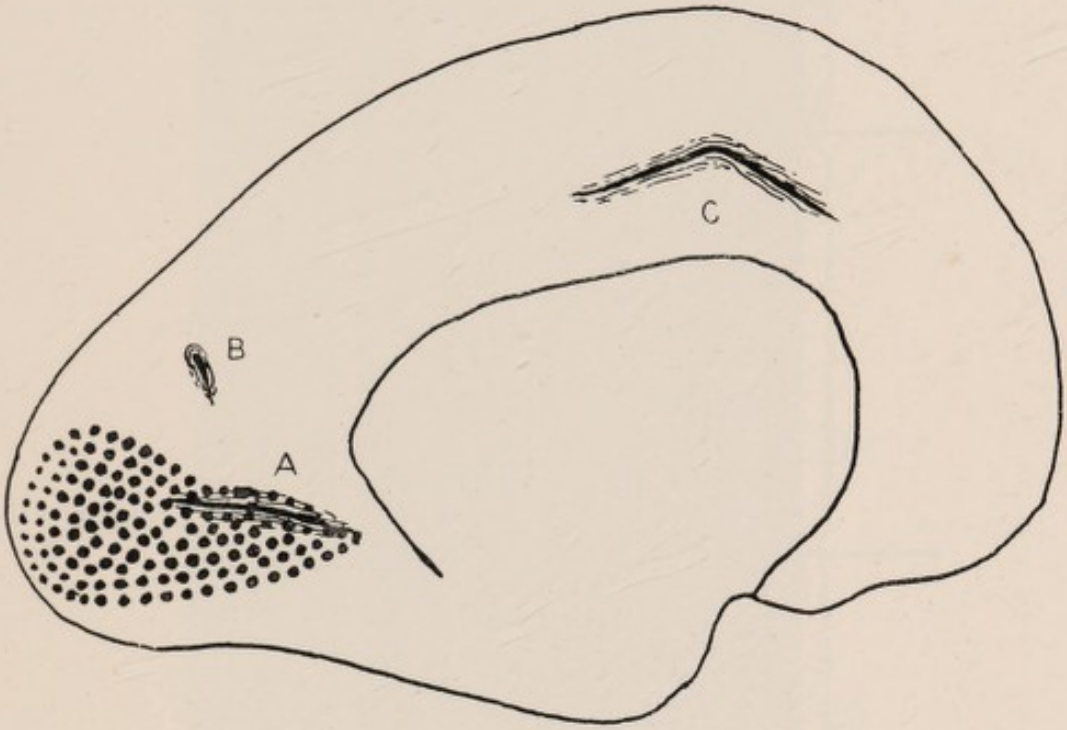


FIG. 5.—INNER SURFACE OF HEMISPHERE OF FŒTUS OF 18 WEEKS. VISUO-SENSORY AREA.

Two diameters. Inner surface of left hemisphere. The visuo-sensory area is mapped out in dots. Posteriorly, as is indicated by the smaller dots, it shades into the surrounding cortex. A, (Permanent) stem of calcarine fissure; B, Parieto-occipital (temporary) fissure; C, Fissura cinguli.

of a fœtus of eighteen weeks, with the Betz-cell area mapped out in dots. Details concerning these illustrations are given in the descriptions, and it is here merely necessary to draw the attention of the reader to the relatively enormous area devoted to the Betz-cells in a fœtus of this early age and to the fact that this area is sharply limited behind by the commencing furrow of Rolando. In Fig. 5 is similarly shown the visuo-sensory area of the left hemisphere of the same case. This area, I may remark, occupies the adult position in relation to the calcarine fissure, and is in a much earlier stage of evolution than is the Betz-cell area. This fact may be functionally associated with the truth that a fœtus

can move its limbs under reflex stimulation from about mid-uterine life, whilst it is unable to use its eyes till after its birth. In Figs. 6 and 7 are respectively shown microphotographs of the precentral (Betz-cell)

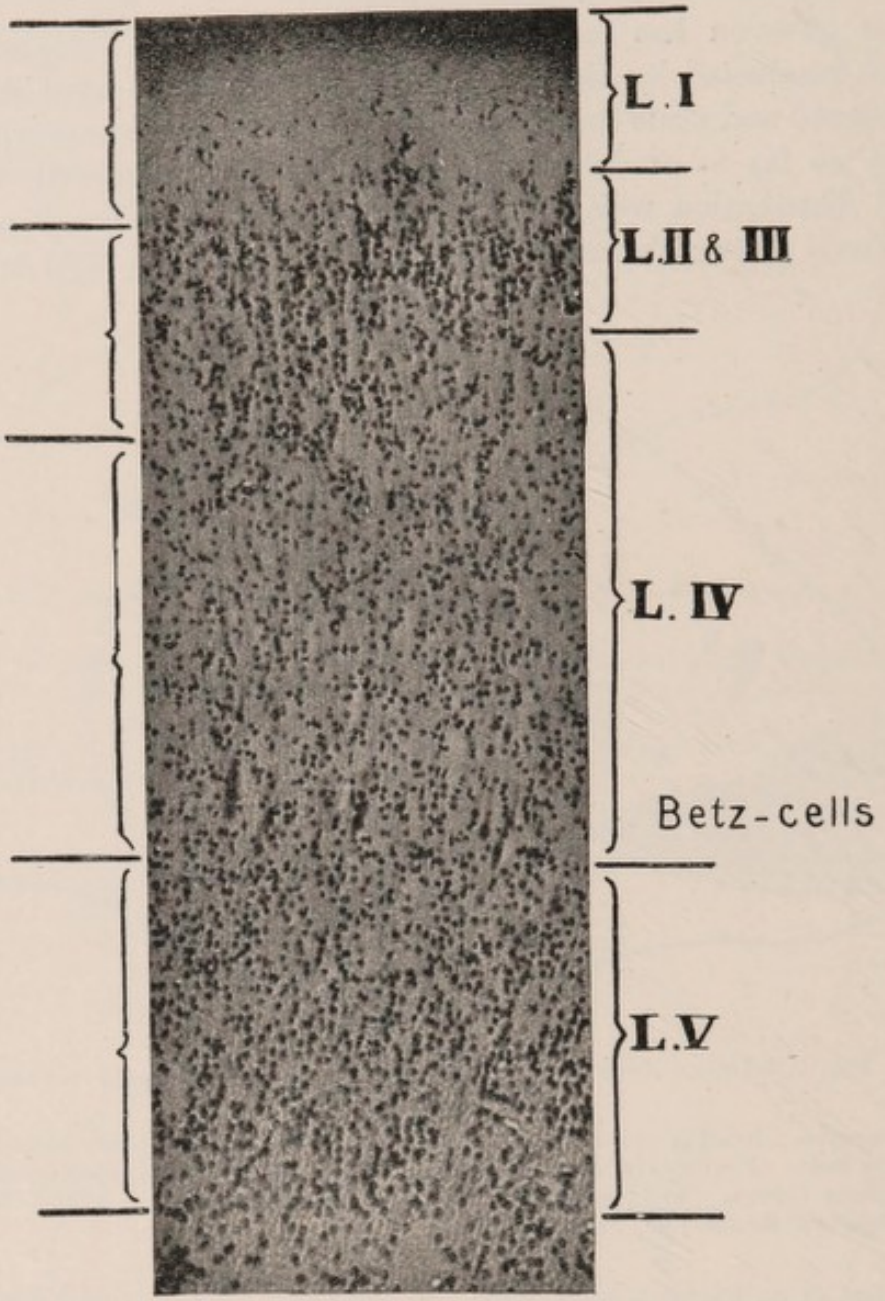


FIG. 6.—FŒTUS OF 18 WEEKS. PRECENTRAL CORTEX SHOWING BETZ-CELLS.

One hundred and thirty-three diameters. The precentral cortex. L. I, the outer fibre-lamina; L. II, and L. III, the outer cell- or pyramidal lamina, and the middle cell- or granule-lamina; L. IV, the inner fibre-lamina, which contains a layer of Betz-cells in its lower part; L. V, the inner cell- or polymorphic lamina.

and the post-central cortices of this case. These already present the characteristic features of the adult cortices in these situations. The former, for instance, shows Betz-cells at the bottom of a wide fourth lamina, and the latter a very wide and well-marked third or granule

lamina. In accordance with the early evolution of these cortices, both show an extremely narrow second or pyramidal laina (see Chap IV.).

Returning now to the question of general adult topography, I have,

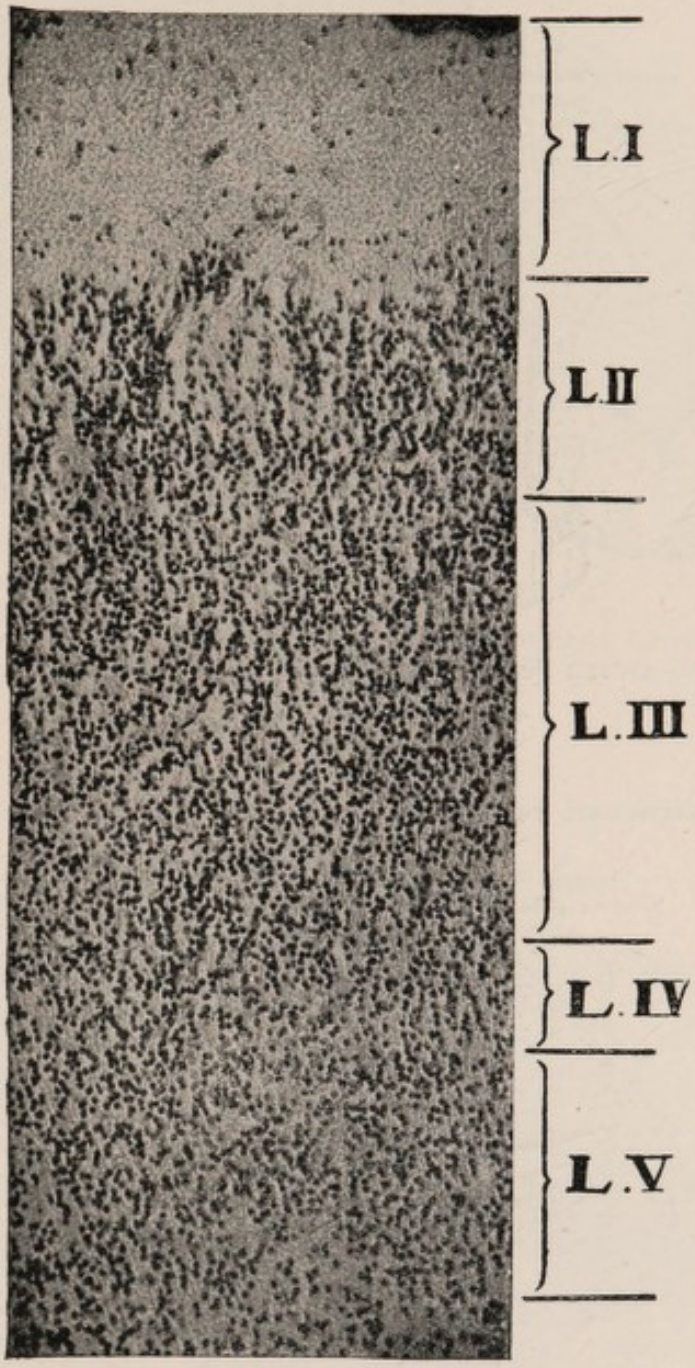


FIG. 7.—FŒTUS OF 18 WEEKS. POST-CENTRAL CORTEX.

One hundred and thirty-three diameters. The post-central cortex. L. I, the outer fibre-lamina; L. II, the outer cell- or pyramidal lamina; L. III, the middle cell- or granule-lamina; L. IV, the inner fibre-lamina; L. V, the inner cell- or polymorphic lamina.

in Figs. 8 to 13, arranged for comparison two sets of maps by Campbell, published in the years 1904 and 1905, and the maps of Brodmann.

In view of the great difficulties involved in the cutting up, blocking,

sectioning, orientating, and reproducing in diagram form the cortex of entire human hemispheres, considerable differences might well be expected in maps prepared by two totally independent investigators. It is, however, difficult to understand the well-marked differences which exist in the case of the two pairs of diagrams of Campbell, one of which is contained in a preliminary communication, and the other, very shortly afterwards, in his monograph, since the fissuration of the two is identical.

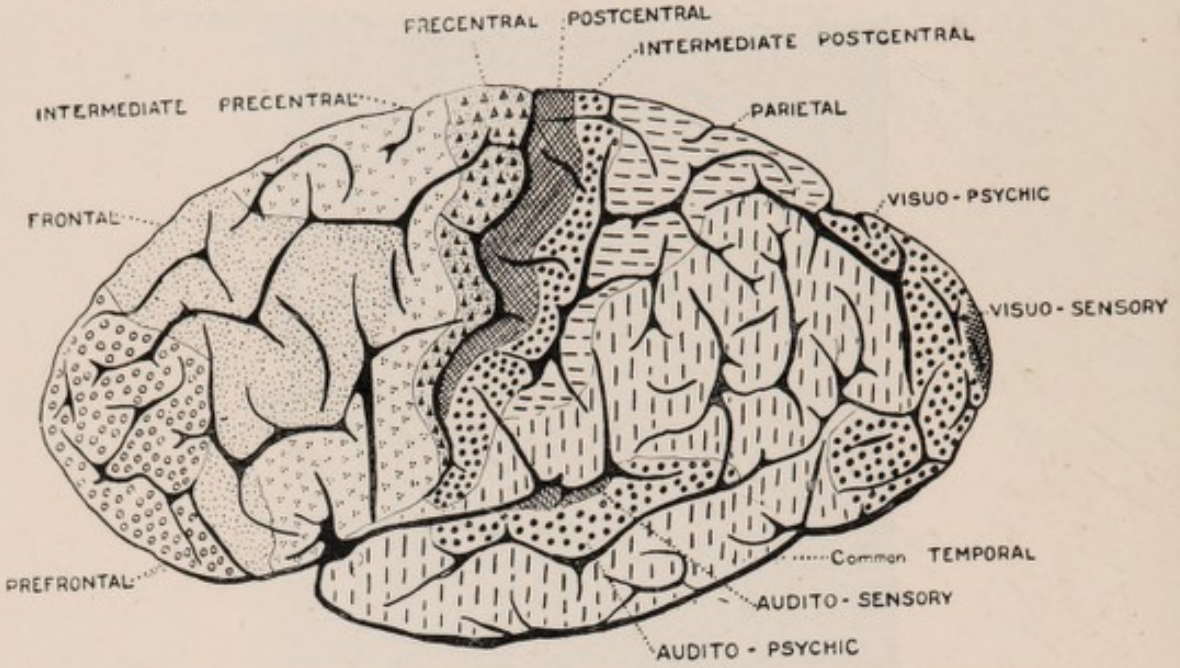


FIG. 8.—OUTER SURFACE OF HEMISPHERE. CORTICAL LOCALISATION. (Campbell, 1904.)

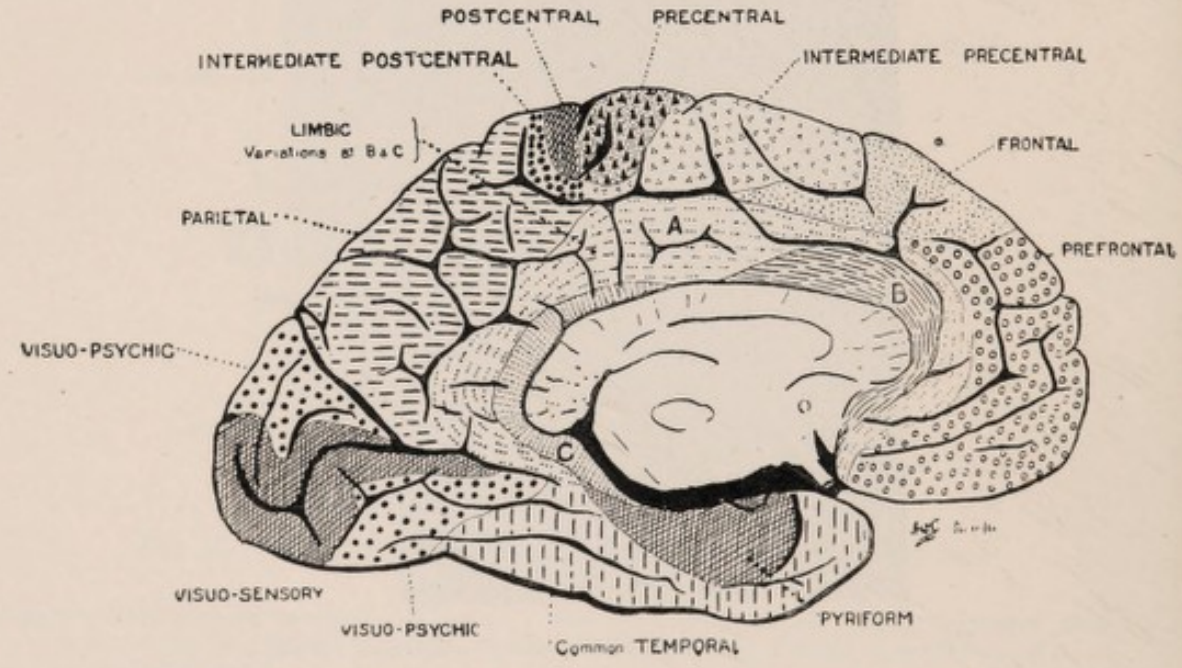


FIG. 9.—INNER SURFACE OF HEMISPHERE. CORTICAL LOCALISATION. (Campbell, 1904.)

In the case of the prefrontal, the frontal, the parietal, and the visuo-

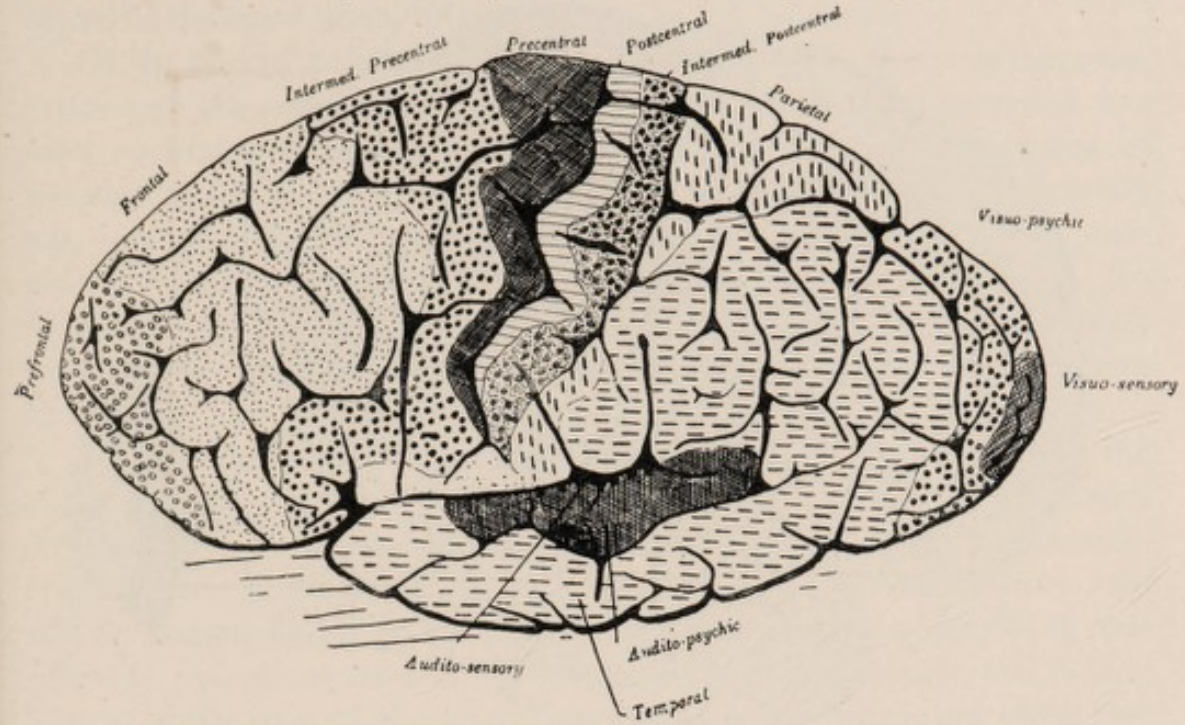


FIG. 10.—OUTER SURFACE OF HEMISPHERE. CORTICAL LOCALISATION.
(Campbell, 1905.)

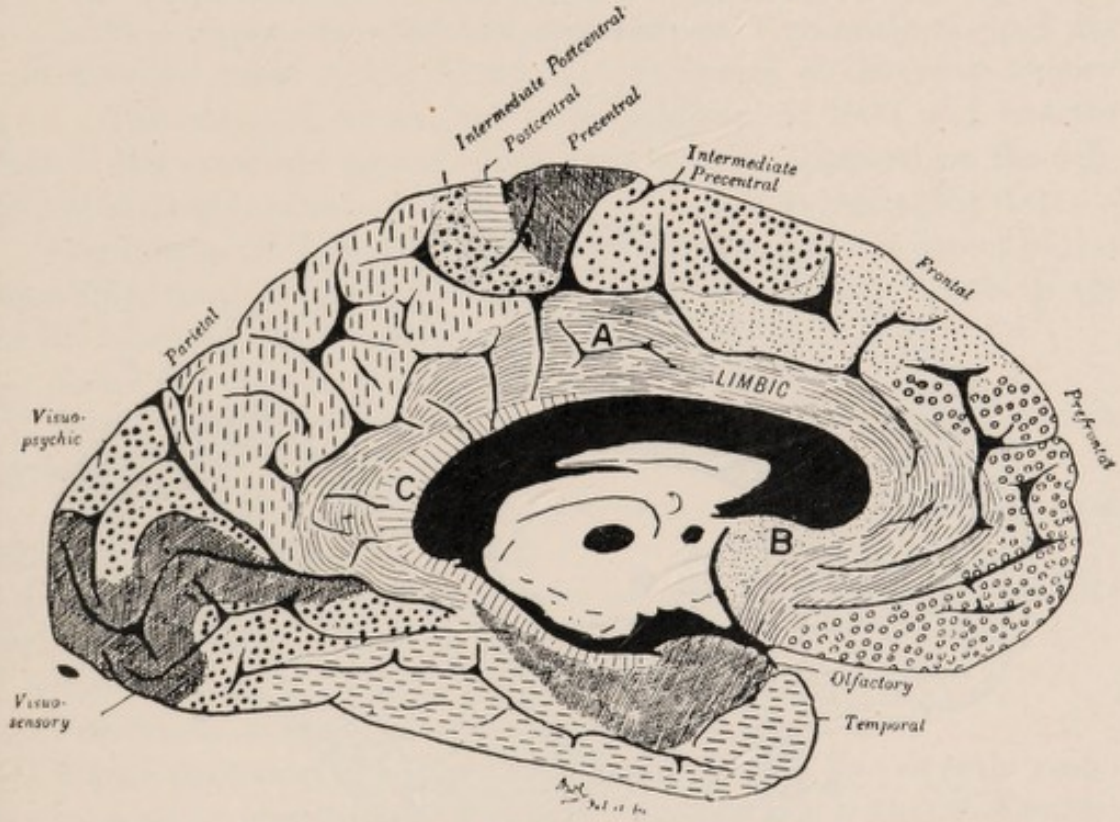


FIG. 11.—INNER SURFACE OF HEMISPHERE. CORTICAL LOCALISATION.
(Campbell, 1905.)

psychic regions, the differences in distribution are very considerable, in view of the fact that, in the case of a particular brain, either the lines

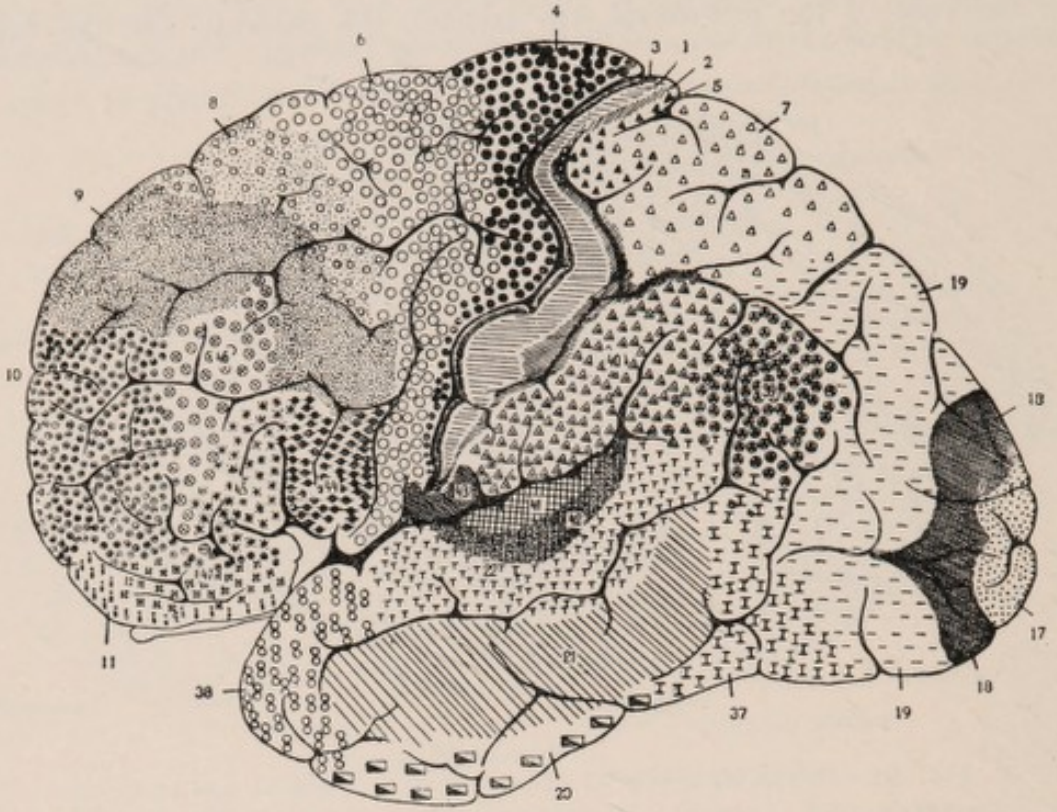


FIG. 12.—OUTER SURFACE OF HEMISPHERE. CORTICAL LOCALISATION.
(Brodmann, 1902–7.)

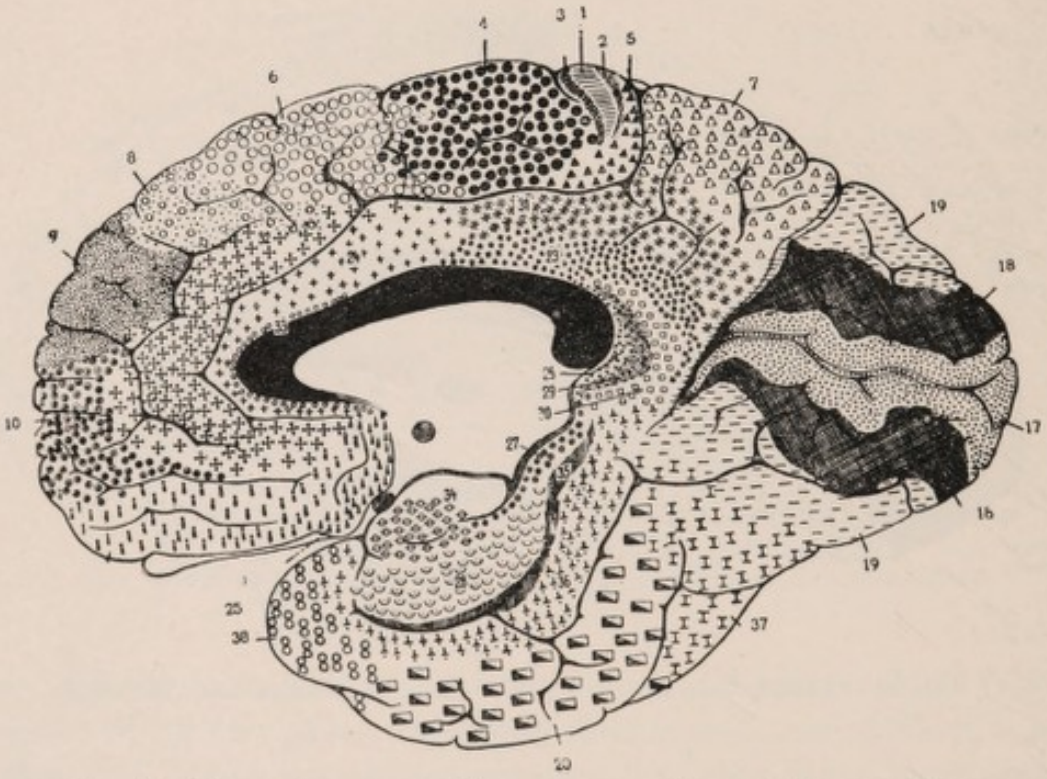


FIG. 13.—INNER SURFACE OF HEMISPHERE. CORTICAL LOCALISATION.
(Brodmann, 1902–7.)

of demarcation should be very exact, say, within a millimetre in different copies of the same brain, or they should be left indefinite.

On the face of it the maps of Campbell appear to be the more diagrammatic and the less accurate of the two sets; and this impression has been confirmed from my personal acquaintance with many regions of the cortex, particularly the frontal lobe and the visual areas. I would also refer to a paper by Gordon Holmes, on the histology of the post-central gyrus, in which the findings of Brodmann are confirmed. To Campbell, however, attaches the credit of being the first author to publish maps of the complete topography of the cortex of the adult human cerebrum.

I am, nevertheless, of the opinion, without disputing in any way the entire accuracy of these particular maps of Brodmann, that the exact differentiation of the greater portion of the grey mantle into such relatively precise areas as are the Betz-cell area and the visuo-sensory area will be attended with great difficulty owing to the probability that considerable differences exist in the case of different individuals, and especially so in the case of the poorly developed brains which are often met with in asylum practice.

As an illustration of my meaning, I have put together a diagram of six occipital regions in which, many years ago, I precisely mapped out and obtained proof of the functional significance of the visuo-sensory area. This research, by the way, was published in 1900, and was the first of the numerous papers which have recently appeared on the subject of cortical localisation by modern histological methods (Fig. 14).

It will be noticed that both the shape and the apparent extent of this area differ considerably in the several cases, even when difference of age or the existence, in some, of long-standing blindness is allowed for.

Case 1 is a normal male aged 55 years.

Case 2, a female aged 17 years, is an example of chronic insanity with epilepsy.

Case 3, a female aged 27 years, is an example of chronic insanity with blindness from infancy.

Case 4, a male aged 30 years, is an example of chronic insanity with long-standing blindness.

Case 5 is a normal infant, aged 3 months; and

Case 6 is an example of anophthalmos, aged 1 month.

If such individual differences exist in a projection area of early evolution and stable organisation, it is, to say the least, likely that still greater individual differences exist in the later evolved and later specialised regions of the cortex.

As another illustration, this time of probable individual variation only, I will refer in a few words to the recent researches of Marie con-

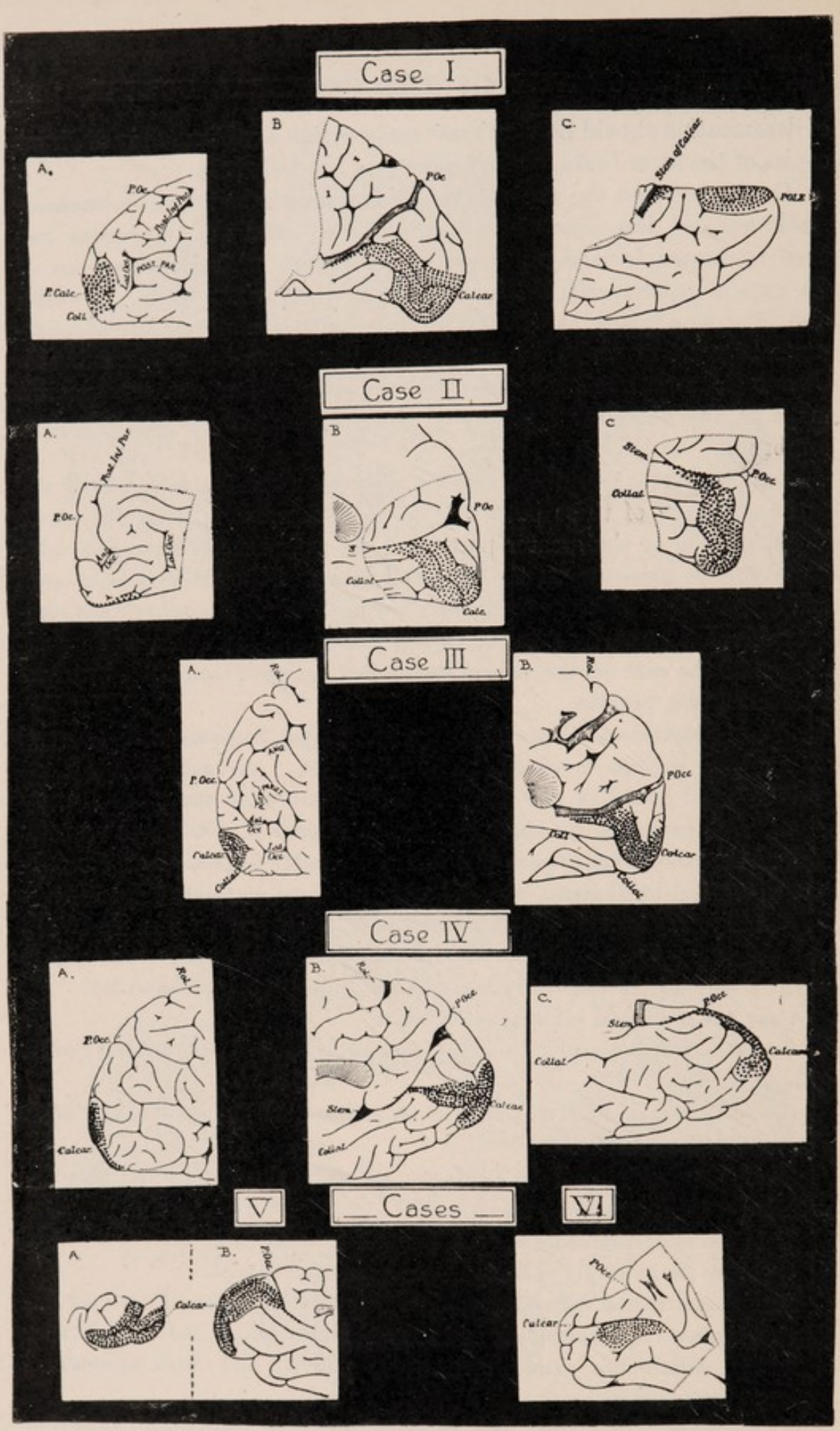


FIG. 14.—VARIATIONS IN THE DISTRIBUTION AND EXTENT OF THE VISUO-SENSORY AREA IN DIFFERENT BRAINS.

The Figure illustrates variations in the distribution and the extent of the visuo-sensory area in different brains. Case I, Normal male, aged 55 years. Case II, Female, aged 17 years, chronic insanity with epilepsy. Case III, Female, aged 27 years, chronic insanity with blindness from infancy. Case IV, Male, aged 30 years, chronic insanity with long-standing blindness. Case V, Normal infant, aged 3 months. Case VI, Anophthalmos, aged 1 month. A, outer surface of hemisphere; B, inner surface. C. under surface.

cerning aphasia and the functions of the area of Broca. It may be accepted, as I have elsewhere remarked, that the thesis of this author, with regard to the intellectual impairment exhibited by all aphasics, is true, at any rate if such cases be studied by methods familiar to the alienist. It is not, however, probable that motor aphasia is invariably the result of anarthria + sensory aphasia, although, on the other hand, it is doubtless true that anarthria + sensory aphasia necessarily give rise to the symptomatology of classical motor aphasia. It is certain that in the case of many persons Broca's speech centre is rightly disrated by Marie, whereas it is extremely probable that in others Broca's area is part of the educated psychomotor area, in which case its permanent loss would result in temporary motor aphasia with temporary interference with voluntary thought. Such variability with regard to the individual distribution of the special part of the psychomotor area which subserves the evolution of speech is, in my opinion, the only possible explanation of the widely divergent views which are held by equally competent observers.

Before concluding this reference to the histological differentiation of the cortex, I wish to mention quite briefly another question of importance. I have indicated the probability, if not certainty, that individual variations occur in the actual extent occupied by the several histologically differentiated areas which have been described. Whilst histological differentiation probably indicates the limits of possible educability, it does not, however, necessitate the existence of functional activity.

A very obvious illustration of this truth may be seen in the motor exhibitions evolved by the psychomotor area, which constitute the sole objective indications of cerebral activity. Whether we consider the infinite variety of skilled movements, the numerous highly complex written and spoken languages, or the wonderful gamut of expression and gesture of which the intelligent human subject is capable, we see in each case gross individual differences in educability. Histological differentiation probably supplies the key with regard to individual potentialities, but it is doubtful whether any single individual of the race has ever even approached the limits of his potential education.

As a further illustration may be mentioned the remarkable manner in which such serious disabilities as congenital or early deprivation of the senses of hearing or sight may be compensated by education.

A person suffering from congenital or early loss of hearing is necessarily dumb; and, unless he live in association with other individuals suffering from the same disability, or be educated by special means, his mental functions differ little from those of the anthropoid apes. In such persons, under either of these conditions, the auditory disability is compensated for by shrewdness of vision, and the speech disability by the

evolution of descriptive mimicry to a high standard. The deaf and dumb think by mimicry just as voluntary thought in normal persons occurs by the preliminary activity of the articulatory part of the psychomotor area, which is important evidence, if such be needed, in favour of the truth of the latter thesis. A normal individual may " think to himself " by means of invisible laryngeal and respiratory movements. A deaf-and-dumb person does not possess the same involuntary ability to hide the results of psychomotor activity during voluntary thought. Further, if such be taught lip-language, they readily learn to communicate with normal persons inexperienced in the special mimicry of the deaf and dumb.

On the other hand, the congenitally or early blind acquire language just as do ordinary non-reading and non-writing individuals, and, in the absence of special education, exhibit little or no defect of the mental functions. In such persons, however, loss of sight is usually compensated by marked hyper-activity of the sense of touch ; and by means of special type the blind are able to acquire education which is often little, if at all, inferior to that of many normal individuals.

CHAPTER III

THE GENERAL HISTOLOGY OF THE CORTEX

THE method which I am about to describe, and which I have employed for many years, is that of micrometric measurement of the primary cell- and fibre-laminæ of the cortex. Neither in detail nor in results is it in any way comparable with the macro- and micrometric mensuration of grey matter which has been performed by several workers for many years, and it is therefore not necessary to refer further to this.

For reasons which I shall indicate later, I am accustomed to subdivide the cortex, for the purposes of measurement, into the five primary laminæ from which it has been evolved—namely, (1) the *outer fibre-lamina* or superficial layer; (2) the *outer cell-lamina* or pyramidal layer; (3) the *middle cell-lamina* or granule-layer; (4) the *inner fibre-lamina* or inner line of Baillargar, which in certain regions contains such bodies as the Betz-cells and the solitary cells of Meynert; and (5) the *inner cell-lamina* or polymorphic layer. These five laminæ may more or less readily be identified in all parts of the neopallium, though they differ in their degree of development in different cortical areas. For example, in the psychomotor area, the third lamina is of minimal depth and can only be detected by careful examination. On the other hand, in the visuo-sensory area, the third lamina is of great depth, the granule-layer being duplicated by the interposition in its midst of the fibre-layer of Gennari, in which terminate the fibres of the optic radiations.

For the micrometric examination of the cortex it is, however, not sufficient merely to determine the laminæ which it is proposed to measure. Granted that accurately vertical sections are obtained, it is further necessary to define the exact regions of the convolutions which are capable of measurement. In theory the flat external surface of the convolutions is the ideal region, and in certain fœtal brains it is the only one which is available. In practice, however, its sole employment is impossible, if only for the sufficient reasons that a trustworthy number of situations is rarely available, and that its degree of development varies greatly, being very different over broad and narrow convolutions. I consequently employ four regions of the convolutions, and from these prepare a general average measurement. These regions are the *flat surfaces* or external parts between fissure lips, the *apices* or fissure lips,

the *bottoms* of fissures, and the *sides* of fissures at some point between the apices or fissure lips and the bottoms of the fissures.

These regions are shown in the diagram (Fig. 15).

It is perhaps hardly necessary to remark that in any given section, though it be cut ever so truly, many obliquities exist, and only a certain number of regions can be selected. In fact, it is by no means easy to obtain the necessary number of regions for measurement, and it sometimes happens that cases of promise have to be rejected, even after all the sections have been cut and stained.

The four well-defined regions to which I have referred are alone capable of accurate micrometric measurement, and, for reasons which I shall now give, it is possible, after a sufficient number of measurements from these have been averaged, to obtain a trustworthy general average measurement from the four, which can be employed for the comparison of case with case.

Taking the four regions in turn, in the case of the *flat surface*, the fourth and fifth laminæ, and usually the third, are above the general average measurements, in some broad flat surfaces slightly, and in some narrow ones markedly. In the case of the *sides* of fissures, laminæ four and five are, as a rule, below the general average measurements, and considerable variation as regards total depth occurs in this region. As, however, many side measurements are, as a rule, available, it is relatively easy to obtain a trustworthy average. Flat surfaces and sides thus, in a measure, when taken together neutralise the defects inherent to each. In the case of the *apices*, the first two laminæ are, as a rule, slightly below the general average measurements, whereas lamina three is usually slightly above, lamina four is markedly above, and lamina five is considerably above the general average measurements. Lastly, in the case of the *bottoms* of fissures, lamina one is considerably above the general average measurement, and lamina two is slightly below, lamina three is moderately below, lamina four is very much below, and lamina five is greatly below the general average measurements. Apices and bottoms, when taken together, thus to a great extent neutralise the defects inherent to each ; and it is probable that, when a general average measurement is made from all four regions, a result is obtained which differs little from the measurements that would be obtained were the whole cortex a smooth, flat surface without fissures. Such a general average measurement as I have described I believe to be entirely satisfactory for the comparison of different cases with one another.

In the diagram are illustrated the general average measurements of a normal case, and of an infant aged three months, and also the average measurements of the sides, apices, bottoms, and flat surfaces of each of these cases.

REGIONS OF CORTEX CHOSEN FOR MICROMETRIC MEASUREMENT

'A' · APEX, 'B' · BOTTOM, 'F' · FLAT 'S' · SIDE

MEASUREMENTS OF VISUO-PSYCHIC CORTEX OF NORMAL ADULT

REGIONS OF CONVOLUTIONS	I	II	III	IV	V
SIDE AVERAGE OF 56	·265	·909	·200	·177	·243
APEX AVERAGE OF 55	·232	·863	·218	·189	·410
BOTTOM AVERAGE OF 12	·345	·757	·163	·067	·166
FLAT AVERAGE OF 19	·255	·948	·221	·282	·554
GENERAL AVERAGE IN MM 160	·274	·864	·200	·229	·293

DITTO OF INFANT, AGED 3 MONTHS.

REGIONS OF CONVOLUTIONS	I	II	III	IV	V
SIDE AVERAGE OF 18	·229	·721	·193	·178	·214
APEX AVERAGE OF 16	·178	·700	·204	·168	·297
BOTTOM AVERAGE OF 6	·327	·496	·148	·069	·150
FLAT AVERAGE OF 3	·236	·786	·221	·231	·236
GENERAL AVERAGE IN MM 1345	·242	·676	·191	·212	·224

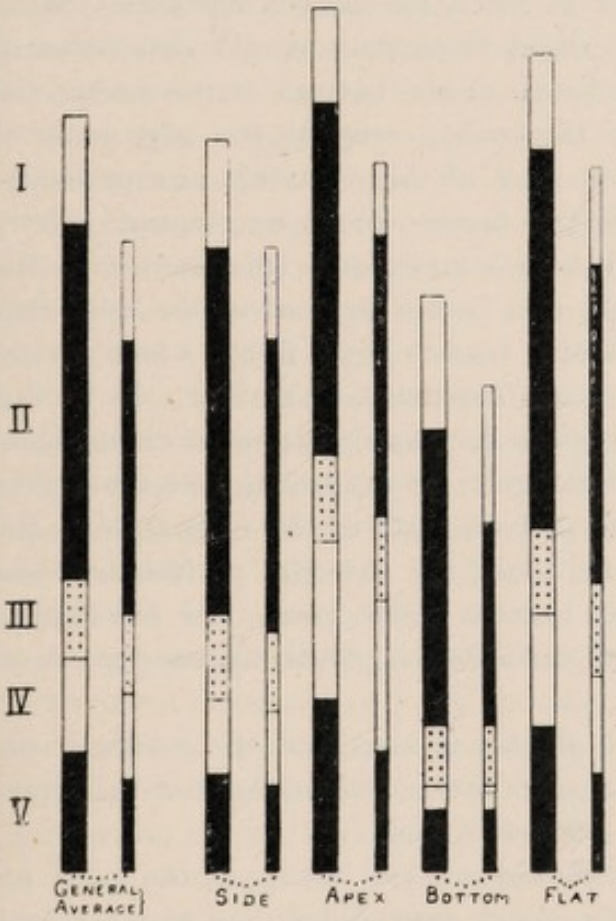


FIG. 15.—METHOD OF MICROMETRIC MEASUREMENT WITH ILLUSTRATION.

The Figure illustrates the method of micrometric measurement. In the upper portion of the figure are shown the four regions of the convolutions, which alone are capable of satisfactory measurement. In the middle part the results of the micrometric measurement of the visuo-psychic cortex of the normal adult and of an infant aged three months are given. In the lower portion the different cortical laminæ are shown graphically. These from above downwards are (1) the outer fibre- or superficial lamina; (2) the outer cell- or pyramidal lamina; (3) the middle cell- or granule-lamina; (4) the inner fibre-lamina or inner line of Baillarger; and (5) the inner cell- or polymorphic lamina. On the left-hand side are shown the general average measurements obtained from a normal adult and an infant aged three months respectively; and on the right-hand side the average "side," "apex," "bottom," and "flat" measurements from which these general average measurements are produced.

I would remark here that these differences in the depths of the several laminæ in the four regions are susceptible of a mechanical or structural explanation, which serves as a further justification for the employment of the four for the production of a general average measurement, since different cases, and also different cortical areas, vary in the degrees to which such variations occur.

As has been remarked, at the apices the outer two laminæ are decreased, the third is slightly increased, the fourth is more than doubled, and the fifth is much increased. In the case of the flat surfaces a similar increase occurs in the lower three laminæ. At the bottom of the fissures, on the other hand, whilst the first lamina is increased, all the others, especially the fourth, are decreased; and in the case of the sides the fourth and fifth laminæ are somewhat decreased.

It is probable that these variations are due to the folding of the grey matter, for at the apices the convex outer surface would from this cause be relatively more extended and the laminæ consequently be thinned, whilst, on the contrary, the inner layers would be much crowded and increased in depth, this condition being intensified by the radiating manner in which the cortico-petal and the cortico-fugal fibres would necessarily have to pass in order to reach the convex surface. Owing to this radiation of fibres, some slight thickening should also occur in the third lamina. On the other hand, at the bottom of the fissure the first lamina would necessarily be thickened, owing to the large mass of fibres it would have to contain in spite of the relatively abrupt bend; and for the same reason the deeper layers would be thinned, partly because they occupy a relatively large convex area compared with the abrupt bend of the outer laminæ, and partly because of the relatively smaller number of cortico-petal and cortico-fugal fibres which would require to pass through their convex extension of surface. If to this be added that the surface convexity is necessarily larger in extent than the sharp bend at the bottom of the sulci, owing to the fact that fibres have to pass to and from all the surface parts of the cortex along the centre of the gyrus, and that the larger the external portion becomes the more acute is the bend at the bottom of the fissure, the mechanical or structural explanation of local variations in depth appears to be an entirely satisfactory one.

In individual cases gyri vary greatly in size, and the bends at the bottoms of fissures vary greatly in acuteness. Hence, regional variations differ in degree according to the particular case.

Lastly, from the aspect of different cortical areas, in the case, for example, of the visuo-sensory area many more fibres pass to the cortex than in the case of the visuo-psychic region, and in conformity with this fact the thinning of the layers at the bottoms of the fissures of the former

(though actually less in degree) is relatively much more definite than is the alteration in depth of the various laminæ of the apices and flat surfaces; in other words, the gyri are more rounded, the layers are less moulded by position, and at the same time the bends at the bottoms of the fissures are relatively more abrupt.

For these various reasons I think it must be ceded that a general average measurement obtained from average measurements of the four regions I have defined is entirely trustworthy for the comparison of cases with one another.

The micrometric measurements are made by means of a Zeiss A objective and a No. 2 eyepiece with a tube of 160 mm. They are then reduced to micro-millimetres by the constant (14·73) of this particular combination. As the constant varies somewhat in the case of different lenses of the same manufacture, I have throughout my work rendered the results strictly comparative by the employment of a microscope and lenses for the special purpose of micrometric measurement.

It may be added that the individual measurements are prepared from sites previously determined during study of the sections. Further, each of these measurements represents not merely the results obtained from one spot on the chosen site, but an average estimate made from the examination of several adjacent points. In some sites such an estimate is easy to obtain as the laminæ are of very regular depth. In others, however, the irregularity in depth is such that a single measurement requires a considerable time for its performance.

The measurements of cases which later in the volume I purpose to present in diagrammatic form have all been prepared in this manner. As the conclusions which I draw from them depend entirely on the accuracy of the method which I have adopted, I have thought it necessary to deal with this method in considerable detail.

A word is here necessary with regard to the method of preparation of the tissue employed. All the hemispheres have been hardened in 5-per cent. commercial formalin; and the sections, though prepared and stained by different methods, have all been mounted in canada balsam. I was at one time of the opinion that different methods of sectioning and different methods of staining might result in quite different micrometric results; and my various series of cases were kept quite distinct from one another—*e.g.* cases cut by freezing or in paraffin, or stained by modified Nissl or ammonia-iron-alum-hæmatoxylin, &c. Comparison of the various micrometric results obtained from the same or different cases, cut and stained by the same or different methods, has, however, satisfied me that the question of method is of no importance, granted that the tissues are *hardened* and *mounted* in the same manner. The original hardening reagent appears to determine once for all the

bulk of the hardened tissue, and any modifications which occur later, in consequence of the reasonable employment of reagents of different specific gravities, become readjusted when the tissue has been finally mounted in canada balsam.

The special regions of the human cortex cerebri which I have hitherto dealt with by this method are the visuo-sensory, the visuo-psychic, and the prefrontal, as the most satisfactory examples available of projection, hall-marked or special associational, and higher associational cortex. The reasons for this selection will appear later.

I have, in all, measured fifty-four regions in thirty-eight hemispheres, which were obtained from thirty-seven cases of various types, including three fœtuses, two stillborns, three infants, four normal cases, and twenty-five examples of various types of mental disease, grading from the idiot with very deficient cerebral evolution, through imbeciles, recent chronic and recurrent non-demented lunatics, and partially demented lunatics, to the gross dement with great cerebral dissolution.

Of the fifty-four regions measured, fifteen are visuo-sensory, fifteen are visuo-psychic, and twenty-four are prefrontal.

The visuo-sensory and visuo-psychic results are from the same cases, and in theory it would appear desirable that all the regions should have been examined in every case. In practice, however, this has been impossible, owing to the laborious nature of the work and the length of time it has been in progress, but especially from the fact that the research gradually evolved itself in the absence of *a priori* considerations. It has also been found to be unnecessary, on the one hand because the differences in measurement are well marked and definite, and on the other because the results of prefrontal measurement are of a different type from those obtained from the visuo-sensory and visuo-psychic regions. I may add that it has, in consequence, been possible up to the present to measure a much larger series of cases than would otherwise have been available. I have, however, specially selected a suitable, well-marked case, and measured all the three regions, in order to obviate such a possible criticism, and to prove the points to which I have just referred.

Whilst the method of measurement which I have described is the basis of my study of the development and cyto-architecture of the cortex, it is not the only one which I have employed. The study of cell-lamination is, I believe, of prime importance ; for, as I shall demonstrate later, it is on this basis that the fibre-architecture is erected during the development of the cortex. In other words, the special fibre-architecture depends on the size, number, and position of the nerve-cells, the fibres largely lying where there is room for them, and not in special regions which are independent of the original cyto-architecture.

Though numerous methods of fibre-staining are in common use, particularly the Volters-Kulschitzky modification of the Weigert-Pal method, the results are in my experience unsatisfactory when such methods are applied to the cortex cerebri. Campbell, in fact, regards the prefrontal cortex as presenting "an extreme of fibre poverty," whereas Turner and myself have independently shown that this region exhibits a great wealth of intercellular fibrils.

I shall refer in its appropriate place to this question, in the meantime concluding this chapter with a general description of the special method of staining the nerve-fibrils of the cortex which I am accustomed to employ.

This method is based on the results of a research which I conducted many years ago into the chemistry of the Weigert-Pal method.

I found that this process is not a specific method for the staining of medullated nerve fibres with hæmatoxylin, but is a method of dyeing fibrils which comprises three distinct operations—the mordanting of the fibrils, the formation of a lake in them by the employment of a basic dye, and, finally, the removal of the stain by oxidation from nearly every other part of the complex tissue under treatment. I compared the method with what would occur were a fabric, composed of different fibres interspersed with fine glass threads, stained by a commercial process. The glass threads would refuse the mordant and consequently the lake, whereas the fibres would retain the stain. In the case of human tissue, the more highly metabolic elements represent the fibres, and the more fixed and lowly metabolic elements the glass threads. Further, the process is applicable to any, and not solely to nervous, tissue—*e.g.* kidney, involuntary muscle, &c., form beautiful low-power specimens.

Of the various lakes which I employed, some were of practical use and others, owing to their faint colour, were of more purely theoretical value. Some stain the axone deeply and the medullary sheath more or less deeply, whilst others stain the axone alone, the myelin being quite unstained.

For example, iron alum resembles osmium in causing a deep staining of the medullary sheath, which normally completely hides the axis cylinder, though in both these cases, with care, the latter can usually be detected in at least a few cases. Tin chloride stains the axone a violet colour, and the medullary sheath a pale pink. Ammonium molybdate stains the axone a deep slate-blue colour, and the medullary sheath a pale blue. Uranium acetate, potash alum, and doubly mordanted methylene blue resemble sodium tungstate in leaving the medullary sheath practically unstained, whilst they stain the axone respectively a deep purple, a red and a blue colour.

The tissue is fixed in 5 per cent. commercial formalin. The sections

are mordanted for twenty-four hours with or without the incubator in a 2 per cent. solution of the metallic salt, and then stained for twenty-four hours with or without the incubator in a bath of Kulschitzky's logwood. Incubation usually gives the best results. They are afterwards differentiated by the Pal method, solutions of from one quarter to full strength being used according as these best suit the particular cases. Differentiation is most satisfactorily performed by frequently alternating the baths.

The result obtained from all the series was the same, namely, that the mordanting of the tissue is the most important part of the process, and that osmic acid, iron alum and ammonium molybdate (used separately or consecutively) are the strongest mordants.

The Osmic Acid Method.—For ordinary relatively coarse nervous tissue, *e.g.* in the greater part of the human nervous system, the osmic acid method is invaluable, owing to the very rapid action of the osmic acid on the medullary sheath, and also to the jet-black character of the lake which is formed. With sections containing very fine fibrils, however, especially if they are short and form complex meshworks, as in the minnow, and particularly when they are non-medullated, it gives inferior results to those obtained by the use of iron alum or ammonium molybdate. In cross sections the axis-cylinders can readily be detected inside the dark rings formed by the sheaths. The use of a chrome compound for hardening is quite unnecessary.

The Iron Alum Method.—Iron alum is in my hands, in many respects, a most satisfactory mordant. The lake formed is relatively insoluble. The axis-cylinders and medullary sheaths, if present, are deeply stained, and particularly if, as in the brains of small fishes, the fibrils are very minute, it gives excellent results. More frequently, however, than in the case of the other methods, owing to the relatively insoluble nature of the lake, nodes exist in the fibrillar meshwork, and it is not unusual to find the nerve cells beautifully stained. The sections prepared by this method require careful washing between the iron alum and the logwood baths. The iron alum solution should also be freshly prepared, and should not be used a second time.

The Ammonium Molybdate Method.—Ammonium molybdate for most general purposes is a very satisfactory mordant. The colour is very agreeable; and, with a yellow screen, the sections photograph readily. In the case, however, of very minute fibrils, iron alum gives better results, owing to the then relatively faint colour of the molybdate lake. In the case of ordinary tissues such as the medulla oblongata and the spinal cord, the molybdate method is very suitable for general class purposes, owing to the cheapness of the materials, and to the ease with which beautiful effects can be obtained. The mordant bath can be used again and

FIG. 16.—MEDULLA OBLONGATA OF FROG, SHOWING NERVE FIBRES.

Thirty-seven diameters. Mordanted with iron alum. The raphe is shown on the left of the figure. The nucleus near the upper surface at the outer trisection is shown, more highly magnified, in the next figure.

FIG. 17.—MEDULLA OBLONGATA OF FROG, SHOWING NERVE FIBRES.

One hundred and fifty-seven diameters. Mordanted with iron alum. The figure shows the nucleus referred to in Fig. 16. The nerve cells and the coarse and fine fibres are all intensely stained. The bodies in the upper part of the figure near the left-hand margin are red blood discs.

again, differentiation is very rapid, and with ordinary care the specimens do not readily spoil. They require, however, to be passed as rapidly as possible through alcohol when mounting. Thorough washing after differentiation and perfectly pure neutral or faintly alkaline absolute alcohol minimise the danger of failure.

Comparison of Methods.—Osmic acid, being a much weaker mordant than ammonium molybdate or iron alum, and having a special affinity for medullary tissue, is consequently in many respects the best substance to use when the sections contain ordinary coarse nervous tissue. With

Fig. 18.—Posterior Root Ganglion of Cat, showing Nerve Fibres.

Thirty-two diameters. Longitudinal section of the posterior root ganglion of the cat. Mordanted with ammonium molybdate. The figure illustrates the results of the application of the method to ordinary coarse nerve fibres.

the use of a moderate amount of care, also, it is the least likely of the three to stain bare axis-cylinders and collaterals. Iron alum, on the other hand, is by far the strongest mordant of the three ; and the whole nervous meshwork, to its minutest ramifications, and including the nerve cells, remains stained after all the binding tissue has been decolourised. Ammonium molybdate occupies an intermediate position, and is consequently most useful for tissues containing neither very large nor very small fibres.

My results were independently and almost simultaneously confirmed

by Herrick, and the process has for years been successfully applied to the staining of cortical fibrils by G. A. Watson, who, in 1903, published details of the special mode of employment necessary to display them, and of the difficulties which attend the obtaining of positive results.

I have dealt at considerable length with the details of this process, as the usual Weigert-Pal methods are still in general use, and by means of these it is practically impossible even imperfectly to stain the delicate

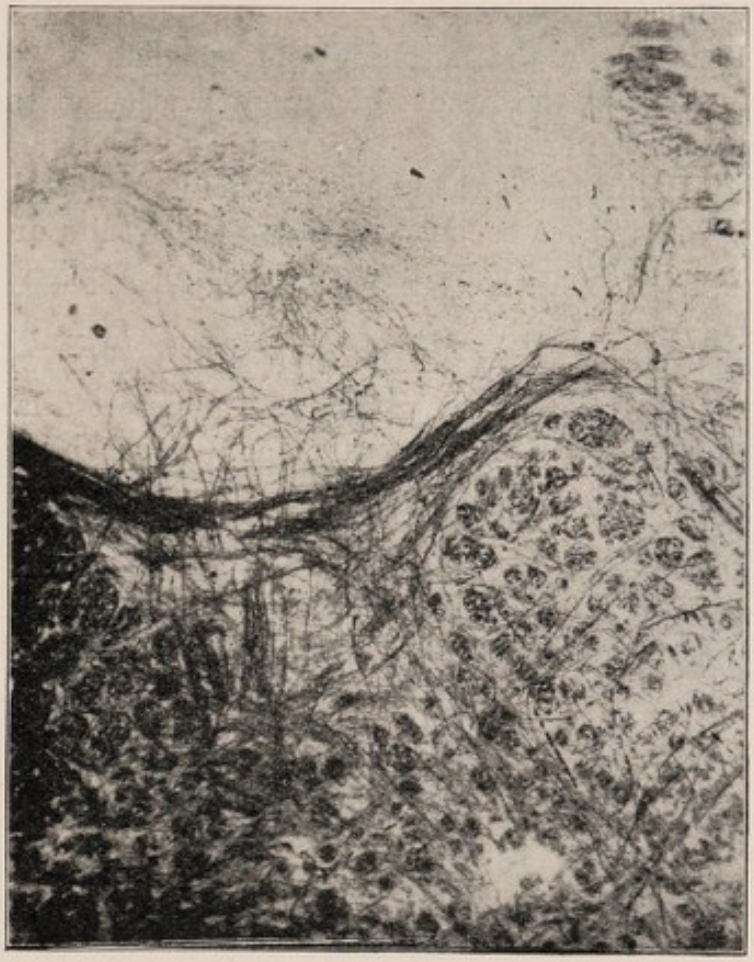


FIG. 19.—NUCLEUS OF ORIGIN OF HYPOGLOSSAL NERVE OF CAT, SHOWING NERVE FIBRES.

Fifty-eight diameters. Mordanted with ammonium molybdate. The figure shows the results of the application of the method to nervous tissue containing a plexus of delicate fibrils.

fibrils of the prefrontal cortex. Further, what I describe is a process requiring intelligence and skill for its performance, and not a rule of thumb method which can be applied by an ordinary laboratory assistant after he has been taught it.

Sometimes the sections are brittle, and frequently the delicate and the coarser meshworks require demonstration in separate sections. Again, great care is needed during differentiation; and frequent washing of sections and changing of baths are necessary if the lake is to be preserved

in the more delicate fibrils. Lastly, it is easy to fail to stain a specimen properly even after repeated attempts, unless the previous experience of the operator enables him to form a correct judgment of his results.

In Figs. 16 to 19 are shown examples of the results which may be obtained. Fig. 16 illustrates the medulla oblongata of a frog under a low, and Fig. 17 the same section under a higher power. These two specimens are introduced in order to show the results of the process when applied to the nervous tissue of the lower vertebrates, which is notoriously difficult to stain.

In Fig. 18 is shown the posterior root ganglion of the cat. This specimen demonstrates the results of the application of the process to ordinary coarse nerve fibres.

Lastly, Fig. 19 illustrates the nucleus of the hypoglossal nerve of the cat. This photograph, as a contrast, shows the results of the application of the process to nervous tissue containing a plexus of delicate fibrils.

Illustrations of the cortex of the prefrontal region, which supplies the best test of the value of the process, will be inserted later when the structure of this portion of the cerebrum is under consideration.

CHAPTER IV

THE DEVELOPMENT OF THE CORTEX

I PURPOSE demonstrating in a later chapter that the essential physical basis of mental disease consists, on the one hand, in an imperfect development of the cell-laminæ of the cortex which is of the nature of a true sub-evolution, and on the other in degrees of decrease of the cell-laminæ which are of the nature of a true involution or dissolution, since such decrease in depth takes place in the converse order to that in which the cell-laminæ are developed during the process of normal growth.

FIG. 20.—OUTER SURFACE OF HEMISPHERE OF FŒTUS OF ABOUT FOUR MONTHS.

Outer surface of the right hemisphere of a male fœtus, aged a little over four months. Weight, after hardening in formalin, 32 grammes. The fissure of Sylvius, and a depression which occupies the site of the future fissure of Rolando, are present, as also are numerous vascular grooves. Figs. 20, 22, 24, and 26 are of the same relative size.

As one of the necessary preliminaries to this demonstration, it is therefore desirable to describe in some detail the normal mode of evolution of the lamination of the cortex. For this purpose I shall employ the prefrontal region—since this is the portion of the cerebrum which is the last to be normally evolved, and also the area in which are present in maximum intensity those indications of sub-evolution and involution which occur in cases of mental disease.

A detailed account of such a subject, even if illustrated, would be too great a tax to put on the attention—perhaps on the imagination—of the reader. I shall therefore adopt the better, if less usual, plan of describing the mode of evolution of the lamination of the cortex by means of an illustrative series of naked eye and microphotographs. These are intended to show from the general point of view the manner in which the lamination of the cortex becomes evolved. Both the series of photographs and that of microphotographs are respectively of exactly the same magnification, with the exception of Fig. 28, the normal.

The first photograph represents the right hemisphere of a male human fœtus of about four months (Fig. 20). The fissure of Sylvius and a

depression which occupies the site of the future fissure of Rolando are present, as also are numerous vascular grooves.

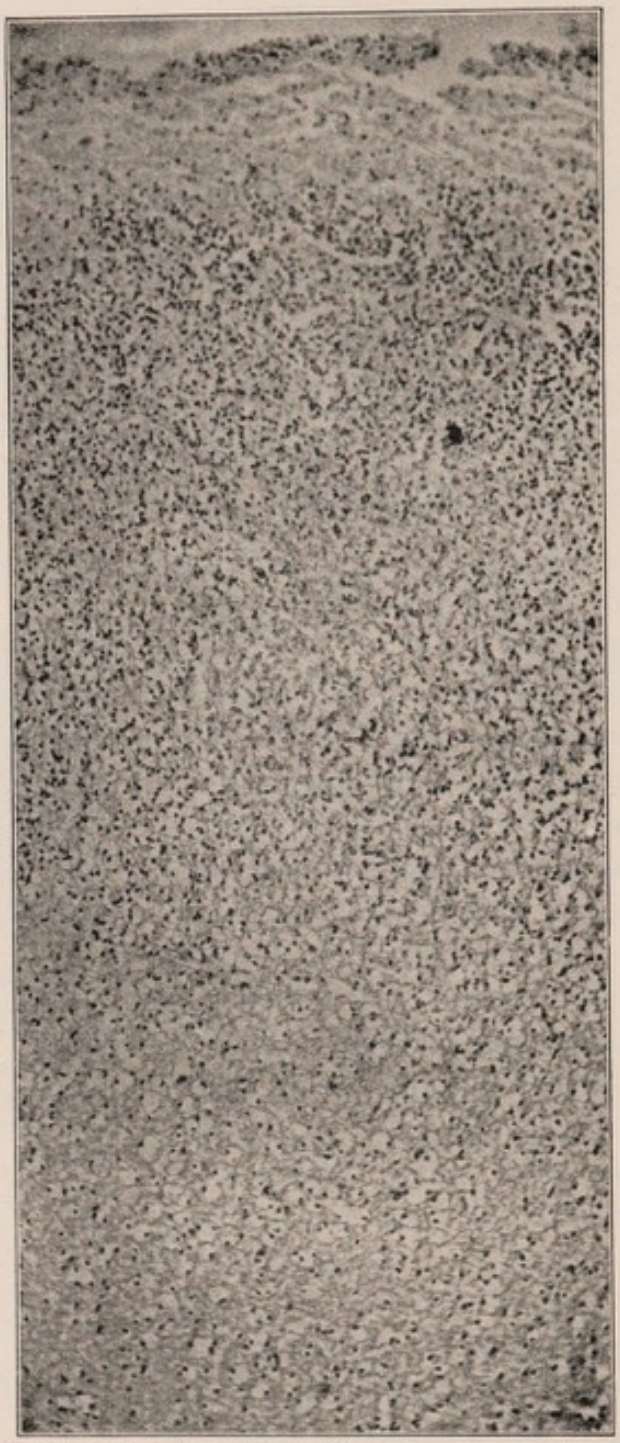


FIG. 21.—PREFRONTAL CORTEX OF HEMISPHERE OF FŒTUS OF ABOUT FOUR MONTHS.

One hundred and nine diameters. The prefrontal cortex of the hemisphere, shown in Fig. 20. It consists of a layer of undifferentiated neuroblasts covered by a superficial layer of neuroglia, into which irregular masses of neuroblasts project.

I have recently examined an almost exactly similar but slightly older fœtus, in which the fissure of Rolando is distinctly laid down. This case was old enough to render it possible to determine the sex to be female.

In the following microphotograph (Fig. 21) is shown a section of the prefrontal cortex of the case illustrated in the previous figure. This will be seen to consist of a layer of undifferentiated neuroblasts covered by a superficial layer of neuroglia, into which irregular masses of neuroblasts project. The neuroblasts are most closely packed towards the surface, and, at about the level of the lower trisection, indications exist of commencing differentiation of the nerve cells. The cortex has not begun to laminate, and its total depth is less than one-half of that of the normal adult.

In the almost exactly similar case already referred to, the anterior frontal cortex exhibits a considerably later stage of evolution. Though the cortex is very thin, there are definite signs of a cleavage of the neuroblasts slightly below their middle. The arrangement of the neuroblasts is, as yet, irregularly mixed, rather than vertically columnar, in the upper part; and the very common pairing or quadrupling of the neuroblasts, &c., indicates proliferation of probably all the elements, whether capillaries, neuroglia, or neuroblasts. In some cases rows of as many as six elements suggest the columnar arrangement of cortex of later development. This appearance, though by no means entirely peculiar to the anterior frontal region of this case, is much more marked and definite here than elsewhere. It may be added that the characteristic feature of the cortex of this region in this case is the fact that all the neuroblasts are equally embryonic, the inner cell-lamina (L. V) being as under-developed as the middle and outer cell-laminæ (L. III and L. IV).

FIG. 22.—OUTER SURFACE OF HEMISPHERE OF FŒTUS OF ABOUT SIX MONTHS.

Outer surface of the left hemisphere of a fœtus aged a little over six months. Weight after hardening in formalin, 55 grammes. The main fissures are defined or appearing, and the brain is larger and firmer than that shown in Fig. 20.

I would remark here that the technical difficulties which occur during the examination of brains of about this age are very great. Such tissue, even when hardened, is of little more than the consistence of jelly, and requires most careful treatment.

In the next photograph (Fig. 22) is shown the left hemisphere of a fœtus of about six months. The brain is somewhat larger and firmer, and the main fissures are defined or appearing. The numerous vascular grooves seen in the previous hemisphere have largely or entirely disappeared, and the prefrontal region of the cortex consists simply of a flat external surface.

The prefrontal cortex, as is seen in the microphotograph (Fig. 23),

shows little increase in depth, but definite signs of the commencement of the process of lamination. The inner cell-lamina or polymorphic

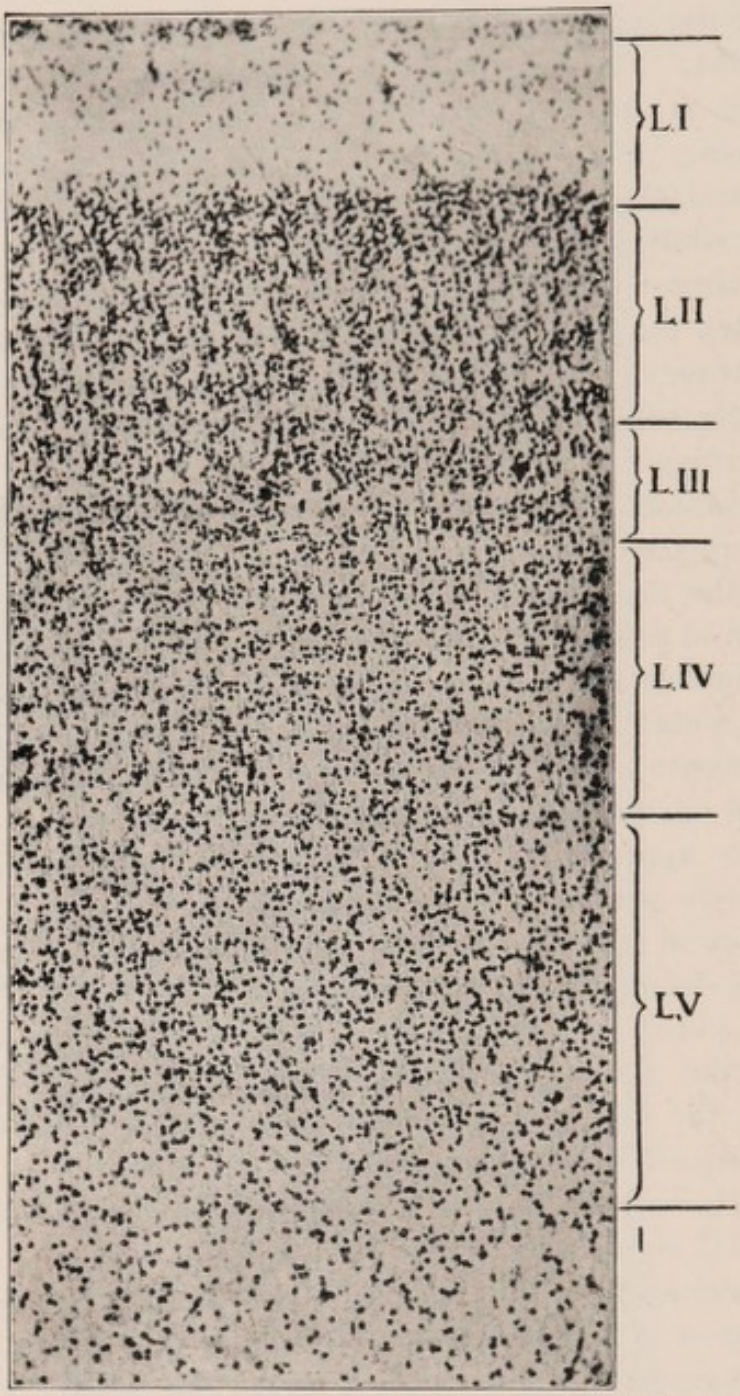


Fig. 23.—Prefrontal Cortex of Hemisphere of Fœtus of about Six Months.

One hundred and nine diameters. The prefrontal cortex of the hemisphere shown in Fig. 22. The process of lamination has commenced. L. I, the outer fibre-lamina; L. II, the outer cell- or pyramidal lamina; L. III, the middle cell- or granule-lamina; L. IV, the inner fibre-lamina; L. V, the inner cell- or polymorphic lamina.

layer (L. V) is being separated from the rest by the development of the inner fibre-lamina or inner line of Baillarger (L. IV). The middle cell-lamina or granule-layer (L. III) is visible, owing to the shape and mode

of aggregation of its constituent cells, and the outer cell-lamina or pyramidal layer (L. II) can also be made out, and exhibits a partially columnar arrangement of its constituent cells in its lower two-thirds, and a massing together of the cells in its upper third. It will be at once evident to anyone familiar with the appearance of the adult cortex that development is taking place from within outwards, and that the superficial laminæ, especially the outer cell- or pyramidal, are as yet of very deficient depth, the last being only about one-fourth of the adult normal.

It will be noted, on comparing the fourth and sixth months fœtuses, that the development of lamination is coincident with greater firmness of the brain and disappearance of the numerous vascular grooves, rather than with any notable increase in the complexity or size of the hemispheres. Microscopically, however, an important advance has occurred during this period—namely, the commencement throughout the hemispheres of the process of lamination and the cleavage of the neuroblasts into an upper and a lower portion. In view of the evidence I shall produce with regard to the functions of the inner cell-lamina, I would remark that this early cleavage of the partially differentiated neuroblasts of the cortex into an upper and a lower portion is an occurrence of the greatest significance.

FIG. 24.—OUTER SURFACE OF HEMISPHERE OF FŒTUS OF SEVEN TO EIGHT MONTHS.

Outer surface of the right hemisphere of a fœtus aged seven to eight months. Weight, after hardening in sublimate and formalin, 56 grammes. The fissuration is completed, with the exception of the less important sub-sulci.

The next photograph (Fig. 24) is of the right hemisphere of a fœtus of seven to eight months. The fissuration is completed, with the exception of the less important sub-sulci, and the brain has a general resemblance to that of the adult.

As is shown in the accompanying microphotograph (Fig. 25), marked progress has taken place with regard to the development of the cortex and the differentiation of the nerve cells. The inner cell-lamina (L. V) is clearly marked off by the inner fibre-lamina (L. IV) from the middle cell-lamina (L. III), and the outer cell-lamina or pyramidal layer (L. II) shows a notable increase both in the depth of its lower part and in the degree of differentiation of the constituent cells of this. The upper portion of this lamina is still in a poorly differentiated condition, and the aggregation of its embryonic constituent cells is by contrast more visible than is the case in the fœtus of six months.

In the next photograph (Fig. 26) is shown the unstripped right hemi-

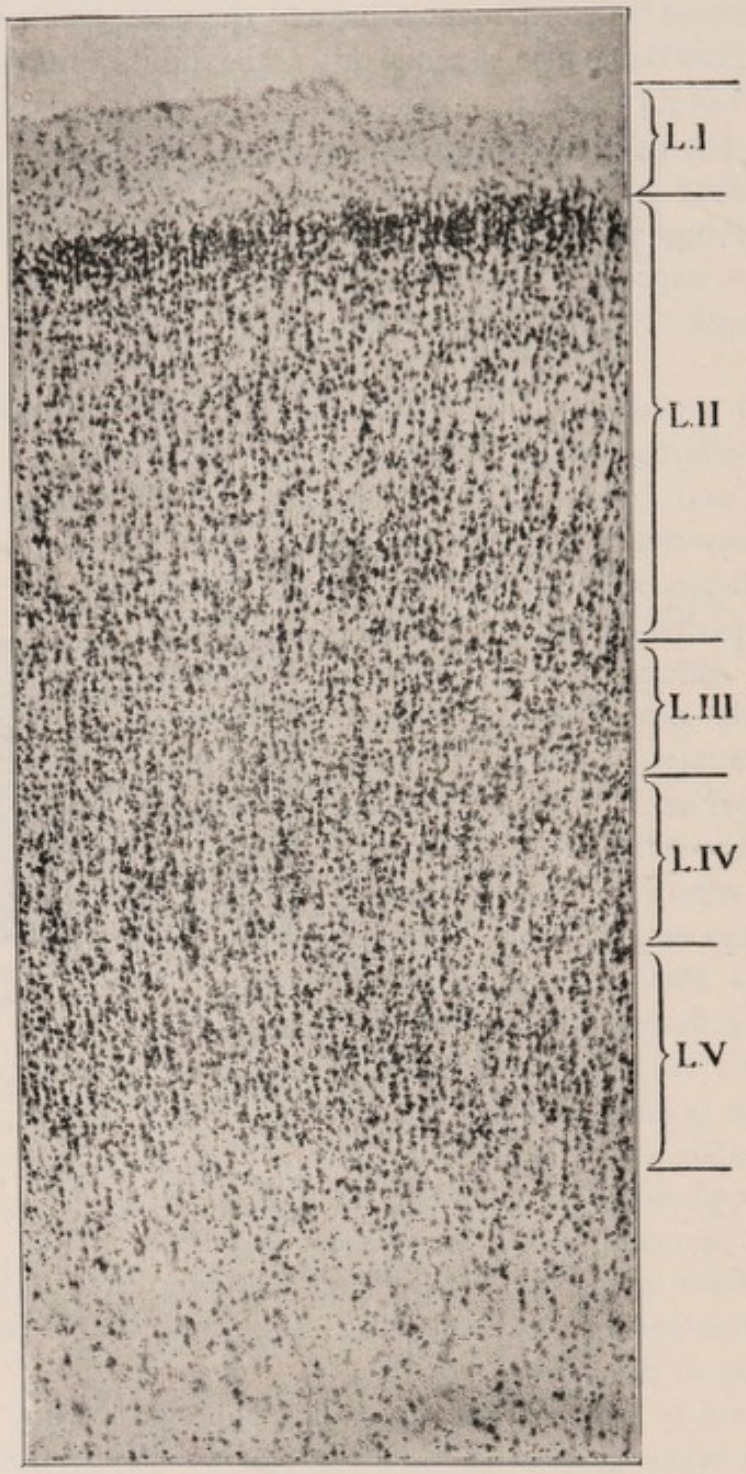


Fig. 25.—Prefrontal Cortex of Hemisphere of Fœtus of Seven to Eight Months.

One hundred and nine diameters. The prefrontal cortex of the hemisphere shown in Fig. 24. L. I–L. V, as in Fig. 23; L. II, the outer cell- or pyramidal lamina, though the latest to develop, has already become the deepest layer of the cortex. In the upper portion of this lamina the aggregation of its embryonic constituent cells is by contrast more visible than is the case in the fœtus of six months.

sphere of a stillborn male infant. The resemblance to the adult appearance of the brain is now well marked.

In the microphotograph (Fig. 27) it will be seen that the cortex also

now exhibits a general resemblance to that of the adult. The nerve cells have largely taken their permanent form, and, being less embryonic and smaller, appear less crowded. A further important factor in causing less aggregation of cells is the increased superficial area of cortex, and the consequent smaller number of cells in a section of the same thickness. The outer cell-lamina or pyramidal layer (L. II) is, however, still little more than one-half of the adult normal depth, and exhibits a very obvious aggregation of embryonic cells in its upper part.

In contrast to the preceding microphotographs, the next illustration (Fig. 28) shows the depth and general appearance of the adult normal cortex. The magnification is five-sevenths of that of the preceding microphotographs.

It was originally my intention to follow the further development of

FIG. 26.—OUTER SURFACE OF HEMISPHERE OF MALE, FULL-TERM STILLBORN FŒTUS.

Outer surface of the unstripped right hemisphere of a male full-term stillborn child. Weight, after hardening in formalin, 194 grammes. The fissure of Sylvius remains somewhat open, and its posterior limb is very oblique. The prefrontal region is small.

the cortex in children of different ages, but I found that such notable individual differences in the degree of the development of the cortex occurred as precluded the possibility of obtaining definite results. This truth is the anatomical counterpart of the known great individual differences in degree of mental development which exist in infants and young children.

In the diagram (Fig. 29) are shown, in percentages of the normal, the general average measurements which I have obtained from the prefrontal cortex of a number of cases. They clearly indicate the point to which I have just referred. The second case, though it falls well into series with the remainder, exhibits certain differences in the depth of the fourth and fifth laminæ which are due probably to the fact that all the measurements are from the flat external surface, owing to the absence of fissures. The fourth and fifth cases exhibit the individual differences

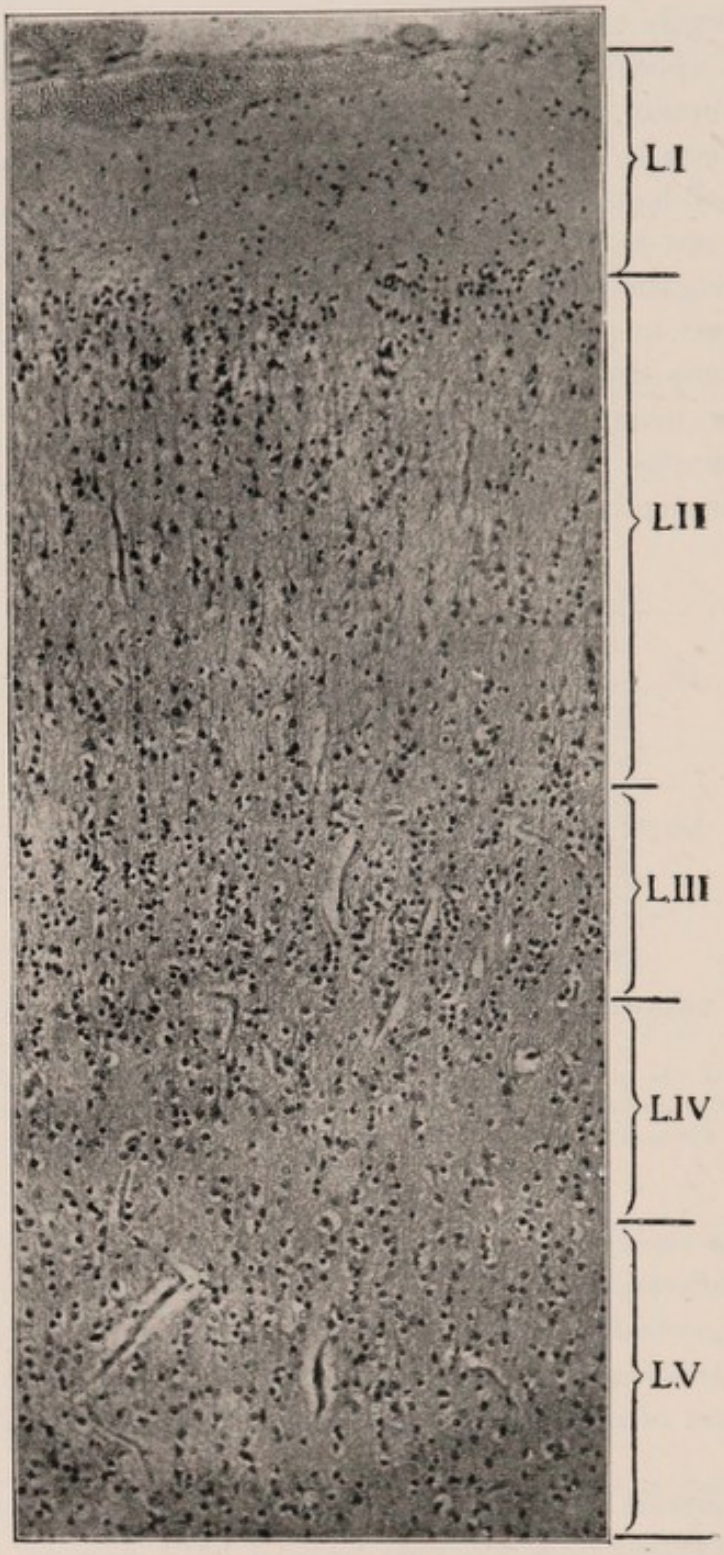


Fig. 27.—Prefrontal Cortex of Hemisphere of Male, Full-term Stillborn Fœtus.

One hundred and nine diameters. The prefrontal cortex of the hemisphere shown in Fig. 26. L. I–L. V, as in preceding microphotographs. The cortex much more resembles that of the adult. L. II, the outer cell- or pyramidal lamina is, however, still little more than one-half of the adult normal depth, and exhibits a very obvious aggregation of embryonic cells in its upper part.

in degree of development which I found to occur in two stillborn infants ; and the case in the sixth column, that of a marasmatic infant of retarded general development, is also interesting in that the outer cell-lamina is of less depth than that of the second stillborn, whilst all the other laminæ are of almost exactly the same depth as are those in the latter. Further, the diagram shows quite definitely that the laminæ are evolved from within outwards, and that the inner cell-lamina approaches the adult normal depth at birth, at which date the middle cell-lamina is about three-fourths, and the outer cell-lamina still little more than one half of the adult normal depth.

The same order of evolution of cortical lamination applies, judging from sample observations I have made, to the whole neopallium, though differences exist, both with regard to the degree of development of the different laminæ and to the date at which it occurs.

The outer cell-lamina or pyramidal layer, for example, in the visuo-sensory area attains in the adult to but five-ninths of the adult normal average depth, and elsewhere, as far as my observations extend, is of more constant depth, with measurable individual variations. The middle cell-lamina or granule-layer, in the visuo-sensory area, is hypertrophied and duplicated by the interposition of the fibre-layer of Gennari ; its total depth, including this, being about three and a half times its depth generally. On the other hand, in the psychomotor area, the granule-layer reaches a minimum depth, and is with difficulty discernible. The inner cell-lamina is of very constant depth. It is somewhat shallow in the visuo-sensory area, though proportionately less shallow than is the outer cell-lamina in this region.

With regard to the date at which evolution of the cortical laminæ occurs, I can produce clear evidence to show that it takes place earlier in the visuo-sensory area (projection sphere) than in the visuo-psychic (zone of special association), and earlier in the latter than in the prefrontal region (zone of higher association).

This evidence is shown in the following diagram (Fig. 30), in which is collected a series of observations on the cortex of certain fœtuses, infants, and adults. The following are the chief points illustrated in the figure. In the visuo-sensory area of the infants of one and three months, the whole of the cell-laminæ have attained to almost the normal adult depth, and the outer cell-lamina is rather better evolved in the former than in the latter, in spite of the existence of congenital blindness in that case. On the other hand, in the visuo-psychic zone none of the laminæ are so far evolved, and the outer cell-lamina of the infant of one month is much shallower than that of the infant of three months. The visuo-sensory cortex is thus obviously evolved earlier than is the visuo-psychic. A further interesting point shown in the diagram is the low evolution of

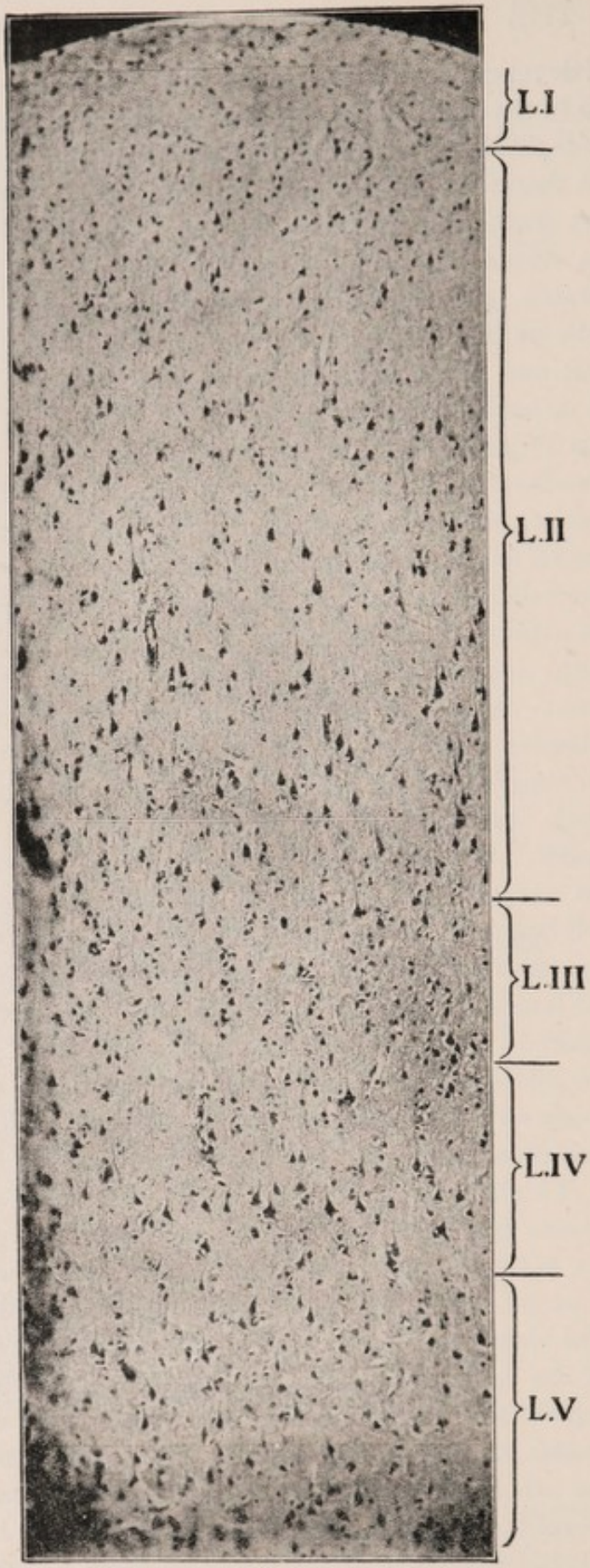


FIG. 28.—PREFRONTAL CORTEX OF NORMAL ADULT.

Seventy-six diameters. The magnification is five-sevenths of that of the preceding microphotographs. L. I–L. V, as in previous figures. It should be noted that the depth of L. II is greater than the conjoined depths of L. III–L. V.

the middle cell-lamina, or receptive layer, of the cortex of the congenitally blind infant of one month, and the almost adult development of this in the infant of three months. The same detail is visible in the case

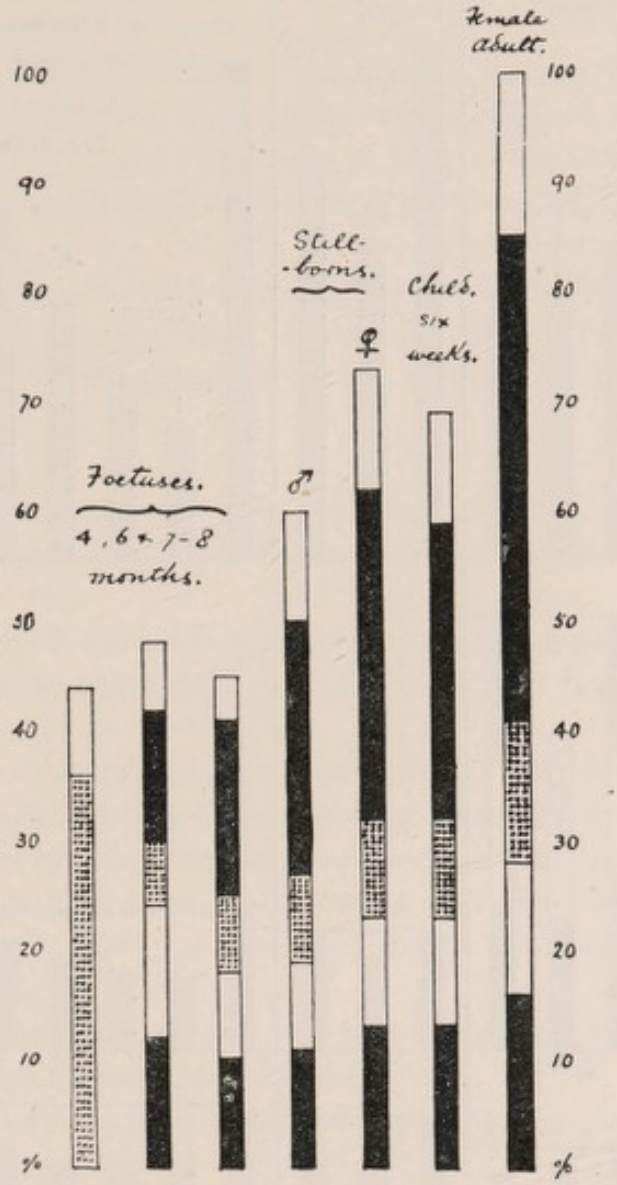


FIG. 29.—MEASUREMENTS OF THE PREFRONTAL CORTEX OF A SERIES OF FŒTUSES AND INFANTS.

The Figure shows, in percentages of the normal, the general average measurements of the prefrontal cortex of a series of fœtuses and infants. The actual measurements of these cases, together with other details concerning them, have already been published. The laminæ from above down are as in preceding figures. The illustration indicates that the cortex evolves from within outwards, the inner cell-lamina being the first to appear, and rapidly attaining almost to the adult depth, and the outer cell-lamina the last, this lamina at birth being still only about one-half of the adult normal depth.

of the visuo-psychic region, and this alone is sufficient to hall-mark the visuo-psychic region as a zone of special visual association, especially when it is noted that this lamina is in the infant of three months of

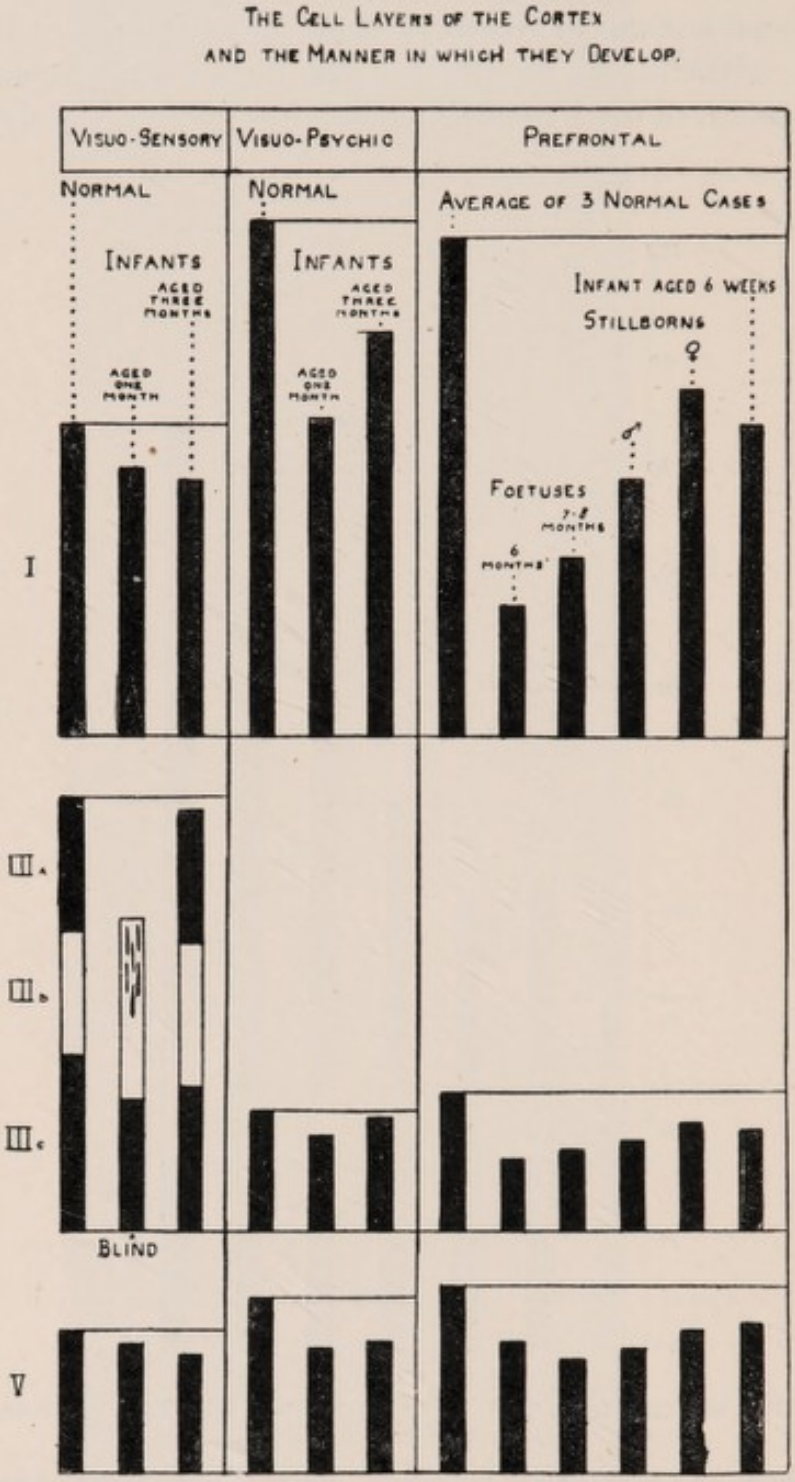


FIG. 30.—MODE OF EVOLUTION OF CELL-LAMINÆ OF CORTEX OF VISUO-SENSORY, VISUO-PSYCHIC, AND PREFRONTAL REGIONS.

The Figure shows the mode of evolution of the cell-laminæ of the cortex of the visuo-sensory, visuo-psychic, and prefrontal regions. The bottom series represents the inner cell- or polymorphic lamina, the middle series the middle cell- or granule-lamina, and the upper series the outer cell- or pyramidal lamina. A description is given in the text, but in general the figure suggests that the visuo-sensory cortex develops before the visuo-psychic, and this before the prefrontal; that the inner cell-lamina develops before the middle and the middle before the outer; and, finally, that in the visuo-sensory and visuo-psychic regions the middle cell- or granule-lamina is the receptive lamina of the cortex, and develops more rapidly than does the inner cell-lamina of these regions. The measurements from which this table is compiled, together with other details concerning the cases contained in it, have already been published.

practically the adult depth, whereas the inner cell-lamina of this case is by no means so well developed. In other words, the granule- or receptive-lamina of the visuo-psychic zone follows the order of its evolution in the visuo-sensory area in being ahead of the inner cell-lamina in its degree of development.

In the case of the prefrontal region, though the results are not comparative, they are sufficient (especially when combined with other data to which I shall refer later) to indicate that evolution is individually variable, and occurs at a later date than is the case in either of the other two regions.

I would here remark that a recent research of Moyes and myself, which has already been referred to, enables us to draw the following conclusions regarding the structure of the cortex of a fœtus of eighteen weeks :—

(1) Considerable progress has already occurred with regard to the specialisation of cortical areas and the differentiation of neuroblasts.

(2) The Betz-cells are well developed, and the relatively very large Betz-cell area can be accurately mapped out. This is shown in Figs. 3 and 4 (p. 14).

(3) The visuo-sensory area can be defined with accuracy (Fig. 5, p. 15). In the case of this area, however, specialisation of the cortex and differentiation of the neuroblasts are both less advanced.

(4) The pre- and post-central cortices and the visuo-sensory area already possess the adult relationships to the Rolandic and calcarine fissures respectively.

(5) The pre- and post-central cortices are remarkably well evolved in comparison with the rest of the cortex.

(6) The cingulate cortex is of poor quality, but is relatively well advanced in development.

(7) The anterior frontal cortex, on the other hand, is throughout its depth extremely embryonic in structure.

(8) There is very definite evidence that, in the complex of phylogenetic and ontogenetic factors which subserve the process of evolution, *the latter from a very early period play a predominant part.*

(9) The cleavage of the developing neuroblasts of the cortex into upper and lower portions, which enclose between them the precursors of the inner line of Baillarger, takes place at a much earlier period than we have hitherto supposed. This is clear, since this line, (L. IV,) is indicated in the rudimentary anterior frontal cortex, and since the Betz-cells which are contained in it in the pre-central region are so well developed.

It may hence be regarded as proved that the pre- and post-central cortices develop before the visuo-sensory cortex, and that this last develops considerably before the prefrontal. These observations are in accord with the truths that reflex fœtal movements can be incited from mid-uterine life, that the eyes do not undergo reflex stimulation until after birth, and that even the simpler cerebral associations do not occur until the child is *at least* many weeks old.

CHAPTER V

LOCALISATION OF CEREBRAL FUNCTION

THE general trend of the results of the recent histological survey of the cerebral cortex, which followed the enunciation by Flechsig of his doctrine of centres of projection and centres of association, and which has culminated in the elaborately detailed descriptions of Brodmann, has, to say the least, been highly suggestive of the existence of a definite correlation between histological structure and functional significance; and it is probable that the histological method, without entirely replacing the experimental, will in the future be still more fruitful in this direction. In the personal investigations which I shall describe I have endeavoured, by the employment of sub-normal and pathological material, to obtain proof of the functional significance of certain of the histologically differentiated regions of the cortex. Such proof as I have obtained leads me to adopt, as a partially proved provisional hypothesis, the following scheme of the localisation of cerebral function. I do not claim originality, except with regard to the production of proof of functional significance, since in dealing with cerebral function one needs to select rather than to enunciate opinions, owing to their multitude.

I would regard the human cerebrum, not as a sensori-motor, but as an intermediate or associative ganglion, which, on the one hand, receives sensorial impressions and elaborates them, by processes of association, into the physical equivalents of psychic products of higher complexity, and which, on the other hand, to a variable extent controls, selects, and co-ordinates certain of these equivalents, eventually transforming them into further physical complexes, whose function is to set in action the lower motor centres. On this functional basis I would divide the cerebrum into pre- and post-Rolandic portions, the former of which possesses controlling and executive functions, and the latter receptive and elaboratory.

I would subdivide the pre-Rolandic part, or frontal lobe, into a posterior or psychomotor area which is concerned with the evolution of such physical complexes as are necessary to give external expression to the results of cerebral association; and into an anterior or prefrontal area which is able to control, select, and co-ordinate certain of the results of post-Rolandic cerebral association, and either to allow these to undergo

psychomotor transformation or to inhibit this process. Both these functions I regard as proved, and I consider the outer cell- or pyramidal lamina of the cortex to be at least the chief seat of their actual performance.

The cortex of the post-Rolandic portion of the cerebrum I would regard as consisting of projection areas, of which the visuo-sensory area is a type. Each of these is surrounded by, or possesses in its proximity, zones of special association, of which the visuo-psychic region is an example, which zones are hall-marked in function according to their appropriate projection areas. It also consists of intermediate cortex, in which are fused and elaborated the results of the special processes of association. I consider the functions of the visuo-sensory and visuo-psychic regions of the cortex to be proved, and, from homology, the functions of the other areas of projection and special association, the exact location of which is still probable rather than certain.

I regard the outer cell- or pyramidal lamina as at least the chief physical basis of these processes of association, and the middle cell- or granule-lamina of the projection areas as the region concerned with the reception and immediate transformation of sensorial impressions. I may, perhaps, here remind the reader that the middle cell- or granule-lamina attains to its maximum degree of development in the sensory-projection areas, and that it continues to be well developed in the special zones of association. In both these types of cortex there is no clear line of demarcation from the laminæ above and below it. The granule-lamina is of good development in the posterior region of general association, and also in the prefrontal area, in which latter it is more distinctly separated from the laminæ above and below it than in any region with which I am familiar. From the prefrontal region backwards, the granule-lamina decreases in depth and distinctness until, in the psychomotor area, it reaches a minimal depth and is barely discernible.

The inner cell- or polymorphic lamina has been shown to be the prominent lamina in the lower mammalia, and must be regarded as subserving such organic and instinctive activities as are not acquired by education. It is probable, for reasons which I shall indicate, that this is its function in man.

After these preliminary remarks I will now pass to the description of those special regions of the cerebrum which it is my intention to consider in detail. These include the cortex of the neighbourhood of the calcarine fissure and that of the frontal lobe.

The former, as will be seen, contains the sensory-projection and sensory-associative regions concerned with visual impressions, and is chosen owing to its being the most satisfactory of the sensory spheres for minute study.

The latter may be subdivided into higher associative and psycho-motor portions, and constitutes the part of the cerebrum which is concerned with the associative-motor aspect of cerebral function.

The Calcarine Fissure.—The following description of the calcarine fissure is abstracted from the admirable monograph of Cunningham, which, owing to its completeness and accuracy, leaves little to be added to our knowledge of the topography of this region of the cortex cerebri :—

" The parieto-occipital and calcarine fissures form upon the mesial aspect of the posterior part of the adult cerebral hemisphere a ≻-shaped figure. In this we recognise a ' stem ' with two divergent branches. The ' stem ' is prolonged obliquely downward and forward, and cuts into the gyrus fornicatus. . . . The calcarine branch proceeds backward in a horizontal direction towards the occipital pole. On this it ends by dividing into an ascending and descending branch. These are usually placed at right angles to the parent trunk . . . both the calcarine and the parieto-occipital branches of this fissural system lie in the human brain entirely on the mesial surface of the cerebrum."

The stem belongs to and is usually directly continuous with the rest of the calcarine fissure, of which it forms a part. It is in most cases separated from the parieto-occipital branch by the gyrus cunei of Ecker. In the calcarine division and about half an inch behind the bifurcation of the fissures is situated the anterior cuneo-lingual annectant of Cunningham, which, like the gyrus cunei, arises from the apex of the cuneus. This gyrus separates the anterior and deeper portion or stem of the calcarine fissure from the posterior and shallower subdivision, which is termed by Cunningham the fissura calcarina posterior, and which is subdivided into two parts near its posterior extremity by the posterior cuneo-lingual annectant gyrus. The calcarine fissure may thus be described as consisting of three subdivisions: a stem, a body which consists of the two cuneo-lingual annectants and the part between them, and a posterior extremity. This subdivision of the fissure is justified for the purposes of description by the usual large size of the posterior cuneo-lingual annectant and the frequency with which this is superficial, thus separating off the posterior extremity of the calcarine sulcus from the remainder. The primary division into a stem and a posterior portion is, however, the correct one, as it is founded on an embryological basis.

In concluding this description it is desirable to refer to certain of the sulci of the occipital region, which are of importance in connection with the boundaries of the area of special lamination in the region of the calcarine fissure, to be described shortly as the *visuo-sensory area*. These are the parallel cuneal sulcus and the polar sulci. The former, which usually goes by the name of the " cuneal sulcus," lies parallel to the calcarine fissure, and is present in five out of the six hemispheres shown

in Fig. 14, p. 22. The case in which it is absent is one of anophthalmos. In forty hemispheres which I examined for the purpose it was typically present in twenty-eight instances, it was irregular or complex in ten, and it was absent in two only. It is as a rule irregular in those instances in which a subsulcus of the calcarine fissure extends upwards into the cuneus, and also in cases where the posterior annectant is large and superficial. By the term polar sulci, I refer to the small and more or less semilunar fissures, which are nearly invariably found surrounding the posterior extremities of the calcarine fissure, and which are frequently distinct from the anterior and lateral occipital fissures. They can readily be seen in the first five brains shown in Fig. 14, p. 22. Whilst the inferior polar sulcus is almost invariably a distinct fissure, it is difficult to determine in many cases whether or not the superior polar sulcus is really a part of the "anterior occipital fissure," owing to the frequent impossibility of being certain of the exact sulcus to which the latter term refers. A word must be added with regard to a fissure described by Elliot Smith as the "sulcus lunatus." Such a sulcus, particularly in brains of simple pattern, not uncommonly curves round the posterior bifurcated extermity of the calcarine fissure. Except when coincident with the polar sulci, this sulcus bears no relationship, in my opinion, to the visuo-sensory area, termed by Elliot Smith the area striata; and I am disposed to doubt its necessary relationship to the periphery, in this region, of the cortex to be described as *visuo-psychic*. I regard both polar and lunate sulci, especially the former, as common but not constant fissures, which probably result from the early development and relatively firm and unyielding structure of the visuo-sensory cortex. In view of the certain influence on cerebral fissuration of arterial distribution and of mechanical conditions of growth, I think that the (necessary) relationship of histological differentiation to fissuration may readily be overrated.

The Cortex in the Region of the Calcarine Fissure.—Since the early part of the nineteenth century, through the observations of Gennari, Vicq d'Azyr, Baillarger, and other workers, it has been known that the cortex cerebri in the region of the calcarine fissure possesses a characteristic structure owing to the existence in the centre of the grey matter of a white line which is readily visible to the naked eye. Numerous observers, since the original description by Meynert in 1872, have divided the cortex of this region into definite layers, but, largely owing to differences in the layers described and in the nomenclature adopted, it is extremely difficult to bring the several classifications into complete agreement. This difficulty is accentuated by the impossibility of being certain even that similar regions of the cortex have been described by the several authors, and by the probability that few, if any, of the descriptions in any sense represent the general average of systematic examination.

In 1900 I described two special cortical regions lying in the neighbourhood of the calcarine fissure, as the visuo-sensory area and the visuo-psychic zone; and this description has subsequently been confirmed by Elliot Smith, Campbell, and Brodmann. The visuo-sensory area was termed by Elliot Smith the area striata, and the surrounding zone was differentiated by him as area para-striata and area peri-striata. The corresponding regions described by Campbell and by Brodmann are shown in Figs. 8 to 13.

My personal investigation was not limited to the delineation of a cortical area, but resulted also in the production of proof of its functional significance.

My original description of the distribution of the visuo-sensory area is as follows :—

(1) The occipital lamination in the region of the calcarine fissure is a well-defined cortical area.

(2) It occupies—

(*a*) The body of the calcarine fissure, including the anterior and posterior annectants, and extending upwards to the parallel cuneal sulcus and downwards to the collateral fissure.

(*b*) The posterior part of the calcarine fissure, extending to the polar sulci surrounding its extremities.

(*c*) The inferior lip of the stem of the calcarine fissure (including the superficial surface and lower lip of the cuneal annectant) nearly to its anterior extremity, just posterior to which the area tails off to a sharp point.

(3) The approximate outline of this area is consequently pear-shaped, with the apex anteriorly and the thick end at the pole of the hemisphere.

(4) The area is much decreased in extent, but not in distribution, in cases of long-standing blindness.

(5) In anophthalmos the area is much contracted as regards both extent and distribution. It occupies the usual position in the stem of the calcarine fissure, but only extends backwards as far as the posterior cuneo-lingual annectant, and it is confined to a portion of the inferior lip of the fissure and to the cortex between this and the collateral sulcus.[1]

I also produced the following proofs of the functional significance of this special area :—

(1) In the area of special lamination, in cases of old-standing optic

[1] This distribution is shown in Case VI, Fig. 14, p. 22, and may be usefully compared with Fig. 5, p. 15, which shows the visuo-sensory area in a fœtus of eighteen weeks. It is clear that the extent and distribution of the visuo-sensory area in this case of anophthalmos are not due to any freak of development, but simply indicate the period at which further evolution of the cortex ceased.

atrophy the line of Gennari is decreased nearly 50 per cent. in thickness, and the outer granule layer more than 10 per cent.

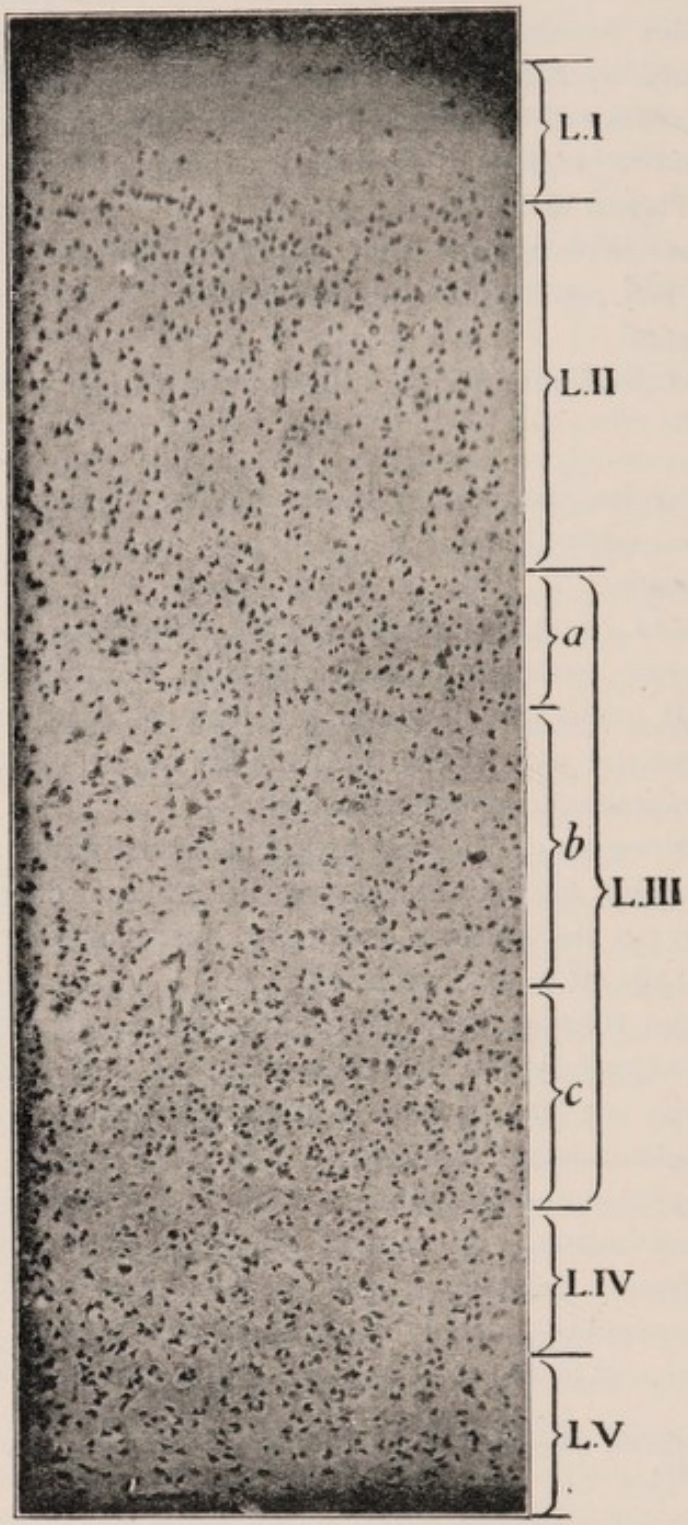


FIG. 31.—VISUO-SENSORY CORTEX OF RHESUS.

One hundred and nine diameters. L. I, the outer fibre- or superficial lamina; L. II, the outer cell- or pyramidal lamina; L. III, the middle cell- or granule-lamina, which is composed of two layers of granules, *a* and *c*, separated by the horizontal fibre-band of Gennari, *b*, in which terminate the fibres of the optic radiations; L. IV, the inner fibre-lamina or inner line of Baillarger; L. V, the inner cell- or polymorphic lamina.

(2) In the visuo-psychic region surrounding the area of special lamination, old-standing optic atrophy causes no modification of the lamination.

(3) In anophthalmos the conjoined outer granule layer and line of Gennari, (for the granules in the former layer are not sufficiently obvious to admit of easy micrometric measurement alone,) are narrowed down to two-thirds of the normal thickness, the other layers of the cortex being approximately unchanged. This amount of narrowing is the same as that found in cases of old-standing optic atrophy.

(4) The majority of the layers of the cortex do not vary appreciably in thickness as a result of age or chronic insanity, but there is an almost exact correspondence between the thickness of the conjoined first and second layers of the cortex (outer layer of nerve-fibres and pyramidal layer) and the degree of amentia or dementia existing in the patients.

In Chapter IV a certain amount of evidence, based on the mode of development of the cortex, was produced with regard to the functional significance of the visuo-sensory area and the visuo-psychic zone. From a different aspect the proofs of this will be completed in Chapter VI.

Minute Structure of the Visuo-Sensory Area and the Visuo-Psychic Zone.—I now pass to the subject of the lamination of the visuo-sensory area and the visuo-psychic zone ; and, in place of a set description, shall repeat the method I employed when dealing with the mode of development of the cortex. In this case, however, the microphotographs are of different magnifications, as it is necessary that the whole depth of the cortex should be displayed.

As the lamination of the visuo-sensory area is somewhat difficult to analyse without special experience, the first microphotograph (Fig. 31) is prepared from this area in the rhesus, in which the various laminæ are exceptionally well defined.

The layers shown in this specimen from above downwards are the outer fibre-lamina, or superficial layer (L. I) ; the outer cell-lamina, or pyramidal layer (L. II) ; the middle cell-lamina, which consists here of two granule-layers (L. III *a* and L. III *c*) separated by the fibre-layer of Gennari (L. III *b*), to which pass the terminal fibres of the optic radiations ; the inner fibre-lamina, or inner line of Baillarger (L. IV) ; and the inner cell-lamina, or layer of polymorphic cells (L. V).

In the next illustration (Fig. 32) is shown an average section of the same area in the normal adult. The same lamination is present, but it is more difficult to identify, and naturally still more difficult to measure.

The visuo-psychic cortex is of simpler structure and consists of the usual laminæ. These are from above downwards the outer fibre-lamina, or superficial layer (L. I) ; the outer cell-lamina, or pyramidal layer (L. II) ; the middle cell-lamina, or granule-layer (L. III) ; the inner

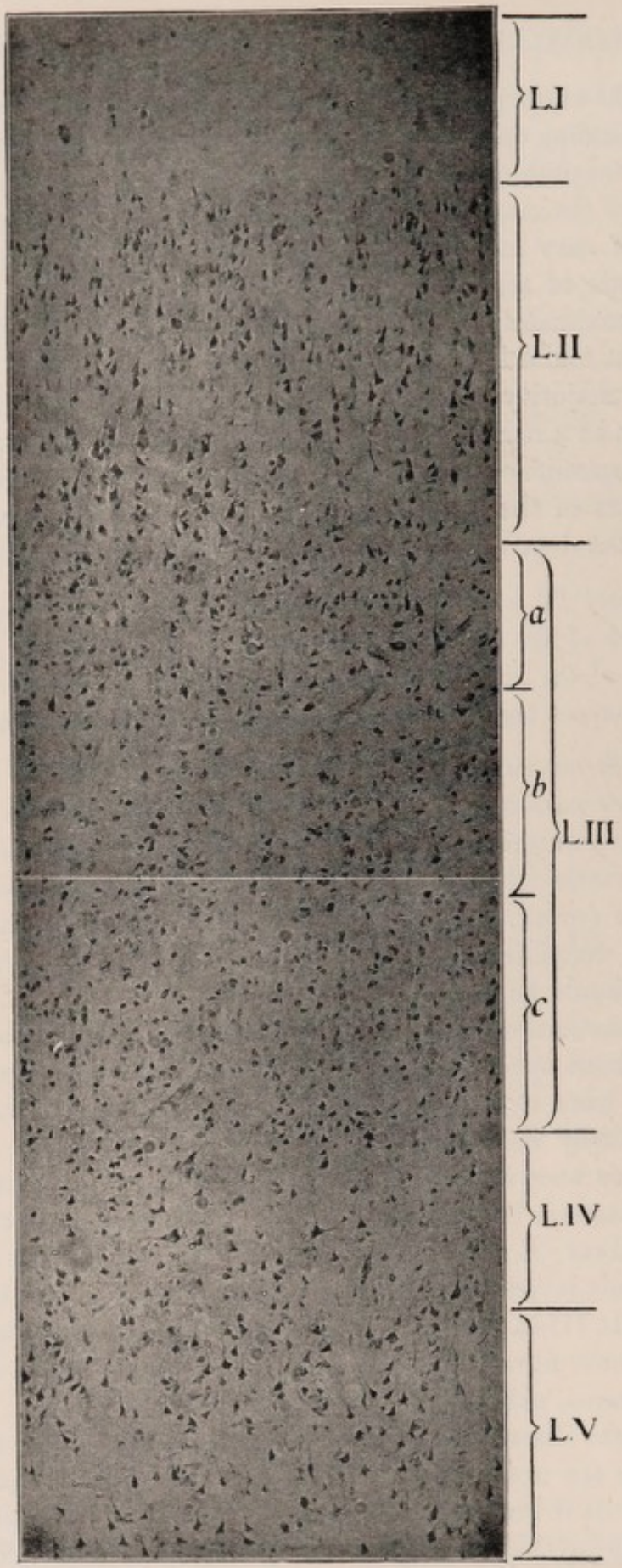


FIG. 32.—VISUO-SENSORY CORTEX OF MAN.

Ninety diameters. L. I–L. V, as in Fig. 31. The lamination of the human visuo-sensory cortex is not easily recognised without special experience, but the different laminæ can be identified without difficulty if the figure be compared with the microphotograph of the visuo-sensory cortex of the rhesus, in which the various laminæ are very clearly defined.

fibre-lamina, or inner line of Baillarger (L. IV); and the inner cell-lamina, or layer of polymorphic cells (L. V).

In the following microphotograph of a human fœtus of seven to eight months (Fig. 33) is shown a section through the periphery of the visuo-sensory area to display the manner in which the visuo-sensory cortex passes abruptly into the cortex of the visuo-psychic zone, and

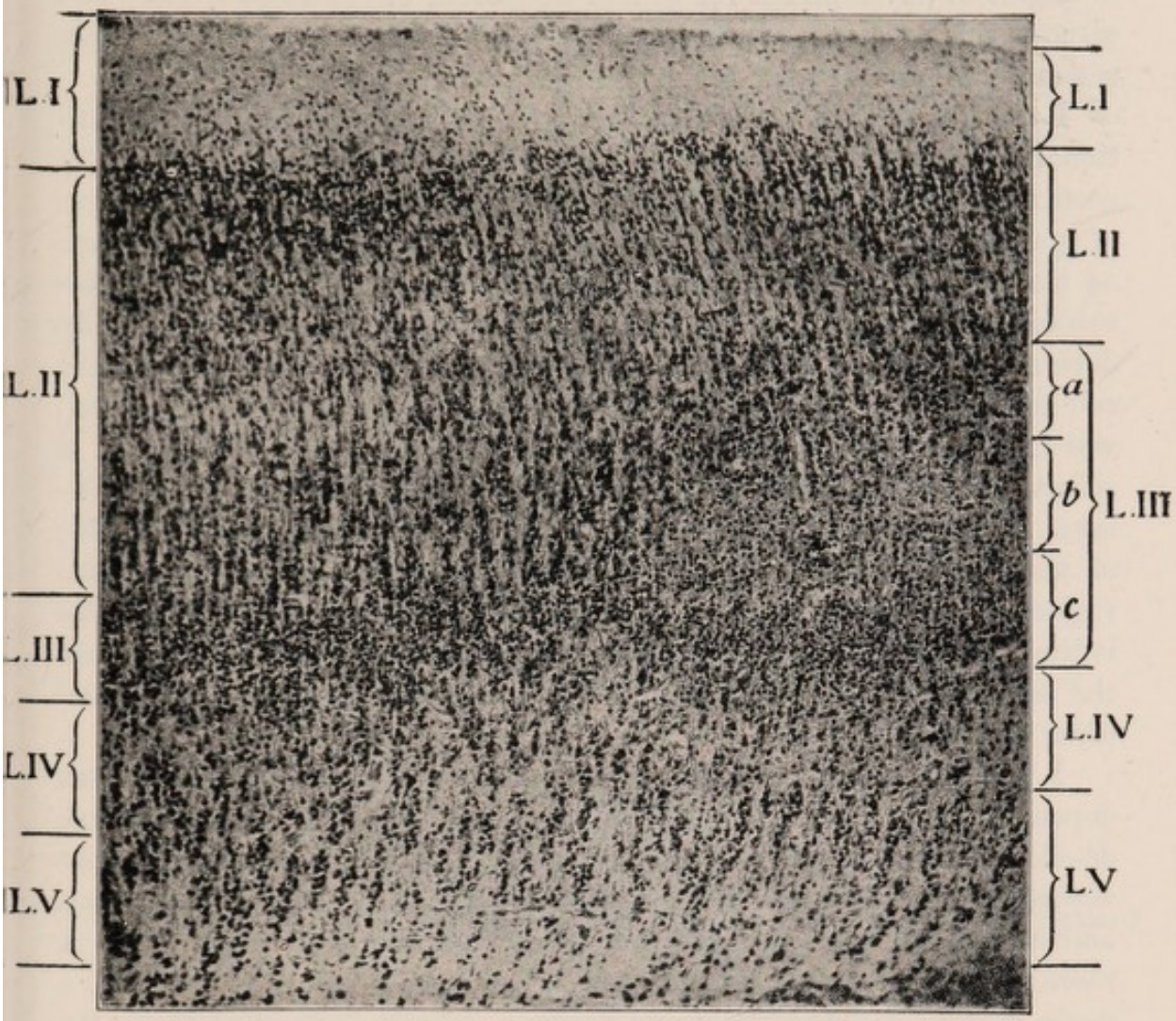


FIG. 33.—CORTEX OF VISUO-SENSORY AND VISUO-PSYCHIC REGIONS OF FŒTUS OF SEVEN TO EIGHT MONTHS.

One hundred and nine diameters. The microphotograph is prepared at the periphery of the visuo-sensory area, and shows the passage of the visuo-sensory cortex into the visuo-psychic. L. I–L. V are as in the preceding illustrations; L. III *a* and L. III *c* are the two layers of granules, and L. III *b* is the intermediate fibre layer or line of Gennari, of which three layers the middle cell-lamina consists in the visuo-sensory area. In the centre of the illustration it will be noted that the line of Gennari, L. III *b*, ceases, and that the layers of granules, L. III *a* and L. III *c*, run into one to form the granule-lamina, L. III, of the visuo-psychic cortex. A comparison of this figure with Fig. 25, which illustrates the prefrontal cortex of the same case, very clearly demonstrates that the visual cortex of this case is much more advanced than that of the prefrontal region in its degree of development. These figures thus afford a partial graphic illustration of the truth that the visuo-sensory cortex develops before the visuo-psychic and the latter before the prefrontal.

also to show the lamination of the latter. It will be seen that the line of Gennari suddenly ceases and the two layers of granules run into one, which occupies the site of the inner of these, the outer cell- or pyramidal lamina at the same time increasing to almost double the depth.

A comparison of this illustration with an earlier one (Fig. 25), which shows the prefrontal region of the same case, indicates that this last is in degree of development far behind the cortex of the visuo-sensory and visuo-psychic regions, which, particularly the former, much more closely resemble the adult type.

I think it quite certain that the outer layer of granules is the additional feature in the visuo-sensory area for three reasons: (1) The cortex normally evolves from within outwards. (2) The deeper layer of granules is of remarkably constant depth—almost as constant, in fact, as that of the inner cell-lamina—whereas the outer layer of granules exhibits differences in depth in individual cases, which are as readily determinable as are the corresponding differences that occur in the outer cell-lamina. (3) The delicate fibre-band in other parts of the cortex, which I personally regard as the homologue of the line of Gennari, is situated between the outer and middle cell-laminæ, *i.e.* above the granule-layer. This point is illustrated in the following rough diagram (Fig. 34) of the fibre-bands of the cortex of the visuo-sensory and prefrontal regions. For these reasons I am certain that the *outer* layer of granules is the additional feature, in spite of the opinion expressed by Mott that the *inner* layer is the addition and that the outer represents the granule-layer elsewhere.

I would remark that the general fibre-architecture of the cortex depends for its chief characters on the lamination and on the relative development of the cell-elements of the different laminæ. In other words, the arrangement of the fibres depends upon the position, size, and number of the pre-existing cells, and the fibres lie where there is room for them. In the fourth lamina, where cells are relatively few, a dense plexus of fibres exists and forms a definite horizontal band, the inner line of Baillarger or fourth horizontal fibre-band. This is particularly definite in the regions of association, but is usually invisible in a projection area like the visuo-sensory, since it is obscured by the immense number of projection fibres which traverse the cortex vertically to reach the line of Gennari. Between the second and third laminæ, where the larger pyramids are more or less definitely separated off from the subjacent granules, lies the third horizontal fibre-band or outer line of Baillarger, which in the visuo-sensory area contains the termini of the optic radiations and has received the name of Line of Gennari. In this region there is a great increase in the number of granules, a portion of which lies as a separate layer above this dense fibre-band, and thus

indicates its functional association with the third or granule-lamina. At about the upper trisection of the second lamina lies the thin second horizontal fibre-band or super-radiary plexus, and at the surface of the cortex lies the first horizontal fibre-band or layer of tangential fibres.

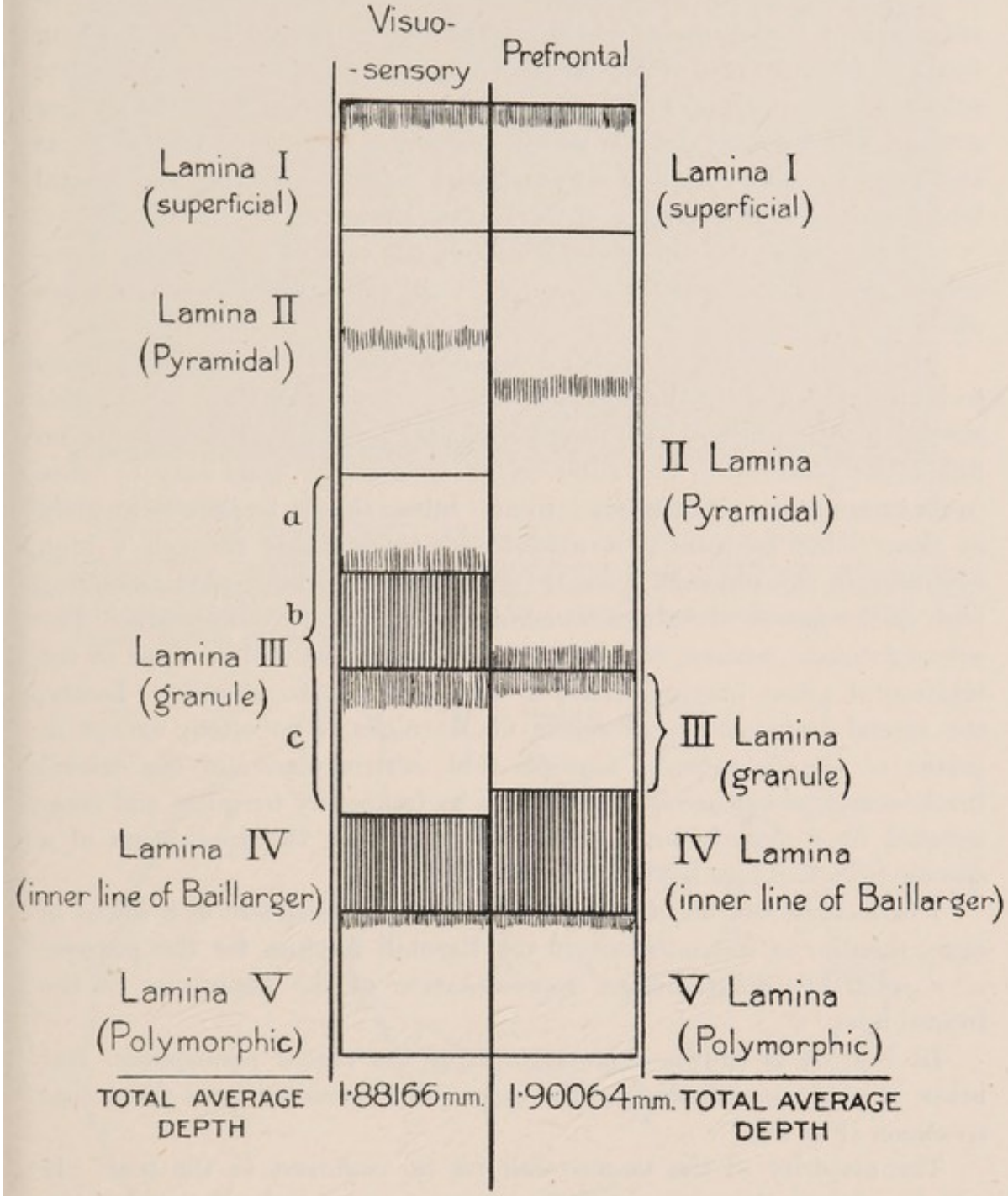


FIG. 34.—DIAGRAM OF THE FIBRE-BANDS OF THE CORTEX CEREBRI.

This diagram of the four horizontal fibre-bands of the cortex is not intended to show either the exact thickness of the bands, or the relative number of fibres contained in them. For the sake of simplicity, laminæ I and V are made the same depth in the two regions. Of these four horizontal bands, the outer is the *layer of tangential fibres*, the next in order is the delicate *supra-radial band of fibres*, the next is the *line of Gennari* of the visuo-sensory area, *and its homologue the outer line of Baillarger* elsewhere, and the innermost of the bands is the *inner fibre lamina of the cortex or inner line of Baillarger*.

The horizontal fibre-bands of the cortex are thus a secondary and accidental feature dependent on the pre-existing cell-lamination, with the subdivision of which into laminæ they should not be confused.

The Frontal Lobe.—In no region of the cerebrum is the fissuration so definite and at the same time so liable to misinterpretation owing to unimportant variations as is the case with the frontal lobe. Nothing could be more definite on the one hand than the existence of a precentral sulcus, of superior and inferior frontal sulci and of the frontalis medius system, which subdivides the middle portion of the second frontal gyrus and ends anteriorly as a fronto-marginal fissure separating the frontal lobe from the orbital surface of the hemisphere.

On the other, the difficulties which, in the case of a particular hemisphere, attend the specific nomenclature of these well-known sulci are often very great.

The upper, middle, and lower divisions of the precentral sulcus require to be isolated, and the diagonalis in front of the last of these often needs careful identification. The superior frontal sulcus usually presents no difficulties posteriorly, but anteriorly it is often far from easy to trace to its termination. The inferior frontal sulcus should be easy to identify in theory, but frequently is almost indistinguishable through a high evolution of the sub-sulci lying between it and the bifurcated ascending limb of the fissure of Sylvius which delimits the pars triangularis. The sulcus frontalis medius, which in theory divides the middle third of the midfrontal gyrus longitudinally, is often difficult to identify. Lastly, the mesial fronto-marginal sulcus of Wernicke is so often, except in brains of simple pattern, multiplicated or irregular, and the lateral fronto-marginal sulcus of Eberstaller is so frequently irregular and complicated by a superimposed sulcus radiatus, that the application of a specific nomenclature seems a hopeless task.

I have therefore selected the fairly typical hemisphere of a fœtus of eight mónths in the museum of the Rainhill Asylum for the purpose of a relatively diagrammatic representation of the fissuration of the frontal lobe.

In Fig. 35 is shown a photograph of the actual hemisphere, and below it is placed a tracing of the main sulci, corrected from the actual specimen (Fig. 36).

The majority of the fissures call for no comment in the text. It will be noticed, however, that the superior precentral sulcus joins the fissure of Rolando, and that the inferior precentral sulcus reaches downwards as far as the fissure of Sylvius. The frontalis medius joins the inferior frontal sulcus posteriorly, and is continuous anteriorly with the ⊥-shaped fronto-marginalis system. The upper limb of this system extends mesially to the border of the hemisphere and laterally joins

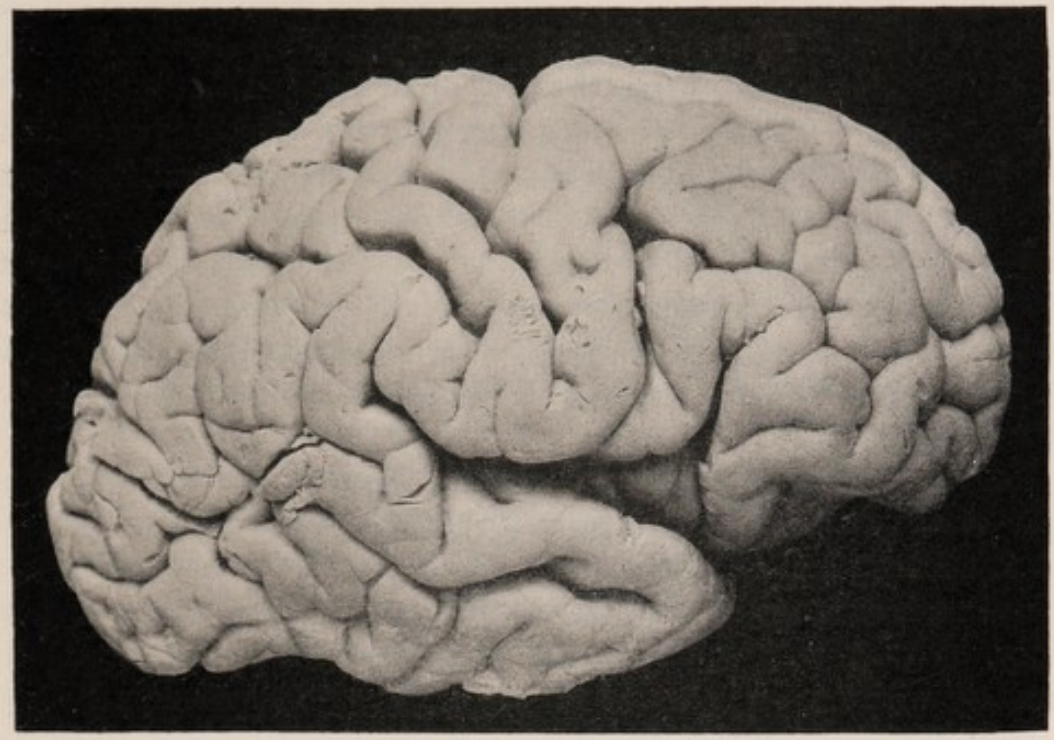


FIG. 35.—RIGHT HEMISPHERE OF HUMAN FŒTUS OF ABOUT EIGHT AND A HALF MONTHS, SHOWING THE HUMAN FISSURAL SYSTEM OF THE FRONTALIS MEDIUS.

Photograph of the right hemisphere of a human fœtus of about eight and a half months. The main primary and secondary sulci are well represented. Those of the frontal lobe are shown in the following figure. The specimen beautifully shows the human fissural system of the frontalis medius.

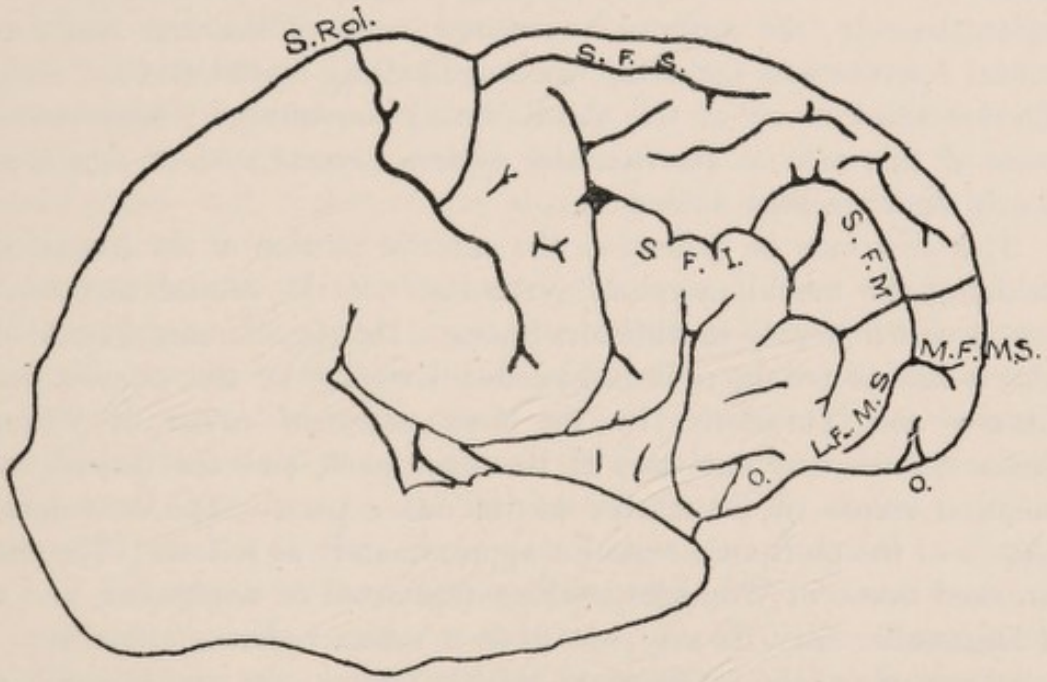


FIG. 36.—TRACING OF SAME TO SHOW THE FISSURES.

Tracing, showing the fissuration of the frontal lobe of the hemisphere shown in Fig. 35. S.Rol., furrow of Rolando; S.F.S., superior frontal sulcus; S.F.I., inferior frontal sulcus, S.F.M., sulcus frontalis medius; M.F.M.S., median fronto-marginal sulcus (Wernicke); L.F.M.S., lateral fronto-marginal sulcus (Eberstaller); O., sulci of the orbital surface. This frontalis medius fissural system is a purely human feature, having no homology with the sulcus rectus of the apes, and it is the focus of the "prefrontal" region to be dealt with later.

the inferior frontal sulcus, forming here what is probably a sulcus radiatus. The lower limb forms mesially the fronto-marginal sulcus of Wernicke, and laterally the fronto-marginal sulcus of Eberstaller.

It is not my intention to enter here into the vexed question of the homology of these sulci, as this is a matter of opinion, and at the same time is not germane to the purpose of this description.

It is, however, necessary to state my conviction that the part of the frontal lobe mesial to the anterior half of the inferior frontal sulcus is almost unrepresented in the anthropoids, and that the frontalis medius system is a purely human feature having no homology with the sulcus rectus of the apes.

The inferior frontal sulcus of man is commonly regarded as the homologue of the combined sulcus arcuatus and sulcus rectus of the apes, but this has of late been disputed, notably by S. J. Cole, who has described numerous ape-like features in the brain of a case of microcephalic idiocy. Whilst this writer argues very ingeniously and almost convincingly with regard to the homology of the sulcus arcuatus, I dispute entirely the homology of the human fronto-marginal system and the sulcus rectus, and I think that a systematic study of the cyto-architecture of the whole frontal lobe of his case would be necessary in order to provisionally establish his thesis.

As I pointed out many years ago, and shall indicate in a later chapter of this work, the main area of wasting in dementia lies in the prefrontal region, namely, the anterior two-thirds or so of the first and second frontal convolutions including the neighbouring mesial surface, and the anterior third or so of the third frontal convolution. Moreover, the focus of this area is the frontalis medius fissural system, which is so clearly shown in Figs. 35 and 36.

This area may be defined as the anterior portion of the frontal lobe, including the mesial marginal gyrus but not the orbital surface. Its extent varies greatly in different brains. Its approximate fissural limitations are as follows: It is bounded laterally by the *inferior frontal sulcus;* and, anteriorly, by the *fronto-marginal sulcus* of Wernicke (sulcus transversus anterior) at its inner part, and the *lateral fronto-marginal sulcus* of Eberstaller at its outer part. The convolutional pattern of the prefrontal region is approximately as follows: The *fronto-marginal sulcus* of Wernicke is often duplicated or triplicated, and that of Eberstaller may or may not have a *sulcus radiatus* above it. The anterior parts of the *superior and inferior frontal sulci* pass forwards over the prefrontal region. Between and extending forwards beyond these is the *sulcus frontalis medius* of Eberstaller, which is often described as a sagittal and frequently detached part of the *fronto-marginal sulcus.* This sulcus is inconstant and often broken into pieces, and it frequently

joins the *superior frontal sulcus*, or extends forwards from this as a series of short interdigitations. In good brains it is well developed, and lies in the centre of a large and complex *middle frontal gyrus*. Lastly, near the midline, parallel to the *superior frontal sulcus*, is the anterior portion of the inconstant and imperfect *sulcus mesialis* of Cunningham.

On the evidence which I shall produce in succeeding chapters of this work, I therefore subdivide the frontal lobe, from the functional aspect, into posterior or psychomotor (cerebral-associative-motor) and anterior or prefrontal (higher-cerebral-associative) portions.

Such a functional division of the lobe is, however, strongly suggested by the myelogenetic investigations of Flechsig and of C. and O. Vogt, and by the histological studies of Brodmann and of Campbell.

In Fig. 37 is reproduced the region of the frontal lobe, in which, according to Flechsig and the Vogts, myelinisation is late in occurring; and also the homologous region in the diagrams of Brodmann (regio frontalis) and of Campbell (frontal and prefrontal areas). In the case of the last author, both his published diagrams are inserted, since, though the fissuration is identical, these differ in important details.

When differences in the method of drawing adopted by these authors are allowed for, in spite of the different methods of investigation which were employed by the several workers, an obvious unanimity exists. Further, since there is great variability in the superficial extent of this region in different brains, more particularly in the poorly developed brains which are common in the insane, it is clear that this region is identical with that which I describe under the term "prefrontal."

It may finally be remarked that the myelogenetic investigations of Flechsig and the Vogts are strongly confirmatory of the view I have expressed above with regard to the almost purely human character of this portion of the frontal lobe.

Minute Structure of the Frontal Lobe.—As I have employed a special method for the elucidation of the functional significance of the psychomotor cortex, and shall in its appropriate place deal with the cyto-architecture of this region, it is unnecessary to make a detailed reference here to its minute structure. It may, however, be remarked that the special peculiarities of this part of the cortex are two. The posterior and smaller portion of the psychomotor area (area 4 of Brodmann and precentral of Campbell) is characterised by the existence of Betz or ganglionic cells in the fourth lamina (L. IV). The location of these cells was minutely and accurately mapped out as a definite histological region of the cortex by Bevan-Lewis and Henry Clarke in 1878. The whole of the psychomotor region, including the Betz-cell area, possesses, however, a further characteristic in the detail that the third or granule-lamina (L. III) is reduced to a minimal depth, being practi-

cally absent posteriorly and becoming gradually definite as the more anterior limits of the region are reached.

In the case of the prefrontal region I shall deal here in considerable

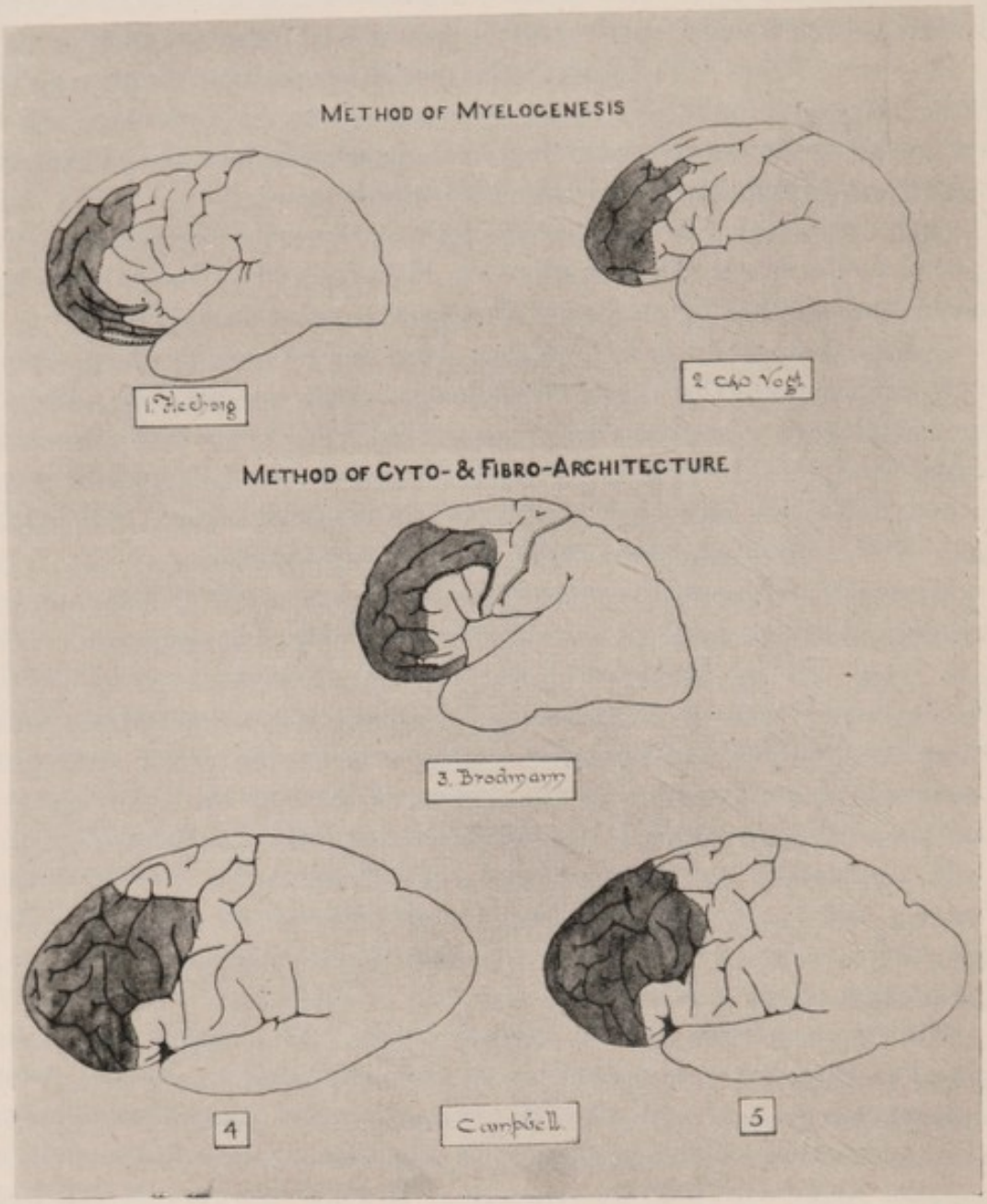


FIG. 37.—DIAGRAMS OF "PREFRONTAL" REGION PREPARED FROM THE FIGURES OF FLECHSIG, C. & O. VOGT, BRODMANN, AND CAMPBELL.

This figure reproduces the region of the frontal lobe, in which, according to Flechsig and C. & O. Vogt, myelinisation is late in occurring; and also the homologous regions determined by Brodmann (regio frontalis) by a study of the cyto-architecture, and by Campbell (frontal and prefrontal areas) by a study of the fibro-architecture of the cortex. The region shown in all these diagrams, differences in the method of drawing adopted being allowed for, is for practical purposes identical, and is that to which I have applied the term *prefrontal* or *higher-cerebral-associative*. The rest of the external surface of the frontal lobe is that to which I have applied the term *psychomotor* or *cerebral-associative-motor*. The purpose of the figure is to accentuate *similarity* of opinion on the part of different authorities, as hitherto attention has been paid chiefly to often unimportant *differences* of view.

detail with its minute structure. I may remark that the particular portion of this region which I shall employ for the purposes of illustration—and the portion moreover which I have made use of for the purposes of the investigations which will be described later—lies in the anterior part of what I have described as the frontalis medius system of sulci, *i.e.* area 10 of Brodmann and prefrontal region of Campbell. This portion is, as I have remarked, the chief focus of the wasting which occurs in dementia.

As I shall indicate later, the prefrontal cortex is of great functional significance, and, in fact, constitutes the physical basis of the more general processes of cerebral association. It is the last region of the cerebrum to be evolved, its degree of evolution varies in normal individuals, and it is the first region to undergo dissolution in mental decadence. It is to be expected, therefore, that such a region should possess a structure of great delicacy and high complexity, and it would seem hardly necessary to demonstrate here that this is the case.

It has, however, been definitely stated by Campbell, in his recent monograph, which has attracted great attention, that the prefrontal cortex is of slight structural and functional significance. He remarks, " The structural development of the ' prefrontal ' cortex is exceedingly low. It presents an extreme of fibre poverty. All the fibre elements are of delicate calibre, and its association system is particularly deficient. Its cell representation is on a similar scale. The cortex is also shallow."

There is no mistake, as has been suggested, with regard to the region under consideration, as a comparison of the diagrams of Campbell and of Brodmann at once indicates ; and I have no doubt that the cause of the great discrepancy in the descriptions of Campbell and myself lies in the difference of method adopted. Campbell used throughout his investigations the Wolters-Kulschitzky method, which, as ordinarily employed, I regard as quite unreliable for this especial purpose. The process, on the other hand, which I adopt for the staining of the fibres of the cortex, is that already described in detail in Chapter III.

A detailed description of the cyto- and fibro-architecture of the prefrontal region, though tedious to the reader, is thus necessary. The cellular elements will first be referred to ; an account will then be given of the fibro-architecture of this region.

(A) *Cellular Elements of the Prefrontal Cortex.*—As I have already remarked, the prefrontal cortex exhibits the same lamination as the visuo-psychic zone and the cerebral-associative cortex generally—namely, an outer fibre-lamina, outer and middle cell-laminæ, an inner fibre-lamina, and an inner cell-lamina.

Lamina I.—Superficial layer. Molecular layer. Outer fibre-lamina.

This lamina resembles the corresponding lamina in other regions of the cortex in possessing few and insignificant cellular elements.

Lamina II.—Layer of pyramidal cells. Outer cell-lamina. This lamina is well developed, and is of practically the same average depth as is the corresponding lamina in the visuo-psychic region of the cortex, namely, 0·83 mm. This depth is somewhat greater than is that of the combined third, fourth, and fifth laminæ, which is 0·77 mm., and in this respect the cortex of the prefrontal region again resembles that of the visuo-psychic area. These facts, as was shown in Chapter IV, which deals with the mode of evolution of the cortex cerebri, prove that the lamina under consideration is as well developed as is the corresponding lamina in the visuo-psychic region.

The nerve cells in this lamina are well developed and pyramidal in shape, and those in its lower half are large and well formed and possess well-marked and complex apical processes and numerous basal dendrites. In the upper third of the lamina the cells are smaller and more closely packed, but even here well-formed cells, of a triangular rather than a pyramidal shape, and possessing well-marked apical processes and basal dendrites, are present.

Lamina III.—Layer of granules. Middle cell-lamina. This lamina is well developed, and resembles in its average depth and in its cellular elements the corresponding lamina in the visuo-psychic region.

The nerve cells are small and closely packed. They are of irregular shape, but as a whole are rounded in outline, or are triangular with convex sides, and they possess two or three short thin processes.

In the upper and lower limits of the lamina the special cells belonging to it are encroached upon by scattered cellular elements belonging to the adjacent laminæ (L. II and L. IV), but very slightly so in comparison with the partial fusion of the corresponding laminæ in the visuo-psychic region (and visuo-sensory area). The middle cell-lamina of the prefrontal region is in fact unusually clearly demarcated from the laminæ above and below it.

Lamina IV.—Inner line of Baillarger. Inner fibre-lamina. This lamina, in average depth and general characters, resembles the corresponding layer in the visuo-psychic region.

The cellular elements contained in it are scattered and of a mixed type. In the upper part of the lamina, however, triangular or pyramidal-shaped cells of considerable size lie singly or in clusters (homologues of Betz-cells and of solitary cells of Meynert in the precentral and the occipital cortex respectively), and similar solitary cells lie here and there in the lower part of the lamina.

Lamina V.—Layer of polymorphic cells. Inner cell-lamina. This

lamina, in average depth and general characters, again closely resembles the corresponding lamina in the visuo-psychic region.

The cellular elements are numerous and irregular in shape, and lie in all directions. They, on the whole, possess at any rate from two to five well-developed processes. As in other regions of the cerebrum, their shape varies considerably with the part of the convolution under examination. At the side of the convolution (parts in contact between the surface of the brain and the bottom of a fissure) they are mostly irregular in shape. At the bottom of a fissure they are often fusiform in shape and lie parallel to the surface. At the apex of a convolution (part where an abrupt bend occurs at the lip of a fissure, &c.) they are largely fusiform in shape and radiate towards the surface of the brain between the columns of Meynert. Finally, on the flat external surface of a convolution their shape and arrangement are intermediate between those on a side and those at an apex.

(B) *The Nerve-Fibres of the Prefrontal Cortex.*—For convenience of description the fibre-architecture of the prefrontal region will be considered as far as possible under the laminæ of the cortex cerebri which have already been referred to.

(1) *Superficial or Molecular Layer. First Lamina.*—Throughout the whole of this lamina, excepting the thin outer neuroglial covering, is a very complex and delicate meshwork of fine varicose fibrils. These fibrils interlace in every direction, though a considerable proportion lie approximately parallel to the surface. Many, of rather coarser calibre, pass vertically or obliquely into and from the subjacent pyramidal or outer cell-lamina (L. II). This meshwork is traversed obliquely by scattered medium and even coarse varicose fibrils. Beneath the outer fibreless covering is a definite but imperfect layer of medium and coarse varicose fibrils, the continuity of which increases with the thickness of the section. Lastly, in the deeper part of the layer, just before it passes into the pyramidal or outer cell-lamina, a sufficiently distinct decrease in the complexity of the fibrillar meshwork exists to enable the line of separation between the two laminæ to be detected even if the nerve cells of the latter are invisible.

(2) *Pyramidal or Outer Cell Layer. Second Lamina.*—Through the lower boundary of this lamina the terminations of the columns of Meynert, composed of fine and medium and also several coarse medullated and varicose fibrils, pass upwards, and some of the fibrils can be traced through the upper confines of the lamina into the outer or first lamina of the cortex.

Lying throughout the lamina under description is an intricate meshwork of mixed fibrils, which is coarser below, and attains its maximum delicacy and complexity about the upper trisection of the lamina and

below the aggregated smaller pyramidal cells. In the outer part of the lamina which is occupied by these cells the meshwork is complex, delicate, and wavy, owing to the manner in which the fibrils interlace in every direction between the individual cells.

(3) *Third, Fourth, and Fifth Laminæ. Middle or Granule-Cell-Lamina, Inner Fibre-Lamina, and Inner or Polymorphic Cell-Lamina.*—Owing to the fact that no exact relationship exists between the fibre-structure of this part of the cortex cerebri and the three primary laminæ of which it is composed, the whole will be included under one description.

This region of the cortex is traversed vertically by the radiations of Meynert, and lying horizontally in it are two fibre-plexuses. The outer and more delicate of these is situated at the junction of the pyramidal layer (second lamina) and the granule-layer (third lamina), and encroaches on the latter. The inner and denser of these horizontal fibre-plexuses lies in the region of the fourth lamina (inner fibre-lamina of primary cortical structure).

Radiations of Meynert.—These columns are composed of medullated and varicose fibrils of different calibre, and include many coarse medullated fibres.

Interradiary Plexus.—This plexus is of remarkable and delicate fibrillar wealth, and is traversed obliquely and horizontally by numbers of coarse medullated and varicose fibres. In the two regions above referred to, a distinct band is produced by a horizontal condensation of the fibrillæ. Of the two bands, the inner (fourth lamina) is the more dense, and the outer (plexus lying between the second and third laminæ and encroaching on the latter) is the more delicate. Even in the latter, however, many coarse medullated and varicose fibres lie obliquely and horizontally, and these may be followed at times for considerable distances.

The interradiary plexus is of the least density in the lower part of the granule-layer (third lamina), but even here is of great and delicate fibre wealth, and in structure is homologous with the band of fibres lying directly above it at the junction of the second and third laminæ. The interradiary plexus is of rather coarser composition and forms a dense meshwork round the nerve cells in the fifth lamina (polymorphic or inner cell-lamina), and in structure is homologous with the fibre-band lying immediately above it in the fourth lamina (inner fibre-lamina of primary cortical structure).

The Horizontal Fibre-Bands of the Prefrontal Cortex.—In order to avoid misinterpretation in one of the most difficult details of the fibre-architecture of the cortex, I shall now refer, in the form of a summary, to the exact position of the horizontal fibre-bands of the prefrontal region.

Of the five primary laminæ of the cortex cerebri, two—the first and the fourth (outer and inner fibre-laminæ)—are in essential structure fibre-layers. These laminæ are laid down in the developing cortex before nerve fibres appear, and are not to be confounded with the fibre-bands of the adult cortex.

The horizontal fibre-bands of the adult cortex are four in number, and, as a whole, decrease in thickness from below upwards.

The Fourth and Deepest Fibre-Band.—Inner line of Baillarger. This band occupies the position of the fourth primary lamina of the cortex. In specimens stained for nerve-fibres, this band is usually visible in sections prepared from the centres of association, but is commonly invisible in sections taken from the sensory spheres, owing to the immense number of projection fibres which traverse the cortex vertically in these regions. In the prefrontal region it is, as a rule, readily discerned in carefully differentiated specimens.

The Third Fibre-Band.—Outer line of Baillarger. This band is much thinner than the last described; it lies between the second and third laminæ (pyramidal or outer and granule- or middle cell-laminæ), and it somewhat encroaches on the latter of these. It is usually readily visible in sections taken from nearly any part of the cortex cerebri. It is especially prominent in the visuo-sensory area of the cortex (the most definite sensory sphere), it has received the name of Line of Gennari, and it is here separated from the second lamina (pyramidal or outer cell-lamina) by an additional layer of granules. This fact proves its connection with the third lamina (granule- or middle cell-lamina); and the association of the third lamina, including this fibre-band, with the optic radiations, is demonstrated by the fact that in long-standing or congenital blindness the outer layer of granules is decreased in thickness to the extent of more than 10 per cent., and the fibre-band to the extent of nearly 50 per cent.

The Second Fibre-Band.—Superradiary fibre-band. This fibre-band is thinner than the last described. It is usually readily demonstrated in sections taken from nearly any part of the cortex cerebri, though its position appears to vary somewhat in different regions. In the prefrontal region it consists of a delicate fibre-band, which in structure is a condensation of the general fibre meshwork of the second lamina, and lies approximately at the outer trisection of this lamina (pyramidal or outer cell-lamina), and below the aggregated smaller pyramidal cells.

The Superficial or First Fibre-Band.—Tangential layer of fibres. This fibre-band lies in the outer part of the first or outer lamina (outer fibre-lamina) of the cortex, just beneath the thin outer neuroglial covering. The coarseness of its constituent fibre-elements varies in different regions of the cortex. In the prefrontal region it consists of a definite

but imperfect layer of medium and coarse varicose fibrils, the continuity of which increases with the thickness of the section.

I shall now complete this somewhat lengthy account of the fibre-

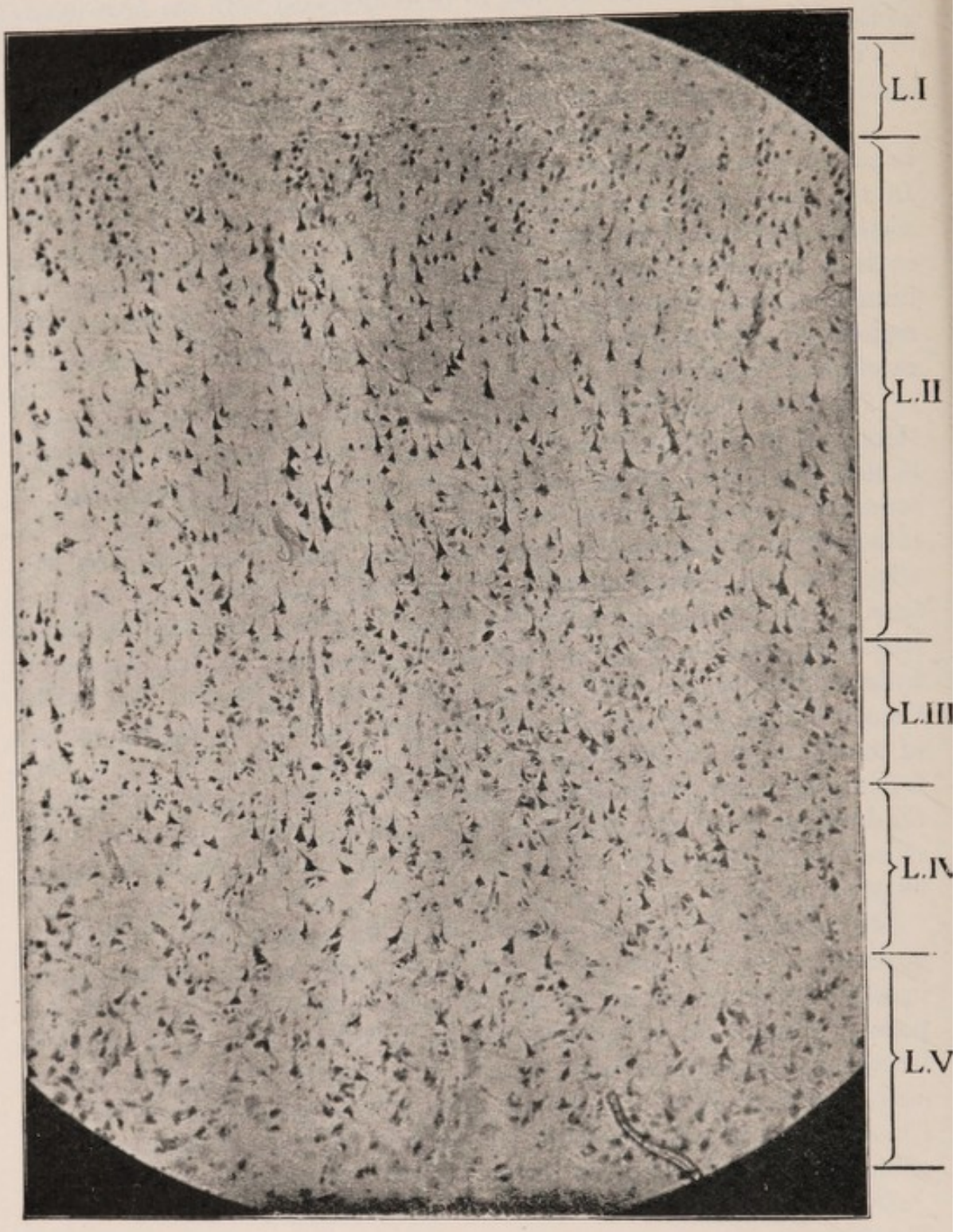


FIG. 38.—NORMAL HUMAN PREFRONTAL CORTEX.

Eighty-two diameters. Normal prefrontal cortex of man. L. I to L. V as in previous figures. The figure gives a general view of the size, number, and degree of development of the constituent cells, which are well evolved even up to the surface of L. II.

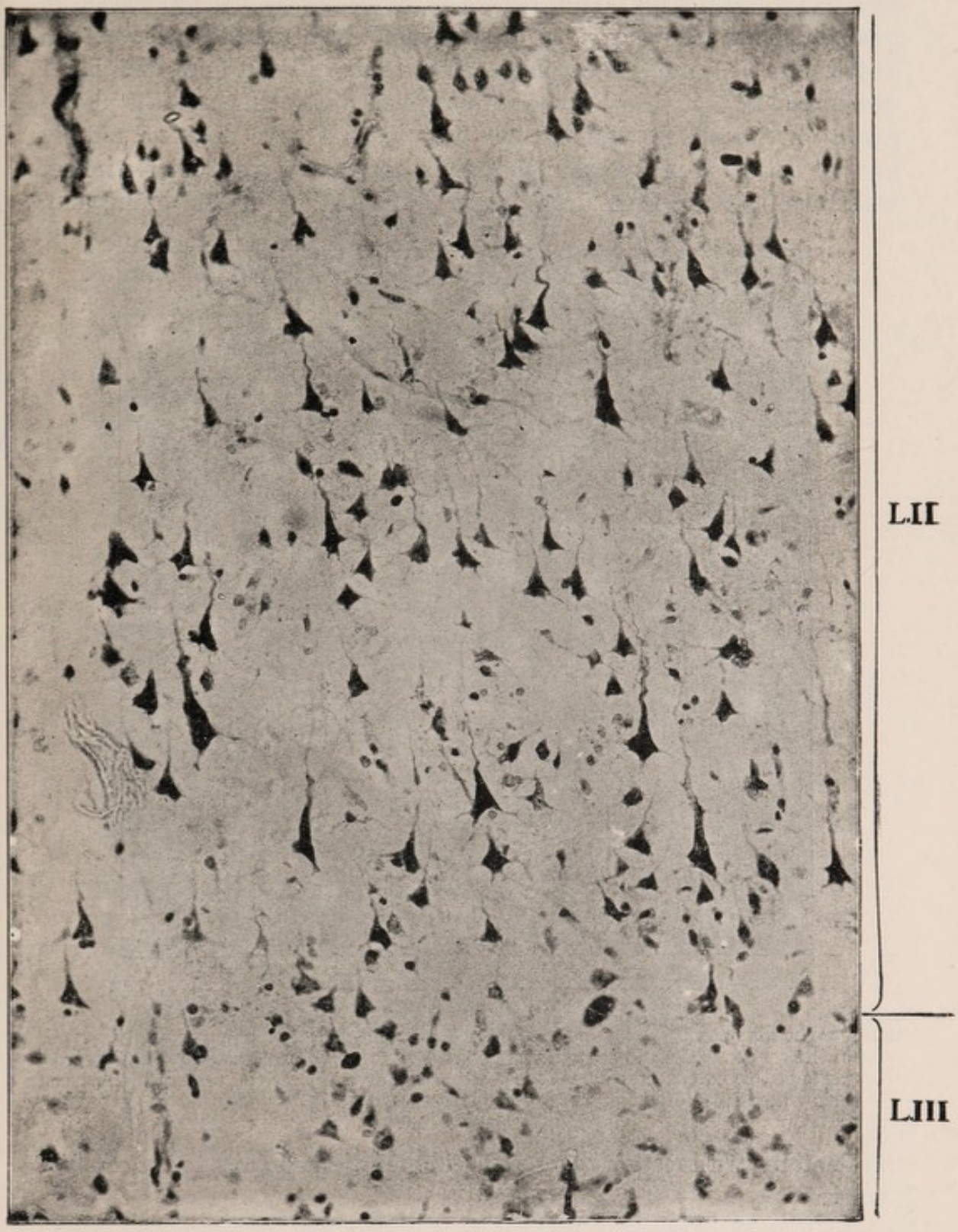


FIG. 39.—PORTION OF NORMAL HUMAN PREFRONTAL CORTEX.

Two hundred and eleven diameters. A portion of the preceding microphotograph more highly magnified. L. I to L. V as in previous figures. The figures show the lower two-thirds of L. II and the upper portion of L. III. The well-known wavy appearance of the apical processes of certain of the cells, which is apparently due to some defect in the process of hardening, is well shown. Sections presenting this appearance are unsuitable for the purposes of measurement, however perfectly they may be stained.

architecture of the prefrontal region of the cortex by the production of proof of the great complexity of structure which exists in this region, in the form of a number of photographs of its cell and fibre wealth. I would remark that the specimens from which I have prepared the photographs of fibres were stained, by the process I have detailed, not by myself, but by G. A. Watson, and thus provide independent testimony with regard to the intimate structure of this region of the brain, and,

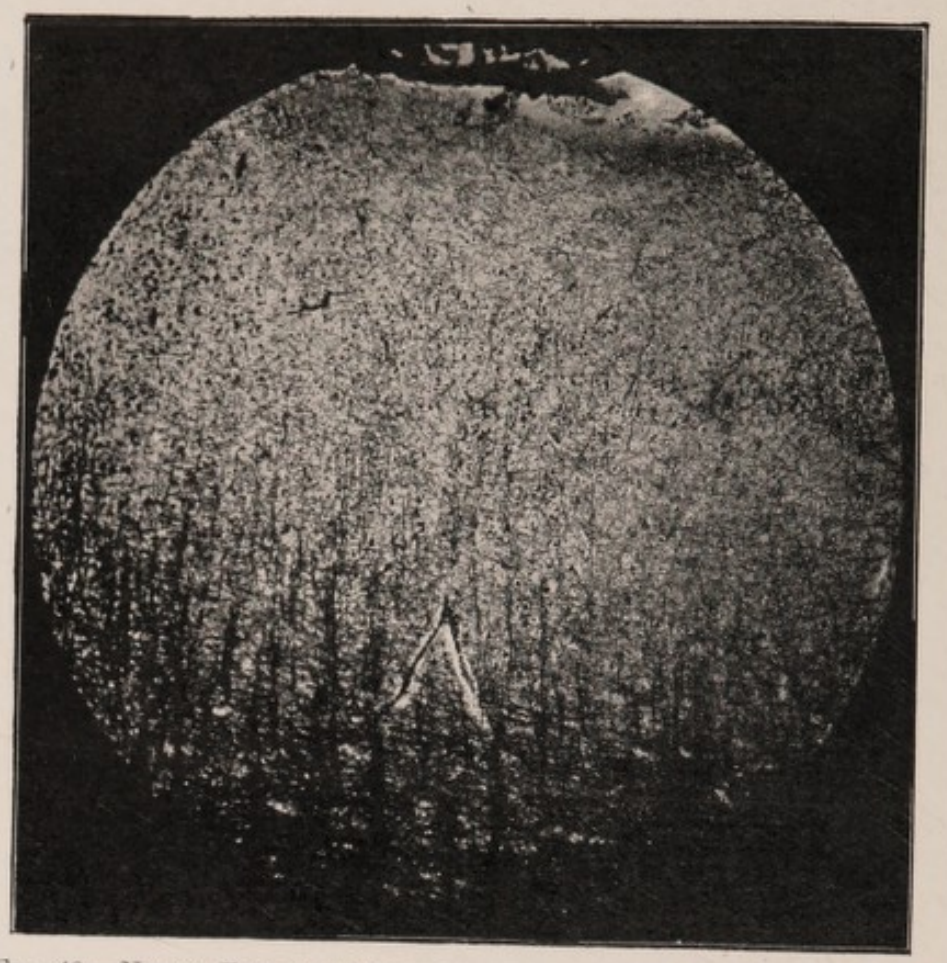


FIG. 40.—NERVE FIBRES OF THE GREATER PART OF THE DEPTH OF THE PREFRONTAL CORTEX.

Forty-eight diameters. A low-power microphotograph of the greater part of the depth of the cortex. The succeeding figures, Figs. 41 to 44, show, from above downwards, parts of this cortex under a higher power; and a portion of the vessel which is seen below the centre of the figure appears in Fig. 43.

incidentally, with respect to the applicability of the process to the cerebral cortex.

In Fig. 38 is shown a general view of the size, number, and degree of development of the constituent nerve cells of the prefrontal cortex. It will be noticed that these are well evolved even up to the surface of L. II, the pyramidal or outer cell-lamina. These details are more clearly visible in the following illustration, Fig. 39, which shows a portion of Fig. 38 more highly magnified, namely the upper part of L. III, the

granule-cell-lamina and the greater portion of L. II, the pyramidal or outer cell-lamina.

These specimens exhibit no evidence of cell paucity, but, on the contrary, show a cell wealth which it would be easier to rival than to

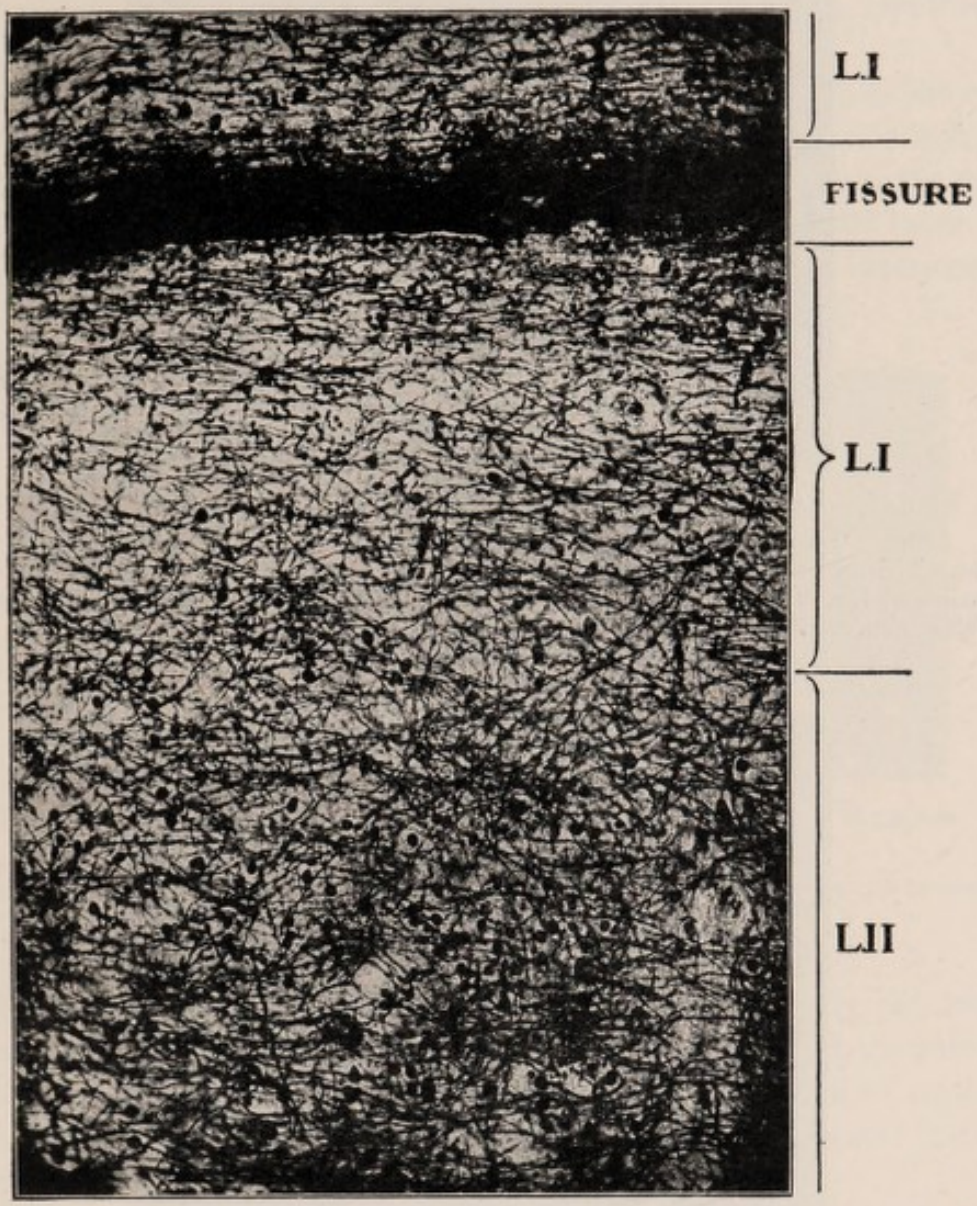


FIG. 41.—UPPER PART OF FIG. 40, SHOWING NERVE FIBRILS OF LAMINA I AND PART OF LAMINA II.

One hundred and sixty-five diameters. The figure shows the great wealth of fine fibrils present in L. I and in the upper part of L. II.

surpass. They show the well-known wavy appearance of the apical processes of certain of the cells, which is apparently due to some defect in the hardening process. For this reason I never employ sections which exhibit this appearance for the purposes of micrometric measurement.

I would remind the reader that the mode of evolution of the prefrontal cortex has already been described and illustrated in Chapter IV, and

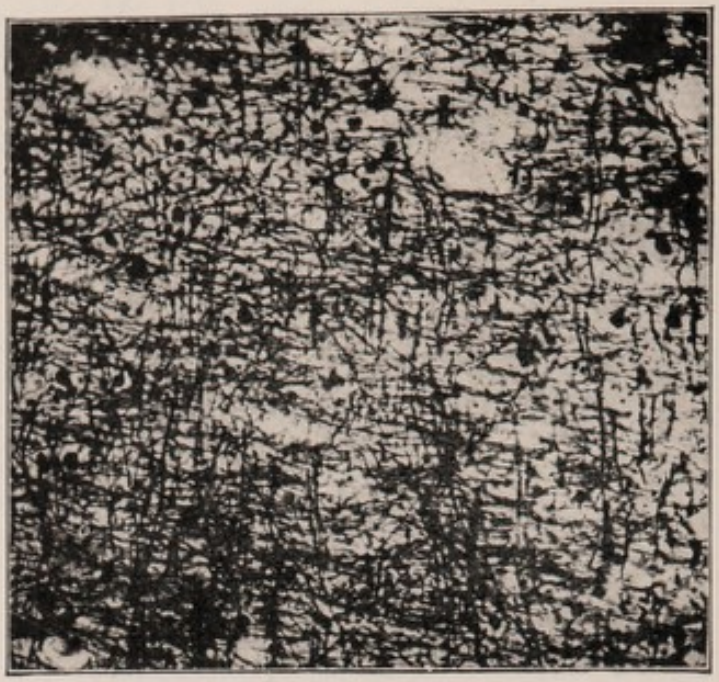


FIG. 42.—PART OF FIG. 40, SHOWING THE FIBRILLAR MESHWORK AT THE JUNCTION OF L. II AND L. III.

One hundred and sixty-five diameters. The figure shows the fibrillar meshwork which exists at the junction of L. II and L. III. In the upper half, the delicate horizontal feltwork about the granules may be seen.

FIG. 43.—PART OF FIG. 40, SHOWING THE FIBRILLAR MESHWORK BETWEEN THE UPPER PARTS OF THE COLUMNS OF MEYNERT.

One hundred and sixty-five diameters. The figure shows the fibrillar meshwork between the upper parts of the columns of Meynert. At the top of the figure is shown the lower part of the Λ-shaped vessel seen in Fig. 40. To the right of the centre may be seen one of the relatively coarse vertical fibres, which are present in considerable numbers.

that the series of figures there introduced are at least equally valuable as evidence of the well-developed cyto-architecture of this region.

I propose now to illustrate the fibre-architecture of the prefrontal cortex by means of a series of microphotographs (Figs. 40–44). The low-power microphotograph, Fig. 40, contains the greater part of the depth of the cortex, and the succeeding four figures show, from above downwards, parts of the cortex under a high power.

In the upper part of the first of these, Fig. 41, may be seen the outer fibre-lamina or superficial layer. The fibrillar complexity is evident, and the tangential system is well developed. In the lower part of the figure is seen the outermost part of the second lamina or pyramidal layer, and the fibrillar wealth is very clear, the cells lying in nests composed of multitudes of interlacing fibrils.

FIG. 44.—PART OF FIG. 40, SHOWING SIX OF THE COLUMNS OF MEYNERT, WITH THE FELTWORK OF FIBRES BETWEEN THEM.

One hundred and sixty-five diameters. The figure shows six of the columns of Meynert, together with the feltwork of fibres between them.

The microphotograph shown in Fig. 42 is taken at the junction of the second, pyramidal, or outer cell-lamina, and the third or granule-cell-lamina. The fibres are rather coarser, and arranged as a whole vertically and horizontally. In the upper half, the delicate horizontal feltwork above the granules may be seen.

Fig. 43 is a microphotograph giving the appearance of the cortex in the upper part of the columns of Meynert. It includes the lower portion of the ∧-shaped vessel, and also a coarse nerve fibre, which are visible in the low-power microphotograph shown in Fig. 40. All types of fibrillar wealth are beautifully seen.

Lastly, the microphotograph in Fig. 44 is taken lower down, and shows six of the columns of Meynert with the interlacing meshwork of fibrils between them.

I would remark that the staining of these various levels in a single section is a very difficult task and a thorough test of the process employed.

It is much easier to fail than to be successful in the attempt to show all the details of fibre-architecture in one section. As a rule one must be content to obtain the finer superficial plexuses in one preparation, and the deeper plexuses in others, different methods of differentiation usually being necessary in order that the required features may be presented.

In view of these illustrations it is impossible for any reasonable individual to deny the richness of the cell-architecture and the great complexity of the fibre-architecture of the cortex of the prefrontal region. It may finally be added that John Turner, in 1906, almost simultaneously with the appearance of my paper on this subject, also combated the statements of Campbell, and remarked that the prefrontal region, treated by a special method of his own, shows a wealth of inter-cellular fibrils which is probably greater than is to be found in any other region of the cortex cerebri.

CHAPTER VI

THE CORTEX IN MENTAL DISEASE

THE data contained in this chapter serve a double purpose. On the one hand they provide the main proof of the generalisation of amentia and dementia which is referred to in the first chapter of this work. On the other, they afford important evidence with regard to the functional significance of the three sample regions of the cerebral cortex which will be dealt with, namely, the visuo-sensory area (sensory projection sphere), the visuo-psychic zone (hall-marked region of lower cerebral association), and the prefrontal area (region of higher cerebral association).

From the former point of view, confirmatory evidence derived from the clinico-pathological study of mental disease will be adduced in a subsequent chapter, which will deal with the abnormal and morbid appearances exhibited by the intracranial contents of the insane. Such evidence, though in itself of little value as proof of the thesis of amentia and dementia, gains greatly in importance when added to the definite facts contained in the following description.

From the latter point of view, not only is definite proof afforded concerning the functional significance of the cortical areas under consideration, but valuable facts are incidentally produced with regard to the structural condition of the visuo-sensory and visuo-psychic regions of the subjects of mental disease. These facts are provisionally suggestive of the thesis that there exists a definite structural basis for the special symptomatology presented by the subjects of mental disease, and perhaps also for the unequal mental endowments of sane or normal persons.

In brief, from the aspect of morbid cerebral function I purpose proving the generalisation of amentia and dementia, and indicating the probability of a structural basis for the special symptomatology of mental disease. Moreover, from the aspect of normal cerebral function, it is my intention to produce proof of the functional significance of certain sample cerebral regions. This will, I hope, be found to provide a safe basis on which to erect the partially proved provisional hypothesis of human cerebral function which has been indicated.

I have already detailed in full the method of micrometric measurement which I have employed, and shall now proceed to describe the results which have been obtained. I shall deal with general average

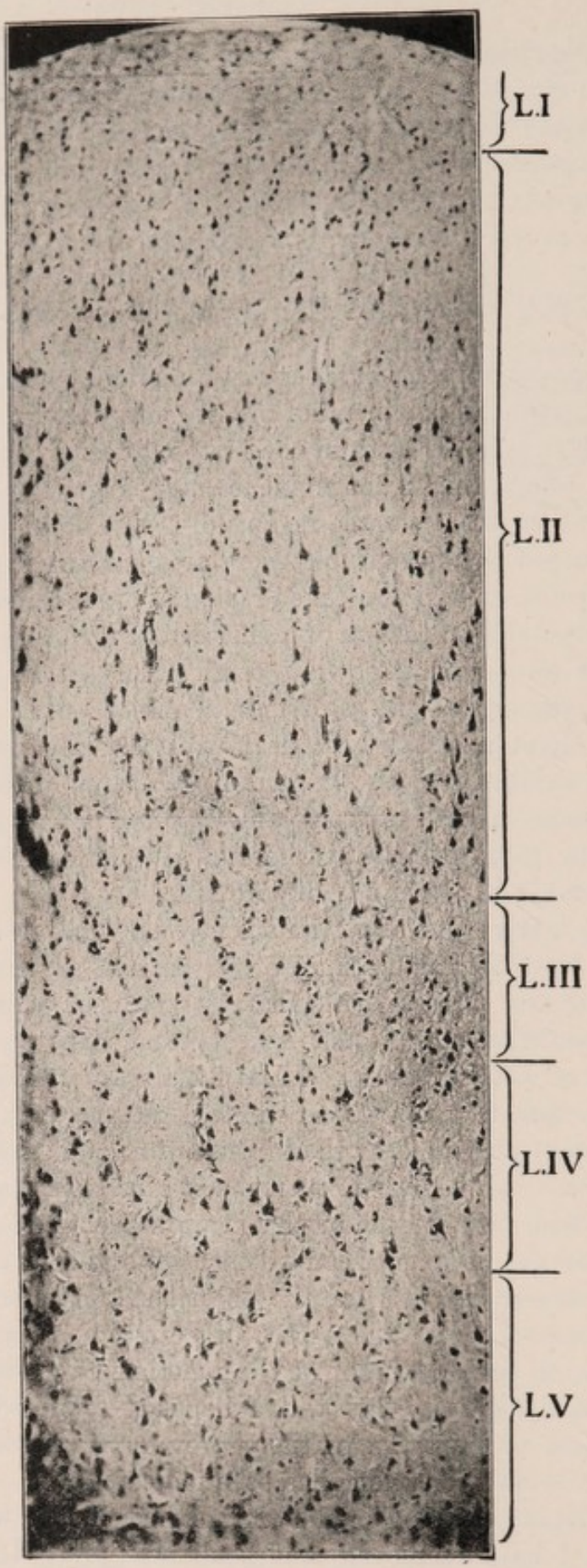


FIG. 45.—THE PREFRONTAL CORTEX OF THE NORMAL ADULT.

Seventy-six diameters. The magnification is somewhat less than is that of the succeeding Figs. 46, 49, and 50. L. I to L. V as in previous figures.

measurements only—and with these in percentages of the normal—as the introduction of tables of measurements would merely burden the text without increasing the lucidity of the description. Moreover, full details, both of the individual cases, and of the complete results of the micrometric examination of these, have already been published.

The series I am about to describe includes thirty cases, of which four are normals, and twenty-six are types of mental disease which grade from the idiot on the one side to the gross dement and the gross general

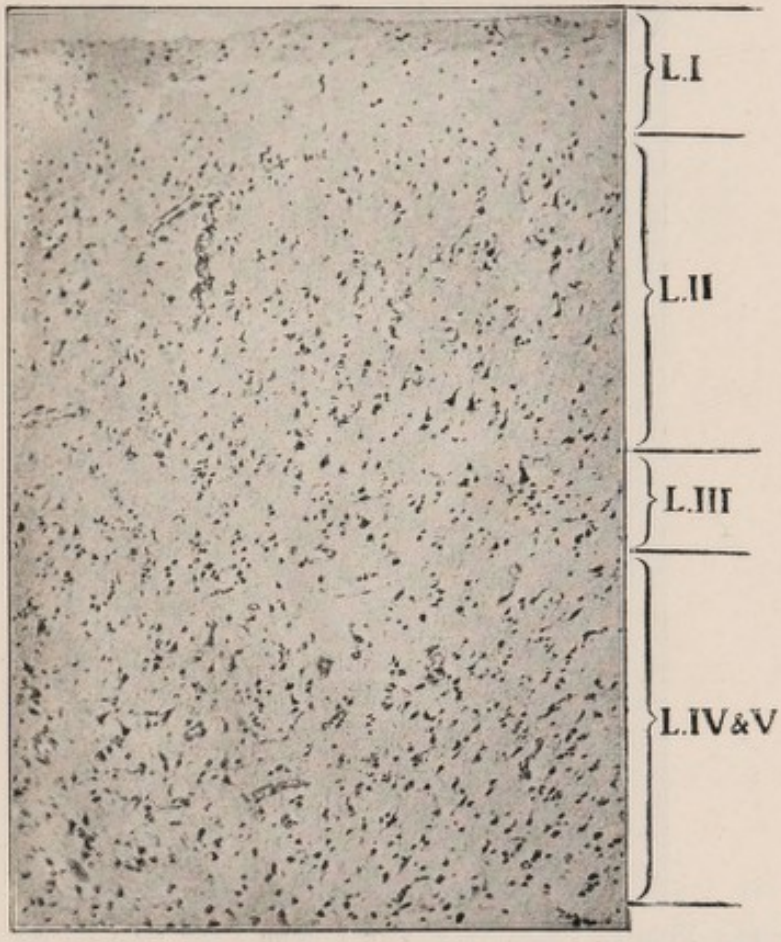


FIG. 46.—THE PREFRONTAL CORTEX IN SEVERE IMBECILITY.

Eighty-four diameters. A case of severe imbecility. L. I to L. V as in previous figures. The markedly subnormal depth, which is especially evident in L. II, may be seen when the figure is compared with Fig. 45, the normal. The constituent cells are deficient in number, defective in structure, and irregular in position.

paralytic on the other. In twelve cases the visuo-sensory and visuo-psychic regions, and in seventeen the prefrontal, have been examined and measured, whilst in one, to which I shall refer in greater detail, all these regions have been exhaustively dealt with. From the theoretical aspect, a series of cases in which all three regions had been studied would have been preferable. This, however, has not been possible, owing to the length of time occupied by the collection and examination of the material, and the great labour, and particularly the eye-strain, necessi-

tated by such a method as that which I have been compelled to adopt. The micrometric study of the cortex by this method produces, however, such trustworthy and comparable results that the larger number of cases which I have thus been able to examine has widened the scope of the research without impairing the validity of the conclusions which result.

Before dealing with actual measurements, I shall again follow the method I have previously adopted during the description of the mode of development of the cerebral cortex, in this instance inserting and describ-

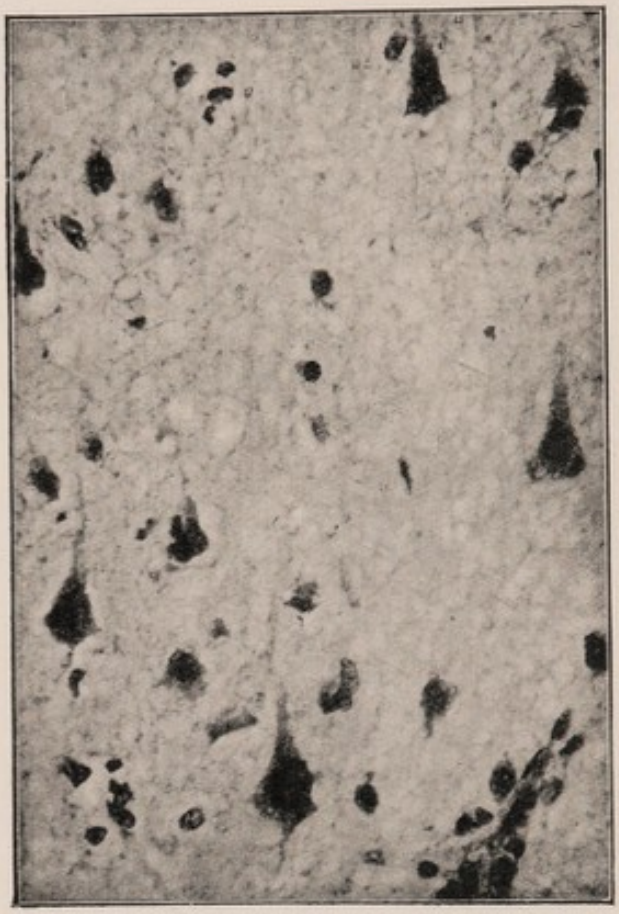


FIG. 47.—NORMAL CELLS FROM THE LOWER PART OF L. II OF FIG. 45.
Three hundred and twenty-five diameters. The absence of the artifact which appears in, and is referred to in the description of, Fig. 39 should be noted.

ing a number of microphotographs of the cerebral cortex (from the prefrontal region), in illustration of the great differences which are presented by cases of different types. As the method of measurement has already been fully described, it is merely necessary to remark here that such illustrations cannot be regarded as in any way indicative of the general average measurements which result from systematic examination, since, by choosing suitable regions, it would be possible to produce the greater number of the photographs from nearly any single case in the series. In all, with the exception of the normal, and the two high-power microphotographs, the magnification is the same.

The first photograph (Fig. 45) represents the normal appearance of the cortex. The five laminæ of which it is composed can readily be deciphered. I would particularly direct attention to the predominant depth of the second lamina, or pyramidal layer, for comparison with the cases which follow.

In the next figure (Fig. 46) is shown the cortex of a case of severe imbecility. The great decrease in depth, especially as regards the second

FIG. 48.—CELLS FROM THE LOWER PART OF L. II OF FIG. 46.

Three hundred and twenty-five diameters. Severe imbecility. The figure shows the stunted and irregularly placed cells from the lower part of L. II of the case illustrated in Fig. 46. The contrast presented by the homologous cells of this and of the preceding figure should be noted.

lamina, is evident. It will be noticed that the constituent cells are deficient in number, defective in structure, and irregular in position.

I now present, under a higher power, photographs of the cells of the lower part of the second lamina of this and of the preceding case. The first figure (Fig. 47) shows the normal appearance of these cells, and the second (Fig. 48) the stunted appearance and irregular position of the corresponding cells of the marked imbecile.

In the next photograph (Fig. 49) is illustrated the cortex of a well-marked imbecile of greater intelligence than the last case. The cortex

is better evolved, and the larger cells are decently formed and less irregularly placed.

The next illustration (Fig. 50) shows practically the whole depth of the cortex of a case of gross dementia, this being very much shallower than the normal. The blood-vessels, I may remark, are both numerous

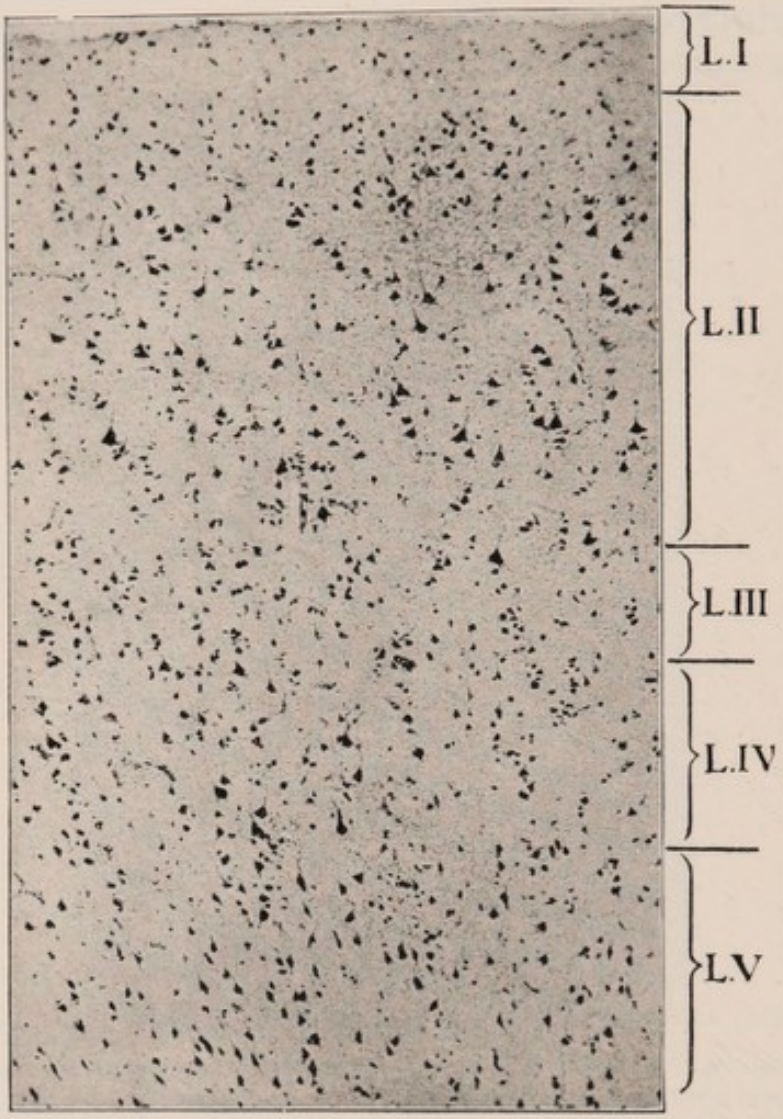


FIG. 49.—PREFRONTAL CORTEX OF WELL-MARKED IMBECILITY.

Eighty-four diameters. A case of well-marked imbecility. L. I to L. V as in previous figures. The cortex is less markedly subnormal in depth than is that of the case illustrated in Fig. 46, and the larger cells contained in it are less stunted in appearance, and also less irregularly placed.

and prominent when compared with a specimen of normal cortex stained by the same method. The neuroglia cells are also very numerous in a section stained to show them.

Lastly, the final illustration (Fig. 51) of this series shows the approximate depth of the cortex in a fœtus of six months, a stillborn infant, a case of severe amentia, a normal adult, and a case of severe dementia.

Lines are drawn which include the second lamina, and the third to the fifth laminæ, in order to show these more clearly.

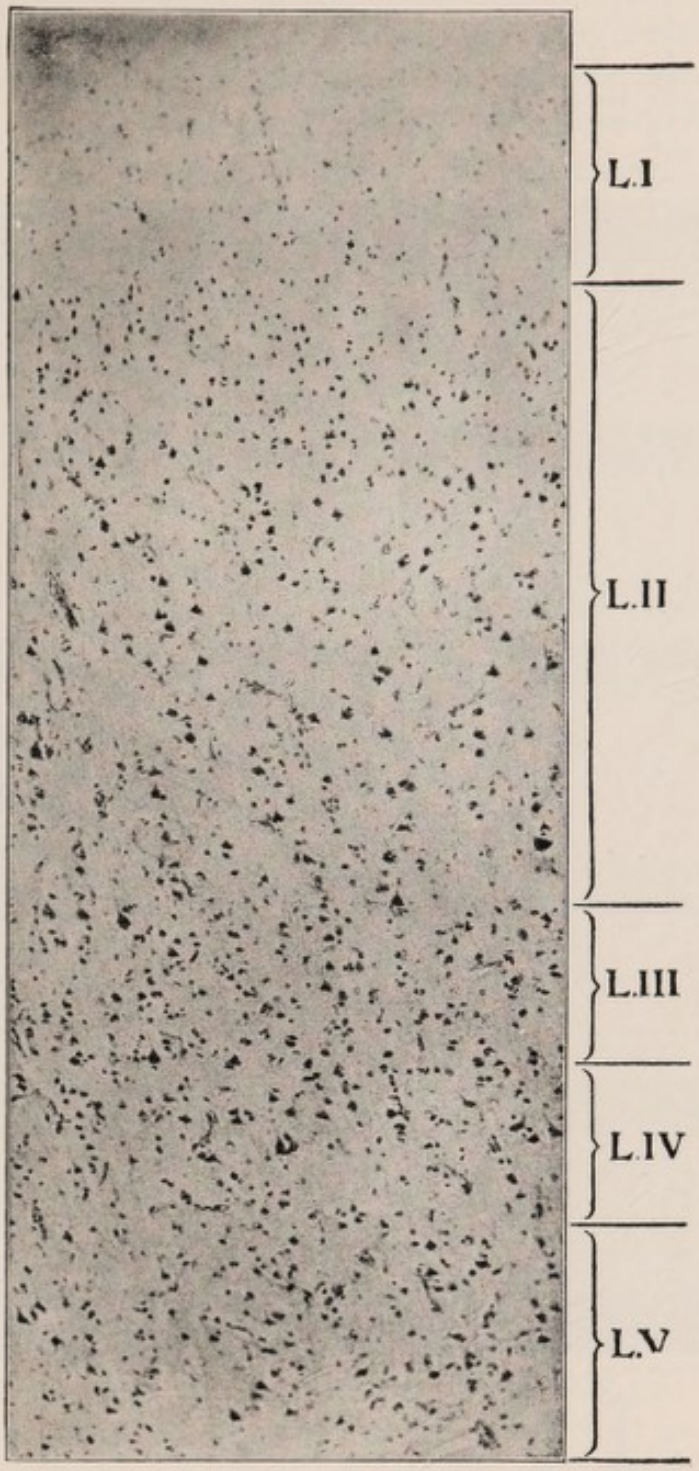


FIG. 50.—PREFRONTAL CORTEX OF GROSS DEMENTIA.

Eighty-four diameters. A case of gross dementia. L. I to L. V as in previous figures. The cortex is much shallower than the normal (*cf.* Fig. 45). The constituent cells, particularly of L. II, are decreased in number and markedly diseased. Though this is not obvious in the figure, the blood-vessels are increased in number, and there is much proliferation of neuroglia, particularly in L. I and L. II.

I now come to the description of the results of the micrometric measurement of the cortex.

It is not necessary here to describe the cases in detail, or to bewilder the reader with actual figures, as the method adopted for the production

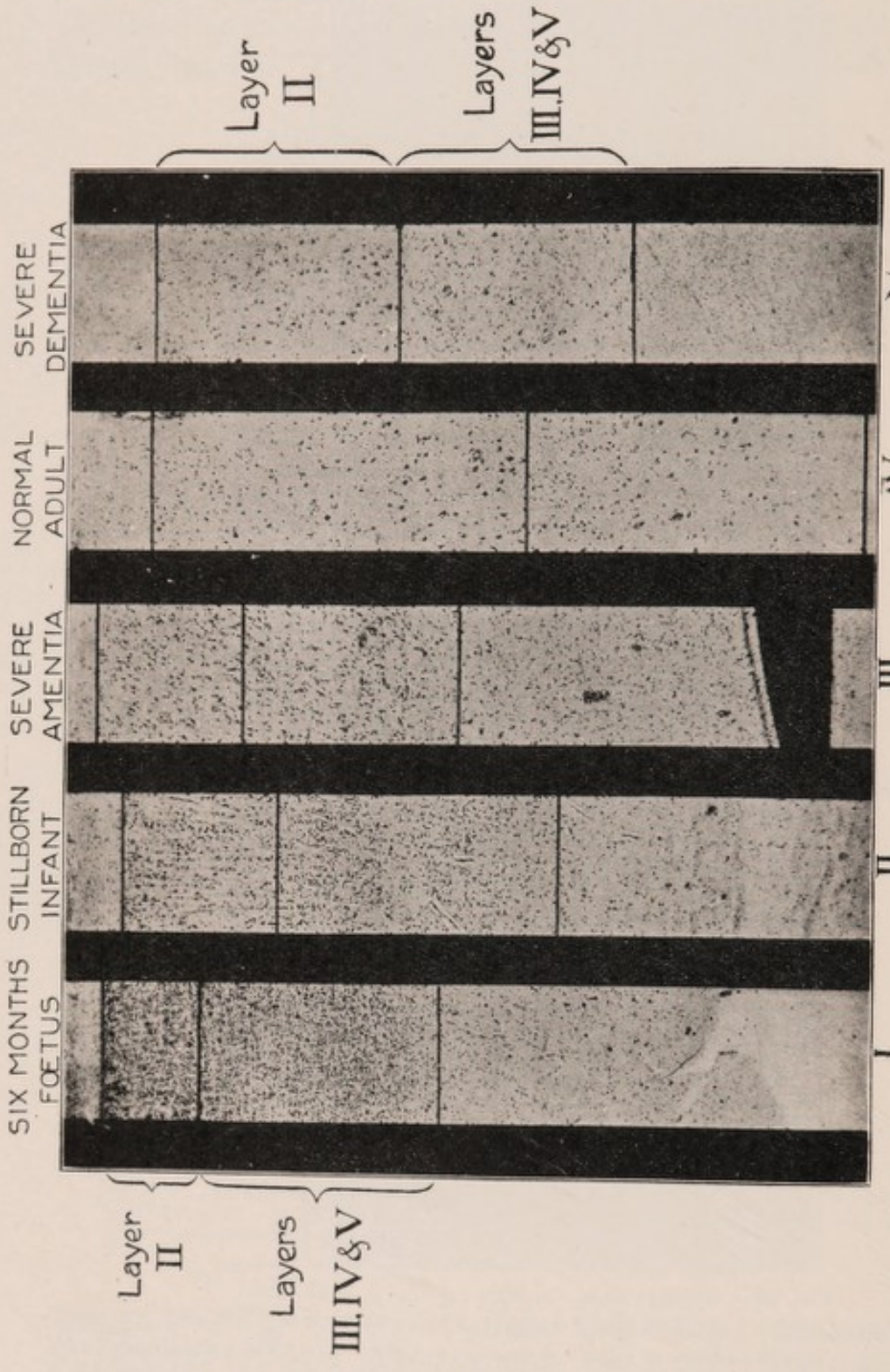


Fig. 51.—The Development of the Prefrontal Cortex and its Condition in Amentia and Dementia.

Forty-three diameters. Horizontal lines are drawn to indicate lamina II, the pyramidal or associative lamina, and the combined III, IV, and V laminæ. A comparison of columns I, II, and IV, indicates the relatively late development and also the high degree of normal evolution of lamina II, compared with laminæ III, IV, and V. Column III indicates the marked sub-evolution of the cortex which exists in severe amentia, and column V the marked dissolution of the cortex which occurs in severe dementia.

of the general average measurements has already been dealt with. I have therefore prepared the series of cases in percentages of the normal. I would remark that each case in itself represents the results of a small research, as the difficulties that have to be overcome in the preparation

of vertical sections which include a sufficient number of measurable regions, are considerable even before it is possible to begin the measurements. In several instances it has in fact been necessary to reject a likely case owing to the impossibility of obtaining measurements, for in some cases either every block which one cuts turns out to be more or less oblique, or else some particular region, especially the flat surface or the bottom, is throughout either oblique or missing. I may add that several cases, when ready for measurement, have been of necessity rejected owing to the existence of cerebral œdema.

On the illustration (Fig. 52) are shown the general average measurements of thirty cases, grouped under visuo-sensory, visuo-psychic, and prefrontal regions. The cases are numbered to allow of identification, and those placed in the visuo-sensory and the visuo-psychic groups are the same.

The cases included in each group are arranged on each side of the normals, those of amentia rising in order of mental capacity from the left-hand side, and those of dementia falling in order of grade of dementia on the right-hand side.

The visuo-sensory group includes one idiot, two imbeciles, a case of imbecility with premature dementia, two cases of recent acute insanity, and a case of simple acute mania of nine months' duration on the left-hand side of No. 8, the normal; and a case of epileptic dementia, two cases of blindness with dementia, a case of premature dementia, and a case of well-marked dementia on the right-hand side of No. 8, the normal.

The visuo-psychic group contains the same cases.

The prefrontal group includes five cases of imbecility of different grades from severe to mild, three cases of recurrent and chronic insanity without dementia, three normal cases (the central one of which, No. 23, is taken as the basis for percentages), a case of imbecility with dementia, two cases of dementia of moderate grade, one case of well-marked dementia, No. 13, which is already included in the other groups, two cases of gross dementia, and one case of gross dementia paralytica.

In the visuo-sensory region the laminæ indicated are from above down the first or superficial layer, the second or layer of pyramidal cells, the third or granule layer, which is in this region duplicated and contains in its midst the line of Gennari, the fourth or inner line of Baillarger, and the fifth or layer of polymorphic cells. It is unnecessary at present to do more than draw the attention of the reader to the markedly decreased depth of the line of Gennari in the two blind cases, Nos. 10 and 11, which detail proves that the region under consideration is the projection area for visual sensations.

In the case of the visuo-psychic and prefrontal regions, the laminæ indicated are, from above downwards, the first or superficial, the second

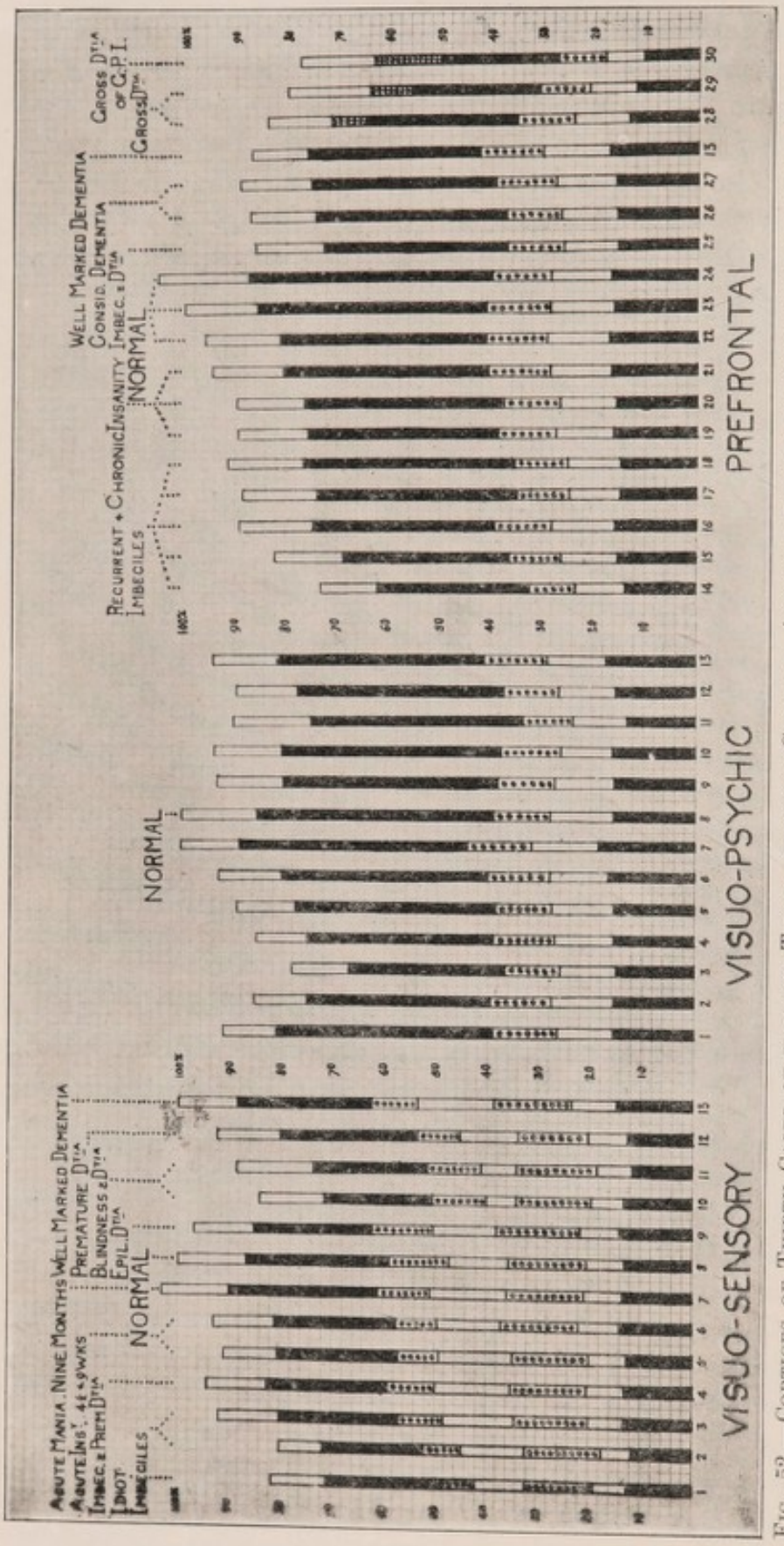


FIG. 52.—CORTICES OF THIRTY CASES OF VARIOUS TYPES, SHOWING GENERAL AVERAGE DEPTHS IN PERCENTAGES OF THE NORMAL.

The actual measurements obtained from these cases, together with other details concerning them, have been published elsewhere. In the three series, the cases are grouped in each side of the normals according to the grade of amentia and dementia. The numbers at the bottom of the columns indicate the several cases. The subdivisions of the columns from above downwards indicate the five laminæ of the cortex—namely, the outer fibre or superficial, the outer cell or pyramidal, the middle cell or granule, the inner fibre or inner line of Baillarger, and the inner cell or polymorphic. In the case of the visuo-sensory area, the granule- or receptive lamina consists of two layers of granules separated by an intermediate fibre layer, the line of Gennari, in which terminate the optic radiations, and which is much decreased in depth in Nos. 10 and 11, the two blind cases.

The figure shows that, whereas in the prefrontal region the cortex varies in depth according to the degree of amentia and dementia, no such variation occurs in the cases of the visuo-sensory and the visuo-psychic regions. The further conclusions, which are derived from a study of the individual cell-laminæ, are indicated in Fig. 53.

or pyramidal, the third or granule, the fourth or inner line of Baillarger, and the fifth or polymorphic.

In the case of the gross dements, Nos. 28 to 30, in the prefrontal region, I would indicate that the depth of the outer two laminæ as measured is not an accurate criterion of the actual loss of neurones, owing to the proliferation of the non-neuronic elements, which, especially in No. 30, is so marked as to a considerable extent to neutralise the results of neuronic destruction.

It is, of course, impossible to indicate the general conclusions which result from the study of these measurements without dealing with the cell-laminæ individually. The most important result is, however, perhaps sufficiently evident to be worth pointing out.

Taking the prefrontal region first, it is obvious that in this region a definite relationship exists between the depth of the cortex of the respective cases and the degree of amentia or dementia which existed.

On the other hand, no such relationship exists in the case of the visuo-sensory and visuo-psychic regions, but an equally important conclusion may be drawn—namely, that great individual differences in depth are evident, in the former even more than in the latter ; and that these individual differences not only bear no relationship to the degree of amentia or dementia which existed, but even in the case of the two regions differ in individual cases. The latter point is sufficiently evident if the first three cases are compared, since No. 1, an idiot, has poor visuo-sensory but good visuo-psychic measurements ; No. 2, a well-marked imbecile, has equally poor visuo-sensory as but rather worse visuo-psychic measurements than No. 1 ; whilst No. 3, a moderate imbecile, shows fairly good visuo-sensory measurements, but visuo-psychic which are much below those of either No. 1 or No. 2.

As the visuo-sensory region subserves the reception and the immediate transformation of visual sensations, and the visuo-psychic is concerned with associational functions which have a special visual hall-mark, it may be concluded from these measurements that marked individual differences exist with regard to both these capabilities in the case of different subjects. The measurements thus afford anatomical proof of a clinical truth, which is, I think, generally recognised, in spite of the difficulty which attends its satisfactory exhibition.

In view of the possible criticism that the ages of the patients might to some extent explain the differences in measurement, I would remark that these vary from eleven to seventy-eight years, and that I have endeavoured without success to trace even a possible suggestion of any relationship between age and measurement.

I will now pass to the consideration of the individual primary cell-laminæ—namely, the second lamina or pyramidal layer, the third lamina

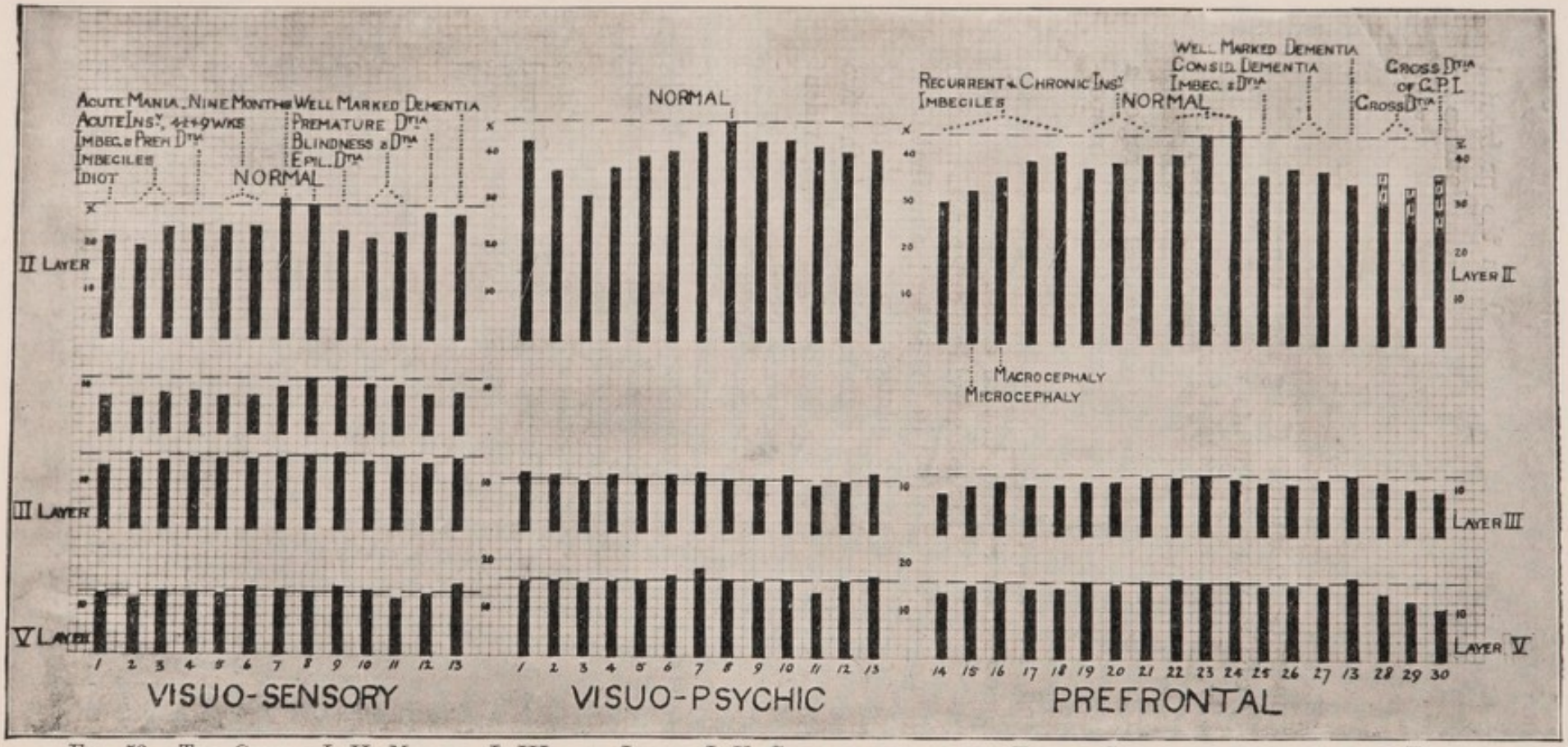


FIG. 53.—THE OUTER, L. II, MIDDLE, L. III, AND INNER, L. V, CELL-LAMINÆ OF THE THIRTY CASES SHOWN IN THE LAST FIGURE.

(I) *The Visuo-sensory Area.*—Specialisation is marked, and is shown by the greatly increased depth and complexity of L. III, the middle cell- or receptive lamina, and by the much decreased depth of L. II, the associative lamina, and the decreased depth of L. V, the instinctive lamina. Well-marked individual variation occurs in the cases of the outer cell- or pyramidal lamina and the outer of the two granule-layers. In this region the cortex does not vary in depth according to the degree of amentia and dementia. (II) *The Visuo-psychic Region.*—Specialisation is not marked, but is indicated by the well developed L. III, or granule-lamina, and also by certain facts of evolution (see Chap. IV and Fig. 30). Individual variation is well marked in the case of the outer cell- or pyramidal lamina. The cortex does not vary in depth according to the degree of amentia and dementia. (III) *The Prefrontal Region.*—Indications of specialisation and individual variation are practically absent. All the cell layers vary in depth according to the degree of amentia and dementia, and this variation takes place according to the order of normal development, L.V, the first to appear, being the least affected, and L. II, the last to appear, being the most affected. In amentia, therefore, the condition is one of true sub-evolution, and in dementia one of true dissolution or involution. In the case of Nos. 28 to 30, the depth indicated in L. II, and to some extent in L. III, does not show the actual amount of neuronic loss, owing to the existence in these cases of more or less extensive reparative proliferation of the non-neuronic elements of the cortex.

or granule-layer, and the fifth lamina or layer of polymorphic cells. These, as abstracted from the last illustration, are presented in Fig. 53.

It will be convenient to consider first all the three regions together from the general aspect, and then to deal with each region individually.

In the case of the fifth lamina, it is evident that its depth in the visuo-sensory region is considerably less than—namely, about $\frac{13}{16}$ of—its depth in the visuo-psychic and prefrontal regions, whereas it is of exactly the same depth in the two last. Further, in the visuo-sensory region seven of the twelve abnormal cases reach to or above the normal line, whereas in the visuo-psychic region only five of twelve, and in the prefrontal region but three of fifteen, excluding, of course, the three normals, which all reach it. The fifth lamina, apart from the normal difference in depth, is thus slightly better developed in the visuo-sensory region than in the visuo-psychic, and is much better developed in both these than in the prefrontal. Further, in the prefrontal region alone does this lamina in the several cases exhibit a gradation in depth which varies according to the degree of amentia or of dementia. This lamina is the first to be evolved during the development of the cortex, and rapidly attains to approximately the normal depth. It is only reasonably below the normal depth in the prefrontal region of infants, well-marked imbeciles, and gross dements, all of whom are unable to attend to the ordinary bodily functions, such as feeding, the calls of nature, &c. This lamina has been shown by G. A. Watson, as the result of his study of the cortex of the chief orders of the mammalia, to be the best developed and the most important cell-layer of the neopallium. It is therefore impossible to avoid the conclusion that the inner cell-lamina is the fundamental cell-layer of the cortex, and that it is concerned with the performance of the instinctive in contradistinction to the receptive, the psychic, and the voluntary-psychic activities.

I now turn to the third lamina or granule-layer. This lamina is exceptionally developed and complex in the visuo-sensory area, consisting of two granule-layers with an interposed fibre-layer, the line of Gennari, in which terminate the optic radiations. In the visuo-sensory area the lower of the two layers of granules is normally much deeper than is the same layer in the visuo-psychic and prefrontal regions, whereas the upper is slightly deeper than that in the visuo-psychic, and of the same depth as that in the prefrontal region.

Of these two layers of granules in the visuo-sensory area, both, in the series of cases, reach the normal depth in only one instance, and the lower layer is throughout much better evolved than the upper. In the visuo-psychic area, the granule-lamina reaches up to or above the normal depth in nine of the twelve cases. On the other hand, in the prefrontal region, it is uniformly below the depth of the highest of the three normals

in all the cases, and well exhibits a gradation according to the degree of amentia or of dementia. Being the lamina which is exceptionally evolved in the projection zones of the mammalian cortex, and being thus the layer which is especially concerned with the immediate transformation of afferent impressions, it is interesting to note the great variation in the degree of evolution of this lamina in the visuo-sensory region of the series of cases, and also that this variation is greater in the outer layer than the inner. I would further point out its relatively normal evolution in the visuo-psychic series, and its subnormal depth in the prefrontal series.

It is, I think, easy to arrive at a reasonable explanation of these differences in degree of development.

As I have already pointed out, the cortex of the visuo-sensory area is evolved earlier than that of the visuo-psychic, and this earlier than that of the prefrontal. It is therefore probable that, in the case of the visuo-sensory area, the individual differences in the middle cell- or receptive lamina are indicative of individual differences in the functional capability of this lamina in different persons. On the other hand, in the prefrontal region the corresponding differences in the middle cell-lamina are simply greater in degree than are those in the inner cell-lamina, and less than are those in the outer cell-lamina ; and are therefore due to the fact that the cortex of this region is as a whole in a condition of sub-evolution or dissolution according to the grade of amentia or dementia.

In other words, the granule-lamina of the visuo-sensory cortex exhibits considerable differences in its degree of evolution in different persons ; the granule-lamina of the visuo-psychic cortex does not, being usually developed up to or above the particular normal with which they are compared ; and the granule-lamina of the prefrontal cortex exhibits degrees of sub-evolution and dissolution which are part of the sub-evolution or dissolution of the whole cortex which occurs in this region alone, and varies in degree according to the existing grade of amentia or dementia.

I will now deal with the second lamina or pyramidal layer. This lamina passes the normal in one case in the visuo-sensory region, and in one of the three normal cases in the prefrontal region. In no other case does it reach the normal depth. In the visuo-sensory region it is in some cases better, and in others worse, evolved than in the visuo-psychic region. These differences bear no constant relationship to the degree of amentia or dementia. On the other hand, in the prefrontal region, the depth of the lamina varies directly according to the degree of amentia or dementia present. In normal evolution this lamina is the last of the cortical laminæ to be evolved, and it develops in the visuo-sensory area earlier than in the visuo-psychic, and in the visuo-psychic earlier than

in the prefrontal region. It is poorly evolved in the lower mammalia, but rises in its degree of development during the ascent of the mammalian scale, as has been shown by G. A. Watson and by Brodmann. It is therefore concerned with the psychic or associational, in contradistinction to the instinctive, activities of the cortex. From the table of measurements—and the consideration of the definitions of amentia and dementia and the symptomatology of the latter which have already been given—it may be concluded that these are in man pre-eminent and voluntary in the prefrontal region, that they are of less general but of more specialised significance in the visuo-psychic region, and that they are of much less but nevertheless very specialised significance in the visuo-sensory area, in which the second lamina is normally but five-ninths of its depth elsewhere. Further, the individual variations in depth in the visuo-sensory and visuo-psychic regions of the series of cases point to real individual differences in the specialised functional capabilities of these regions, whereas in the prefrontal region the differences are not of an individual nature, but vary according to the degree of amentia or dementia which existed.

To turn finally to the general consideration of the cortex of each of these regions, I would again remind the reader that in normal evolution the visuo-sensory cortex develops before the visuo-psychic, and the visuo-psychic before the prefrontal, and also that the inner cell-lamina is evolved before the middle, and the middle before the outer. In view of these facts it is evident, from the study of the different series of cases, that the visuo-sensory cortex is rather better evolved and much more specialised and individually variable than the visuo-psychic ; that the visuo-psychic is better evolved than the prefrontal, and that it also exhibits well-marked indications of specialisation, and especially of individual variation ; and that the prefrontal cortex shows clear indications, not of specialisation and individual variation, but of sub-evolution or dissolution according to the grade of amentia or dementia. I would also indicate that, as the three normal cases show, the degree of evolution of the second or pyramidal cell-lamina varies considerably in normal individuals.

In the case of the visuo-sensory area, the specialisation is indicated by the great depth and complexity of the third or granule-cell-lamina, by the much decreased normal depth of the second or pyramidal cell-lamina, and by the somewhat decreased normal depth of the fifth or polymorphic cell-lamina, whilst the individual variation is chiefly visible, though not necessarily in the same direction or to similar degrees, in the outer granule-layer and the second or pyramidal cell-lamina.

In the case of the visuo-psychic region, the specialisation is indicated by facts of normal evolution which I have already pointed out, and by

the well-developed third or granule-cell-lamina; and the individual variation is especially evident in the second or pyramidal cell-lamina.

In the case of both regions it may be added that, specialisation being allowed for, whether the cases are considered individually or collectively, the degrees of evolution of the laminæ follow the normal order, the inner cell-lamina being better developed than the outer or middle.

In the case of the prefrontal region, whether the cases are considered individually or collectively, there is direct evidence of degrees of sub-evolution according to the grade of amentia, and of degrees of dissolution according to the grade of dementia. Further, this sub-evolution or dissolution involves the whole cortex, and this according to order of normal development, the inner cell-lamina exhibiting the least decrease and the outer the most.

Lest this should be doubted by any statistician, on the ground that the layers are not of the same depth, and that therefore exact comparison is not possible, I have, in Fig. 54, averaged together the depths of the laminæ of the various types of case, and turned these depths into percentages, so that each lamina appears of the same depth. It will be seen that the inner cell-lamina is the first to be evolved and the outer cell-lamina the last; that the same order of sub-evolution applies according to the grade of amentia which existed; and that, in the case of dementia —also according to its grade—the outer cell-lamina, which is the last to be evolved, is the first to undergo dissolution, and the inner cell-lamina, which is the first to be evolved, is the last to undergo dissolution. In the case of the gross dements, it is necessary, as has been stated, to make an allowance for the extensive non-neuronic reparative proliferation which has occurred in lamina II and lamina III.

I will now complete this part of the subject by describing a special case in which I have exhaustively examined all the three regions under consideration. As far as it is possible to judge, the patient, before his illness, possessed at least the average normal degree of intelligence, and probably more. In the course of less than two years he gradually developed a well-marked grade of dementia, which was unusually profound for a man of forty-four years of age, who did not suffer from degeneration of the cerebral arteries. The cerebral dissolution was therefore of an unusually pure neuronic type; and it seemed to me, in view of the originally good development of the brain, that a better case could not well be found for the exhibition of the different grades of cerebral dissolution which might be expected to be found on examination of the visuo-sensory, visuo-psychic, and prefrontal regions of the cortex, since it was probable that all these, in their original condition, were of at least the average normal depth.

The results justified my expectation in that they showed quite clearly

PERCENTAGES OF AVERAGE DEPTHS, IN THE CASES OF LAYERS II, III & V, ALL TO THE SAME SCALE IRRESPECTIVE OF ACTUAL DEPTH.

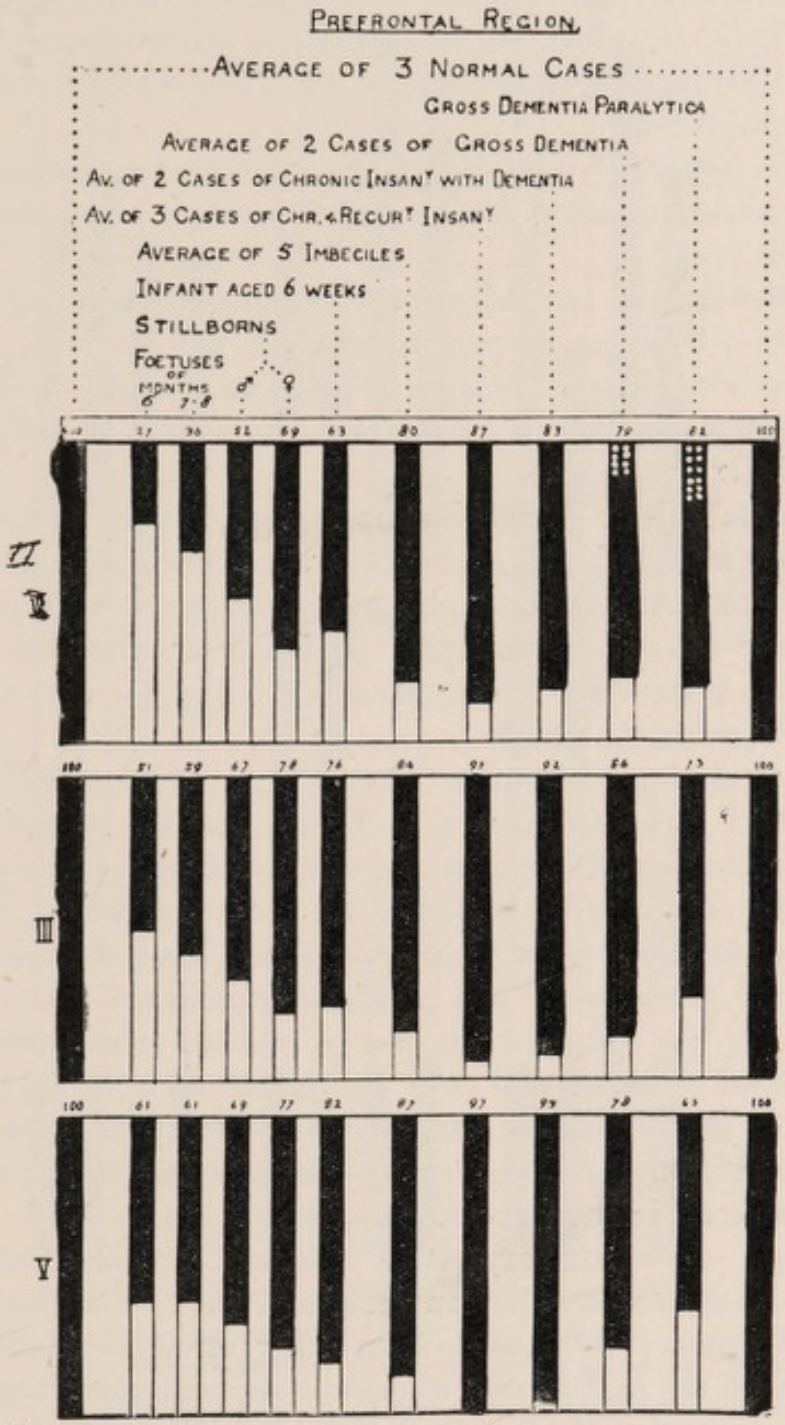


FIG. 54.—THE THREE CELL-LAMINÆ OF THE PREFRONTAL CORTEX OF THE SAME THIRTY CASES, AVERAGED INTO PERCENTAGES OF THE NORMAL, IRRESPECTIVE OF ACTUAL DEPTH.

In this figure, for the purpose of direct comparison, the three cell layers, of the prefrontal cortex of the cases which have been dealt with, are averaged into percentages of the normal irrespective of actual depth. The figure proves that the inner cell-lamina develops before the middle, and the middle before the outer; that the same order of sub-evolution occurs in amentia; and that in dementia, if non-neuronic reparative proliferation in laminæ II and III be allowed for in the gross cases, the last lamina to develop is the first to undergo dissolution, and the first the last.

that the order of dissolution is the converse of that of normal evolution, the loss being most marked in the prefrontal region, next marked in the visuo-psychic zone, and least marked in the visuo-sensory area.

The results of the examination of this case are shown in the following diagram, Fig. 55, in which are contrasted, in percentages of the normal, the general average measurements of the visuo-sensory, visuo-psychic, and prefrontal regions.

From the aspect of total depth, the visuo-sensory cortex is normal, the visuo-psychic shows a decrease of 6 per cent., and the prefrontal one of 13 per cent.

When the laminæ are individually considered there is, in the case of the outer cell-lamina or pyramidal layer, a 6 per cent. decrease in depth in the visuo-sensory area, a 13 per cent. decrease in depth in the visuo-psychic region, and a 24 per cent. decrease in depth in the prefrontal region.

The middle cell- or granule-lamina is much below the normal in the visuo-sensory area, it is well above the normal in the visuo-psychic zone, and it is of practically the normal depth in the prefrontal region.

The inner cell- or polymorphic lamina is considerably above the normal depth in the visuo-sensory area, and is well above it in the visuo-psychic and prefrontal regions.

Whilst it is impossible to be certain as to whether the cortex was originally fully evolved or not, it is obvious that the visuo-sensory area possesses an individually deficient granule- or receptive lamina, and had commenced evolution (see lamina V) in a manner which should have carried it beyond the level of the normal case. The latter remark applies equally to the visuo-psychic and prefrontal regions.

If, however, the cortex of this case be credited merely with evolution up to the level of the normal case, the significant fact appears that the pyramidal or psychic lamina has become decreased in depth by 24 per cent. in the prefrontal region, by 13 per cent. in the visuo-psychic zone, and by 6 per cent. in the visuo-sensory area.

Summary.—As a summary of the results of my micrometric studies, I would remark that the human cerebral cortex is originally evolved from three primary cell-laminæ: an inner or polymorphic, which is concerned with the performance of organic and non-voluntary activities; a middle or granule, which is receptive in function; and an outer or pyramidal, which serves as the physical basis of the associative or psychic functions of the cerebrum. The last of these, as has been shown by the investigations of Brodmann, of John Turner, and of G. A. Watson, is the distinctive feature of the cortex peculiar to the mammalia, or the neopallium, to employ the term introduced by Elliot Smith.

These three laminæ appear during normal development, in the order

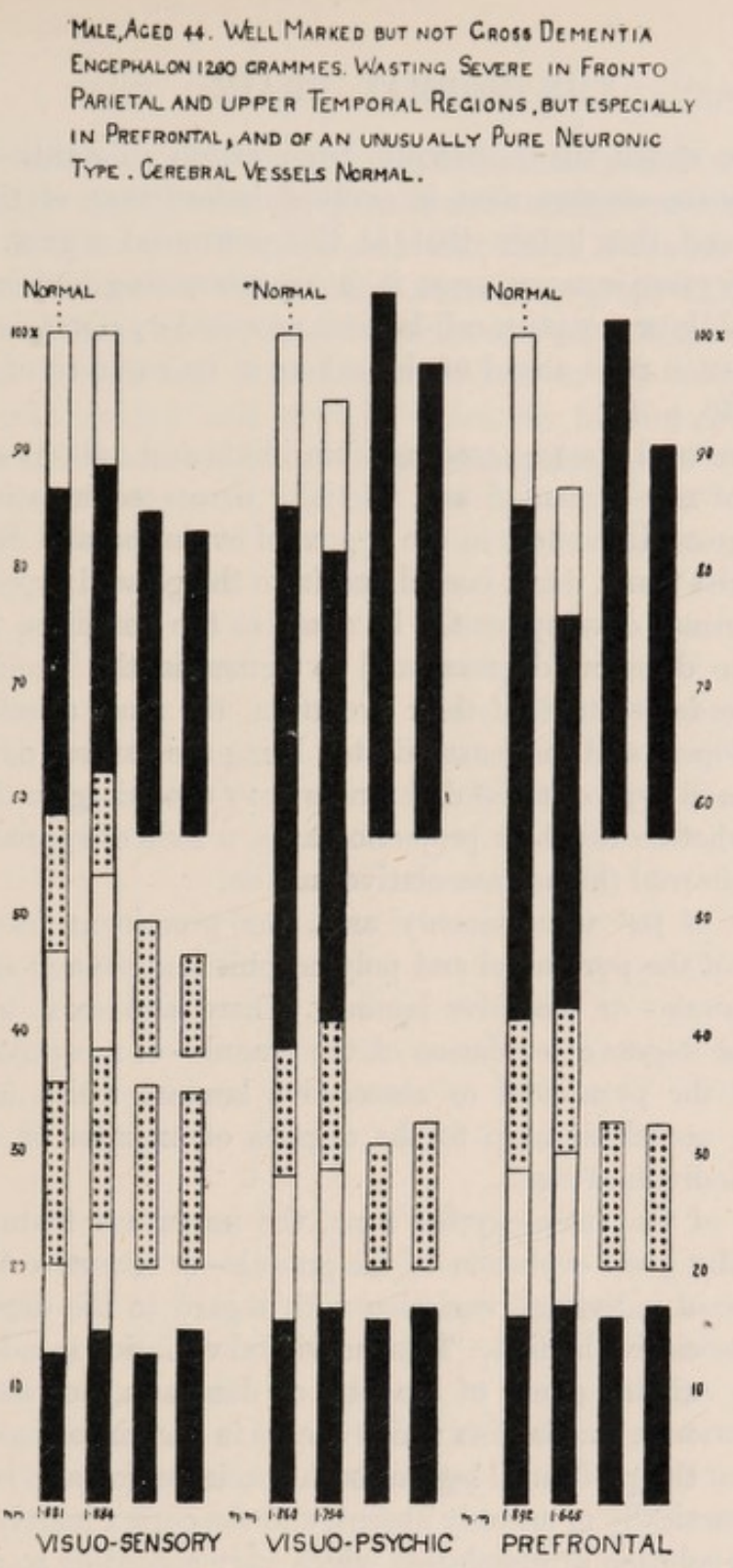


FIG. 55.—THE CORTEX OF THE VISUO-SENSORY, VISUO-PSYCHIC, AND PREFRONTAL REGIONS OF A CASE OF WELL-MARKED DEMENTIA COMPARED WITH THE NORMAL.

The figure shows, in comparison with the normal, the cortex of the visuo-sensory, the visuo-psychic, and the prefrontal regions of a case of well-marked dementia. From the aspect of total depth, the visuo-sensory area is normal, the visuo-psychic region shows a decrease of 6 per cent., and the prefrontal one of 13 per cent. In other words, the prefrontal region, which is the last to develop, shows the most affection, and the visuo-sensory area, which is the first to develop, shows the least. If the outer cell-lamina or pyramidal layer be considered alone, there is a decrease of 6 per cent. in the visuo-sensory area, one of 13 per cent. in the visuo-psychic region, and one of 24 per cent. in the prefrontal. The middle cell-lamina or granule-layer exhibits an individual decrease in the visuo-sensory area, and is very well developed in the visuo-psychic and well developed in the prefrontal regions. The inner cell-lamina is of a greater depth than that of the "normal" case in all the three regions, which fact suggests that the case under consideration was at any rate capable of development to a degree above that of this particular normal, even if this had not actually occurred.

in which I have stated them—namely, from within outwards—and the cortex of the visuo-sensory area is evolved before that of the visuo-psychic zone, and this before that of the prefrontal region. In the instance of the visuo-sensory area, it is an interesting and important fact that the middle or receptive cell-lamina, as would *a priori* be expected, in normal evolution runs ahead of the others in its rapidity of development (see Fig. 30, p. 48).

In cases of mental disease, grading from idiots and imbeciles through various types of non-demented and partially demented lunatics to the gross dement, great differences in the degree of evolution and dissolution of the cortex exist; and these, considered from the general aspect, follow the order of normal development. In amentia the condition is one of sub-evolution to different degrees, and in dementia the laminæ suffer in the reverse order to that of their evolution, the most affected being the latest developed, and the least affected being the earliest developed.

The degree and type of these differences vary according to the region of the cortex, whether this be a projection area, a zone of special association, or the prefrontal (higher associative) region.

In the case of the visuo-sensory area, the prominent features are poor evolution of the pyramidal and polymorphic laminæ and specialisation of the granule- or receptive lamina. There also exist individual variations in the degree of evolution of the granule- or receptive lamina, and in that of the pyramidal or associative lamina, which individual variations bear no relationship to the degrees of amentia or dementia which exist in individual cases.

In the case of the visuo-psychic zone, the important feature, apart from an especially good evolution of the granule- or receptive lamina, is a marked degree of individual variation with regard to the depth of the pyramidal or associative lamina. This individual variation is independent not only of the existing grade of amentia or dementia, but also of the individual variation in this lamina which occurs in the visuo-sensory area.

In the case of the prefrontal region, both specialisation and individual variation are practically or entirely absent, and the cortex merely exhibits degrees of sub-evolution or dissolution which vary according to the grade of amentia or dementia which exists in the individual cases. That the condition is one of true sub-evolution is shown by the fact that the laminæ are sub-evolved in the order of their normal development, the last to appear being the least developed, and the first the most. The reverse order holds with regard to dissolution, the last lamina to appear during normal development being the first to undergo retrogression in dementia, and the first the last. In the case of the cortex of the prefrontal region, therefore, the associative function of the pyramidal lamina must be regarded as *voluntary*-associative, in view of the fact that the

essential feature of amentia and dementia is decrease, instability, or loss of voluntary control over the processes of cerebral association.

As a final remark, I would add that there is reason to believe that this physical basis of the cerebral functions, which exhibits such well-marked variations in the subjects of mental alienation, exhibits equally important though less extensive variations in the case of presumably normal individuals; and thus indicates the likelihood of a structural origin for individual differences in mental endowment.

CHAPTER VII

THE PSYCHOMOTOR CORTEX

HAVING completed the description of my observations and deductions with regard to the structure and functions of the visuo-sensory (or sample sensory projection), the visuo-psychic (or sample special associative), and the prefrontal (or higher voluntary associative) regions of the cortex, I now pass on to certain observations with regard to the structure and functions of the final type of cortex with which I propose to deal—namely, the pre-Rolandic or psychomotor.

This type includes the cortex known as agranular, and occupies a much larger area than the (hinder) part of it which contains the Betz-cells and which must be regarded as the original portion.

As I have illustrated in Figs. 3 and 4 (p. 14), the Betz-cells are developed, and the then relatively large Betz-cell area can be delineated, in a fœtus of the very early age of eighteen weeks. The pre- and post-central cortex is well evolved at this very early period (*i.e.* practically at mid-uterine life), and is at this time by far the best evolved type in the cerebrum. Further, *at the period of eighteen weeks of intra-uterine life, the adult line of demarcation between pre- and post-central cortex already exists*, and, as may be seen in Figs. 6 and 7, the respective cortices already present Betz-cell and sensory characters respectively.

I would draw the especial attention of the reader to these observations, as they have only recently been made by Moyes and myself, and since they are of prime importance in that they finally prove the truth of the conclusions to which I have been led during my study of the structure and functions of the cortex in the neighbourhood of the furrow of Rolando.

At the outset of the following discussion, a word is necessary in justification of my special application of the term *psychomotor* to the agranular cortex in general. As has already been stated, I am responsible for coining the terms visuo-sensory and visuo-psychic, which latter seems preferable to visual-cerebral-associative ; and these terms have been generally adopted by English writers and have been extended by Campbell and others to the auditory, &c., areas. The term psychomotor is employed in this work in a strictly analogous manner in preference to the cumbrous cerebral-associative-motor, which would

otherwise be needed. In the course of the present chapter such evidence will be adduced as will, I think, be found to justify the application of this term to the portion of the cortex of the frontal lobe which lies behind and below the prefrontal area defined in Chapter V, and which is thus much more extensive than the special Betz-cell area of Lewis and Clarke.

It is unnecessary for our purpose to describe in detail the great controversy which raged for so many years as to whether the pre-Rolandic cortex possessed purely motor or sensori-motor functions. I shall merely remind the reader of how the histological researches of Bevan-Lewis and Henry Clarke, which as long ago as 1878 resulted in the delineation of the Betz-cell area, were forgotten in the heat of the controversy until 1901, when, through the experimental work of Sherrington and Grünbaum, followed by the histological researches of Campbell and of Brodmann, they finally received belated recognition.

Since that time the majority of observers have credited the pre-central gyrus with motor, and the post-central with sensory, functions; and this opinion received confirmation, so far, at any rate, as the experimental method can be regarded as capable of affording it, from the researches of Oskar Vogt, who in 1906 published a paper describing the results of stimulation and extirpation of the pre-central and post-central gyri. In brief, Vogt concluded that palsy without ataxy followed destruction of the pre-central gyrus, and that ataxy, but no palsy, resulted from destruction of the post-central gyrus. In 1909, however, in the Linacre Lecture, Victor Horsley described what he regards as a crucial test case, and reiterated his conviction that the so-called motor area is really sensori-motor. From this patient, who suffered from athetoid movements of the left hand, followed by violent convulsive movements of the whole upper limb, Horsley removed by operation the portion of pre-Rolandic cortex which, as the result of stimulation, he concluded to constitute the whole of the arm area. He carefully describes the immediate results, which were partly motor and partly sensory, and the remote results (a year later), which consisted of permanent absence of spasmodic movement, partial recovery of voluntary movement of the left upper limb, and considerable recovery from the sensory disability. On this case Horsley bases his contention that the pre-central gyrus is sensori-motor in function.

The evidence which I shall produce points to very different conclusions regarding the functions of this region of the cortex, and, unless these conclusions are correct, the whole of the observations and deductions which have already been detailed fall to the ground. I would therefore submit that, in my opinion, the experimental method, even in the hands of so renowned an operator as Horsley, cannot be regarded as trustworthy. On purely theoretical grounds, it might well be doubted

whether a gyrus of considerable size could be removed without any disturbance of the functions of the immediately adjacent gyrus resulting, but in this instance anatomical reasons exist which appear to me to render such an operation a practical impossibility. To indicate these, I will now show (Fig. 56) naked-eye sections through the fissure of Rolando, which are situated above and below the buttress, and thus indicate the arrangement of the neighbouring gyri in both these positions. I introduce the two sections in order to avoid the possible criticism that the arm area is not included, since this area was placed above the buttress as the result of the earlier stimulation experiments on man, although it is now considered to lie below this annectant.

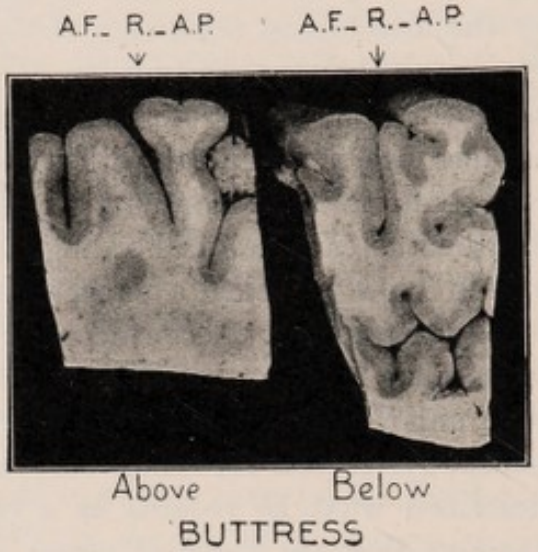


FIG. 56.—NAKED-EYE SECTIONS ACROSS THE CENTRAL CONVOLUTIONS OF THE HUMAN BRAIN.

The left-hand section is above the buttress, and the right-hand section is below this annectant. R., furrow of Rolando; A.F., pre-central or ascending frontal gyrus; A.P., post-central or ascending parietal gyrus. Both sections show the extremely narrow neck of the post-central gyrus, and the right-hand one also indicates the proximity of the gyri of the parietal operculum. The figure demonstrates that removal by operation of the pre-central gyrus, however skilfully performed, must necessarily result in functional, and probably also in structural, damage to the fibres entering the neck of the post-central gyrus.

In the first section, which is above the buttress, is seen the extremely narrow neck of the gyrus post centralis, and the nearness of this to the site of operation.

In the next section, which is below the buttress, the same point is equally clearly visible, as is also the relative nearness of the gyri of the parietal operculum to the seat of operation.

Apart entirely from the intimate structural and functional associations of the pre- and post-central gyri, these photographs in my opinion indicate the probability—I may even say the certainty—that removal of the pre-central gyrus, however carefully performed, will result in

functional, if not also in actual structural, disability of the fibres passing to and from the post-central gyrus.

I now pass on to the consideration of the structure of the psycho-

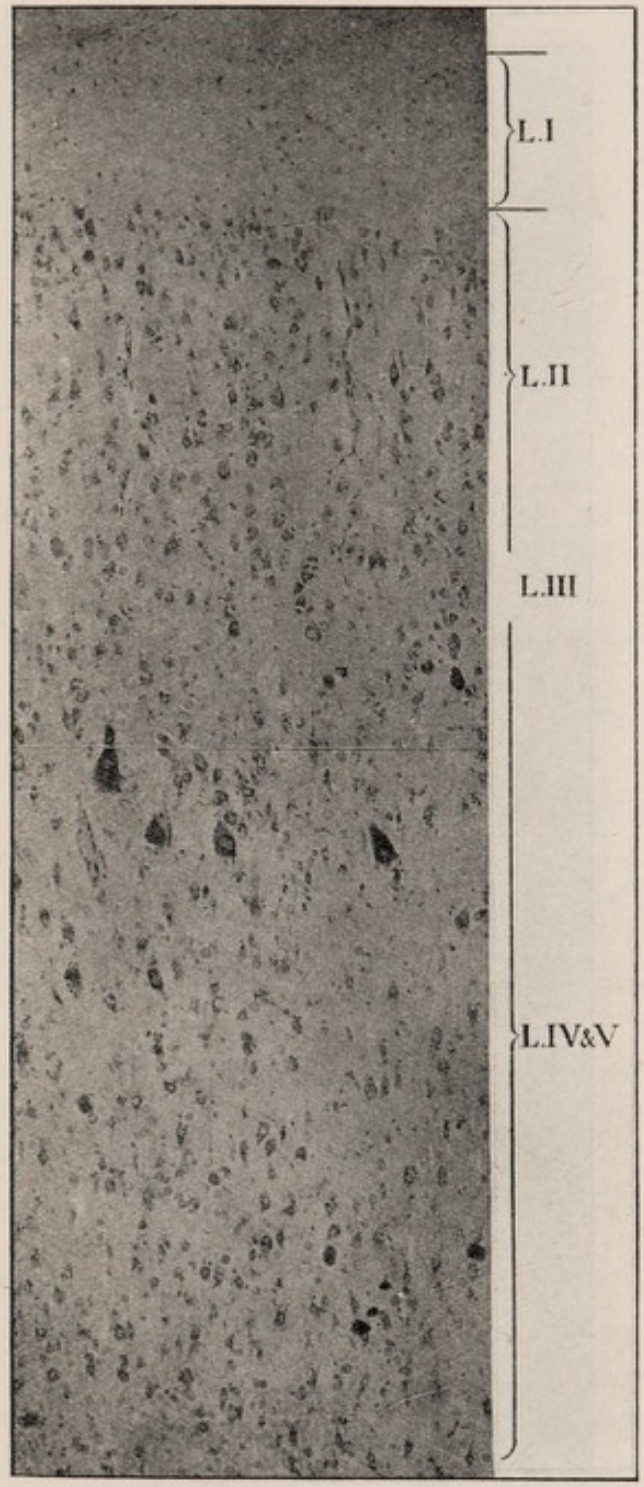


FIG. 57.—CORTEX OF THE BETZ-CELL AREA OF THE DOG.

Eighty-nine diameters. L. I, outer fibre- or superficial lamina; L. II, outer cell- or pyramidal lamina; L. III, the indistinct middle cell- or granule-lamina; L. IV and V, the inner fibre-lamina or inner line of Baillarger containing Betz-cells, and the inner cell- or polymorphic lamina. The depth of L. II is about one-third of the conjoined depths of L. III to L. V. The cells are of large size and are embryonic in appearance.

motor cortex from the aspect of cell-lamination, and for this purpose I shall employ the cortex of the well-known pre-central gyrus, as the most definite type, but at the same time a quite fair sample of the whole area. It is necessary here merely to remark that the chief differences between

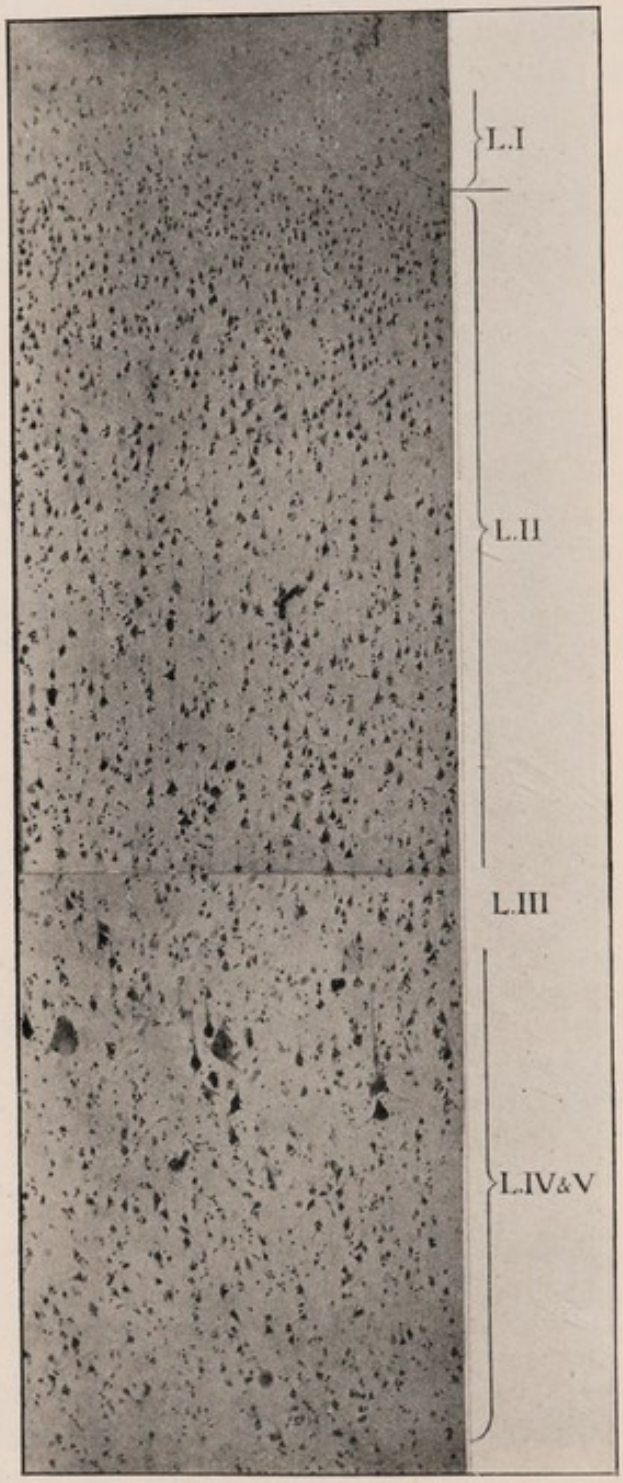


FIG. 58.—CORTEX OF THE BETZ-CELL AREA OF THE RHESUS.

Eighty-nine diameters. L. I to L. V as in the preceding figure. The depth of L. II is practically equal to the conjoined depths of L. III to L. V. The constituent cells are smaller and more numerous than in the dog, and are also better made and relatively farther apart.

the several parts of this area consist in the presence of Betz or giant cells in the posterior part, together with a minimal development of the granule- or middle cell-lamina, and in the absence of Betz-cells and an increasing degree of evolution of the granule- or middle cell-lamina towards the anterior or prefrontal limits of the area.

In the case of this region I have not resorted to the micrometric method, partly because the structural conditions preclude the possibility of obtaining a series of measurements from the four situations I am accustomed to select, and partly because the practical absence of a middle cell-lamina or granule-layer renders measurements of this lamina untrustworthy even if possible. I propose, therefore, to illustrate my point, not by series of measurements from human subjects, but by exhibiting certain mammalian cortices which show the depths of the various laminæ in a cruder but equally satisfactory manner. As a preliminary remark I would state that the lamination of the pre-central gyrus, though to the inexperienced eye indefinite, is of the usual general type, consisting of an *outer fibre-* or superficial *lamina*, an *outer cell-* or pyramidal *lamina*, a *middle cell-* or granule-*lamina*, an *inner fibre-lamina* or inner line of Baillarger, which here contains the Betz-cells, and an *inner cell-* or polymorphic *lamina*.

The photographs which form illustrations Nos. 57, 58, 59 are strictly comparable, apart from the somewhat lower magnification of Fig. 59.

The first of these (Fig. 57) is taken from the Betz-cell region of the dog. It shows all the five laminæ—namely, the superficial, the pyramidal, the indefinite granule, the inner line of Baillarger with Betz-cells, and the polymorphic laminæ.

I wish particularly to draw the attention of the reader to the fact that the second lamina or pyramidal layer (0·45 mm.) is in depth about one-third of the combined depth of the laminæ below it (1·18 mm.). I would also point out the large size and generally embryonic condition of the cells in all the laminæ.

The next photograph (Fig. 58) illustrates the pre-central cortex of the rhesus, with its five laminæ.

I must ask the reader carefully to note that the depth of the pyramidal lamina (0·91 mm.) is practically equal to the conjoined depth of the laminæ below it (0·90 mm.), and also that the individual cells of all the laminæ are smaller and more numerous than in the dog, and are also better made, and relatively more widely separated from one another.

The third photograph (Fig. 59), less highly magnified, shows the cortex of the human pre-central gyrus, with its five laminæ.

I would draw the attention of the reader to the fact that the second or pyramidal lamina (1·24 mm.) is in depth four-thirds of the conjoined depth of the laminæ below it (0·92 mm.), and also to the detail that the

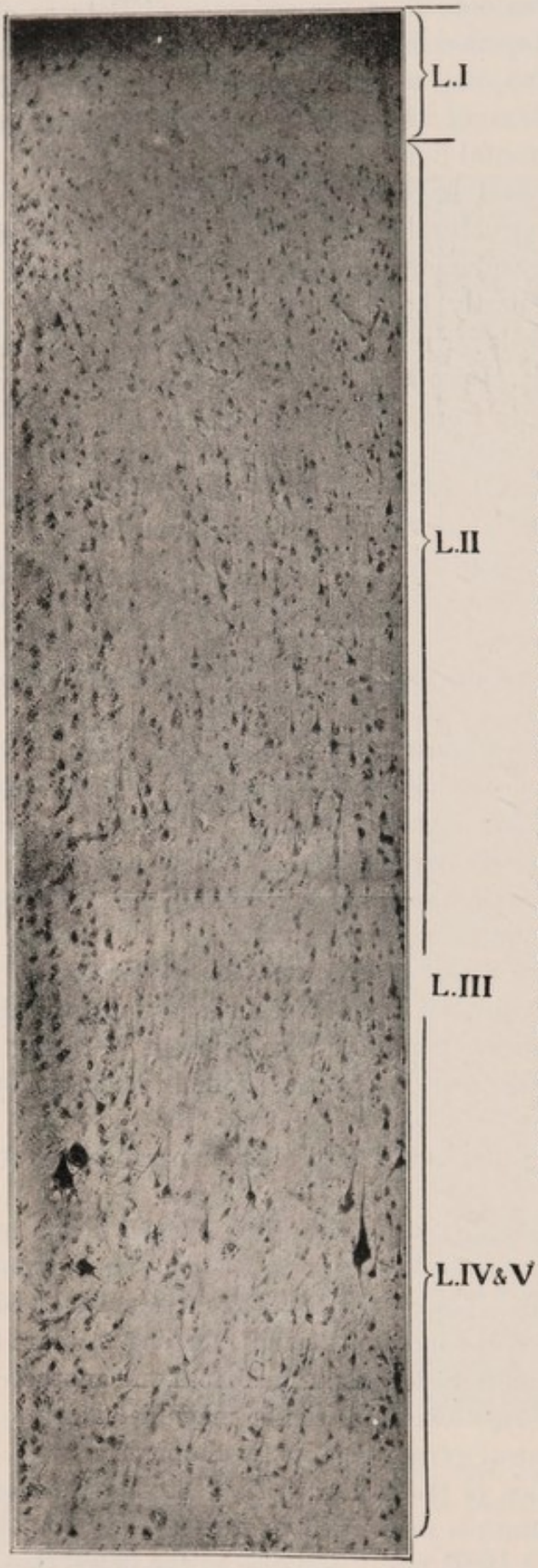


FIG. 59.—CORTEX OF THE BETZ-CELL AREA OF MAN.

Seventy-four diameters. The magnification is five-sixths of that of Figs. 57 and 58. L. I to L. V as in the preceding figures. L. II is in depth four-thirds of the conjoined depths of L.III to L.V. The constituent cells are very well made, and are farther apart than in the rhesus. A comparison of Figures 57 to 59 shows that the essential differences between the cortices consist in a very marked and progressive improvement in the development of the individual cells in all the laminæ, but, particularly, in the degree of evolution of L. II, the pyramidal lamina, of the several cases. L. II, the outer cell- or pyramidal lamina, which is of psychic, associative, and educative significance, is thus the prominent feature of the pre central cortex of man. L. III, the granule- or receptive lamina, is reduced to a minimal depth in all the cortices. L. IV and L. V, which are of organic and instinctive significance, are similar in type in man and in the rhesus, and in the dog their depth is somewhat greater, and their constituent cells are more embryonic in structure.

individual cells are very well made, and are more widely separated from one another than in the rhesus.

A study of these cortices leads to the following conclusions :—

The outer cell-lamina or pyramidal layer of the dog is one-half of the depth of that of the rhesus, which again is but three-fourths of that of the human subject.

The middle cell-lamina is so deficient in depth as to be practically invisible, except to the experienced observer.

The conjoined depth of the lower laminæ is practically the same in the rhesus and man, and is one-fourth deeper in the dog than in the others.

The ratio of the depth of the second or pyramidal lamina to that of the three lower laminæ is in the dog about $\frac{1}{3}$, in the rhesus $\frac{1}{1}$, and in man $\frac{4}{3}$. In man, therefore, the pre-central ratio is as high as, or slightly higher than, in the prefrontal region, in which general average measurements give an average ratio of about $\frac{11}{10}$.

As a very rough analogy, the pyramidal lamina of the dog may be compared with that of a stillborn infant ; and the pyramidal lamina of the rhesus with that of an imbecile.

Finally, in passing from the dog to the rhesus, and from the rhesus to man, there is a very marked and progressive improvement in the development of the individual cells in all the laminæ, which general improvement, however, pales before the great difference which exists in the three cortices with regard to the evolution, both in depth and in content, of the pyramidal or outer cell-lamina.

In view of the conclusions which I expressed in Chapters IV and VI with regard to the functions of the primary cell-laminæ of the cortex, the deduction is evident.

The pyramidal or outer cell-lamina, which is of psychic, associative, and educative significance, is the prominent feature of the pre-central cortex of man.

The granule- or receptive lamina is reduced to a minimum depth in all the cortices. This fact negatives the possibility of the existence of sensori-receptive functions in this part of the cortex.

The fourth and fifth laminæ, which are of organic and instinctive significance, are of the same depth and general type in man and in the rhesus ; and in the dog their conjoined depth is one-fourth greater and their individual cells are more embryonic in structure.

The obvious conclusion, therefore, is that in man the psychic, associative, and educative functions of the precentral gyrus are paramount ; that in all three the receptive functions are minimal or non-existent ; and that the organic and instinctive activities are approximately on the same level in all the three.

When this conclusion is regarded in association with the well-known truth that the particular type of cortex under consideration increases in area and differentiation during the ascent of the mammalian scale, not according to muscular bulk, but according to the degree of motor educability exhibited by the several parts of the body, the further conclusion, that the Betz-cells merely serve as a relatively simple motor mechanism, and that motor educability must have its seat in the pyramidal or outer cell-lamina, is inevitable. That the Betz-cells serve as the origin of the pyramidal tracts has long been believed. It is, in fact, many years now since I noticed well-developed Betz-cells in the cortex of a fœtus of six months, and therefore took for granted that they served as the origin of these tracts ; and Moyes and myself have recently found such cells in typical nests and numbers in the cortex of a fœtus of eighteen weeks, and have even mapped out the Betz-cell area (Figs. 3 and 4, p. 14). The truth of this presumption has not long ago been finally proved by Holmes and Page-May. Further, it has long been known to physiologists that, whilst the pyramidal tracts normally conduct voluntary efferent impulses, such impulses in the functional absence of these tracts can still find passage. For example, a hemisection of the spinal cord of a dog, followed by a higher hemisection on the opposite side, and this again followed by a still higher hemisection—this time on the original side—results in at least a very considerable return of power over both lower limbs.

It may thus be regarded as proved that the Betz-cells serve not as the psychomotor cortical mechanism, but simply as a subservient mechanism for the direct transmission of voluntary impulses to the lower motor centres.

I may add, as the necessary consequence to this conclusion, that the Betz-cell distribution need no longer, therefore, be regarded as indicative of the limits of the cortical zone concerned with the evolution of those associational processes which, when translated by the agency of the lower motor centres into muscular movements, constitute the sole objective indications of cerebral activity. If, as I consider proved, reliance can be placed on the results of the histological investigations of the past decade, the educable psychomotor cortex, with little modification, extends over almost or quite the posterior half of the frontal lobe (see Fig. 37), where it grades, through cortex of an intermediate type, into that of the prefrontal region.

In the gibbon (Mott, Schuster, and Sherrington) such intermediate type of cortex occupies merely a small space near the frontal pole above the sulcus rectus : in the chimpanzee and the orang (Campbell) such intermediate type is much more extended in distribution, and a rudimentary prefrontal region is present : in man (see Figs. 12 and 13,

Brodmann) the psychomotor cortex occupies about half of the frontal lobe, and the intermediate type of cortex shades into a prefrontal region of notable size.

Having, as I hope, sufficiently indicated my reasons for regarding

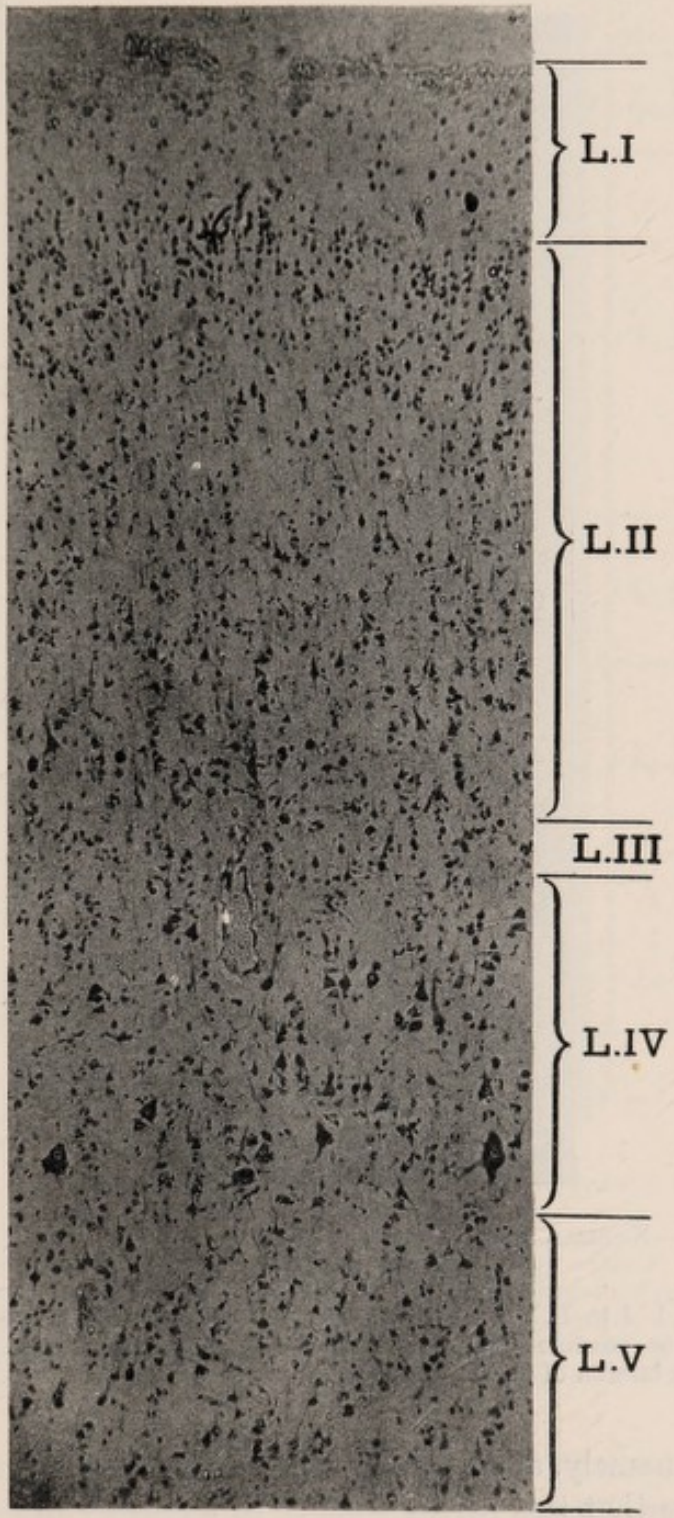


FIG. 60.—NORMAL PRE-CENTRAL CORTEX FROM THE "SIDE" OF THE FURROW OF ROLANDO.

Sixty diameters. L. I to L. V as in the preceding figures. The practical absence of L. III, the middle cell- or granule-lamina, should be noted.

the pre-central cortical zone as psychomotor, rather than motor or sensori-motor, in function, I will now remark that the post-central gyrus possesses an exceptionally well-defined middle cell-lamina or granule-layer. The proportion which the depth of this lamina bears to the total depth

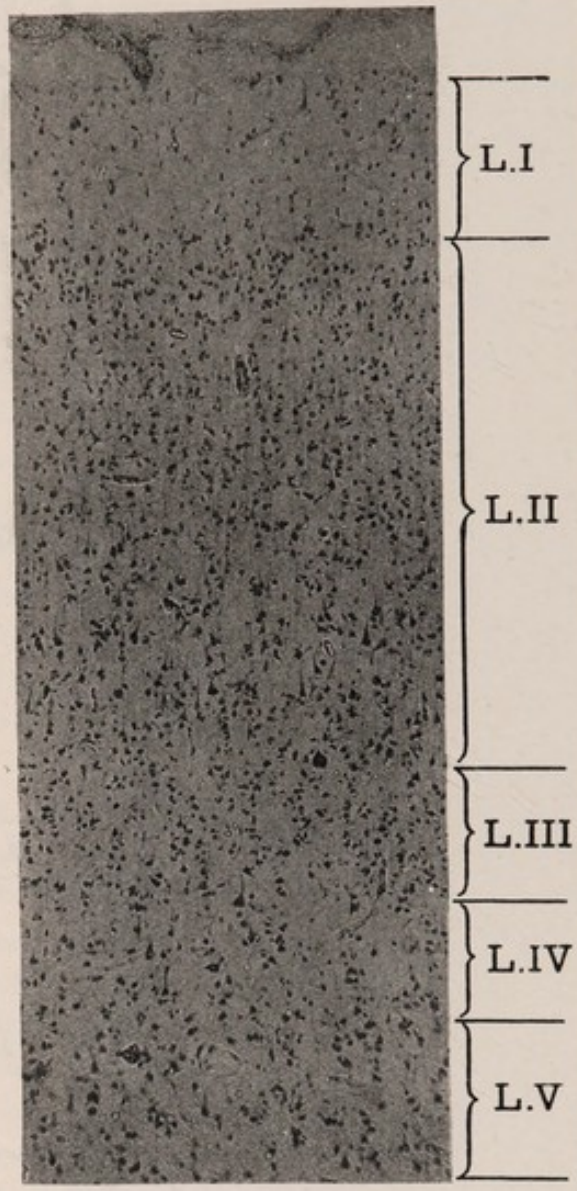


FIG. 61.—NORMAL POST-CENTRAL CORTEX FROM THE "SIDE" OF THE FURROW OF ROLANDO.

Sixty diameters. L. I to L. V as in the preceding figures. The well-marked L. III, the middle cell- or granule-lamina, should be compared with the poorly developed corresponding lamina of the preceding figure.

of the cortex—namely, about one-eighth—is, to me at any rate, sufficient almost to prove that this cortex belongs to a sensory-projection sphere; in other words, to indicate with great probability the performance of sensori-receptive functions by the post-central gyrus. This area is the post-central and intermediate post-central of Campbell, and areas 1 and

3 of Brodmann. It has been shown by Gordon Holmes that the delineation given by the latter investigator is the more correct of the two.

In Figs. 60, 61, and 62 are shown comparative microphotographs of the normal adult pre- and post-central cortex. The first is from the

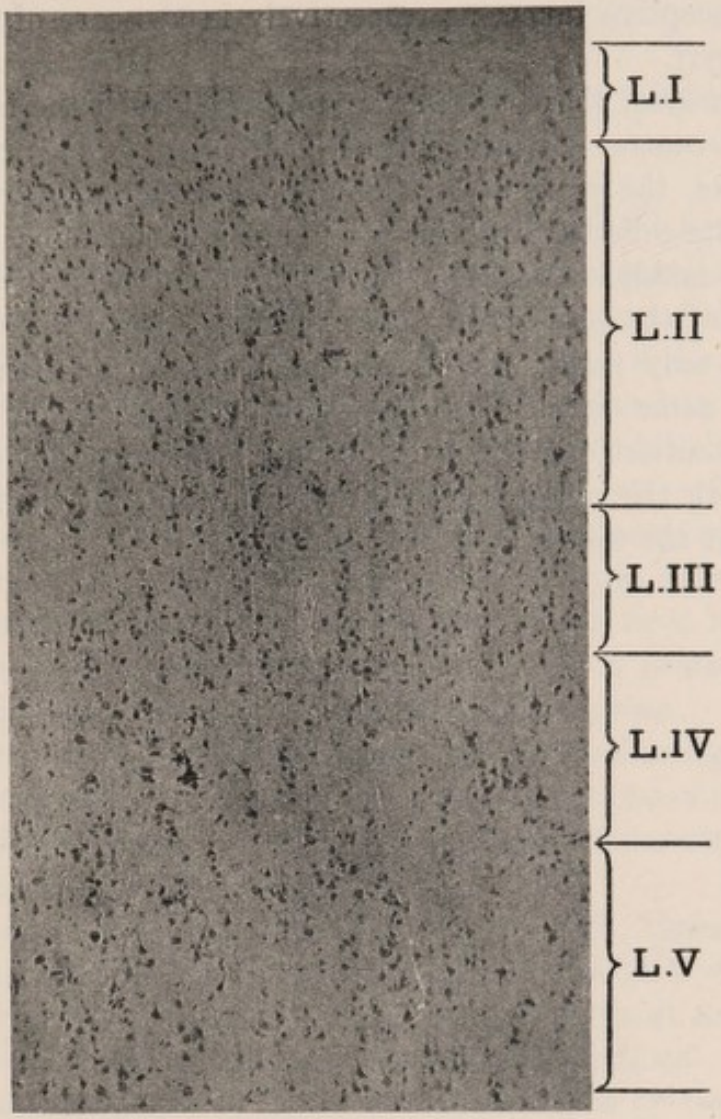


FIG. 62.—NORMAL CORTEX FROM THE EXTERNAL SURFACE OF THE POST-CENTRAL GYRUS.

Sixty diameters. Normal post-central cortex from the "flat surface," *i.e.* the external surface, of the post-central gyrus. L. I to L. V as in the preceding figures. The entire alteration in the type of lamination should be noted, especially the relatively deep inner three laminæ and the relatively shallow outer two; also the relative sparseness of nerve cells, and the relative prominence of L. III, the middle cell- or granule-lamina.

side of the furrow of Rolando and shows typical Betz-cell cortex (Brodmann 4). The other two respectively illustrate post-central cortex from the side of the furrow of Rolando (Brodmann 3), and the flat surface of the post-central gyrus (Brodmann 1).

The pre-central cortex (Fig. 60) is agranular, but at L. III is shown

the site in which the few granules, which here constitute the lamina, are visible.

The post-central cortex (Figs. 61 and 62), in both sites illustrated, possesses a well-defined and relatively deep granule-lamina (L. III).

This structure affords strong presumptive evidence in favour of motor and sensori-receptive functions respectively in the case of the pre- and post-central gyri.

When, however, these figures are compared with the corresponding pre- and post-central cortices (Figs. 6 and 7, pp. 16, 17) of a fœtus of eighteen weeks, the presumption may be regarded as proved, since in Fig. 6 the Betz-cells lie in a very deep inner fibre-lamina (L. IV), and in Fig. 7 the middle cell-lamina (L. III) is seen to be by far the best evolved part of the post-central cortex. Figs. 6 and 7, in fact, which illustrate the only really well-developed cortex of a fœtus of eighteen weeks, at the same time present the motor and sensory portions respectively of the earliest evolved of the cerebral reflexes, that developed in association with the reflex movements of the limbs of the fœtus, which begin at about the mid-uterine period of life.

CHAPTER VIII

HUMAN CEREBRAL FUNCTION: LANGUAGE AND THOUGHT

The description of the probable mechanism of cerebral function which I have hitherto attempted has been given as far as possible in general terms which are applicable equally to man and to mammals, and from the aspects of anatomy and physiology alone. It now remains to pass the border-line between physiology and psychology and to attempt, at any rate, to indicate the probable manner in which the infinitely complex processes of human cerebral association are carried out on the physical basis which has been detailed. It is necessary here, however, to remind the reader that, whilst anatomical truths have hitherto served as a sure basis for the majority of the deductions which have been made, in the present chapter inference and hypothesis will play a considerable part in the evolution of a consistent and connected description.

As I have remarked, the cerebrum must be regarded as a great sensori-associative-motor ganglion, the only objective indications of the functions of which are derived from the various motor exhibitions which are presented by its possessor.

In the lower animals, but especially in mammals, these are of two kinds—evidences of feeling or emotion, and indications of intelligent (instinctive or acquired) activity; and either of these may to some extent be presented in the form of articulatory exhibitions.

The same evidences of cerebral activity are shown by man, in whom, however, the indications of emotion are more numerous and complex and the evidences of psychomotor activity are infinitely more elaborate. The former will be briefly dealt with in a succeeding chapter; the latter largely form the subject of the present description. These, apart from the ordinary motor indications of intelligence, consist of gestures and of spoken and written language; and of the two the latter, in the normal subject, is of prime importance.

The elements on which cerebral activity is based are the various sensory impressions which arrive at the sensori-projection spheres of the cortex, and which are conserved there or in their respective zones of special association as sensori-memorial images. These elements form the raw material or exciting cause of the processes of cerebral association

and are termed *sensations*. To be understood, sensations require localisation in space and reference to the objects from which they arise. The process of cerebral association which is involved in the preliminary fusion of sensations is termed *perception*. For example, the sound caused by the tick of a clock results in the localisation of the sensation in a certain direction and to a particular object, the clock. Not only, however, does the process of perception involve the fusion of direct sensations, but it also necessitates the awakening and fusion with these of certain sensori-memorial images of former sensations. In the act of identifying an object, *e.g.* a locomotive, the various sensations arising from it, whether of sight, sound or smell, awaken a variable number of sensori-memorial images. Again, the sound of the word "horse" awakens certain sensori-memorial images, which may be of any type from the written word "horse" to the last horse we have seen.

The presentation of a sensation, therefore, results in a process of cerebral association which evolves a psychic product termed a *percept*. It will, however, readily be understood that sensations are rarely presented a second time in exactly the same manner as before, unless repeated in a way which for our present purpose is equivalent to a continuation of the original sensation, and that the particular series of sensori-memorial images which is aroused by practically the same sensations is never likely to be repeated owing to their multitude and to their continually varying degrees of excitability or capability of being aroused into consciousness. The word "microscope," *e.g.*, heard at different times, evokes numerous related but dissimilar sensori-memorial images, and the same remark applies to the sensori-memorial images aroused by the sight of an actual microscope.

Perception, therefore, or the process of cerebral association which subserves the evolution of a percept, varies on each occasion on which it occurs. It is thus incorrect to speak of a cerebral centre for percepts, which are psychic products that, except when very simple, and then by accident, are rarely or never identical even if the arousing sensation is the same.

I would remark that perception can hardly be described as the act of naming objects, for it is as often the reverse, namely, the act of applying one or more sensori-memorial images to a name. It may also consist merely of the act of identifying a sensation with a sensori-memorial image. The last corresponds to the crude perceptions of animals: the others are perceptions which involve the employment of the symbolic mechanism of language.

The dog, for example, can distinguish his master from other men by the recollection of the sensations, in this case chiefly of smell, which he has in the past received. By the association of these sensations with

one another he has developed a composite image of his master which can be aroused, not only by the sense of smell, but by that of hearing and even by that of vision. This composite image is almost the highest form of psychic product evolved in the dog. Such a process of comparison of a sensation with a sensori-memorial image is the simplest form of perception.

The human being, in addition to perceiving in this manner, possesses words as symbols for things, and is able to recall the word when he recognises the thing, or the thing when he recognises the word. Names, therefore, may be described as symbols which are incited by sensations, or which, when presented, enable former processes of perception to be repeated in a more or less exact manner according to their lesser or greater complexity, and new processes of perception to be evolved.

There are thus three processes of cerebral association, any one of which may be described as perception and may evolve the psychic product termed a percept.

The next grade of complexity of cerebral associative processes which is rendered possible by the aid of language is the formation of a *concept* or general notion, *e.g.* the evolution of a general name such as animal, man, building. The psychic product is termed a concept, and the process of conception involves the revivification of numerous sensori-memorial images which present common points of similarity.

The process of cerebral association involved becomes still more complex for the evolution of such "abstract concepts" as heaviness, beauty, religion.

It is at once evident that the process of conception, whether it takes the form of generalisation from a series of sensori-memorial images to a general name, or of revivification of a series of sensori-memorial images in order that the meaning of a general name may be interpreted, is a very complex one ; and necessarily differs in detail, in spite of a general similarity in nature, on each occasion on which it occurs. It is thus incorrect to speak of a cerebral centre for concepts.

A physical basis for the several words which symbolise the variable cerebral associative processes termed conception undoubtedly exists in the cerebral cortex. Common or abstract names, however, are not concepts, but are merely symbols which enable former active processes of conception to be repeated in a more or less exact manner according to their lesser or greater complexity, and future acts of conception to be evolved.

Proper, common, and abstract nouns may thus be compared in function to the algebraic symbols employed by mathematicians, whilst sensori-memorial images and crude sensations may be likened to the numerals of arithmetic.

Language may thus be described as the instrument or the symbolic mechanism of cerebral association. As the mathematician requires to utilise symbols in place of elaborate masses of figures which would be too complex and unwieldy to manage without this aid, so the psychic products resulting from the least complex of the processes of cerebral association require symbols in the form of words before it is possible even to realise them, and still more before it is possible to compare and elaborate these products by more complex processes of cerebral association.

Language is thus an infinitely more complex symbolic system than is that employed by mathematicians ; and its numerals, *i.e.* its sensori-memorial images and crude sensations, are innumerable.

Words naturally possess very different symbolic values. Articles, pronouns, prepositions, conjunctions, interjections, and the simpler adjectives, adverbs, and verbs, when thought of alone, as a rule arouse little beyond their respective visual or auditory word-images, which in themselves are meaningless.

Adjectives, adverbs, verbs, and abstract nouns, when thought of alone, arouse first their respective visual or auditory word-images. These, however, are meaningless until by complex processes of cerebral association they are defined and illustrated through the sensori-memorial spheres attached to the various sensori-projection areas.

Common and proper nouns, when thought of alone, may first arouse their visual or auditory word-images ; but they frequently at once awaken a whole series of processes of cerebral association, and thereby determine the reproduction of sensori-memorial images attached to one or more of the several sensori-projection areas. It may be remarked that any such series of processes of cerebral association differs in detail on each occasion on which it is evolved. For example, the processes of cerebral association induced by the word "cat," whether this be thought of (articulatory sphere) or heard or seen (auditory or visual sphere), are different, not fundamentally, but in detail, on each occasion on which they are aroused. This ever-varying perceptive content is consequent on the revivification of, and the modification of the complex relations of, the numerous existing sensori-memorial images of which the word is symbolic, which are constantly taking place under the influence of even apparently unrelated afferent impressions.

Language is produced by the suitable co-ordination of words of different symbolic value ; and by its means it is possible to perform the highly intricate processes of cerebral association which form the physical bases of *judgment* and *reasoning*.

The whole of the higher intellectual processes are dependent on, and develop *pari passu* with, the evolution of language.

An intelligent child, by the end of the first year, begins to use words

by imitation: well before the end of the second year it begins to put two to four words together, also purely by imitation; and, at the end of this period, first to use pronouns, again also purely by imitation. During the fourth year the first attempts are made voluntarily to put together sentences; and before the end of this period more or less elaborate sentences are formed which often combine two, three, or more separate and vague attempts at complex cerebral association in a manner which spoils the sense, though the real goal may be quite clear to the careful and sympathetic observer. It is at this period that close observation so clearly shows that thoughts are elaborated *by means of language*, and are not present and waiting for expression. Soon afterwards language and thought run *pari passu;* and, by the time the superadded reading-and-writing part of the language mechanism undergoes education, the earlier auditory-articulatory portion is stable and reasonably elaborate.

Till of recent years the majority of, and even now many, individuals depend on the sense of hearing for the acquisition of the greater portion of their (human) psychic content, though persons who read and write perhaps gain an equal amount by means of the sense of sight, and the more intellectual members of the race probably acquire the greater part by means of the latter sense. It may, however, be remarked that whilst in some normal intelligent reading-and-writing individuals visual association has become the more natural method, in others auditory association continues to play the greater part in the process of acquirement.

Language, therefore, as the instrument of thought, or even as its compeer—for the higher refinements of thought depend so entirely on, and draw so much of their inspiration from, the possession of a highly elaborate vocabulary—is of fundamental importance for the performance of the higher, as of the less complex, psychic functions.

As will be indicated later, the complete performance of the respective processes of cerebral association, with the resulting reintegration of the particular percepts or concepts of which words are symbolic, does not necessarily occur during the mechanical employment of the language mechanism. Rowland, in fact, in her investigation of the psychological experiences connected with the different parts of speech, distinguishes three stages of meaning: (1) A feeling of familiarity with the word; (2) a feeling that she would know how to use it; and (3) the unrolling of the images. The monograph of this author, which includes a valuable bibliography, is well worthy of study in this connection.

The cerebrum possesses an almost infinite capability for the development of symbolic systems. New languages may be acquired, and, as if on the principle of the more the merrier, with each new acquisition the process of further acquirement appears to become easier. The acquisition, for example, of a small number of languages not only assists

languages allied to each to be readily acquired, but even enables one practised in languages to at once more or less clearly understand and be intelligible in a hitherto unknown tongue or dialect.

The numerous skilled psychomotor performances which only compare with language in variety and complexity, *e.g.* music, painting, sculpture, &c., may also be indicated as allied in nature to, though lower in grade than, the symbolic systems of language and mathematics.

THE LANGUAGE MECHANISM

Words, *per se*, are, from the afferent aspect, mere sensations, the memories of which are stored in the appropriate zones of association attached to the particular cortical projection areas to which they happen to pass. For example, a word seen stimulates the visuo-sensory area, and the resulting image is stored in the neighbouring visuo-psychic region.

Again, from the efferent aspect, words are mere cheirographic (one might say gesticulatory) or articulatory-motor results of the action of complex neurone groupings in the higher portions of the psychomotor area.

In the complete language mechanism words thus possess, from the sensory aspect, four sensori-memorial bases in the cortex, namely, in the neighbourhood of the auditory and visual projection areas of the cortex, and in that of the kinæsthetic projection area lying behind the furrow of Rolando in especial relation to those portions concerned with the reception of sensations from the larynx and the hand.

From the motor aspect, words possess two memorial-motor bases in the neighbourhood of those parts of the psychomotor area lying in front of the furrow of Rolando which are concerned with the evolution of acquired movements of the larynx and hand.

Words are originally acquired and reproduced through imitation by means of the auditory and articulatory-motor word-centres, the latter working in conjunction with its sensory coadjutor, the articulatory-kinæsthetic word-centre.

In persons who read and write, the later evolved, and in some types the eventually more important, visual and cheirographic centres are brought into action, the latter working in conjunction with its sensory coadjutor, the cheiro-kinæsthetic word-centre.

In the evolution of the language mechanism, suitable and highly complex associations occur between these various word-centres or sensori- and memorial-motor bases ; and when completely evolved this mechanism is of extraordinary complexity. For its truly useful employment, however, there necessarily occurs an active associational participation on the part of practically the whole mantle of the cerebrum.

For example, the word " mouse " at once sets on foot processes of association, which pass to the neighbourhood of every projection sphere with the solitary exception of the gustatory, and even this may be reached in a person who has eaten a fried mouse in the hope of thereby recovering from an attack of whooping-cough.

When it has once been acquired, language (*i.e.* functional activity of the several word-centres with their commissural systems) is not necessarily employed as the instrument of thought, although it has been primarily evolved for this purpose. The language mechanism, like the routine systems and " red tape " of every-day life, whilst a good servant, tends to become a bad master, unless the processes of cerebral association necessary for the elucidation of the meaning of the words employed are continually being voluntarily performed.

It is thus especially necessary, during the voluntary employment of written or spoken language for the evolution and reproduction of the highest psychic products, *i.e.* abstract thought, to continually revert to concrete examples. Many results of the higher reasoning processes would in fact be quite unintelligible to the reader in the absence of concrete illustration, and, what is even more important, the author himself would not infrequently find a tortoise successful in its race with a hare. Philosophic disputes have as a rule depended largely on questions of definition, or on the employment of the same words under slightly different connotations. Forms of words are worse than useless unless their exact meaning is appreciated ; and many discussions and disputes have arisen owing to the critic holding strictly to these, and thereby rendering it difficult or impossible for their originator to make his intentions quite clear and intelligible.

The necessarily imperfect employment of the language mechanism, owing to the occasional impossibility of satisfactorily discovering a form of words in which to clearly express the exact meaning of the writer or speaker, is in fact one of the most fruitful sources of disputation. It is not intended by this remark to imply that such a person *knows* what he wishes to express. He knows only too well that he does *not*, and many a promising train of thought is for ever broken owing to the resulting effect, unless he takes the precaution of writing down and preserving his unfinished results. He is aware that the phrases he is employing do *not* express what he desires ; and at times his uncompleted processes of cerebral association succeed in reaching their goal through the suggestion by another individual of a suitable form of words.

On the other hand, from the purely didactic aspect, a speaker occasionally finds his only safe refuge in generalities which are capable of varied interpretation. Many a sermon is acceptable to, and is approved by, a congregation, which would be up in arms if the preacher produced

concrete illustrations of his meaning, *e.g.* his views with regard to certain political questions, &c.

Again, this time from the reverse aspect, it is often truly astonishing to note the credulity of non-reading and non-writing individuals with regard to written or printed language. Anything written or printed must *a priori* be true, and hence the uneducated—and not always merely the uneducated—fall an easy prey to all kinds of quack advertisements. Even well-trained and educated men, who do not know shorthand but who employ an expert stenographer accustomed to their style and matter, often fall into the fallacy of supposing that anything transcribed from shorthand must be an accurate record. The following quotation from a recent number of *Punch* appears, to say the least, to be a good example of this fallacy : " ' The latter vessel reports having a hole forty feet long across the bows—due to the impact of stopping the engines. She was badly out by the starboard propeller.'—*The Statesman.* ' The latter vessel reports having encountered a whale, forty feet long, across her bows. The impact stopped the engines. The whale was fearfully cut by the starboard propeller.'—*The Englishman.*" *Punch* remarks : " Anyhow it was forty feet long. That's the point."

As a final illustration, I may remark that words are often employed in order to cause portions of the presumably sane human race to " follow their leader " and to act temporarily like the herbivora. Such terminological inexactitudes as " Chinese slavery " have at times served their purpose, and anything from a new soap to a new pill only requires a taking name in order to insure a fortune to its introducer.

From a different point of view, namely, that of the mechanical employment of the language machine, it is easy to provide illustrations to demonstrate that this may act as a mere mechanism for the evolution and reproduction of language which to the individual may be meaningless or practically so.

For example, imbeciles can sometimes learn by rote long paragraphs of the meaning of which they are ignorant. Children learn a large portion of their lessons in this manner. Adults can learn the Lord's Prayer backwards, or sentences in an unknown foreign tongue. Lunatics often employ the language machine in an almost entirely mechanical manner.

Examples of this mode of employment of the language mechanism may be readily drawn from everyday life. Many word-complexes which are frequently repeated, *e.g.* daily prayers, are often gone through in a purely mechanical manner whilst the individual reproducing them is perhaps thinking of something else. Again, it is appreciated by few that language, as normally employed, is very largely a purely reflex, or, at any rate, automatic function, and that the significance of what is

spoken is but feebly appreciated by the speaker. The words "bore" and "gossip" sufficiently illustrate my meaning.

In the majority of persons the word-vocabulary which is in common use is very limited; and the phrase-vocabulary is extremely limited, remarkably stereotyped, and in many instances quite automatically employed. In educated, and particularly in well brought-up, persons, on the other hand, the word- and phrase-vocabularies, though equally stereotyped, are much more extensive in range. In this respect women are, as a rule, worse culprits than men, and lunatics are much worse than either.

From an allied aspect, the performances of calculating boys are well known; and many persons can mechanically reproduce long quotations after a single reading, or complex musical compositions after a single hearing. The purely mechanical nature of such exhibitions is evident from the observation that an interruption at once breaks the sequence and necessitates a start from the beginning. These illustrations indicate that the symbolic mechanism of language is but one of a number of symbolic systems which the (educated) cerebrum is capable of evolving.

During the above observations an endeavour has been made to indicate that language, though so commonly employed in a largely automatic manner and with but a feeble appreciation of its signification, is nevertheless in essence a symbolic mechanism for the integration of sensori-memorial images, and, though more complex, is analogous, as an instrument, to the symbolic system employed by mathematicians.

By its use it is the servant, and the necessary servant, of thought: by its abuse it becomes the compeer, or even the supplanter, of thought.

Words are but symbols which possess different grades of value, and which are meaningless unless they are employed to incite the occurrence of such processes of cerebral association as are necessary to awaken the various sensori-memorial images of which such words are symbolic. A word is merely either an auditory or a visual sensation, or a muscular movement of the glottis or the hand, until such memories are awakened as are needed in order to supply it with meaning.

PSYCHO-PHYSIOLOGY OF THE LANGUAGE MECHANISM

Words may arise into consciousness through any of the language spheres. When, however, they are voluntarily and silently reproduced, *i.e.* thought of, words are invariably awakened through the articulatory-motor word-centre under normal conditions. Further, this reproduction requires a muscular effort, and cannot take place without a definite attempt at articulation, usually, but not necessarily, accompanied by a slight expiration. Again, words cannot be voluntarily repeated in

thought by means of the cheirographic centre if the hand is not actually moved, unless such hand-movements are replaced by slight movements of the head, or even of the lower jaw or the eyes, through the agency of their respective motor spheres. Such observations as have just been indicated are valuable because they render it probable, if not certain, that the important factors in this reproduction are not the muscular movements but the sensorial impulses derived from these; otherwise there is no reason why such muscular movements should not be imagined, without any attempt at their actual performance.

If words should spontaneously arise in the auditory or the visual word-centre, the condition is so abnormal as to constitute a hallucination, which the subject may or may not be able to distinguish from a true auditory or visual sensation. A homologous phenomenon to such a hallucination may be observed during the stimulation of the psychomotor area of a monkey which has recovered from anæsthesia. Such an animal regards the movement, say of the arm, with great surprise, and at once performs a voluntary and opposite movement, exactly as if the limb had been moved by an external agency. I have, during many years, accumulated observations on the subject of verbal hallucinations in the insane. Such persons exhibit every grade from the hallucinations of the sane, which are recognised not to be due to true sensorial stimuli, to hallucinations which are regarded by the subject as real sensations. I have become convinced that they are due to the arising into consciousness of words and phrases through the spontaneous activity of the particular word-centre concerned. I believe that words arising in the mind are interpreted as hallucinations when they develop in sensory spheres and can therefore be projected externally, since this is the source from which the corresponding sensations would arise. On the other hand, such words, when voluntarily reproduced in thought, are awakened through the preliminary aid of the psychomotor centre, *i.e.* by an act of volition, and are therefore regarded, not as hallucinations, but as normal products of thought of *personal* origin.

A word, therefore, in my opinion, invariably arises in a sensory sphere, and it may arise in one of three ways. It may arise in consequence of sensorial stimulation; in normal voluntary thought it arises through the preliminary aid of the psychomotor centre; or, thirdly, it may arise spontaneously in one of the sensory spheres, in which case it is a hallucination, which may or may not be distinguished by the subject from a true result of sensorial stimulation.

It is now possible to insert the language mechanism into the scheme of cerebral function which was detailed in Chapter V (p. 51 *et seq.*), and supported by proof in the succeeding chapters.

In this scheme the pre-Rolandic portion of the cerebrum or the

frontal lobe possesses controlling and executive functions, and the remainder of the hemisphere is concerned with the reception and recording of sensorial impressions and with the elaboratory association of these. The symbolic mechanism of language constitutes the means by which the high evolution of the sensori-psychomotor activity of the human cerebrum is attained.

As has been indicated, during voluntary thought words are awakened through the preliminary action of the prefrontal region on the psychomotor area, activity of which results in stimulation of appropriate neurone complexes subserving the evocation of the particular sensori-memorial images, which arise in the zone of special association attached to one or more of the sensory projection spheres. This view, I may remark, is merely an elaboration of that long ago advanced by Hughlings Jackson, more recently supported by Stricker, and strongly combated by Bastian.

Whether the rousing of such sensori-memorial images is followed by further processes of cerebral association—and what these further processes are, if they occur—depends partly on the general condition, as regards excitability, of the regions of lower association, and partly on such degree of voluntary guidance and control of these processes as happens to be exercised. For example, in dreamy states, when voluntary selection, co-ordination, and control are at a low ebb, processes of lower association, involving the awakening of all kinds of sensori-memorial images, occur in a more or less riotous manner according to certain general laws which are well known and need not be further referred to here. Occasionally these processes extend to the psychomotor area, and the dreamer actually speaks aloud if the stimulus be strong enough. Some such persons at once awaken either owing to the sensations associated with the act of speech or to hearing their own voice. Others may talk, or even converse, without awakening. On the other hand, as an extreme example, during the voluntary employment of written or spoken language for the evolution and reproduction of the highest psychic products—*e.g.* the writing of an abstruse thesis or the delivery of an extempore lecture on some technical subject—voluntary control over, and guidance of, the processes of lower association are paramount. In such a case, however, there is a tendency, which requires to be continually combated, for the cerebral processes to keep to the general lines of the mechanism of language, to the exclusion of such processes as involve the evocation of visual sensori-memorial images of the ordinary type. In such a case the writer or speaker tends on the one hand to reason falsely, and on the other to become unintelligible to his readers or audience. There is further, particularly during extempore speaking, a great tendency for the speaker to wander along the lines of thought which are aroused, in other words to become the slave of his own processes

of lower cerebral association. In such a case psychomotor activity is occurring under inadequate prefrontal control, and the speaker is failing to keep to the point.

To sum up, in dreamy states and in dreamland, cerebral activity consists chiefly of more or less riotous processes of (post-Rolandic) lower association in which the language mechanism plays a relatively minor part: during ordinary voluntary thought there is a marked tendency for the language mechanism, from the psychomotor aspect, to play too predominant a part: and, when the cerebral functions are performed in the manner which is possible but is unfortunately too rarely exercised, prefrontal control is paramount; and, through the intermediary activity of the portion of the psychomotor region of the cortex which is concerned with the language mechanism, the processes of lower cerebral association are selected, controlled and co-ordinated into orderly series, which series are guided towards a goal which may or may not be clear to the subject until its attainment.

As has been remarked, however words are aroused and however the speech mechanism is employed, language is meaningless unless the necessary processes of cerebral association occur which are required in order that its meaning may be elucidated by the revival of the numerous sensori-memorial images of which words are but symbols. Further, even the more elementary processes of cerebral association cannot occur in the absence of the language mechanism.

It is thus evident that any gross structural or functional derangement of the language mechanism must necessarily seriously impede, or even in certain cases prevent, the adequate performance of those further complex processes of association which serve as the physical basis of the psychic functions.

Loss of the visual or auditory word-centres would necessarily maim the language mechanism from the aspect of word images.

Loss of the intermediate cortex of association would grossly maim this mechanism from the aspect of the correlation of word images into the necessary groupings which constitute language as seen or heard.

Lastly, complete or partial loss of the psychomotor area would, according to its site, completely or partially interfere with voluntary thought. Thus, for the complete inhibition of normal voluntary thought, the whole psychomotor area would necessarily have to be lost, though voluntary thought would be extremely difficult were the portion concerned with laryngeal movements alone affected. The contention of Marie, therefore, that the subjects of classical Broca's aphasia exhibit intellectual impairment must necessarily be true.

I may here remark that loss of the prefrontal cortex would affect, not the integrity of the language machine, but the normal activity of the

cerebrum, owing to the inability of the subject to employ voluntarily the language mechanism for the purposes of general cerebral association.

I now propose to elucidate and illustrate the above remarks by certain references to the somewhat allied subjects of aphasia and sense-deprivation, which will be found to afford support to the views I have expressed with regard to the cerebral functions and the psycho-physiology of the language mechanism.

The statement of Marie that Broca's aphasia is invariably due to the existence of sensory aphasia together with anarthria is not in accord with the results of the preceding discussion. On the basis of the above remarks, the symptom-complex of Broca may be due (1) to a lesion involving Broca's area or its neighbourhood or, (2) to lesions causing sensory aphasia + anarthria.

In the former case, even if the lesion be permanent, the symptoms are often at any rate soon recovered from, and it is certain that such a lesion often occurs in the absence of loss of speech. Only one possible conclusion, it seems to me, can be drawn from these truths, which are, I think, through the investigations of Marie and Déjérine alone, too well known to need further corroborative reference to the experience of others or myself.

I am of the opinion that Broca's gyrus is in many persons part of the articulatory-motor word-centre, though not the whole of this, and that the actual portion of the psychomotor area which subserves the functions of articulatory-motor word-centre varies in extent in different individuals, and is independent, as regards regional distribution, of mere secondary cerebral fissures. This, by the way, is a conclusion which has for more than a decade obtained with regard to the visuo-sensory area (Fig. 14, Chapter II), the exact limits of which are readily determinable by histological methods. If such variable individual limits obtain in the case of a projection area which represents the lowest grade in the hierarchy of cerebral function, it is at any rate likely that the limits assignable to the higher parts of the psychomotor area should exhibit still more marked individual variations. There is, in fact, reason to believe that considerable individual variations exist in all the histological areas into which the cerebral cortex has been subdivided, and that these histological areas in reality indicate the *limits of educability*, rather than the actual grade of functional activity, of any particular brain.

With regard to cases of sensory aphasia, it has long been accepted that such patients exhibit intellectual impairment. The reason which has hitherto gained credence has been the hypothetical allocation of the auditory and visual word-centres to the convolutions surrounding the posterior portion of the fissure of Sylvius. I have already indicated

that auditory and visual word-memories necessarily possess their physical bases in the hall-marked zones of association surrounding the auditory and visual projection areas respectively ; and would here merely remark that the cortex of the region affected in sensory aphasia is neither auditory nor visual associational cortex, but is associational cortex of a still higher grade, which lies interpolated between the projection areas with their special hall-marked zones of association. In other words, this cortex is concerned with the elaboration of complex processes of association involving several or all the separate sensory and memorial zones, and thus possesses a high intellectual value. This is, in fact, the explanation of a (vascular) lesion in this region resulting in the symptomatology described under the term sensory aphasia, and it accords with the truth that word-deafness (the physical basis for auditory word-memories being located close to the cortex under consideration and possessing the same arterial supply) is merely a symptom of sensory aphasia, whereas word-blindness (the physical basis for visual word-memories being located a considerable distance away from the cortex under consideration and being supplied by a different cortical artery), often exists as a relatively isolated symptom.

I will now, from the aspect of aphasia, briefly indicate the special points to which I wish to draw the attention of the reader.

Granted that the language mechanism and the whole post-Rolandic portion of the cerebrum are intact, sub-evolution or dissolution of the prefrontal region of the cerebrum interferes with or prevents the higher voluntary functions of attention and inhibition, and of general co-ordination, selection, and control into orderly sequence of the processes of cerebral association. Such a person may be a lunatic or a dement, but he is not an aphasic.

Loss of the whole psychomotor area would entirely prevent voluntary thought ; and partial loss, involving the portion concerned with acquired elaboration of the laryngeal movements, would cause voluntary thought to be at any rate extremely difficult of performance. Broca's area in many persons is probably a part of this, and transient loss of speech with transient interference with voluntary thought would thus often result from a local lesion of this region. The purest transient forms of classical motor aphasia thus must exhibit intellectual impairment, if this be sought for by the methods of the alienist.

A lesion of the convolutions surrounding the posterior end of the fissure of Sylvius affects, not the visual and auditory word-centres, but cerebral cortex of highly complex associational (*i.e.* intellectual) value ; and this is the true reason why sensory aphasics exhibit impairment of the intellectual functions.

The main thesis of Marie, that all aphasics exhibit intellectual impair-

ment, is thus true. It is not, however, probable that motor aphasia is invariably the result of anarthria + sensory aphasia, although, on the other hand, it is doubtless true that anarthria + sensory aphasia necessarily give rise to the symptomatology of classical motor aphasia.

Further, whilst Broca's speech centre, as a special region of the cortex in the posterior portion of the third left frontal convolution, is rightly disrated by Marie, this especial region has long been regarded by many investigators of eminence as only portion of the speech area ; and it is impossible to accept Marie's contention that it *ne joue aucun rôle spécial dans la fonction du langage.* In the case of many persons his statement is doubtless true, whereas in that of others Broca's area is probably part of the educated psychomotor area, in which case its permanent loss would result in temporary motor aphasia with temporary interference with voluntary thought.

I purpose, finally, to refer to a subject allied to aphasia, namely, sense-deprivation, owing to its equally important bearing on the matters under discussion.

Language is originally acquired by the sense of hearing, and is reproduced by means of speech. The auditory and articulatory regions of the cortex thus constitute, with their associative systems, the fundamental language mechanism. In persons who read and write, a secondary mechanism, the visual-cheirographic, is superadded, and in some persons this is employed, even more than is the fundamental mechanism, for the evolution and the reproduction of those processes of cerebral association which form the physical aspect of the psychic functions.

A person suffering from congenital loss of hearing is necessarily dumb, and, unless he be educated by special means, his mental functions differ little from those of the anthropoid primates. The cerebrum, however, possesses a marked capability for the replacement of its disabilities, especially if these occur early in life. Such deaf and dumb persons thus possess a high capability for the replacement of their auditory disability by shrewdness of vision, and particularly of their speech disability by the evolution of descriptive mimicry to a high standard. Further, when they are taught lip-language they readily learn to communicate with normal persons inexperienced in the special mimicry of the deaf and dumb. The former represents the natural method by means of which the maimed cerebrum replaces its disability : the latter is a belated attempt to educate the cerebrum to function on normal lines. Yearsley, whose opinions are entitled to respect, considers that if the congenitally or early deaf commenced their education at the early age of three under teachers of proved experience " the automatic speech attained to by hearing children might be at least partly acquired by the deaf." By this method the maimed child would begin its training on *normal* lines before the *natural* method

of replacement by compensatory hyper-activity in other directions had commenced.

It is, however, with the natural method of replacement of their disability that I am concerned at present. When development of the cerebrum has resulted on these natural but abnormal lines, such congenitally or early deaf individuals think by gesture, just as voluntary thought in normal persons occurs by the preliminary activity of the articulatory-motor part of the psychomotor area. Such visible thinking in the part of the deaf is most important evidence in favour of the truth of the latter thesis.

On the other hand, the congenitally or early blind acquire language just as do ordinary non-reading and non-writing individuals, and, in the absence of special education, exhibit little or no defect of the mental faculties. In such persons, however, loss of sight is usually replaced by marked hyper-activity of the sense of touch, and, by means of special type, the blind are able to acquire education which is often little if at all inferior to that of many normal individuals.

Deafness in early life is thus a much more serious disability than blindness; and the mental strain, involved in such an extremely abnormal mode of performance of the cerebral functions as is common in the subjects of the former, often results in the development of insanity followed by dementia.

Cases of deprivation in early life of the senses of hearing or sight thus afford a valuable illustration of the importance of the language mechanism to the cerebral functions. Further, they well illustrate the ingenious manner in which the cerebrum is able to replace such serious disabilities as loss of hearing or sight by means, from the sensory aspect, of hyper-activity of other special senses, and from the motor, of a high evolution of the power of descriptive mimicry through the special adaptation of other portions of the psychomotor area.

Cases of deprivation of hearing in early life also illustrate, as is obvious to anyone who studies them, the absolute necessity of psychomotor activity to voluntary thought. A normal person may " think to himself " by means of invisible laryngeal and respiratory movements. A deaf and dumb individual does not possess the same involuntary ability to hide the results of psychomotor activity during voluntary thought.

The subjects of aphasia and of sense-deprivation thus provide important confirmation of the thesis with regard to the cerebral functions and to the psycho-physiology of the language mechanism, to the description of which this chapter has been devoted.

CHAPTER IX

HUMAN CEREBRAL FUNCTION: FEELING, EMOTION AND SENTIMENT

In the preceding chapter I have discussed in detail the psycho-physiology of the cerebral functions, and have endeavoured to indicate the part played by the symbolic mechanism of language in the performance of these. I have shown in what manner the possible mode of employment of this mechanism may result in the evolution of cerebral function of the highest grade. I have indicated how the normal mode of employment of the language mechanism results in a form of cerebral function which, though common, is largely automatic and is of relatively poor quality—of such a character, in fact, as to suggest that a less highly complex and intricate grade of cerebral structure might well serve the purpose. Lastly, I have illustrated how the cerebral functions may be performed in an entirely unworthy manner—how the language mechanism, which, as the crowning feature of the higher mammalian cerebrum, should be the pride of man, may be so degraded in function that literally at a word large numbers of the presumably sane human race may unthinkingly prejudge a cause or even become bloody revolutionaries with whom the lower animals might well hesitate to claim kinship.

It now remains, in this the final chapter of this part of the volume, briefly to describe and illustrate the further features or elements of the human cerebral functions by means of which such surprising results may be attained, namely, the *emotions* and *sentiments*. Through the influence of these, the highest grades of cerebral function—the high-water mark of the human intellect—may be achieved; and the poorest types of cerebral mal-function—the lowest depth of intellectual degradation—may be reached.

With the elementary sensori-motor mechanism are associated the equally elementary feelings of pleasure and pain. These are necessary equally for conservation and for evolution. In the next grade of sensori-motor development the original elementary feelings are further evolved as desires for food, combat, and the other sex, these being requisite respectively for the preservation of the individual and the continuation of the race. Later on, as the sensori-motor mechanism becomes more highly evolved, development occurs first of the maternal and then of

the gregarious instinct, the former being necessary for the preservation of the individual members of the race, and the latter for that of the race itself.

The essential significance of these elementary feelings consists, in brief, in their influence on the sensori-motor mechanism, which influence in the earlier stages of evolution is regulatory only, in the sense that this mechanism acts under the guidance of feeling until the necessary result is achieved. In the later stages of early evolution, however, whilst the influence of feeling is in the main regulatory—one might perhaps, without being misunderstood, say teleological—this influence is already liable to result in motor exhibitions which are less or greater than those necessary for the attainment of their purpose, or which actually frustrate that very purpose. An animal under the influence of fear may be paralysed or flee into greater danger: a starving animal may gorge itself to death: a mother may eat her young: animals in a herd may trample on and kill one another in their efforts to escape from danger, although the primary object of herding is mutual protection.

One may say, in fact, without being seriously in error, that the obvious difference between a sensori-motor mechanism uninfluenced by feeling and an ordinary animal possessing this quality is roughly the difference between a decerebrate frog and a normal one. The characters of the motor exhibitions of the former are exactly indicative of the qualities of an applied stimulus. Those of the latter are not. The usual explanation of this difference is that the existing static condition of the cerebral mechanism modifies or inhibits the motor exhibitions which should follow the application of a given stimulus. In a word, there is interposed between stimulus and reaction some form or grade of volition.

This is a view—although a common one—from which I must dissent. It is in fact my purpose during the following discussion to indicate my reasons for holding that lack of certainty in the degree and character of the motor exhibitions which normally indicate the existence of sensori-psychomotor activity is caused not by intellectual or volitional states, but by the influence of what up to the present possesses a name derived from psychology alone, namely, feeling, emotion or sentiment.

Sensori-psycho-motor activity would, in my opinion, according to its lights, as infallibly and invariably reach its goal as does an ordinary sensori-motor reflex in a decerebrate frog, were it not for the modifying influence of feeling, emotion or sentiment. I remark, according to its lights, because the sensori-*psycho*-motor mechanism, which is evolved in the mammalia alone, and is therefore a relatively recent evolutionary acquisition, readily becomes degraded, as was indicated in the last chapter, under the influence of habit. It thereby largely loses its higher quality of conscious and directive volition, and thereby tends to respond

to the modifying influence, often attached to a verbal symbol, of feeling, emotion, or sentiment. I have employed the triple term for the sake of clearness, as for many reasons the modern word affect is by no means free from objection, suggesting as it does something of a sensory nature, or at any rate some accompaniment of a sensation. In the following remarks I shall for brevity use the term "emotion" in the general sense, without further apology for employing, in an anatomico-physiological sense, a term belonging to the science of psychology.

If emotion be studied from the aspect of ontogenetic evolution, it is readily seen to possess both sensorial and motor aspects, and it is equally clear that the latter develops before the former. A baby, when but a few weeks old, exhibits at first fleeting but soon well-developed external indications of not one but several emotions, to which may be attached many terms connoting more than mere pleasure and pain. Indications of psychomotor activity on the other hand do not appear until between three and four months. These exhibitions, whether of emotion or of psychomotor activity, are undoubtedly at first of a purely reflex and mechanical nature, and unaccompanied by consciousness. They indicate the early practice of the emotor and psychomotor mechanism, and at the same time illustrate the original divorce between the sensory and motor aspects of cerebral activity of which in adult life so many examples may be adduced.

The earlier development, and at the same time the lower position in the evolutionary scale, of emotional in contradistinction to psychomotor exhibitions, may also be illustrated through the actions of less highly complex members of the higher mammalia, *e.g.* the practically reflex growl or bark of a dog when it hears an unusual noise, which by the sound of a well-known footstep or the scent of its master's clothing is immediately converted into fawning and wagging of the tail.

Indications of feeling are in fact on the instinctive and those of psychomotor activity are on the educative grades respectively of development. That children exhibit more signs of emotion than adults, and women than men, whereas the converse occurs in the case of psychomotor activity, is an observation which leads to a like deduction. The common observations that one cannot reason with a child, and can rarely reason with a woman, when either is under the influence of an emotional storm, point in the same direction, as does the allied truth that such emotional storms are evanescent in direct relationship to their severity.

Regarded from the purely sensorial and purely motor aspects, emotion in the former case may be termed static, *e.g.* that accompanying the contemplation of a work of art, and in the latter dynamic, *e.g.* that accompanying physical activity.

On the other hand, from the aspect of character or quality, the

emotion accompanying a sensation varies according to the content of mind aroused by the sensation. One example of this will suffice, namely, the different emotions aroused in an ordinary individual and an artist by a picture. Again, on the motor side, the emotion accompanying psychomotor activity varies in grade according to the degree of evolution of this. One example will again suffice, *e.g.* the emotions respectively aroused by carrying a hod, and by highly skilled labour or work, or by extempore oratory.

Emotion thus accompanies all sensori-psychomotor activity, as a lower-plane influence which may make for good or ill according as it is the servant of or the master of the later evolved and higher-plane cerebral mechanism.

The latest evolved mammalian acquisition, namely, articulate speech, which, for its highest evolution as the servant of supreme cerebral function, is relatively free from emotional interference, is, in its lower grades, peculiarly liable to abuse, with resulting degradation of the cerebral functions under emotional sway.

The philosopher, who regarded a conflagration in his house as a purely domestic matter beneath his personal concern, excites one's pity for his lack of practical common sense, but is nevertheless of a much higher type than is a nation which goes insane under the influence of a political catch-phrase, or a section of the population which provides a fortune for the inventor of a well-named and well-advertised quack medicine.

The high-water mark of cerebral activity, *i.e.* the evolution of genius (not talent), cannot be reached in the absence of emotional influences, though these, when unduly great, make for mental instability and alienation. This latter truth may be further illustrated by the observation that the commonest, and often a relatively early, characteristic of the sufferers from dementia is a dulling of the expression of the higher emotions, and often an exaggeration of that of the lower. In such cases there is reason to believe that the sensory aspect of such higher emotions is first lost, and that the exaggeration of the lower is one of expression only.

It may in fact be stated that one of the most trustworthy indications of incurable mental alienation (whether associated with dementia or not) is loss or dulling, from the sensory aspect, of the higher emotions and sentiments. On the other hand, from the motor aspect, it is a common observation that in chronic lunatics the physical expression of emotion not only long outlasts the actual experience of such, but may even continue permanently. In this respect the lunatic resembles the actor who successfully simulates the emotion he no longer feels, with, however, the difference that the latter voluntarily brings into existence the physical

indications of emotion which in the case of the former are merely the motor remains of the originally complete emotion.

The external exhibition or motor aspect of emotion is thus not only the last part of the complete emotion to remain, but, as has been indicated above, is the first part to appear in the infant. The physical expression of emotion is, as has been stated, more evident in children than in women, and in women than in men ; and it is evanescent in direct relationship to its intensity, whereas there is reason to believe that the reverse is the case with regard to the sensory aspect of emotion.

Lastly, emotion differs from sensori-psychomotor activity in not requiring education for its full development, and in not being liable to suppression or degradation in quality by habit. It undergoes elaboration from both sensory and motor aspects *pari passu* with increase in the complexity of sensori-psychomotor activity—from the former aspect in association with more complex sensori-psychic content, and from the latter in association with a more highly intricate psychomotor activity. These elaborations of the fundamental emotions are, however, lost when dissolution of the sensori-psychomotor mechanism ensues.

Emotion therefore conforms to the general law of evolution and dissolution ; it possesses hitherto nameless homologues of the sensory and motor components of reflex action ; and it must be regarded as being on an earlier and lower evolutionary plane than sensori-psychomotor activity.

PART II

CEREBRAL FUNCTION IN MENTAL DISEASE

CHAPTER X

ABNORMAL AND MORBID APPEARANCES

As a preliminary to the description of the morbid anatomy of mental disease, a few remarks on the post-mortem appearances of the normal intracerebral contents are necessary.

In the healthy adolescent or adult, intracranial fluid is minimal in amount. The cerebral membranes are smooth and glistening in appearance. The venous sinuses, which before the opening of the skull-cap and dura mater were distended with fluid blood, now contain but a little blood and perhaps a little loose clot in the more dependent regions, and are empty in the less dependent. The larger arteries at the base of the brain are collapsed and empty, and are by no means obvious to the inexperienced eye. The pia-arachnoid is thin and transparent, it exhibits with more or less clearness the arteries and veins contained in it, and it tears readily and strips with considerable difficulty from the hemispheres.

In older persons, and particularly in such as exhibit the various grades of disease of the cerebral arteries from early atheroma to gross calcareous degeneration, there is often a little thickening and opacity of the pia-arachnoid over the vault, together with enlargement of the Pacchionian bodies. The thickened pia-arachnoid strips rather more readily than natural from the hemispheres. There may be some slight grade of prefrontal and fronto-parietal wasting, with increase of sub-arachnoid and also of subdural fluid, but such in a healthy individual are all slight in degree.

The cerebral pattern is commonly of average complexity, but it is not rarely simple or complex.

Œdema of the brain and membranes, associated with pallor consequent on the diminished amount of blood in the veins, often occurs in general infective and cardio-vascular diseases. Under normal conditions a good deal (some 20 c.c.) of blood is held up in the veins and venous

sinuses, and escapes when the skull-cap is opened, leaving many of the veins reddish in colour from partial emptying. In cerebral œdema, pallor is usually well marked owing to emptiness of the veins consequent on the presence of an increased amount of lymph and cerebro-spinal fluid in the closed cavity of the skull.

After this introduction it is now possible to describe, from the clinico-pathological aspect, the chief abnormal and morbid appearances which are exhibited by the intracranial contents of the subjects of mental disease.

With few exceptions, which are unimportant in this connection, such abnormal and morbid appearances have long been well known, but, at any rate up to the time when I published my first article on the subject, no attempt, so far as I am aware, had been made to correlate these with any special symptomatology, and they had been described as common concomitants of the more chronic forms of insanity. Of these abnormal and morbid appearances, the more important are abnormal structure or wasting of the cerebrum, thickening and opacity of the pia-arachnoid, disease of the cerebral vessels, excess of intracranial fluid, subdural deposit, thickening of the dura mater, and abnormalities of the cranial vault.

The following description thus consists not merely of an account of abnormal and morbid appearances, but it also indicates the relationship of these to certain clinical states, and in some instances the pathology of their production.

In two consecutive series of 200 and 233 cases of mental disease, from which general paralysis and special examples of gross lesion, &c., were excluded, and in which both the clinical and the post-mortem aspects presented by these were systematically recorded, I was able to determine that an important correlation existed between these.

The cases of the first series were divided pathologically into five convenient, though artificial, groups, namely :—

(1) Cases with or without abnormal, but without morbid, appearances.

(2) Cases with slight morbid appearances—namely, slight excess of intracranial fluid, slight thickening of the pia-arachnoid, which stripped rather more readily than natural, and slight or no cerebral wasting.

(3) Cases with morbid appearances of moderate grade—namely, intracranial fluid to the level of the tentorium, moderate thickening of the pia-arachnoid, which stripped readily from the hemispheres, and a moderate degree of cerebral wasting.

(4) Cases with marked morbid appearances—namely, intracranial fluid well above the tentorium, much thickening and opacity of the pia-arachnoid, which stripped very readily from the cerebrum, much

wasting of the cerebrum, and, as a rule, marked disease of the cerebral vessels.

(5) Cases with gross morbid appearances—namely, very definite excess of intracranial fluid, much thickening and opacity of the pia-arachnoid, which stripped like a glove from the hemispheres, gross wasting of the cerebrum, and almost invariable affection of the cerebral vessels, which were usually greatly diseased.

On comparing the cases, from the aspect of symptomatology, with the post-mortem records, it was at once evident that these five groups corresponded, with few exceptions which were readily explicable, with five artificial clinical groups, namely :—

(1) Cases without dementia.
(2) Cases with appreciable dementia.
(3) Cases with moderate dementia—*i.e.* the ordinary chronic lunatic with dementia of moderate grade.
(4) Cases of severe dementia.
(5) Cases of gross dementia.

Exactly similar results followed the study of the second and confirmatory series of cases ; and I have since, for some years, been accustomed to prognose intracranial appearances with certainty, in all but the rare cases in which I have been uncertain as to the clinical state of the patient.

I was hence able to subdivide cases of mental disease into two types—namely : (1) cases which, from the macroscopic post-mortem aspect, exhibited abnormal, no abnormal, no morbid, or slight morbid appearances ; and (2) cases which exhibited morbid appearances of any grade of severity, and, in some instances, abnormal appearances also.

The former group from the clinical aspect I class under the term " Amentia," which I employ to connote *the mental condition of patients suffering from deficient neuronic development ;* and the latter under the term " Dementia," which I use to signify *the mental condition of patients who suffer from a permanent psychic disability due to neuronic degeneration following insufficient durability.*

The subjects of amentia, therefore, as I have already proved from the microscopic (pp. 81–84) and shall now indicate from the macroscopic aspect, suffer from a more or less marked grade of sub-evolution of the cerebrum. The chief clinical varieties of amentia are *low-grade amentia*, or idiocy and imbecility of all grades with or without epilepsy, and *high-grade amentia*, which includes " moral," unstable and excited cases, together with cranks and asylum curiosities, recurrent cases of all types, hysteria, epileptic insanity, and true paranoia and allied cases.

Before referring to the question of dementia, a further explanatory description of this mental condition is necessary. The word "dementia," and particularly the word "demented," are employed by alienists for different purposes. Some speak of demented patients recovering, others regard almost any reasonably quiet chronic case as demented, and others, again, deny the possibility of in any way whatever correlating psychic states and material conditions of the brain, and regard such as a form of confusion of thought. It is therefore necessary, in addition to defining the term, to indicate the commoner symptoms which are presented by patients suffering from dementia.

These, in brief, are as follows :—

General dullness and apathy, a loss of initiative, and an indifference to their surroundings ; a marked degree of stereotypism of all the mental processes, and an inability to learn new acquirements ; a mechanical method of performing known acquirements, a general stupidity and inability to understand when an attempt is made at correction of any kind, and a tendency to revert to accustomed modes of speech and action ; finally, there is a tendency to the repetition of accustomed actions, which often shows that these have been performed in the entire absence of intelligent volition.

This description, I may remark, in certain respects resembles that given by numerous experimental physiologists with regard to the motor exhibitions presented by certain lower vertebrates after removal of the cerebral hemispheres, and by certain higher mammals after removal of the frontal lobes.

The subjects of dementia, as I have already proved from the microscopic aspect (pp. 85–86 and 94–97), and shall now indicate from the macroscopic, suffer from a more or less marked grade of involution or dissolution of the cerebrum. I group such cases into a *primarily neuronic class* composed of senile, presenile, mature and premature types ; into a *progressive and secondary class* which includes senile dementia associated with gross degeneration of the cerebral vessels, and, as the result of a special study, general paralysis also ; and into a *class of special varieties* following sense-deprivation, epilepsy, and cerebral lesions.

This generalisation of amentia and dementia is a gross one, and, as I have indicated in Chapter VI, pp. 96–99, is based on the fact that cases of mental disease exhibit a lesion of the cortex of the prefrontal region of the cerebrum, which lesion, in the case of amentia, is of the nature of a true sub-evolution, and, in the case of dementia, is of the nature of a true involution or dissolution.

The existence of amentia does not of course preclude the onset of dementia. The necessary precursor of dementia is a more or less severe grade of *mental confusion*, which term I employ to connote *the mental*

symptoms which occur in association with certain pathological states of the cortical neurones which may be followed by the recovery or by a more or less extensive dissolution of these elements.

Although the necessary precursor of dementia, mental confusion, when incited by temporary and removable causes—*e.g.* alcoholic excess—is nevertheless often entirely recovered from. Further, certain clinical indications are frequently, though not constantly, present which enable a prognosis to be made as to whether a given case of mental confusion is recoverable or will result in dementia. Again, it is certain that recoverable mental confusion may occur in persons possessing normal cerebra. Lastly, mental confusion followed by dementia more commonly occurs in cases with cerebra of normal or relatively normal development, though probably of deficient neuronic durability, than in cases with cerebra which exhibit some grade of sub-evolution. The generalisation may, in fact, be made that the greater the grade of amentia the less is the tendency to dementia, not through a more normal durability of the cortical neurones of the former, but owing to the fact that cases of amentia so readily suffer from symptoms of mental alienation under any form of " stress " that, as a rule, little or no irreparable damage to the cortical neurones results.

The generalisation of amentia and dementia, I may remark, does not cover the subject of special symptomatology, which, as I have indicated in Chapter VI, but have not yet fully proved, depends on the degree of evolution of the cortex of the projection areas and zones of lower association of the cerebrum.

Before dealing individually with the morbid appearances found in mental disease, I propose to draw the attention of the reader to the following general summary, in which the percentages given are based on the 433 cases already mentioned. It is unnecessary to give also the figures obtained from the two series as they much resemble one another, and also those in the complete table, which similarity of results naturally adds largely to the value of this.

An examination of the percentages given in Table I indicates that the morbid changes existing in these 433 cases vary directly with the grade of dementia present. The groups in this table (p. 140) are the five groups described on pages 136–7.

The more important of these morbid appearances will now be described and discussed, according to their relative importance, in the order in which they are grouped in the table ; and this description will be followed by remarks on the condition of the cerebral hemispheres, from the aspects of weight and naked-eye appearance, and on the subject of degeneration of the cerebral blood-vessels. The somewhat lengthy description and discussion will be completed by a brief account of the pathology of the

TABLE I.—*Showing the Increasing Frequency and Severity of Morbid Changes in the Various Grades of Dementia*

433 CASES OF INSANITY.	Group I. (65 Cases.)	Group II. (96 Cases.)	Group III. (101 Cases.)	Group IV. (92 Cases.)	Group V. (79 Cases.)
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Dura: thickened or adherent	4·6	17·7	27·7	42·4	45·6
Subdural deposit	3·1	5·2	17·8	17·4	22·8
Subdural excess	**38·5**	**76·0**	**92·1**	**100·0**	**100·0**
(1) Slight	26·2	31·2	9·9	5·4	...
(2) Moderate	10·8	40·6	67·3	27·2	17·7
(3) Great	1·5	4·2	14·9	67·4	82·3
Pia-arachnoid strips:					
(1) Naturally	69·2	6·2	...	...	...
(2) Rather more readily than natural	29·2	74·0	2·0	...	...
(3) Readily	1·6	19·8	82·2	13·0	1·3
(4) Very readily	...	...	15·8	82·6	40·5
(5) Like a glove	...	...	...	4·4	58·2
Subarachnoid excess	**21·5**	**61·4**	**92·1**	**100·0**	**100·0**
(1) Slight	16·9	27·1	31·7	19·6	3·8
(2) Moderate	4·6	33·3	56·4	47·8	36·7
(3) Great	...	1·0	4·0	32·6	59·5
Lateral ventricles:					
(1) Dilated	10·8	39·6	73·3	92·4	98·7
(2) Granular	1·5	1·0	8·9	10·9	26·6
(3) Dilated and granular	4·6	2·1	1·0	3·3	1·3
IV. Ventricle:					
Granular lateral sacs	35·4	55·2	65·3	78·3	70·9

abnormal and morbid appearances found in mental disease, and of the generalisation of amentia and dementia which is based, from the macroscopic aspect, on the contents of this chapter, and, from the microscopic, on the subject matter of Chapter VI.

Subdural Deposits (Pachymeningitis hæmorrhagica)

It is now many years since I formulated the thesis that the ordinary subdural deposits found in the insane develop owing to the alteration in the intracranial physical conditions which occurs in dementia. The excess of intracranial fluid, which primarily is developed to replace loss of cerebral substance in the closed bony chamber, interferes with the normal relations of the pia-arachnoid to the dura mater, and converts a potential space into an actual one full of fluid. This excess of fluid, which is often of abnormal composition, necessarily predisposes to the development of a chronic degenerative process in both the dura mater and the pia-arachnoid, as does also the hopeless attempt at the formation of replacement or scar-tissue which is made by these membranes. Hence, any more or less sudden alteration in intracranial tension, due, *e.g.*, to a convulsion, a trauma, &c., or even to the change of blood-content from the arterial to the venous side which occurs at the time of death, tends

to cause an effusion of blood from the degenerate and often dilated vessels of the dura mater, the pia-arachnoid, or both. Again, states of local congestion of the dura predispose to the formation of subdural deposits, *e.g.* following a severe bruise of the head or erysipelas of the scalp.

Subdural deposits may be grouped into two classes :—

(1) Thin films, probably due to deposition of abnormal contents of the cerebro-spinal fluid on the degenerate dura mater. The films may be more or less organised. When this latter has occurred, it is common to find larger or smaller hæmorrhages lying between the film and either the dura mater or the pia-arachnoid, from either of which membranes the blood may have been effused. These films readily strip from both the dura mater and the pia-arachnoid, and on reflecting the dura mater they may remain on it or on the pia-arachnoid, according, apparently, to whether the hæmorrhages have arisen from the former or the latter. The hæmorrhages may be recent or old, in which latter case the films may be more or less rusty in colour. It is frequent also to find several super-imposed films of different ages. The films, again, appear in many cases to be primarily hæmorrhagic in nature, and may arise from either the dura mater or the pia-arachnoid, and in many cases small hæmorrhages exist in the substance of the latter membrane.

These films are the direct results of the abnormal intracranial conditions present in dementia, and their frequency increases with the grade of dementia present. Many are of very recent date, and it is my opinion that they not unfrequently arise during the alteration in the intracranial blood-content, from the arteries to the veins and venous sinuses, which occurs at death.

(2) Larger or smaller effusions of blood into the subdural space, usually or invariably arising from rupture of pial veins, and frequently from a vein connecting the great anastomotic vein to the lateral sinus.

These hæmorrhages are especially frequent amongst the deposits occurring in dementia paralytica, in which the liability to blood-effusions is increased by the epileptiform convulsions, which are a common symptom of this disease, and which necessarily cause considerable alterations in intracranial tension. The same remark may be made with regard to such other cases of mental disease as are associated with similar convulsions.

If the effusion be large and the excess of intracranial fluid slight, the patient will show more or less severe pressure symptoms, or he may even die suddenly. If the excess of intracranial fluid be considerable, to a large extent the site of the blood will depend on gravity, and also on the roughening of the dura mater, for under normal conditions such blood should be largely or entirely flushed out by the movement (perhaps the term "circulation" is open to misinterpretation) of the cerebro-spinal fluid. If the effusion be large or occur in successive small quantities,

the blood, as a rule, clots *in situ*, say, on the vertex or in one of the middle fossæ. The effusion very rarely extends below the tentorium. I have only seen two or three cases in which this occurred.

The frequency with which no symptoms follow even large blood-effusions is undoubtedly due to the excess of intracranial fluid, which by escaping through the foramen magnum allows space for the effusion without any important increase in intracranial tension. I have seen more than one case in which this did not occur, and in which large cysts developed in association with great increase in intracranial tension together with the usual symptoms of this. On the other hand, large deposits or cysts may result in marked flattening, distortion or local wasting of the frontal portion of a hemisphere—and this in the absence of any noticeable symptoms provided that the morbid product has been but slowly developed. It is by no means rare to find a deposit of semi-organised membranes, or cakes of blood, which in many cases contain semi-fluid contents, or even of calcareous masses. In some of these cases the history suggests a former large sudden effusion of blood from the immediate effects of which the patient has recovered : in others the condition is unexpectedly found at the post-mortem examination.

Frequency of Subdural Deposits.—According to Bevan-Lewis subdural deposits occur in 5·2 per cent. of all cases of insanity. Wiglesworth gives the higher percentage of 8·47. Ford Robertson, from an examination of 290 cases of insanity, has reported a percentage of 25·5, and has also stated that a degenerative condition of the dura mater existed in another 25 per cent. of these cases.

From the records of the first 1626 autopsies performed at the Cleybury Asylum, I found a percentage of 9·76 in the males, and 5·54 in the females, or 7·75 in the whole of the cases. This is probably too low, for considerable variations exist in the percentages at different periods, and these appear to be largely due to the personal equations of the different observers.

As may be seen in the table on p. 140, which deals with 433 consecutive cases of mental disease, from which examples of dementia paralytica and of severe gross lesion were excluded, the percentage of subdural deposit in the five groups into which the cases are divided is respectively, 3·1 in Group I, 5·2 in Group II, 17·8 in Group III, 17·4 in Group IV, and 22·8 in Group V. These figures strongly support the views I have expressed on the pathology of subdural deposits. Further, an analysis of the cases occurring in Groups I and II, which should *a priori* be of an accidental nature, affords equally useful evidence.

Of the 200 cases in Series A, only two examples occur in Group I, and only three in Group II ; and of the 233 cases in Series B, there is no instance in Group I, and only two in Group II.

Of these seven cases, the two occurring in Group I are in fact accidental, and of those occurring in Group II one is accidental in association with a gross lesion, and the other four are all recent and are explicable on general pathological grounds by the cause and mode of death, *i.e.* progressive cardiac failure.

For comparison with the percentages given on the following table, I may say that if the 433 cases are taken *in toto*, the percentage of subdural deposit is 13·6 in the consecutive cases from which dementia paralytica and severe gross lesion are excluded.

This table, in which the deposits are classified according as whether they are "old" or "recent," gives the percentage personally observed by me during the first 500 post-mortem examinations which I performed at the Claybury Asylum :—

TABLE II.—*Showing the Frequency of Subdural Deposits in Ordinary Insanity and Dementia Paralytica respectively.*

	Autopsies.		Subdural Deposit.		
			Old.	Recent.	Total.
Males	Ordinary insanity	133	14	14	28 (21·1 %)
	Dementia paralytica	85	12	13	25 (29·4 %)
	Total	218	26	27	53 (24·3 %)
Females	Ordinary insanity	244	19	11	30 (12·3 %)
	Dementia paralytica	38	2	2	4 (10·5 %)
	Total	282	21	13	34 (12·1 %)
	Total	500	47	40	87 (17·4 %)

This table, which includes all cases, indicates that subdural deposits are more common in the male than in the female sex, but at the same time does not unduly charge dementia paralytica with their responsibility. I should be inclined to regard 17·4 as a percentage which for practical purposes represents the actual proportion of subdural deposits of all grades, from the merest films to the most severe effusions of blood. I think that from 8 to 10 per cent. is nearer the mark in the case of post-mortems done in a routine manner, for unless especial care is taken the thinner and colourless films are easily missed.

Subdural and Subarachnoid Excess

When considering the relative value of the intracranial morbid appearances in mental disease, I cannot too strongly emphasize the importance of excess of intracranial fluid in the pathology of dementia. This excess

is so commonly neglected in discussions on intracranial morbid changes in favour of gross or fine changes in the dura mater, the pia-arachnoid, or the cerebrum, that it might almost be supposed to be valueless as a criterion of the degree of cerebral wasting which is present.

It is, however, now proved, chiefly through the masterly researches of Leonard Hill, that the intracranial fluid is normally minimal in amount, and that the blood-content of the cranium is for practical purposes constant. Any considerable and constant increase in the amount of this fluid is therefore associated of necessity with a corresponding loss of cerebral tissue. Certain cases, who die slowly from cardiac failure with secondary œdema of the lungs, &c., show also some œdema of the brain or some excess of subdural fluid of *recent* development, with associated alteration of intracranial blood-content; but these belong to quite a different category in being recent and due to blood-stasis, temporary if the patient should live, and part of a general pathological body-state, and therefore not of local origin. The recent subdural deposits which, as has already been stated, occur in, but are not peculiar to, Group II, are chiefly found in cases of this type.

For the purposes of the present description of morbid appearances, the amount of intracranial fluid present has been estimated on the following plan, which has been employed owing to the ease with which it can be practically applied. The cases are divided into three groups, of which the first contains those where the subdural fluid was in excess of the normal small quantity, and which are described as showing "slight excess"; the second those where with the brain *in situ* the subdural fluid reached to the level of the tentorium, described as showing "moderate excess"; and the third those where the subdural fluid extended above the tentorium, described as showing "great excess." In the majority of instances the first is equivalent to Groups I and II, especially the latter; the second to Groups II and III, especially the latter; and the third to Groups IV and V, especially the latter, though some overlapping occurs, as may be seen in the table.

In the case of the sub-arachnoid fluid, three degrees have again been adopted, but here the estimation is more a personal matter, and is dependent on experience. "Great" excess, however, on the whole signifies a ballooning up of the arachnoid in the frontal and prefrontal regions; "moderate" excess indicates an obvious amount of fluid in the frontal and central regions of the hemispheres; and "slight" excess denotes a smaller, but visible, amount of fluid in the same regions.

The Pia-Arachnoid

For practical purposes the morbid appearances found in this membrane can be most satisfactorily summarised by the ease with which it

can be removed from the hemispheres. As is shown in Table I, five grades have been adopted, which on the whole correspond to the five groups into which the cases have been classified.

The chief factor in modifying the manner of stripping is the œdema of the cerebrum, which at times exists, especially in patients slowly dying from exhausting diseases, *e.g.* tuberculosis, cancer, &c., or rapidly dying from acute dysentery, convulsions, &c. In some cases of œdema the membrane comes off abnormally readily, whereas in others, where the cerebral tissue is very œdematous, stripping is extremely difficult.

Post-mortem changes markedly modify the process of stripping, but owing to the use of a cold chamber they were slight or absent in the cases employed for the purposes of the investigation on which this account is based.

The Lateral Ventricles

Dilatation of the lateral ventricles, like increase of subdural and subarachnoid fluid, is evidence of loss of cerebral tissue. Such dilatation is probably of late occurrence in many cases, and it is in my experience particularly evident in cases in which the dementia has progressed but slowly. Whilst, therefore, in order to form an estimate of the actual loss of cerebral tissue which has occurred, it is necessary to take into account both the amount of extra-cerebral and the amount of intra-cerebral fluid, the former is, taken by itself, a fairly trustworthy criterion for the fixing of the artificial group to which the case belongs. In fact, even as far as Group IV, cases occasionally occur in which dilatation of the lateral ventricles is absent or very slight.

The degree to which dilatation of the lateral ventricles exists is somewhat difficult to estimate with any approximation to accuracy. I have therefore not introduced grades of dilatation into the table. The increasing frequency of this morbid appearance as one passes from Group I to Group V is, however, well shown.

Granularity of the ventricles is an interesting morbid appearance, which is, however, not necessarily of importance. It is in all probability the homologue of the normal proliferative (and degenerative) condition of the epithelium of the central canal of the spinal cord in adults. In the adult this proliferative condition is due to the small size of the canal, owing to development of the white matter of the cord, and to the absence of flow of cerebro-spinal fluid. Probably granularity of the ependyma of the ventricles is due to a similar cause, namely, loss of function of the epithelium, aggravated by bathing with abnormal cerebro-spinal fluid which contains products of neuronic degeneration. As is seen in Table I, granularity of the ependyma rarely occurs in the lateral ven-

tricles in Groups I and II, but appears with increasing frequency in Groups III–V. In the fourth ventricle, however, it is frequently present in the " lateral sacs," or lateral pockets containing the choroid plexuses, occurring even in Group I in these situations in one-third of the cases. This appearance in the " lateral sacs " is therefore probably an indication rather of adult life than of disease. In both Series A and Series B granularity of the ependyma was less frequent in Group V than in Group IV, and therefore the observation is probably accurate. A possible cause may be the greater chronicity of the cases in Group IV, and the grosser degeneration of the cerebral vessels in Group V. Granular ependyma occurs also in a small percentage of cases, in the later groups, in the upper half of the floor of the fourth ventricle on each side of the mid-line, and in a similar small percentage in the third ventricle. Such cases appear to present the more extreme stages of this morbid appearance, which, however, does not occur solely in dementia, but is also seen to a marked degree in certain general diseases, *e.g.* chronic Bright's, &c. In my experience granularity of the ventricle never occurs in the calamus or lower half of the fourth ventricle to an appreciable extent except in dementia paralytica, in which disease, except in very early cases or when obscured by œdema, it is a constant and characteristic sign. In accordance with the view expressed above as to the probable cause of granular ventricle, it is likely that granularity of the calamus is due to stagnation, in the lower apex of the ventricle, of the cerebro-spinal fluid, which, in dementia paralytica, is loaded with products of neuronic degeneration.

Weights of the Cerebral Hemispheres

Of the abnormal and morbid intracranial appearances under description, the simplest, and that which is most readily determinable with accuracy, is the weight of the stripped cerebral hemispheres in the fresh state. In the following table are classified, under the five groups which I have indicated, the weights of the stripped hemispheres from 417 consecutive and unselected cases of mental disease.

On examination of this table, it is at once evident that the weights in all the groups are much below the average normal weight, which I have estimated from the relatively recent statistics of Marchand. I do not lay stress on this point, as Marchand's results were obtained from the brains of Hessians, although, if to the weights of Group III one added the 30 to 50 grammes which it is probable they have lost in consequence of wasting, they would come approximately up to Marchand's figures.

I would, however, indicate the obvious and important conclusion that the average weights of the hemispheres in Group III must, before wasting had occurred, have been considerably greater than those in

Groups I and II. The average weights of the hemispheres of Groups IV and V, in which severe and gross wasting had occurred, point to the same conclusion—namely, that the original weights in these groups must have been considerably greater than those in Groups I and II, since the loss of cerebral tissue in the former groups cannot average less than about 100 grammes, and may be much more, in view of the large amount of intracranial fluid which is present.

I would remark that the first two groups include a small number of cases who might have recovered had they lived, and those brain weights would tend to increase rather than to decrease the average. They also include a small number of idiots and imbeciles whose brain weights do not affect the average to an appreciable degree, some of them being much above it. The few epileptics scattered through the groups have also no important influence on the average weight. Whilst such cases might with theoretical advantage have been omitted, they have no practical influence on the average weights of the groups, and their inclusion avoids the necessity of interrupting the consecutive series.

TABLE III.—*Weights of Stripped Hemispheres from* 417 *Cases.*

No.	GROUP.	MALES.		FEMALES.	
	Total Number of Cases.	Number of Cases.	Average Weight in Grammes.	Number of Cases.	Average Weight in Grammes.
		Normal.	589.	Normal.	534.
I.	61 No wasting	21	552	40	497
II.	95 No, or slight, wasting	21	564	74	485
III.	96 Moderate wasting . .	31	560	65	482
IV.	90 Marked wasting . .	38	511	52	456
V.	75 Gross wasting . . .	25	513	50	437

The striking conclusion thus follows that the average brain weight of lunatics without intracranial morbid appearances is less than the original average brain weight of lunatics who exhibit such changes.

In other words, the cerebra of Groups III, IV, and V have fallen from a higher original level of development than that to which those of Groups I and II have attained.

I now turn to the consideration of the abnormal and morbid appearances presented by these cerebra. The question of *abnormal appearances* requires for its solution the microscopic rather than the macroscopic

method. For example, a case of idiocy which I examined, and in which the brain, though somewhat below the average weight, appeared to the naked eye perfectly normal, except for slight simplicity of the convolutional pattern, and a somewhat decreased development of the prefrontal region, gave, when investigated by the micrometric method, general average measurements which were almost identical with those obtained from a stillborn female infant. It is, nevertheless, common to meet with small, and especially with simply convoluted and abnormally convoluted, cerebra in cases belonging to the first two groups, though it is extremely rare to meet with under-developed cerebra of average convolutional pattern which show a macroscopic decrease reasonably comparable with the marked wasting presented by cases of severe dementia. In such cases, the macroscopic decrease (apart, of course, from lesions due to abnormal development of vascular or traumatic origin) occurs in the prefrontal region of the cerebrum.

The *evidences of wasting* presented by the cerebra of the insane are, on the other hand, almost as fit a subject for macroscopic as for microscopic study, since, perhaps in the majority of advanced cases, the tendency to decrease in cortical depth owing to neuronic loss is to some extent neutralised, especially towards the surface of the cortex, by reparative proliferation of the non-neuronic elements.

The macroscopic relationship of the degree of wasting to the degree of dementia is on the whole very exact, and the regions of relative wasting can with practice be determined with considerable accuracy. This relationship is more constant in ordinary insanity than in dementia paralytica, owing to the more complete removal of the products of neuronic degeneration which has occurred at death, though, when cases of dementia paralytica live long enough, the macroscopic wasting occupies the same sites as, and is often even more pronounced than, is the case in ordinary gross dementia.

These regions of wasting, taken generally—for individual variations occur—are as follows :—

(1) The greatest amount occurs in the prefrontal region.

(2) The wasting is next most marked in the remainder of the first and second frontal convolutions. (In dementia paralytica, Broca's gyrus should, as a rule, be included here, and (2) and (3) should follow (4).)

(3) It is perhaps next most marked in the ascending frontal and Broca's gyri, though this grade should, in many cases at least, follow (4).

(4) It is next most marked in the first temporal gyrus and the insula, and in the superior and inferior parietal lobules. In practically all cases it is more marked in the two former than in the two latter.

(5) It is least marked in the remainder of the cerebrum (including

the orbital surface of the frontal lobes), particularly the inferio-internal aspect of the temporo-sphenoidal lobe and the posterior pole of the hemisphere.

I am of the opinion that exceptions to this general order are invariably due to vascular or traumatic causes, and should therefore be excluded from the ordinary and normal wastings of dementia.

It is necessary to insert here a few words with regard to certain pitfalls into which the student of cerebral convolutional patterns may readily happen.

In the first place, *the actual size of a hemisphere markedly influences the apparent complexity of its pattern.* Large hemispheres appear to be of simpler pattern, and small hemispheres appear to be of more complex pattern than is actually the case. The reason for this is clear. Hemispheres, when studied one by one as they occur at post-mortem examinations, are unconsciously inferred to be of about the same size, unless they appear to be very large or very small.

Again, *gross wasting markedly increases the apparent complexity of the convolutional pattern,* and especially so when the convolutions are closely packed. A small wasted brain thus may appear to be of complex pattern when this is really simple, or the pattern of a large brain may appear to be normal when it is actually simple.

I now give figures of a number of hemispheres in illustration of the abnormal and morbid appearances which I have indicated. They are chosen on clinical grounds, being from patients in whom I was interested and with whose mental condition I was very familiar.

Group I

Female, aged 28, single. An imbecile of moderate grade. The youngest of a family of eleven. Normal until a severe fall at the age of 3 years, after which she had fits until the age of 13. Was never at school, but when 8 to 9 years of age could converse and go errands.

Cerebrum small and simply convoluted, and very asymmetrical. R.H. (Fig. 63), 372 grm. ; L.H., 414 grm.

Male, aged 24, single, labourer. Insanity with epilepsy. An only child. Was in standard vii. at the age of 12 years. Had a severe fall at the age of 14 years, which was followed by fits. Mental symptoms began at the age of 18 years.

Cerebrum of average size and pattern. L.H., 593 grm. (Fig. 64).

Female, aged 35, single. A drunken prostitute with over fifty convictions. Excitable, unstable, cunning and very dangerous. A terror to the nurses owing to her violence and her unfounded accusations of ill-treatment.

Cerebrum large and of rather simple pattern. L.H., 618 grm. (Fig. 65).

Female, aged 30, single, servant. Heredity of insanity. Alcoholism.

Previous attack. Acute mania of non-confusional type. Death from cancer of the lung nine months after admission.

Cerebrum large and of very complex pattern. L.H., 645 grm. (Fig. 66).

Group II

Female, aged 22, married, housewife. Acute mania following confinement and associated with some confusion. Died from phthisis two and a half years after admission, and for some months before death exhibited well-marked stupor.

L.H., 495 grm. (Fig. 67). Convolutional pattern was below the average in complexity. Slight intracranial morbid appearances.

Male, aged 52, married, steward. Mulatto. Intemperate. Slight dementia. Died, after a residence of 18 months, from aneurism of the aorta.

L.H., 520 grm. (Fig. 68). Cerebrum below the average size, but little if anything below the average convolutional pattern. Slight intracranial morbid appearances, and slight prefrontal wasting. Moderate atheroma of cerebral arteries.

Group III–IV

Male, aged 41, single, seaman. Duration of attack nearly 15 years. A case of chronic insanity who was at first depressed and confused. He then exhibited ideas of persecution, became grandiose, and eventually developed a moderate grade of dementia. Until he became demented he never spoke, refusing to communicate with others except by signs or by writing.

L.H., 525 grm. (Fig. 69). Considerable wasting, chiefly in the prefrontal region. Several small softenings in the left hemisphere (*cf.* mental condition). Slight atheroma of the cerebral arteries.

Group IV

Male, aged 61, single, schoolmaster. Duration 14 months. A case of melancholia with confusion which resulted in severe dementia.

Cerebrum large. Convolutional pattern very complex. L.H., 585 grm. (Fig. 70). Marked general wasting, which is especially evident in the prefrontal region. Moderate degeneration of the cerebral arteries.

Group V

Female, aged 78, widow, housekeeper. Duration about 3 years. A case of marked senile confusion. She was lost to time and place, and restless. She undressed herself. She suffered from illusions of identity. She developed gross dementia.

The cerebrum (Fig. 71 and also Fig. 74, p. 378) had originally been probably of above the average size. R.H. unstripped, 525 grm. L.H. unstripped, 520 grm.; stripped, 480 grm. Gross cerebral wasting, which is especially marked in the prefrontal region. Some degree of asymmetry, the right hemisphere being of simpler pattern than the left. Gross degeneration of the cerebral arteries.

Contrast Case

Male, aged 91. Senile decay with relatively little dementia.

R.H., 485 grm. (Fig. 72). Very gross degeneration of the cerebral vessels. Pia-arachnoid grossly thickened over the fronto-parietal region, and adherent over the temporo-occipital.

The case resembles the last in the post-Rolandic portion of the hemisphere, but markedly contrasts with it in the pre-Rolandic in exhibiting relatively little in comparison with gross cerebral wasting.

I will now draw the attention of the reader to the more important conditions which appear to influence the passage of cases from the earlier to the later groups, since, the groups being artificial, the position occupied

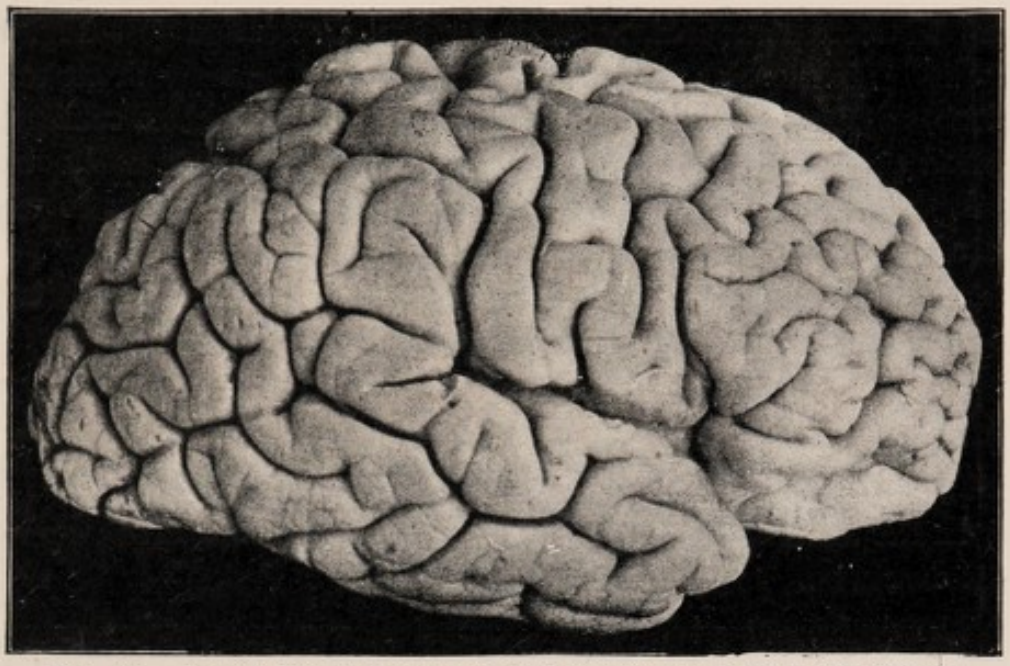


Fig. 63.—Right Hemisphere of an Imbecile of Moderate Grade.

Right hemisphere of a female, aged 28, single. An imbecile of moderate grade. Cerebrum small and simply convoluted, and very asymmetrical. R.H., 372 grammes; L.H., 414 grammes. No wasting. Group I.

by a particular brain at death depends on the grade of cerebral dissolution which has occurred when this ensues.

Many cases remain in Groups I or II up to old age. These constitute the majority of the examples of low- or high-grade amentia of the types I have indicated. The remainder of these cases, often in consequence of severe poisoning of the cortical neurones (especially by alcohol), gradually pass into Group III, and eventually into the later groups. All the groups thus contain a number of examples of amentia.

The ordinary individual of relatively normal cerebral development is not especially prone to the onset of symptoms of mental alienation. When such a person becomes insane, the limits of neuronic durability

are as a rule passed, and the usual group into which the brain falls is the third, though the patient may die before it is reached. Group III, in fact, represents the position which would be eventually occupied by nearly all examples of cerebral dissolution, in the absence of the additional factor to which I am about to refer—namely, degeneration of the cerebral vessels.

Degeneration of the Cerebral Vessels

A direct relationship exists between the presence of degeneration of the cerebral vessels and the existence of advanced cerebral dissolution. That the latter is not a necessary consequence of the former is proved by the occasional existence of gross degeneration of the cerebral vessels without the coexistence of marked cerebral dissolution (see Fig. 72). Whilst both (in the absence of former syphilis) commonly occur in old age alone, neither is the necessary consequence of this, since senility, or the period at which the body-elements wear out, is an extremely elastic term, depending on their inherent resistance and on the stress to which they are subjected.

The more important data in favour of a causal relationship between severe degeneration of the cerebral vessels and gross dementia are as follows :—

(1) Simple senility (*i.e.* old age) is not necessarily associated with gross degeneration of the cerebral vessels.

(2) In the insane gross degeneration of the cerebral vessels may exist without dementia.

(3) Dementia, except in rare cases of slowly progressive presenile involution of the cortical neurones, does not progress beyond a moderate stage, if gross degeneration of the cerebral vessels does not coexist.

(4) In the 433 cases on which this description is largely based, the percentage amount, and also the severity, of naked-eye degeneration of the cerebral vessels varies directly with the degree of dementia present. The actual percentage amount in the five groups is respectively 6 in Group I, 22 in Group II, 38 in Group III, 75 in Group IV, and 90 in Group V. From the aspect of severity, I may remark that the differences in grade are very much more marked than those in mere amount. For full details with regard to this question I must, however, refer the reader to my original papers.

(5) Severe degeneration of the cerebral vessels occurs before the development of gross dementia. In *recent* senile cases, with the mildest dementia but considerable confusion, which, had they lived, would on clinical grounds have been expected to develop gross dementia, the per-

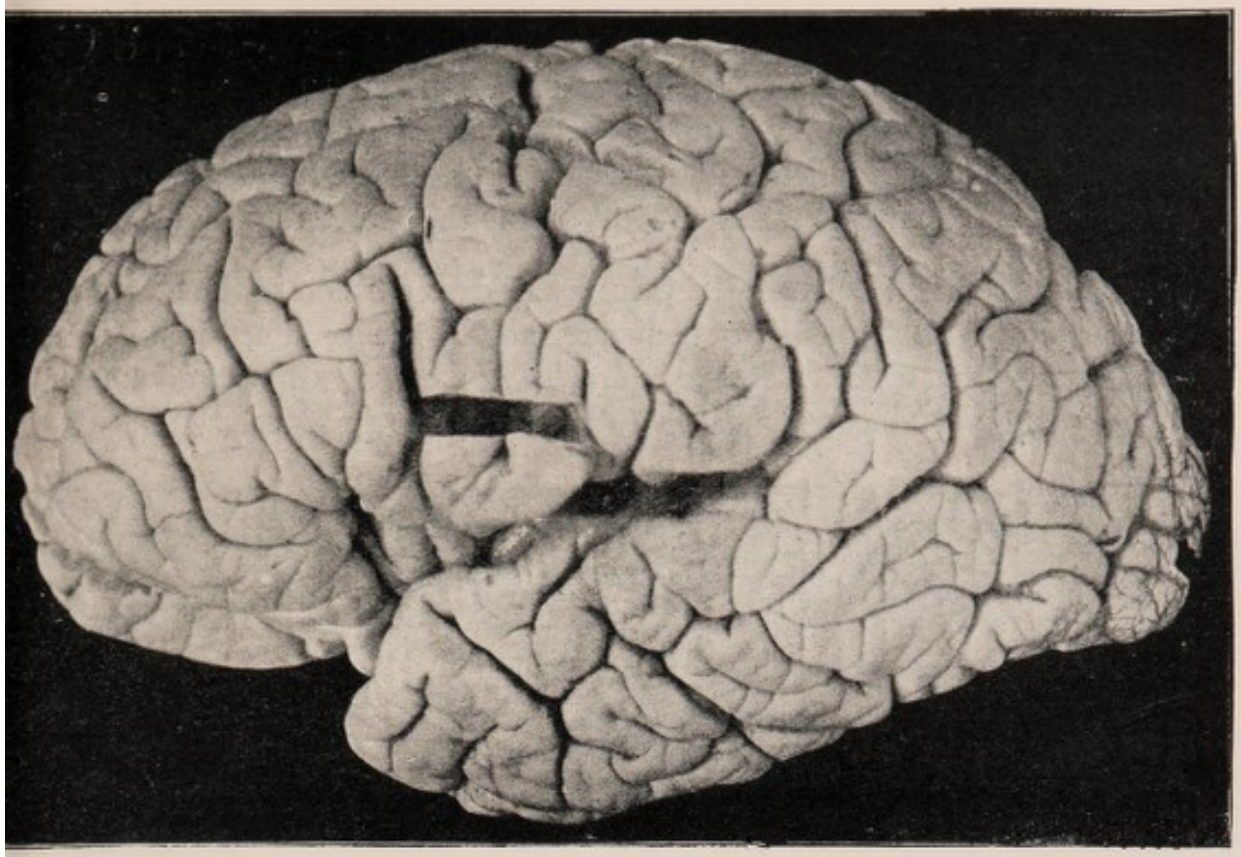


FIG. 64.—LEFT HEMISPHERE OF A MALE SUFFERING FROM INSANITY WITH EPILEPSY.

Left hemisphere of a male, aged 24. Single. Labourer. Insanity with epilepsy. Fits from the age of 14, and mental symptoms from the age of 18. Cerebrum of average size and pattern. L.H., 593 grammes. No wasting. Group I.

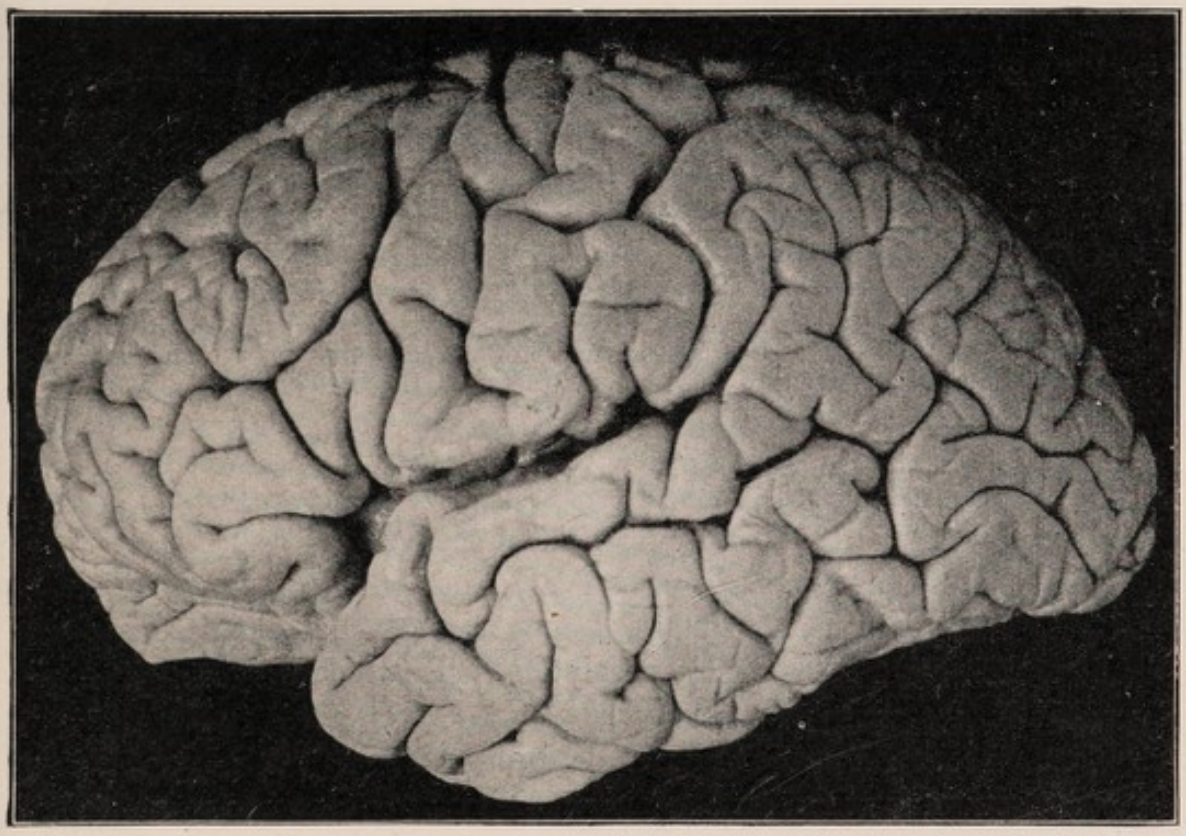


FIG. 65.—LEFT HEMISPHERE OF A DRUNKEN PROSTITUTE SUFFERING FROM MANIA.

Left hemisphere of a female, aged 35. Single. A drunken prostitute with over fifty convictions. Excitable, unstable, cunning, and very dangerous. Cerebrum large and of rather simple pattern. L.H., 618 grammes. No wasting. Group I.

centage amount of naked-eye degeneration of the cerebral vessels is as great as it is in Groups IV and V. On the other hand, in chronic and recurrent senile cases with mild dementia only, naked-eye degeneration of the cerebral vessels is rarely present and is then relatively slight.

The relationship between the presence of degeneration of the cerebral vessels and the development of dementia may be thus summed up :—

In a cerebrum which has begun to break down, or where degeneration has progressed to the " moderate " stage (Group III), the presence or incidence

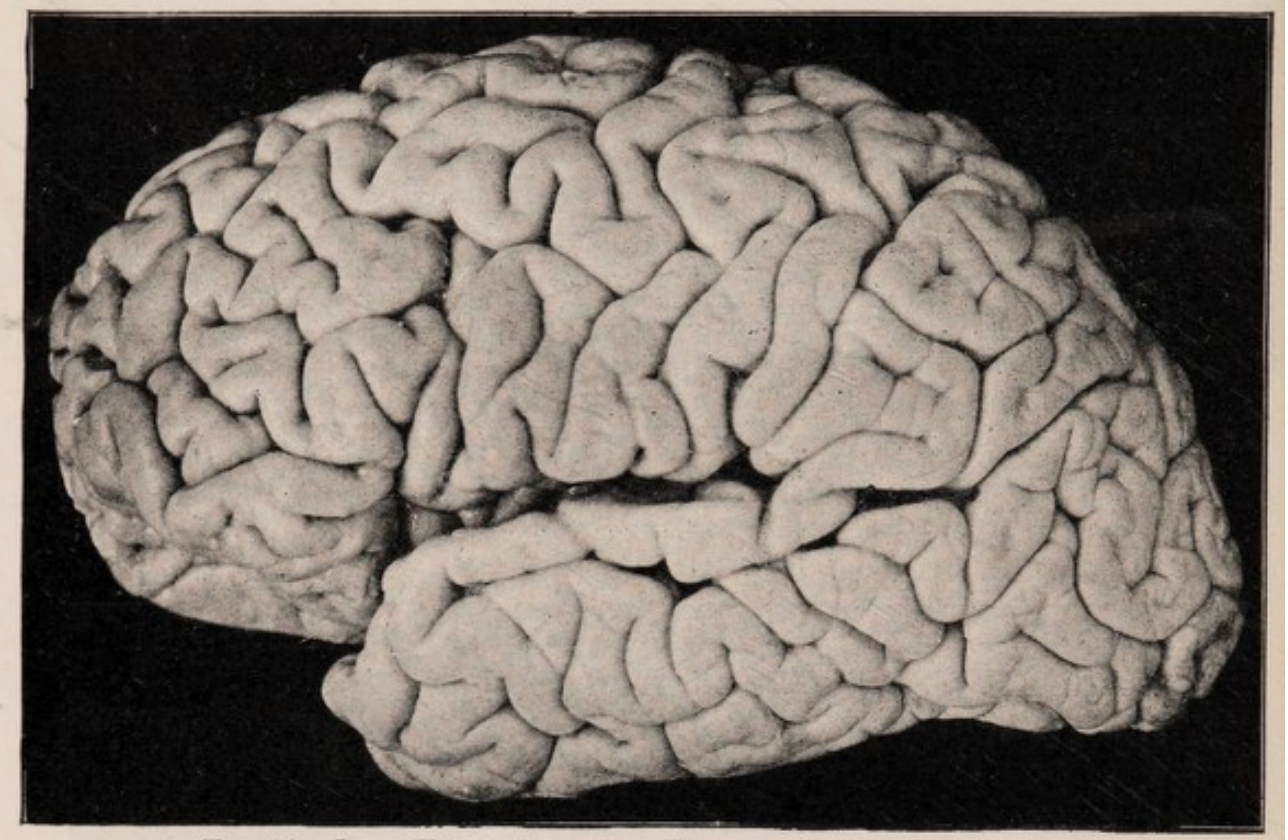


FIG. 66.—LEFT HEMISPHERE OF A FEMALE SUFFERING FROM ACUTE MANIA OF NON-CONFUSIONAL TYPE.

Left hemisphere of a female, aged 30. Single. Servant. Alcoholism. Acute mania of non-confusional type. Death from cancer of the lung nine months after admission. Cerebrum large and of very complex pattern. L.H.,645 grammes. No wasting. Group I.

of gross degeneration of the cerebral vessels will cause rapid progress of the neuronic degeneration, with, from the clinical aspect, gross dementia.

The contents of Groups IV and V are thus examples of progressive and secondary dementia, and are, I may remark, homologous, in my opinion, with cases of dementia paralytica, with which they will be discussed in a succeeding chapter of this work.

Before proceeding to a general description of the pathology of dementia, I would remark that certain general bodily diseases may seriously modify the macroscopic appearances presented by the intracranial

contents. Of these the chief is tuberculosis, which not only so modifies the clinical picture exhibited by many cases of mental disease as often to render accurate clinical diagnosis almost an impossibility, but by producing œdema of the intracranial contents occasionally makes the determination of the group to which the case belongs a question of great difficulty.

It is probable that intracranial œdema, apart from cases of cerebral lesion, is usually due to progressive cardiac failure, to the different toxæmias and infections, or to these conditions combined, and that tuberculosis acts either by causing exhaustion and cardiac failure or by means of the secondary infections which in chronic cases are important factors in the production of " pulmonary phthisis."

Of the 433 cases of mental disease which have been used as a basis for the description given above, no less than 84 exhibited œdema of the brain to a noticeable degree. There were 105 cases of tuberculosis, and of these 36, or about one-third, showed œdema of the brain. Of the 84 cases with œdema of the brain, as many, therefore, as 36 occurred in tuberculous subjects.

It is hence necessary to draw special attention to a factor which so frequently modifies the intracranial appearances found in insanity, and to a disease which so often affects both the clinical picture and the post-mortem appearances of cases of mental disease.

The Pathology of Dementia—Summary

As has been shown, the morbid appearances inside the skull-cap, which occur in many cases of insanity, namely, chronic thickening and degeneration of the dura mater, excess of intracranial fluid, chronic thickening of the pia-arachnoid, &c., are the macroscopic equivalents of, and vary in degree with, the grade of dementia present, and are otherwise independent of the duration of the insanity. These morbid appearances are all especially evident in dementia paralytica, which is a progressive dementia occurring in the syphilised subjects of those types of mental disease in which the cortical neurones are of deficient durability, and are consequently prone to undergo dissolution (see Chapter XV).

These morbid appearances are the physiological results of the loss of cerebral substance, caused by the neuronic dissolution which is the physical expression of dementia, reacting on the mechanical conditions existing within the skull-cap. The skull is a closed bony chamber, and, were the dementia ever so slow in its progress, replacement of the lost cerebral tissue could not well be fully performed by a chronic hypertrophy of the inner wall of the skull-cap and of the cerebral membranes.

In fact, however, the progress of dementia is relatively rapid, and

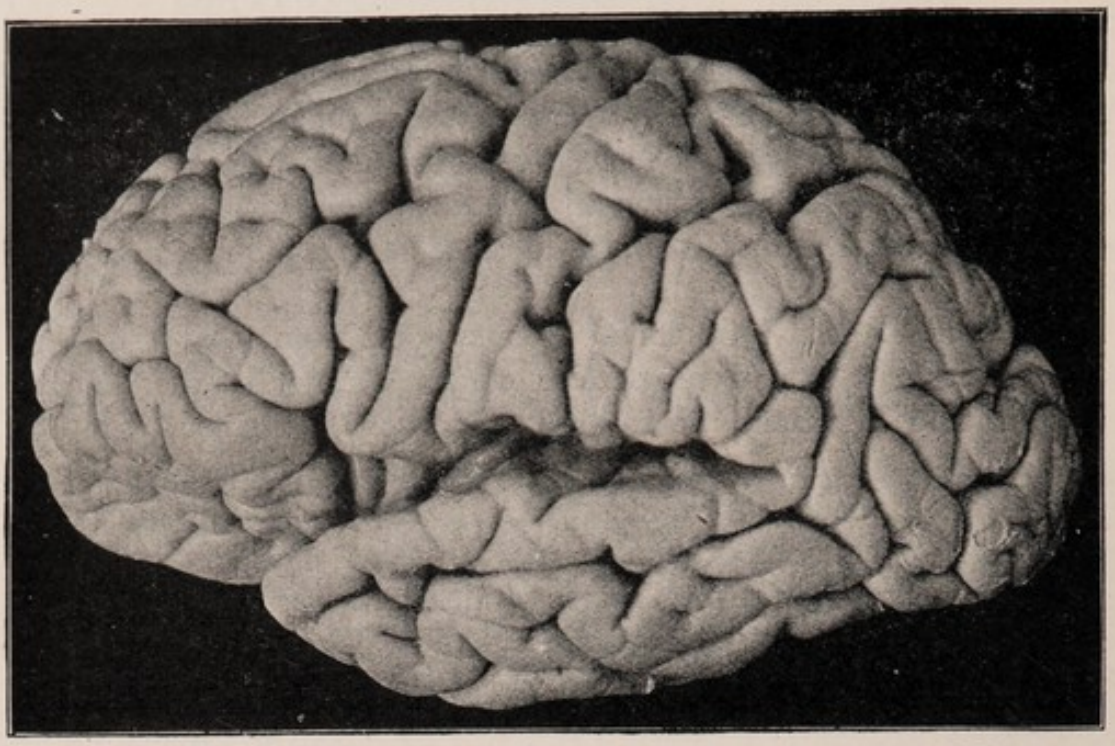


FIG. 67.—LEFT HEMISPHERE OF A FEMALE SUFFERING FROM ACUTE MANIA WITH CONFUSION, FOLLOWING CONFINEMENT.

Left hemisphere of a female, aged 22. Married. Housewife. Acute mania, following confinement and associated with some confusion. Died from phthisis two and a half years after admission; and for some months before death exhibited well-marked stupor. Cerebrum below the average size, and convolutional pattern below the average in complexity. L.H., 495 grammes. Slight intracranial morbid appearances. Group II.

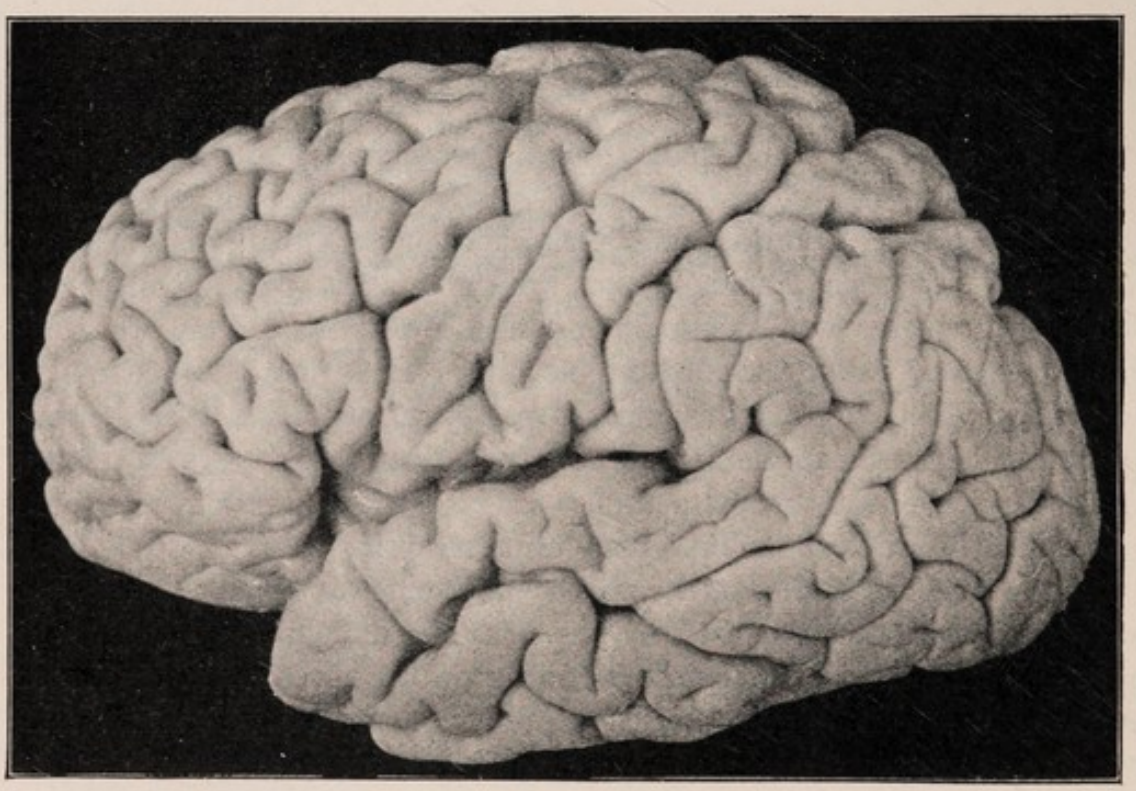


FIG. 68.—LEFT HEMISPHERE OF A MALE SUFFERING FROM SLIGHT DEMENTIA.

Left hemisphere of a male, aged 52. Married. Steward. Mulatto. Intemperate. Slight dementia. Cerebrum below the average size, but little if anything below the average convolutional pattern. L.H., 520 grammes. Slight intracranial morbid appearances, and slight prefrontal wasting. Moderate atheroma of the cerebral arteries. Group II.

hence the cerebral membranes, especially the pia-arachnoid, make a hopeless attempt at the formation of scar or replacement tissue, and what space cannot be filled in in this way is occupied by cerebro-spinal fluid.

Under normal conditions the subdural fluid is minimal in amount. Under these altered conditions, the excess of fluid interferes with the normal relations between the dura mater and the pia-arachnoid. The mere absence of normal contact, and of the normal slight movements

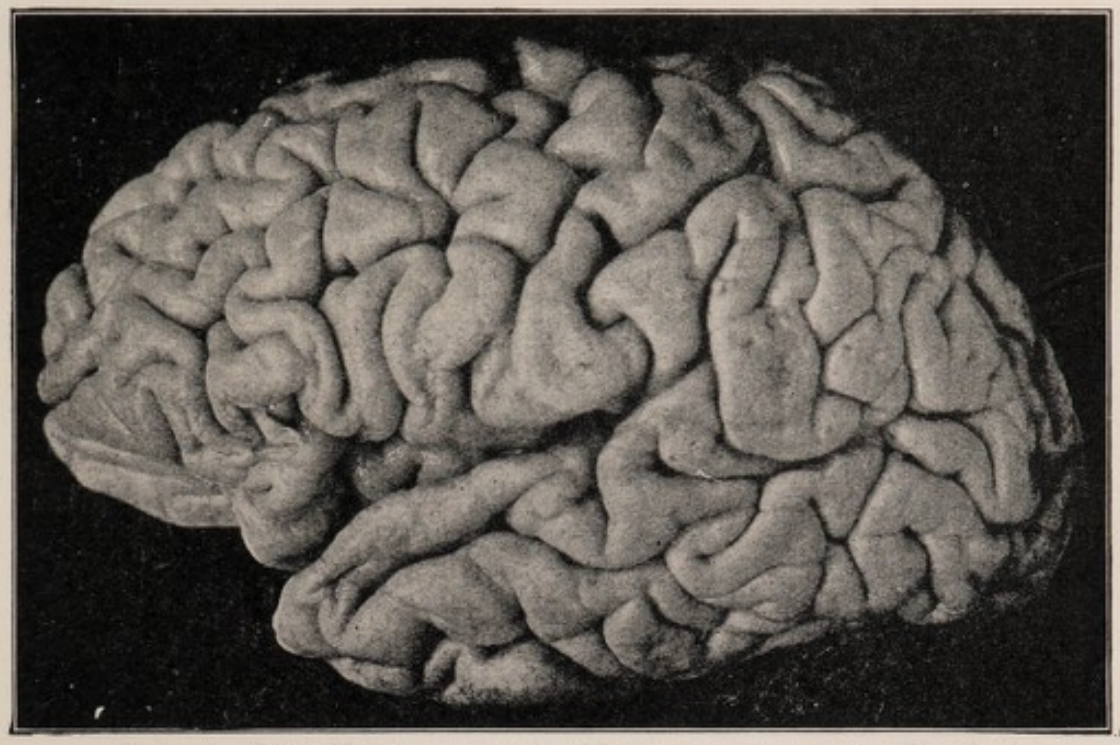


FIG. 69.—LEFT HEMISPHERE OF A MALE SUFFERING FROM CHRONIC INSANITY WITH MODERATE DEMENTIA.

Left hemisphere of a male, aged 41. Single. Seaman. Duration of attack nearly fifteen years. Chronic insanity with moderate dementia. Until the patient became demented he never spoke a word, refusing to communicate with others except by signs or writing. L.H., 525 grammes. Considerable wasting, chiefly in the prefrontal region. Small softenings at the hinder part of the supramarginal gyrus, at the foot of the pre-central gyrus, and at the anterior extremity of the inferior frontal gyrus. Slight atheroma of the cerebral arteries. Group III–IV.

on one another, must of necessity tend to result in absence of function and in degenerative conditions of the endothelium lining these membranes. It is, however, probable that the excess intracranial fluid is often abnormal in composition. In dementia paralytica, for example, the intracranial fluid has been shown by Halliburton and Mott to contain cholin and nucleo-proteid and to be deficient in reducing substances. It is probable, in fact, that not only degenerative but also in many cases definite inflammatory conditions are set up, particularly where pia-arachnoid meets pia-arachnoid, *i.e.* in the mid-line prefrontal region below the falx cerebri, and between the posterior extremity of the corpus callosum

and the upper surface of the cerebellum. Adhesions in these situations are very characteristic, though not pathognomic, indications of dementia paralytica.

Degenerative conditions of the dura mater and the pia-arachnoid, when once set up, becomes more extensive and severe as the morbid process which has induced them advances. They are especially marked over the anterior two-thirds of the vault, where false membranes readily develop, and sooner or later occur throughout the base above the ten-

FIG. 70.—LEFT HEMISPHERE OF A MALE SUFFERING FROM SEVERE DEMENTIA.

Left hemisphere of a male, aged 61. Single. Schoolmaster. Duration fourteen months. A case of melancholia with confusion, which resulted in severe dementia. Cerebrum large. Convolutional pattern very complex. L.H., 585 grammes. Marked general wasting, which is especially evident in the prefrontal region. Moderate degeneration of the cerebral arteries. Group IV.

torium. Here, largely perhaps under the influence of gravity, are deposited, and sooner or later organised, blood-effusions from above, which, were the membranes normal, would probably escape deposition, and be flushed away in the stream of cerebro-spinal fluid, or absorbed.

Inside the ventricles a similar morbid condition develops, namely, granularity of the ependyma, again due to excess of, and stagnation of, the cerebro-spinal fluid. This condition occurs chiefly in the regions most subject to stagnation of the cerebro-spinal fluid, namely, in the lateral ventricles behind the foramina of Munro, and in the lateral sacs, and the calamus or lower half of the fourth ventricle. As may be seen

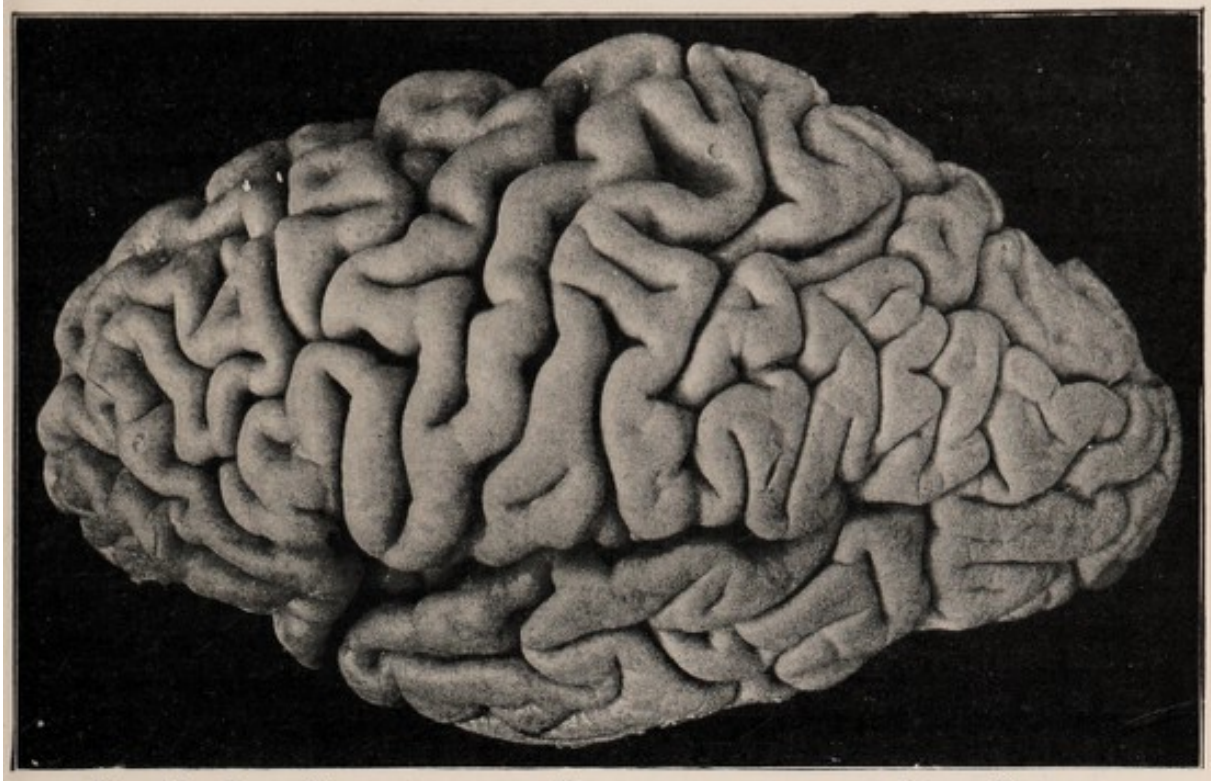


FIG. 71.—LEFT HEMISPHERE OF A FEMALE SUFFERING FROM GROSS DEMENTIA.

Left hemisphere of a female, aged 78. Widow. Housekeeper. Duration about three years. A case of marked senile confusion resulting in gross dementia. The cerebrum had originally been probably of above the average size. R.H., unstripped, 525 grammes; L.H., unstripped, 520 grammes; L.H., stripped, 480 grammes. Gross cerebral wasting, which is especially marked in the prefrontal region. Some degree of asymmetry. Gross degeneration of the cerebral arteries. Group V.

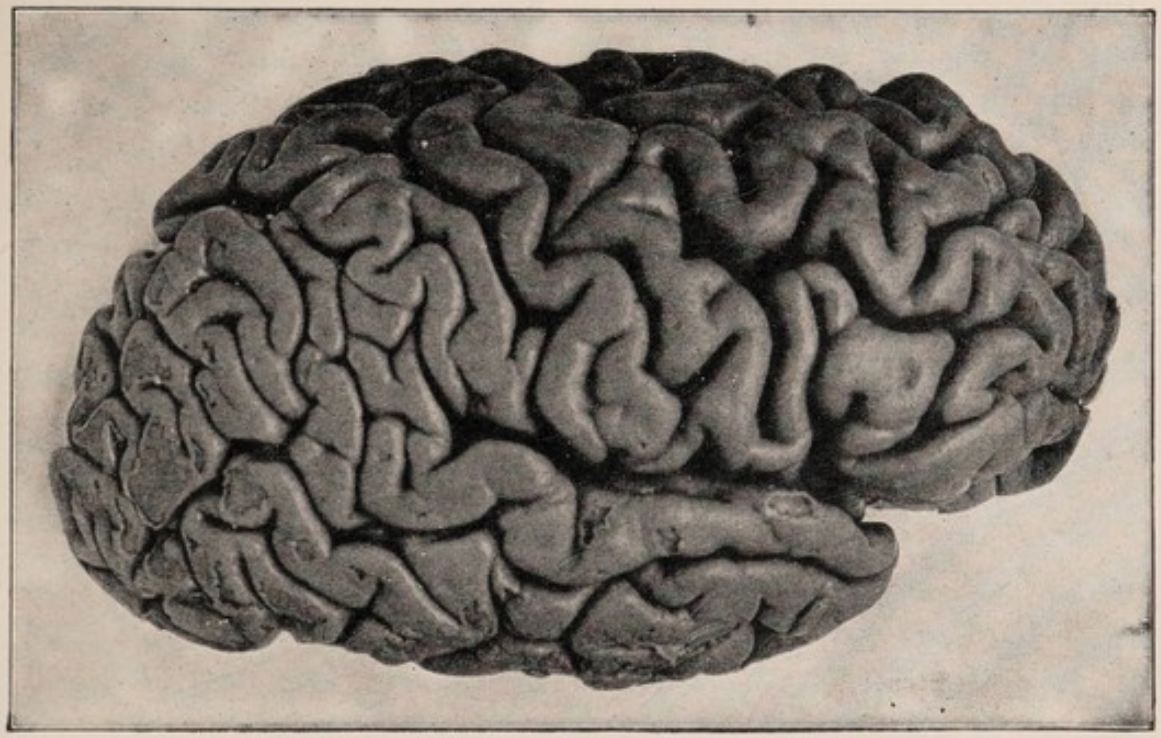


FIG. 72.—RIGHT HEMISPHERE OF A MALE, AGED 91, SUFFERING FROM SENILE DECAY, WITH RELATIVELY LITTLE DEMENTIA.

Convolutional pattern somewhat above the average in complexity. R.H., 485 grammes. Very gross degeneration of the cerebral arteries. The pia-arachnoid is grossly thickened over the fronto-parietal region, and adherent over the temporo-occipital. The hemisphere resembles those of Figs. 81 and 82 (pp. 408 and 410) in the general distribution of the intracranial morbid appearances, but exhibits a marked contrast in the relative absence of cerebral wasting.

from the observations which follow, granularity of the ventricles, when most marked, as in severe dementia and in dementia paralytica, is probably the result of irritation by the stagnation of abnormal cerebro-spinal fluid, and when slight may be regarded almost as a normal character.

In the lateral sacs of the fourth ventricle, granularity is common even in cases of insanity with little or no dementia. In this situation it is probably the homologue of the common proliferative condition of the ependyma of the central canal of the spinal cord in adults, which may be regarded as the result of stasis of cerebro-spinal fluid. In severe dementia it may occur on each side of the mid-line in the upper half of the floor of the fourth ventricle, as well as in the third ventricle and in the lateral ventricles behind the foramina of Munro. In dementia paralytica it exists so constantly in the calamus, or lower half of the floor, of the fourth ventricle as to afford a characteristic sign of this disease ; and it is usually most marked in this site even when practically widespread in the fourth and even the third and lateral ventricles.

As has been shown earlier in this chapter, the degree of cerebral wasting varies directly with the grade of dementia present. This occurs in spite of the fact that at the time of death a complete removal of the products of neuronic degeneration has not, in at least many cases, occurred. The latter is particularly the case in fulminating dementia paralytica, where the amount of wasting is relatively little compared with that in advanced chronic examples of the disease and in advanced cases of progressive senile dementia. In ordinary insanity, on the other hand, the process of dissolution of the cortical neurones is, as a rule, slower, and the waste products are so largely removed at the time of death that the gross macroscopic wasting is for practical purposes proportional to the grade of dementia.

(*A.*) AMENTIA

CHAPTER XI

INTRODUCTION: LOW-GRADE AMENTIA

THE present chapter contains a general clinical description of those types of mental disease which, in accordance with the thesis developed in the course of this volume, are classed under the heading "Amentia." Under this term I include, from the standpoint of morbid anatomy, all cases of subnormal cerebral development, and, from that of clinical symptomatology, all cases of subnormal, and hence frequently abnormal, mental manifestation.

I thus employ the term "amentia" to connote in the widest sense *the mental condition of patients suffering from deficient neuronic development.*

I have already in earlier chapters sufficiently elaborated the pathological basis on which I have found it necessary to group under one heading many types of mental disease which have hitherto been described as if they had nothing strictly in common; and I will therefore here content myself with a general clinical description of the subject. It is, however, desirable to repeat that the types of mental disease with which I am about to deal agree, from the aspect of general histology, in possessing a subnormal development of the cortex cerebri which, except in the severer grades, is limited to the pyramidal or outer cell-lamina of the cortex; and, from that of morbid anatomy, in possessing an average brain-weight which is below that of the normal adult average, in association with normal cerebral membranes, vessels and intracranial fluid. The whole group of cases therefore comes under the heading of Subnormal Cerebral Development.

After mature consideration, and in spite of the various uses to which the term "amentia" has been put by different authors, I still think that it better serves my purpose than would an entirely new word, as such would also necessitate the introduction of a term in place of "dementia" (which also is put to various uses by different writers) to connote *the mental condition of patients who suffer from a permanent psychic disability due to neuronic degeneration following insufficient durability.* I have therefore for many years continued to employ these well-known

words in a different manner from that sanctioned by common usage, in the sense that I use them as contrasting terms; and I have endeavoured to avoid misinterpretation by the employment of careful definitions.

The group of cases classed under the heading "amentia" thus includes not only idiots and imbeciles, but also a large number of cases which exhibit a milder degree of cerebral under-development and of mental deficiency than the imbecile, and which form the connecting link between the mildest type of imbecile (the "mental defective" of the non-alienist) on the one hand, and the ordinary "sane" individual of average intelligence and mental stability on the other. This group of cases, termed by me "high-grade amentia," closes a recognised but hitherto unfilled gap between morbid and normal psychology, and makes it possible to reduce the subject of mental alienation into a coherent system, which on the one side of the normal includes all types possessing subnormal neuronic development under the term "amentia," and on the other side of the normal all cases suffering from deficient neuronic durability with resulting dissolution under the term "dementia."

I hope that recognition of the fact that mental disease consists in essence of a large group of cases with varying degrees and types of cerebral degeneracy and of another larger group with varying degrees and types of cerebral dissolution will be of value at a time when, with the object of elucidating the ætiology of insanity with a view to its prevention, even a bacterial origin of mental alienation has been seriously discussed. If the views expressed in the present volume receive credence, I trust that future attempts to deal seriously with the incidence of mental disease will treat the subject, not as a branch of infectious disease or at any rate a toxæmia, but as the greatest of the degeneracies; and that an endeavour will be made on the one hand to discover and to minimise the causes which lead to cerebral degeneracy, and on the other to diminish the "stress" (in the widest sense) to which actual degenerates are subjected, with the object of decreasing the degree and the frequency of cerebral dissolution.

In my experience cases of "amentia" possess "stigmata of degeneracy," *e.g.* abnormalities of the skull, face, ears, palpebral fissures, teeth, palate, mammæ, hair, &c., more frequently and in greater severity than do normal individuals or even other types of mental disease. They more frequently have a heredity of mental alienation, and, not uncommonly, two or more members of the same family may be found in the same institution. They, also, are the cases about whom, apart from purely domestic or pecuniary reasons, the friends are never tired of instituting inquiries or expressing desires for their discharge: and it is amongst the friends of these types that the major portion of "borderland" cases of mental disease are found. Finally, many of the milder

cases of amentia are in asylums because they are so unstable that they cannot be kept outside them for any lengthened period, rather than because they constantly exhibit abnormal psychic manifestations. In other words, apart from senile or presenile involution of the cortical neurones, or from neuronic degeneration due to primary and direct toxæmia of the cerebrum or to systemic diseases, *e.g.* vascular lesions and emboli, carcinoma, the very rare cases of tuberculosis of the brain, &c., these cases remain in a stationary condition for an indefinite period and do not develop dementia. It may, however, be considered worthy of note here that the lower grades of amentia, *e.g.* many idiots and imbeciles, frequently develop senile involution at a relatively early age, *e.g.* thirty to forty, and that the higher grades—for example, many cases with systematised delusions—frequently arrive at presenility by the time that their stationary mental state has properly developed.

In the subdivisions of amentia which will later on be described little or no attention is paid to two conditions which at first sight might appear to be of importance, namely, the age-incidence, and the emotional tone of the general symptomatology.

The former, however, is so largely a question of environment—as the age at which the first or any later breakdown occurs depends almost entirely on the general " stress " to which the neurones of the individual are subjected—that it practically comes under the category of accident. The patient, for example, may become unable to withstand the normal environment of sane individuals at the change from school life and acquisition to the earning of his living and the practice of his acquirements, or as the result of illegitimate pregnancy or of a normal non-septic parturition, or at the climacteric or presenile period of life as the result of sexual involution, or when retiring from business at the senile period of life and undergoing the consequent entire change in habits and responsibilities, &c. At any one or more of these or similar critical periods, the degenerate may fail to respond to what should be a normal environment, and may show his or her previously latent mental disability. The mere age of breakdown must therefore be considered to be of slight importance in a classification of the types of amentia.

As regards the emotional tone of the general symptomatology manifested during a temporary or permanent breakdown, equally important reasons may be brought forward to show its slight importance from the point of view of classification. The emotional tone during mental alienation depends, however, not so much on the environment of the individual as on his normal emotional tone. This may be seen from a study of the mental characteristics either of the patient or of his relatives. A natural tendency to look at things from the black side, for example, may end in simple melancholia, from which the patient awakens

with a feeling as if he had been under a cloud and without any attempt on recovery to explain his temporary abnormal condition. In an environment of religious observances, however, such a patient may temporarily or permanently develop any variety of idea of personal unworthiness, which may crystallise eventually into a fixed delusion, as in the case of a patient who thought she had for her sins been changed by God into half a serpent or devil and half a human being, and who, to the best of her ability, acted up to her fancied transformation, and seemed to glory in being such an abnormality as had never before been seen on the earth. Again, cases in a delusional state in which they are out of accord with their environment, but in whom a definite content of delusions has not yet developed, are suspicious, solitary, and often depressed, until by accident of environment they develop this, when the depression disappears and may even be followed by excitement or exaltation. In cases, again, of simple emotional instability, recurrent attacks of excitement with secondary depression may occur, and the positive and negative phases may bear any time relationship to each other or to the lucid interval. Examples of variation of emotional tone might be multiplied, but the above will probably suffice to explain the omission of emotional tone as an important feature in classification.

It is here necessary to remark that cases of amentia differ fundamentally from cases of dementia in that their capability to feel or to react to their feelings may be temporarily exalted, diminished or modified, whereas in dementia such capability to feel becomes diminished and eventually lost. In other words, the ament may react abnormally to stimuli, but he does not lose the capability either to feel or to react: the dement, on the other hand, at an early stage loses his capability to feel, although stereotyped external indications of emotion may persist for long periods. The ament remains permanently or variably abnormal, though normal according to his own standard: the dement loses a capability he formerly possessed.

Before I proceed to classify and describe the different varieties of amentia, one other matter requires reference, namely, the accidentally aberrant symptomatology which occurs in many cases where the breakdown is precipitated by the direct action of toxines, especially alcohol and those of puerperal sepsis. Such cases may, by the family and personal history and by their general physical and mental characteristics, be typical examples of high-grade amentia, but they may on admission show such marked mental confusion that the general symptom-complex is quite altered, and in some cases they may eventually develop a certain amount of dementia. Usually, however, the mental confusion entirely clears up in a few weeks or months, and the early aberrant symptomatology bears no closer a relationship to the later mental condition than do

the symptoms of an attack of broncho-pneumonia following a chill in an apparently healthy individual to those occurring during the course of a chronic pulmonary tuberculosis which has been precipitated by the broncho-pneumonia. Nevertheless, in not a few cases an aberrant symptomatology may at first cause temporary difficulty in diagnosis, though the further progress of the case after the "acute" symptoms have subsided, together with the family and personal history, as a rule readily enables the diagnosis to be made.

In the following description of the types of amentia the group is separated into two subdivisions—*low-grade amentia*, or idiots and imbeciles of various degrees and types; and *high-grade amentia*, or cases in which the developmental deficiency is slighter, and which show evidence of abnormal psychic processes at or after puberty.

Low-Grade Amentia.—For my present purpose it is unnecessary to endeavour to subdivide the group into primary and secondary types, and to give examples of each individual variety of low-grade ament, as these are already fully described in certain standard works. I have therefore grouped the cases into those without and those with epilepsy, and have further subdivided each of these into classes showing extreme, moderate, and slight mental deficiency respectively. Though this classification is not a scientific one, it has nevertheless for many years afforded a practical basis on which I have been able to deal, from the purely clinical aspect, with a group of cases for which the words "idiocy" and "imbecility" have always been unsatisfactory. I imagine that the three above classes approximately correspond with the "idiot," "imbecile," and "mentally defective" groups of the Act which has just come into operation, in spite of the recent discovery of "feeble-mindedness" as a common mental state unknown to alienists.

High-Grade Amentia.—In this group are inserted several types of mental disease, the inclusion of which I hope to justify in the appropriate place, namely, under the respective descriptions of the different types. It contains many cases which are usually classified as "chronic mania" or "chronic melancholia," but which, as will be seen later, exhibit developmental deficiencies, that show themselves under the form of general mental or moral instability or perversion on the one hand, or under that of curious and abnormal mental function on the other. It also includes the very large group of recurrent cases of mental disease, whether these are still subject to periodic relapses and are temporarily under treatment, or are permanently certified. Further classes in this group contain cases of hysteria and of true epileptic insanity. Finally, I have inserted certain cases of insanity with systematised delusions

(developmental paranoia), and I believe and hope to demonstrate that these also are developmental in origin and should be described amongst the highest types of amentia.

As I have already stated, the common physical feature of these various cases is a more or less marked under-development of the cerebrum associated with the absence of intracranial morbid appearances, and the common psychic feature is the entire, or almost entire, absence of dementia, unless this occurs as the result of senile or presenile involution of the cortical neurones, or in a small proportion of cases as the result of neuronic degeneration following excessive primary and direct toxæmia of the cerebrum. In other words, apart from senility of or direct injury to the cortical neurones, their durability in the class of cases under consideration is sufficient to resist dissolution and dementia, although the readiness with which abnormal psychic manifestations develop, under what should be a normal environment, requires their possessors to be periodically or permanently placed under asylum treatment. Reference will be made later to those cases of high-grade amentia which eventually develop dementia, and these therefore need not be further considered at present.

Amongst the cases which have been employed for the preparation of the following description is a consecutive series of 728 chronic and recurrent lunatics who were admitted into the Hellingly Asylum during the first seven months after its opening. Practically all these cases were transfers from other asylums, and all were chargeable to the different unions of East Sussex. As this series is representative of the total chronic insane of a particular district, and is sufficiently large to enable trustworthy conclusions to be drawn from it, I continue to employ it for descriptive purposes, although I have since examined thousands of insane persons in other parts of the country. I would, however, make the remark that I merely employ this series, as illustrative of the chronic insane of a special district, in order to be able to produce relative figures, and not as the basis of the following description.

Of the 728 cases of chronic and recurrent insanity, 283 or 39 per cent. are examples of amentia without any complicating dementia. Of the 283 cases of amentia, 94 or one-third are low-grade aments, and 189 or two-thirds are high-grade aments. Hence, of the total series, low-grade amentia constitutes 13 per cent. or about one-eighth, and high-grade amentia 26 per cent. or about one-quarter, thus leaving 445 or about five-eighths to be classed under the term dementia.

The subject of amentia will now be considered under the subdivisions contained in the following table, in which are introduced, in order to give the reader some notion of respective frequency, the number of cases of each kind which were classified from the series just referred to.

AMENTIA

	M.	F.	T.
Low-grade (Idiocy and Imbecility, primary and secondary) .	51	43	94
(1), (2),) and (3) Extreme, moderate and slight grades.			
(4), (5), and (6). Ditto, with epilepsy.			
High-grade—			
(1) Excited and "moral" cases.	22	64	86
(*a*) "Moral" cases			
(*b*) Simple emotional chronic mania.			
(*c*) Chronic mania with incoherence and delusions.			
(*d*) "Cranks" and asylum curiosities.			
(2) Recurrent cases	17	30	47
(*a*) Relapsing.			
(*b*) Now chronic.			
(3) Hysteria	—	6	6
(4) Epileptic insanity	6	18	24
(*a*) Epileptic mania.			
(*b*) High-grade amentia with epileptic mania.			
(5) Cases with systematised delusions (developmental paranoia)	10	16	26
Total Amentia	106	177	283

LOW-GRADE AMENTIA

(Idiocy and Imbecility, primary and secondary)

	M.	F.	T.
(1), (2), and (3) Extreme, moderate and slight grades, without epilepsy	35	24	59
(4), (5), and (6) Extreme, moderate and slight, with epilepsy .	16	19	35
Total	51	43	94

This group includes 94 idiots and imbeciles of various types, and, as is usual, the males preponderate over the females in number in the cases without epilepsy.

As a practical working basis, the cases have been grouped into those without and those with epilepsy; and each of these classes has been further subdivided, according to the degree of mental deficiency, into extreme, moderate, and slight grades.

Though from a purely pathological standpoint this grouping of cases possesses the obvious disadvantage of classing together indiscriminately cases of primary and secondary low-grade amentia, it nevertheless has a practical basis in that the cases are arranged according to mental capacity. It also avoids what, for my present purpose, would be a still greater disadvantage, namely the errors which would necessarily arise

in the absence of a complete series of post-mortem examinations, for experience shows that an examination of the cerebrum is necessary in many cases before a correct pathological diagnosis is possible. Further, the life-history of many of the severer types of low-grade amentia is peculiar in the facts that childhood or cerebral immaturity is relatively prolonged, that adult life is short, and that senility rapidly ensues on the latter, the whole cycle perhaps lasting thirty to forty years only.

As the result of these several considerations I think it desirable, when dealing with the subject from the standpoint of morbid psychology, to employ a classification, which after all is only a common sense one, namely, that based on the relative degrees of mental deficiency.

The three grades are in my opinion natural divisions. They are based on the well-known normal characteristics of (1) infants under a year, (2) children of one to four years, and (3) children of from four to ten years. The first group cannot talk. The second can talk and are imitative and acquisitive, but possess relatively little intelligence and, especially in the case of the male sex, are as yet too young to reason with. The third group are learning to employ their intelligence, and acquisitiveness is rivalled and to some extent overshadowed by elementary reasoning.

Class 1. *Cases showing extreme mental deficiency.*—This class contains 21 cases, of whom 13 are males and 8 are females, and includes examples of most of the common types of idiot. A few of the cases show slight signs of intelligence, but none of them are able to work or even to do anything for themselves. All have shown symptoms since birth or infancy. Two males suffer from paralytic lesions; a third male is a well-marked case of cerebral immaturity; and a fourth is a severe example of microcephaly.

Class 2. *Cases showing moderate mental deficiency.*—This class includes 23 cases, of whom 15 are males and 8 are females. All the cases show moderate signs of intelligence, can speak more or less, and possess a certain power of imitation; and some can write a word or two. In every instance symptoms have existed since birth or infancy. Of the 15 males, 3 are unable to work, 1 does a little work, 6 are ordinary workers, and 5 work fairly well. Of the 8 females, 4 do a little work, 3 are ordinary workers, and 1 works fairly well. Two of the males are brothers, and 2 of the females are sisters. Though neither the brothers nor the sisters are twins, they resemble one another both in appearance and in mental capacity, particularly the brothers, who are chiefly distinguishable owing to the fact that their respective squints are in different eyes. The one has greater imitative power than the other, and can even make a feeble attempt to imitate handwriting. Of the sisters, one articulates rather better than the other, but is useless at sewing, whereas the other has

little to say, but possesses a case of needles, pins, and cotton, and can make shirts and do plain sewing well. Both are emotional, the former being fond of notice and the latter becoming very petted when crossed.

Class 3. *Cases showing slight mental deficiency.*—This class includes 15 cases, of whom 7 are males and 8 are females. All the cases possess considerable intelligence, but are distinctly feeble-minded. Some can read moderately and can write a little. Others can do neither, and were unable to learn at school. Of the 7 males, 5 are fairly good workers, one is an ordinary worker, and one, a very troublesome patient of filthy and disgusting habits, refuses to work. Of the 8 females, one, suffering from advanced phthisis, is unable to work; one, who is violent, spiteful, and of filthy and depraved habits, refuses to work; one is of no use as a worker; three are ordinary workers; and the remaining two are fairly good workers.

Class 4. *Cases showing extreme mental deficiency in association with epilepsy.*—This class contains 15 cases, of whom 6 are males and 9 are females. Two of the males and two of the females suffer from paralytic lesions. Several of the cases, especially the females, show slight signs of intelligence, but, except in the case of one female who commenced fits at the age of six months and does a little simple work, none of the patients are able either to work or to do anything for themselves. One male and one female suffered from adenoma sebaceum. The latter died of status epilepticus, and neurogliosis of the brain and new growths of the kidneys were found at the post-mortem examination. The series includes a good case of cerebral immaturity, aged 7 years, who looks and acts like an infant of the age of 2 years. The case exhibits very interesting reflex imitative efforts which are sufficiently indicated by the following extract:—"At times hums 'Dolly Gray,' 'Jesus loves me,' or 'Home, sweet home,' with an excellent idea of time; and occasionally puts in one or two of the words. Sometimes she pinches and scratches as she sings, and she pinches quite savagely when she sings loudly. The singing sounds extremely like a gramophone, and she at times stops suddenly in the middle as if the record were finished. She has no habit movements, she takes no notice when spoken to, and she shows no evidence of a capacity for imitation apart from her singing. She can eat bread and butter or biscuit, but she has no idea of feeding herself with a spoon. She cannot do anything for herself, and she is wet and dirty in her habits. She is stated not to have had an epileptic fit for four years."

Class 5. *Cases showing moderate mental deficiency in association with epilepsy.*—This class includes 17 cases, of whom 8 are males and 9 are females. All the cases show a moderate amount of intelligence and possess powers of imitation, in some instances to a considerable degree.

Some can write a little, and others have learned the rudiments of arithmetic. Seven of the males are unable to work, and one is a fairly good worker. Of the females, 8 are unable to work, and one does a little work. Two of the males and one of the females suffer from paralytic lesions. Such cases give very good evidence at times that they possess memory rather than understanding. A boy unable to imitate simple movements may nevertheless remember that two threes are six or even that five sevens are thirty-five. A boy of this class once puzzled me by the following remarks, which at first suggested possible hallucinations: "Someone talks about me," "My aunts," "I don't know what they say about me," "I'm always happy." I found that his right ear was burning owing to his holding it, and I then got from him the information that when the ear burns someone is talking about one! This was a case suffering from palsy, and, as is well known, such on superficial examination often appear to be more intelligent than they really are.

Class 6. *Cases showing slight mental deficiency in association with epilepsy.*—This class includes 3 mild imbeciles, of whom 2 are males and 1 is a female. These cases differ from many of those included under the later class of "epileptic insanity" solely in the existence of a degree of feeble-mindedness which is just sufficient to class them as imbeciles. Both the males are fairly good workers, and the female, who died of status epilepticus, was an ordinary worker when not suffering from many fits. As an illustration of the grade of intelligence possessed by this class of case—such is desirable, for many high-grade aments with epilepsy are notoriously "soft"—the following notes of the female above mentioned are appended:—"Is a hawker, aged 24 years, and has been certified for four years. She is a vacuous but pleasant-looking girl, who says she has a lot of fits and 'when I first had 'em a man frightened me. He dressed himself in white. He picked some wood in a pinafore, and give me some beer and some bread and cheese. That was at Crober, and there was a club there—and the next day I had fits.' 'I've had fits all my lifetime.' 'When it comes on me, sir, I hollers to the nurses. I can't help it, sir. It seems as though there's a man coming to me. I says, "Oh, nurse, there's a man coming after me," and I can't help it.' 'He was a nasty man. He dressed himself in white.'"

CHAPTER XII

HIGH-GRADE AMENTIA

GROUP I.—EXCITED AND "MORAL" CASES

	M.	F.	T.
(*a*) "Moral"	5	9	14
(*b*) Simple emotional chronic mania	4	32	36
(*c*) Chronic mania, with incoherence and delusions . .	6	13	19
(*d*) "Cranks" and asylum curiosities	7	10	17
Total	22	64	86

IN this, the lowest type of high-grade amentia, the cases vary in characteristics from, on the one hand, what is little better than mild imbecility, to, on the other hand, the most grotesque and interesting examples of asylum inhabitant. Three-fourths of the cases are of the female sex, and the great majority are, for obvious reasons, unmarried. Many of them show more or less marked stigmata of degeneracy, and quite a number of the females possess a left infra-mammary hysterogenic zone, which is often almost as hyperæsthetic as is the left ovarian zone in hysteria.

A common characteristic of the class is the absence of dementia, at any rate till the presenile or senile period of life. These cases are usually vain and egotistical, and take strong likes and dislikes, which are frequently intense and uncontrollable. As an example, when I was appointed an assistant at an asylum, and was as usual taken through the wards, a girl of the "moral" type, after my visit, asked one of my colleagues whether "that —— headed b——" had been elected, as if so, and if he were put on her section, she would kill herself. This occurred, and within a few weeks she carried out her threat and almost died from strangulation. After causing a great deal of trouble for months, she settled down and became good friends, promising me that she would behave in future and, what some sane people fail to do, keeping her promise.

The cases of this group may be easy to get on with, and are in many instances good workers, but they are erratic, unstable, and eccentric, and are at times extremely violent and dangerous.

Although the cases belong to one well-defined group, this may, on the

whole, readily be subdivided into four classes, which show the following prominent characteristics :—

(*a*) *Alteration of moral sense*, with a tendency to do desperate things, *e.g.* to commit suicide or even homicide, to perform acts of self-injury or self-mutilation, to strike, smash, or destroy, to irritate intensely those around them, to be sexually inclined in a normal or abnormal direction, &c.

(*b*) *Alteration of emotional and intellectual control*, *e.g.* exuberance, instability, vanity, garrulity, childishness, and often violence, treachery, and destructiveness. The younger and adult patients usually display a more or less marked loss of control over the emotions and instincts. The older patients differ from these in the fact that the loss of control affects chiefly the intellectual functions. Their association of ideas is normal, except for its extreme rapidity and complexity. They talk continuously whenever a listener can be found ; and they are frequently inconsequent, and show a marked tendency to parenthesis during their descriptions.

(*c*) *Rapid and uncontrolled association of ideas*, with delusions of grandeur, which may or may not co-exist with or follow delusions of persecution. These cases form a half-way house between sub-classes (*b*) and (*d*), and shade gradually into each of these. They differ from the former in being, on the whole, less troublesome, and in showing an apparently complete incoherence in their association of ideas, and from the latter in the fact that their ideation is simply rapid and uncontrolled, rather than grotesque or symbolical and liable to result in erratic and eccentric conduct.

(*d*) *Stereotyped, symbolical or grotesque association of ideas*, which leads to weird actions and eccentric general behaviour. These cases are extremely conceited, vain, and grandiose. They are of many types, and may be simply asylum " show-birds " or may possess considerable artistic or intellectual talent. As a class, these cases only differ from certain " sane " individuals in the absurd and grotesque extremes to which they carry their ideas and their resulting behaviour and actions ; and their stereotypism, which often suggests dementia, also only differs in degree from the stereotypism and prejudice which are often seen in the " cranks " of the outside world.

There is no clearly defined age of onset, as accident of environment is largely responsible for the time at which asylum treatment becomes necessary. The frequent heredity of mental disease, and the resemblance between the behaviour of the patients and that of their " sane " relatives, together with the personal history and physical conformation of the individual case, as a rule readily demonstrate that the patient is born a

degenerate, although such obvious evidence as necessitates an asylum régime may be more or less delayed.

An interesting example of this type of degeneracy is afforded by a family of which no less than four members—two brothers and two sisters—are at present patients in the County Asylum, Rainhill. The family originally consisted of six members, of whom the oldest was lost at sea, and the fourth appears to have died, when a young adult, of intestinal tuberculosis. The remaining four went insane, from the youngest upwards, at the respective ages of approximately 23, 30, 33, and 46 years. All four cases show the more marked characteristics of this group of cases, being grandiose, eccentric, and erratic; and all but the oldest are grotesquely vain, self-opinionated, and sexual. The youngest is a good worker, but has gradually become dull and commonplace, though she is still fond of finery and extremely vain. She appears to have developed a mild degree of premature dementia. The next member is a typical example of class (*d*). He is grandiose, eccentric, and abrupt, and shows a most weird association of ideas, with a marked tendency to symbolism. The next member is a good example of class (*b*), being grandiose, garrulous, very erratic, silly and childish, very fond of finery, extremely vain, and too much of the fine lady to work. The oldest member, who is married and has a family, is grandiose, solitary, and eccentric, suffers from marked hallucinations of hearing and delusions of persecution, and is apparently developing presenile dementia. The second member takes a slight interest in his sisters, but none in his brother; in fact the brothers regularly pass one another at exercise without ever speaking. The third member takes great apparent interest in her "poor" brothers and sister. The latter she has some degree of contempt for, and she swindles her out of her share of their joint possessions. The others she regards as unfortunately insane and to be greatly pitied!

This series of cases shows in a striking manner both similarity of family type and an increasing degree of degeneracy to a maximum in the youngest member of the family; and it affords an illustration of the life-history of mental disease from the aspects both of degeneracy and of dissolution.

Class (A). *Cases of "moral" type.*—This class contains 14 cases, of whom 5 are males and 9 are females.

The cases are of many types, but possess the common characteristic of an abnormal moral sense. Some resemble silly children in being emotional, erratic, and inconsequent in speech. They are fond of decorating themselves with trifles, are most troublesome and mischievous, and are constantly misbehaving themselves and playing "monkey-tricks." Others are excitable, petted, and passionate, and at times

even homicidal. They, however, work well, and are readily managed by kindness and tact. Even when in strong clothes in a padded room, such patients may become tractable at once if, for example, they are allowed to search one's pockets, play with one's watch and chain, &c., and are generally treated like spoiled children. Others, again, are readily managed by men, but are spiteful, violent, treacherous, and resistive with women. They cause all the trouble they can, throw things about, and destroy or smash out of pure wantonness. Others, finally, are emotional, unstable, and suicidal. They try numerous methods of self-injury and self-mutilation. They put pins and needles into their arms, legs, breasts, abdomen, ears, nose, &c., or swallow them. They mutilate themselves with glass, knives, scissors, or anything available. They endeavour to strangle, choke, or hang themselves, or to injure their heads or limbs by striking them against walls or furniture. They often do these things in an impulsive way, if upset by not being allowed to do as they wish, or out of pure mischief, or frequently in order to get nurses or attendants into trouble. They often, however, really intend to commit suicide, and in any case the result may, whether from intention or accident, be fatal.

The "sexual pervert," male or female, belongs to this group. Such are rare in English asylums, as in law, whether sane or insane, they are criminals. Any detailed reference to their mental characteristics is, therefore, unnecessary here.

Several of the 14 cases in this class are good workers. Of the 5 males, 3 are usually good workers; one does a little work at times; and one refuses to work and is a marked degenerate who is excitable, abusive, and often violent. Of the 9 females, 2 are as a rule ordinary workers, and one at times can be got to do a little work; of the remaining 6, 3 are troublesome suicidal cases, and 3 constantly refuse to do any work at all.

Class (b). *Cases of simple emotional chronic mania.*—This class contains 36 cases, of whom 4 are males and 32 are females.

The chief characteristic of these cases is a lack of higher control, in the younger types over the emotions, and in the older over the intellectual processes.

In many cases the abnormal mental state is one of simple instability. The patients are like silly, lively, unstable, and petted children, with an exuberance of spirits and a liability to act on impulse and to do *outré* things. They are passionate and wilful, and at times are difficult to manage, but they are often pets and favourites. Intellectually they may be inconsequent in conversation almost to the stage of complete incoherence, and during attacks of excitement they present such a

marked degree of hyperæsthesia of the special senses that they are credited with hallucinations, and at times probably suffer from these.

The more marked cases have an almost entire loss of control over their emotions and instincts, and are troublesome, spiteful, impulsive, treacherous, destructive, and often degraded and filthy in their habits. This type includes the very worst examples of refractory patient, some being like savage wild beasts, with few or no redeeming features; and it is this variety of case which, under prolonged sulphonal treatment, dies suddenly of hæmatoporphyrinæmia.

Other patients are full-blooded, exuberant adults, who are constantly quarrelling with someone; or they are querulous, complaining, and irritating, and constitute the cases who, if at large, would drive their husbands to drink or to wife-beating.

Many of the older cases differ from the above in the fact that the loss of control affects chiefly their intellectual functions, and the result is a quite abnormal garrulity. Their association of ideas is normal, except for its extreme rapidity and complexity; and during conversation the illustrations of their meaning flow in such an overwhelming torrent that the listener can be excused for becoming bewildered and exhausted, and for doubting the coherence of their ideas. They talk continuously whenever a listener can be found, and whether he be interested or not. They devour the contents of all the books and periodicals available, and abstract and learn by heart apparently for the mere enjoyment of the exertion entailed. They are frequently very inconsequent, and show a marked tendency to parenthesis during their descriptions; and at times they return to the original subject long after the listener has become quite confused and has forgotten all about it. One of the most marked examples of the type I have come across was a retired professor of natural science, whose mental state, except in general terms, it was practically impossible to obtain. The rapid but orderly association of his ideas, his extreme erudition, and the ease with which he could, in a relatively short period, cause exhaustion in cultivated listeners without the least effect on himself, were the most prominent features of his case. He was an excellent linguist, and did a large amount of translation for me from several languages, both extremely rapidly and absolutely correctly. In fact, when he was in doubt as to the exact meaning of a particular sentence, usually owing to its technical character, he would present me with several possible meanings and learnedly discuss the pros and cons in the case of each. One of the most interesting features of his case was his knowledge of insanity and his exact appreciation of his own mental condition! I have met with a similar case of the opposite sex, in which the talents were somewhat different, consisting of great skill as an artist

together with a quite remarkable knowledge of and memory for poetry. She was an exceptionally well-read and cultured woman.

Of the 36 cases in this class several were good workers. Of the 4 males, 3 worked well as a rule, and the fourth constantly refused to work. Of the 32 females, 9 were good workers, 5 were ordinary workers, 2 did a little work, 9 refused to work at all, and the remaining 7 were dangerous and violent cases who were quite untrustworthy or entirely incapable.

Class (c). *Cases of chronic mania, with incoherence and delusions.*—This class contains 19 cases, of whom 6 are males and 13 females. These cases form a half-way house between the previous class and class (*d*), and shade gradually into each of these. They differ from the former in being on the whole less troublesome and in showing an apparently complete incoherence in their association of ideas, and from the latter in the fact that their ideation is simply rapid and uncontrolled, rather than grotesque or symbolical and prone to result in erratic and eccentric conduct.

In conversation they appear absolutely incoherent as a rule, although frequently the sequence of ideas by relative association is readily followed. Usually they are garrulous and exuberant, and are therefore grandiose. When ideas of grandeur arise, whether or not as a result of the suggestion contained in a question, they repeat the names of every person of eminence they happen to think of, or perhaps of every place in the world they know by name, and hence the result is either an absurd exaggeration of their importance on the one hand, or a mere list of casual but related names on the other. The sequence of words may occur as a result of sound, or meaning, or both; and as a rule their ideation appears to be largely mechanical or automatic. The smart word-play, &c., which is a marked feature in the cases of class (*d*), is not as a rule obvious in these patients. They, however, equally with class (*d*), suggest gross madness to ordinary outside observers.

In some cases a rather curious type of incoherence exists. The intonation is correct, and the patient, whether in reply to questions or not, would appear to be talking sense if one did not hear the words clearly; but all or any of the words are misplaced or replaced by coined words with a very curious effect. In other cases, again, no sequence of ideas whatever can be made out, but scattered words occur during their conversation which suggest grandiose or persecutory notions. Finally, in other cases an apparent partial consciousness of, with some control over, their subconscious ideational processes occurs; and this leads to a condition allied to a coexisting double consciousness on the one hand, or to intense pseudo-hallucinations of an imperative nature on the other.

The following note gives a good illustration of my meaning. "The patient keeps on talking to herself, telling herself to say something and then saying it. Often she tells herself in a whisper, and then makes the remark aloud. In the following remarks the whispers are in ordinary type, and the reply or repetition is in italics. 'Harvey . . . Lue Harvey on to Kerby at Maryfield. Say Thomas Scurvy Maryfield. *Thomas Scurvy Maryfield* Murdock Kerby really, really. Say me my own. *Me my own.* Say your son Charles. *Your son Charles.* Isabe, say Isabe. *Isabe.* Say your son Charles. *Your son Charles. Your son Charles.* Again. *Your son Charles.* Don't, leave me alone. You're right. You're not leaving me nice as I should, would, ought. Say B——r. *B——r.* Now. *B——r.* Now. *B——r.* Now. *B——r.* Now. *B——r.* Now. *B——r.* Now. *B——r'* (B——r is a foul name she is applying to me)."

A considerable proportion of the 19 cases were workers. Of 6 male cases, 4 were good workers, 1 was an ordinary worker, and 1 did a little work: and of the 13 female cases, 6 were good workers, 1 was an ordinary worker, 2 refused to work, and 4 for mental or physical reasons were incapable of useful work.

Class (d). *"Cranks" and asylum curiosities.*—This class contains 17 cases, of whom 7 are males and 10 are females.

These cases are of many types, but possess certain fairly constant characteristics. They are extremely vain, conceited, and grandiose, and frequently form the "show-birds" of asylums. Their general behaviour is grotesque and usually amusing or absurd, and their actions are uncertain, erratic, and frequently weird. They usually are fond of finery, and they wear absurd and curious decorations to which they often attach a symbolic meaning, whilst at other times they either refuse to say why they wear them or invent some ridiculous excuse on the spur of the moment. For similar reasons they at times perform strange actions—*e.g.* constantly holding a finger in one or other ear whatever they are doing, going out of their way to touch particular articles as they pass, placing some utterly useless article on a particular part of the table where they work, &c. Sometimes they are artistic, and if carefully watched may turn out good work, but if left to themselves they tend to spoil the effect by erratic modifications, or by introducing grotesque features, &c. One artist, for example, could not leave a picture of whatever kind without somewhere or other inserting a bird into it. These characteristics find their counterpart and cause in their association of ideas, which is usually erratic and frequently grotesque, and at times appears quite incoherent. Usually, however, a careful study of the case shows that this is not really so, and it is often difficult to determine how

far they are voluntarily talking nonsense and how far the words they use are employed in some curiously symbolic manner or with some specially invented meaning. One day when I was reprimanding a patient for misbehaviour, he turned round to me and asked if I thought I was God. On my denying this, he straightway informed me that I might be Jesus Christ perhaps, but that he was the Archangel Michael and would stand none of my d—d nonsense! This was merely a round-about way of telling me to mind my own business.

The following extract from my notes affords a good illustration of the characteristics of this type of case:—"Patient is a shrewd, well-read, and well-informed man, and at times talks quite sensibly, but he is very unstable, and when he gets excited one does not know whether to marvel at his extraordinary and grotesque association of ideas, or to be disgusted with the foulness of his language. He frequently makes most apt and cutting remarks, even when one might suppose that he was totally incoherent, whereas he is largely showing off. On one occasion, when he quite correctly thought that a friend of mine was laughing at him, he suddenly turned on him with a torrent of questions. My friend time by time replied 'No'; but eventually incautiously answered 'Yes' to a question as to whether he knew some purely imaginary individual. The patient at once rapped out: 'Go and —— his —— then for a —— liar!' to my friend's discomfiture and the attendants' amusement."

These patients are always interesting, and many of them keep one in a continual state of expectation as to what particularly smart or apt remark they will make next, or as to what peculiarly erratic action or absurd antic they will perform. They are usually good-natured and are frequently favourites; but they are unstable and passionate, and take strong likes and dislikes.

Some cases are solitary in their habits and peculiar in their behaviour, and are given to morbid introspection; and these patients at times invent some new system of morbid philosophy. They readjust the world on lines of their own, and invent all kinds of new words to express either directly or in a kind of shorthand their meaning. Some cases of this type, in their views of life and of affairs, remind one of the Christian scientists or the different kinds of mystic, and may only differ from them in the fact that they themselves are not merely the inventors of the particular system, but the actual holders of the leading-strings of the world. One patient, a relatively uneducated man, has invented a remarkable system under which he is a Doctor of Divinity and holds fourteen other "doctor's certificates." A few of the more important of these are—"chief doctor of bibolitical literature, chief doctor of medical aspects, chief doctor of aristoristic voice singing and apian music, chief

doctor of prevelenation of cruelty, chief doctor of silk, cloth, and carabanic art-work, chief doctor and instructor of deaf and dumb motions." All these hard words were carefully spelled and partially explained for my benefit—and amusement.

It may finally be added that these patients as a class (like many other types of ament) only differ from certain " sane " individuals in the absurd and grotesque extremes to which they carry their ideas and their resulting behaviour and actions, and that their stereotypism, which often suggests dementia, also only differs in degree from the stereotypism and prejudice which are often seen in the " cranks " of the outside world. It is this type of case, in fact, which most obviously illustrates the connecting link that exists between normal and morbid psychology, and which most clearly suggests an organic basis and a developmental origin for individual mental peculiarities.

Of the 17 patients in this class, a considerable proportion are good workers. Of the 7 males, 4 are good workers, 1 does a little work, 1 refuses to work, and 1 is mentally incapable of useful work. Of the 10 females, 2 are good workers, 3 are ordinary workers, 1 does a little work, 1 as a rule refuses to work, and 2 are mentally and 1 is physically incapable of work.

Group II.—RECURRENT INSANITY

In apparent contradiction to the number of (certified) cases contained in the group of " Recurrent Insanity," this variety may be said to constitute the most common type of mental disease. Few students of psychiatry, in fact, appear to realise the immense importance of this group, owing, I presume, to the fact that their attention is attracted by the actual cases they observe rather than by the previous (and future) history of these.

In the sixty-sixth (1912) Annual Report of the Commissioners in Lunacy for England and Wales (Table XXIV, p. 200), it is shown that the yearly average number of patients admitted during the four years 1907–1910 (excluding cases of congenital insanity, and those where it is unknown whether the attack is the first or not), is 19,613, and that the yearly average number of those in which it is stated that the attack is not the first is 5120. This, then, represents the *minimum* number of " previously insane " persons who annually (on the basis of these four

years) are readmitted into asylums, and amounts to a proportion per cent. of 26·1.

Without hazarding an approximate estimate, it is thus evident that the number of "previously insane" persons in the general population must be very great. To this number is annually added an average (on ten years) of 7954 persons who are discharged recovered from asylums (*ibid.*, Table IV, p. 120), the net annual increase of the "previously insane" who live amongst the general population thus approaching 3000.

Bearing in mind the non-identity of the terms "previously insane" and "recurrent insanity," it is nevertheless clear that the number of persons, who have more than once been insane, or who will become insane a second time, must be very large, and not only very large, but very important from a sociological point of view, since many of these cases, being at large, must be regarded as a standing menace to the mental health of the community.

The following are the recurrent cases contained in the series of 728 cases which is employed for descriptive purposes :—

	M.	F.	T.
(*a*) Relapsing	6	13	19
(*b*) Now chronic	11	17	28
Total . . .	17	30	47

This group includes recurrent cases of insanity, or cases subject to relapses from an apparently normal mental condition to one of mental alienation. The patients differ from those of the previous group in that during their lucid intervals they pass as normal sane individuals. They are, however, liable to become so far out of accord with an environment, which would have little or no influence on normal individuals, that attacks of temporary mental alienation develop at regular or irregular intervals. In other words, the mental equilibrium of these patients is so unstable that it becomes upset by the various influences which constitute the normal "stress" to which the several members of a civilised community are necessarily subject. Though the cases in this group grade insensibly into, and during their attacks exhibit a mental symptomatology similar to that of, those included in Group I, classes (*a*) and (*b*), the fact that they are sane during a greater or a lesser portion of their lives affords a sufficient reason for placing them in a separate group as one of the types of high-grade amentia.

As is the case generally in high-grade amentia, the ages of incidence of the several attacks are uncertain, and the symptomatology exhibited is various. An attack may be precipitated by the normal physiological changes occurring at any of the "critical" periods of life, or by any undue or unusual condition of "stress," whether toxic, physical, or

mental, &c. A patient may, for example, suffer from one or more attacks of insanity during the period of adolescence, and may then develop another, some years later, after confinement, or may continue sane until the presenile or even the senile period of life. Other cases, again, may not suffer from any attack whatever until middle life or later; and in some instances no psychic phenomena of so abnormal a character as to necessitate an asylum régime may appear until even the senile period of life is reached. Whatever be the age of incidence, however, the result is recovery, after a varying period, without the development of an appreciable amount of dementia. The period elapsing between the recurrent attacks of insanity varies in different cases, and is largely dependent on the inherent resistance of the individual to his environment. In cases of low resistance, the attacks may be almost or quite periodic, whereas if the resistance is greater many years may elapse before a recurrence of insanity. It is, in fact, probable that a large proportion of the cases of "recovery" from an attack of insanity relapse sooner or later, and that the remainder would also do so were it not that they die before the recurrence actually happens, or that their environment has been made suitable to their capability of resistance by their friends or relatives.

The symptomatology manifested during the attacks is as various as is the age-incidence of these. Whilst, however, in the case of the latter, the important factors are the resistance of the individual and the external "stress" which is applied, in that of the former, individual temperament and general psychic experience are probably the determining causes of the phenomena manifested. The symptoms may be those associated with excitement or with depression, or a period of excitement may be followed by one of depression. The order of sanity, excitement, depression, and again sanity may always be the same, and each of these phases may even be of approximately the same respective duration in subsequent attacks, as in patients whose mental equilibrium is very unstable. The psychic disturbance may, however, be of an entirely different character in the several attacks, as in patients who are more stable mentally, and in whose cases environment is the most important factor in determining the incidence and even the course of a relapse. Almost any phase of psychic disturbance may exist during an attack, and, if more than one phase occurs, each may vary in duration independently of the other. It is, nevertheless, common to find that, the more regularly and the more frequently the attacks of insanity recur in a given individual, the more usually do they resemble one another both in symptomatology and in duration: and this statement applies both to still relapsing cases, a proportion of whom are usually described as "*folie circulaire*," and to cases permanently under asylum treatment.

The usual, if not the invariable, result in cases which live long enough is a gradual shortening of the lucid intervals, with, finally, permanent confinement in asylums: and in a large proportion of the cases little or no dementia supervenes, even when the patient has become aged, unless senile involution of the cortical neurones ensues, or any of the causes of progressive and secondary dementia interfere with the course of the case.

Amongst the exciting causes of the onset of attacks, alcoholic excess is one of the most potent, but it does not, in the type of case under consideration, necessarily produce any cerebral dissolution. Cases, in fact, which readily lose their mental equilibrium under the influence of alcohol, may be brought before a magistrate scores of times before or without going to asylums at all, and may continue up to old age without the development of dementia. On the other hand, however, cases, which exhibit greater resistance to breakdown, will, under the prolonged and excessive abuse of alcohol, with the other necessarily concurrent mental and physical forms of "stress," sooner or later develop some or even considerable dementia.

In cases of the type under consideration it is not uncommon to find a premonition of the impending incidence of an attack, and patients after recovery may graphically describe their efforts at self-control and how these finally became ineffectual. In some instances there is complete recollection of the attack, and the patient is able to state exactly what occurred during it, and to describe his utter inability to control his thoughts and actions. In other cases, again, especially when the attack is of sudden onset and great severity, the patient has no recollection of what has occurred, and consequently on recovery shows complete loss of memory regarding the events during his illness. In such severe cases the patients, as regards their behaviour, their general appearance, and even their facial expression, may be quite unrecognisable. Modest and quiet girls, for example, become talkative, noisy, excited, and erotic; and pleasant and respectable women become foul-mouthed fiends.

In no type of high-grade amentia is the homologue in sane individuals more readily discoverable than in the group of cases under consideration: and, though it be at the risk of a charge of exaggeration, I will now proceed to illustrate what appears to be the psychic relationship between recurrent insanity on the one hand, and the lapses of control over the emotions, words, and actions which occur in the normal individual on the other. The ordinary sane person usually exercises relatively little voluntary control over his emotions or intellectual processes, but glides along according to accident of environment and prearranged duties: and all individuals are subject to more or less severe lapses of voluntary

control. Common examples of this are the excitement or depression which lasts for hours or days under unusual circumstances or after startling occurrences. In the presence of strangers one person may talk incessantly and volubly from sheer nervousness, whilst another can hardly be got to speak a word. Other individuals, again, whenever they converse, even with strangers, are quite unable to refrain from repeating all kinds of fact or gossip which ought to be kept secret, and afterwards are quite aware of their delinquency. A girl may be violently excited for hours before a ball or after the advent of a new gown : and a man, after a game of golf or cricket, may be a perfect nuisance to uninterested listeners by persisting in recounting his exploits, and particularly in repeating what would have happened had so-and-so *not* occurred. More marked examples of loss of voluntary control are the violent " passions " or " sulks " which in some individuals are precipitated by apparently inadequate causes, and these, again, pale before the extreme excitement and *delirium tremens* of acute alcoholism. To these examples may finally be added the tendency, as a natural reaction to prolonged application to work or to undue restraint, to break control for a few hours or more and to " go on the bust," which is so extremely common in nearly all individuals, and which, where resistance to environment is at all weak, may end in undesirable results. The last instance is especially instructive owing to the readiness with which it recalls the severe efforts to keep sane which are made by many cases of insanity, who suffer from frequent relapses, and who, during their lucid intervals, are most anxious to obtain their discharge and to return to their friends.

Class (A). *Relapsing Cases.*—This class contains 19 cases, of whom 6 are males and 13 are females.

Though, from what has already been stated, the number of cases in this class is no indication of the actual proportion of lunatics of the type under consideration, it serves a useful purpose in that it shows that patients suffering from relapses are not infrequently met with in an asylum population during any given period of time—in this instance a few months. As will be seen in a later chapter, the total of 728 cases includes 48 examples of senile or " worn out " dementia, which were in the first instance cases of recurrent insanity, and 75 examples which had continued in asylums since their first certification. Both these numbers represent an accumulation of cases of varying duration, and any attempt at their exact use would be beset with fallacies. They, however, at any rate indicate that the proportion of relapsing to primarily incurable cases is high, and they are therefore inserted in the absence of more trustworthy data. Naturally I do not wish to attach any undue

importance to these figures, for, though the average duration of life of relapsing cases is probably much higher than it is for the chronic insane, the proportion of the former figure to the latter still perhaps remains higher than an average recovery rate of about 30 per cent. would allow of, even if the majority of these cases relapsed.

The symptomatology exhibited during recurrences of mental alienation is various and difficult to classify into types. In a large proportion of cases, however, certain emotional states, namely excitement, depression, and fear, predominate; and these may be associated with or may result in impulsive actions, *e.g.* violence to others, destructiveness, and attempts at suicide, the last usually by such methods as can be carried out without premeditation.

Cases of the excited type are boisterous, restless, violent, noisy, mischievous, and imitative. They possess only the slightest power of fixing the attention and are unable to settle to anything, but react to sensory stimuli so rapidly that their actions appear wild and their speech incoherent. Their attention flits to and fro; whatever they begin to do, or say, or sing, they leave unfinished; and their mental functions at times appear to be in a state of confusion. With patience it may be possible to get them to write their names, but they either leave the name unfinished, or cover it with flourishes, or end by performing some violent or absurd antic. They can usually be got to answer occasional questions, at any rate if their attention can be attracted long enough to enable them to understand them: and therefore short and abruptly-spoken questions are more frequently replied to than long ones. They often, however, give inconsequent or inapposite replies, and they may make voluntary remarks, usually about objects near them or sounds heard by them, which appear quite incoherent unless both the patient and his surroundings are most carefully and minutely studied. Such replies and remarks usually form sentences and phrases which in themselves are verbally correct; and, in cases where the ideation is so rapid, and the attention is so flitting, that no sequence of ideas can be traced, this characteristic of verbal correctness in the phrases and sentences spoken is still maintained. In the more marked cases of exaggerated reaction to external stimuli, where the capacity of attention is practically absent, only the shortest phrases, or single words even, may be repeated; and here especially association by similarity becomes evident, and whole strings of words which rhyme or sound alike may be repeated. Beyond this stage it is not usual for sensory and ideational hyper-reaction to pass in cases of the type now under consideration, for, on the one hand, aberrant and grotesque ideational processes generally occur in cases belonging to Classes (*b*), (*c*), and (*d*) of the preceding group, who are never really sane, and, on the other, still more abnormal ideation is, at any rate as a rule,

inconsistent with recovery, and cases exhibiting it are in the preliminary stages to or have actually developed more or less dementia. Hallucinations are not common in cases of relapsing insanity, unless the attack is precipitated by alcoholic excess or some other cause of cerebral toxæmia: and many examples are credited with this symptom when the explanation of the phenomena exhibited is to be found in the hyper-æsthesia of the special senses, which occurs in association with an abnormally rapid reaction to the sensations experienced.

In certain cases, of the excited and apprehensive types especially, it is not uncommon to meet with a psychic state which, without analysis, might be mistaken for confusion, but which is really allied, on the one hand, to the inability to think which occurs in some persons owing to nervousness, *e.g.* a student at a *vivâ voce* examination, and, on the other, to the thoughtless remarks of children, or of persons who happen to be talking "through the backs of their heads." As an example of the former may be mentioned a patient who, on being asked her name, appeared quite uncertain as to her personal identity, asked the nurse who she was, and finally mentioned certain marks of identification which she possessed, and which would enable the question to be settled; and, of the latter, a patient who, when asked to open her mouth and show her teeth, said that she would like to have all her teeth removed, and requested me to perform the operation without delay.

Cases of the depressed type are more or less melancholic, and, if the depression is not so profound as to annul the capacity of attention, the patient either is unable to give a reason for his condition or he affords an intelligent explanation which, in many cases at least, is in essentials true. At times a correct or possible cause may be grossly exaggerated, but the elaborate introspection seen in developing delusional cases does not occur. A certain patient gave, as the cause of his first relapse, his anxiety about his aged mother, who had recently become insane; and his mother gave as the cause of her attack her anxiety about this same son, who had just before developed his first attack of insanity. The son, again, as the cause of his first attack, which became obvious owing to a determined attempt to cut his throat, stated that he had begun to think that he could not help it, as it was born in him, for his grandmother was like his mother in the fact that she suffered from depression at times. The son, during the period he was under observation, recovered from his second attack, again relapsed, and once more recovered; and the mother remained an inmate of the asylum and suffered periodically from mild depression. As an example of a possible but exaggerated cause, which the patient, on recovery, ceased to accept, may be mentioned an individual who stated that his attack began owing to the worry from which he suffered in consequence of his having made a mistake

in his accounts, which was the cause of great monetary loss to his employers.

Fear or apprehensiveness is the important symptom in many of the cases in the class under consideration. The patient is perfectly frantic, owing to terror which he cannot explain or give a reason for. The emotion in such a case is not the apprehensiveness of a confused or lost patient, but is downright honest fear; and it may lead to violent behaviour or to sudden and unpremeditated attempts at suicide. One such patient could not be kept in bed a moment, and would not stay in a side-room unless the door was fastened. The opening of the door resulted in frantic attempts to escape, which, on one occasion, led to a struggle between the patient and a nurse, who, contrary to instructions, had entered the room alone. The contest lasted until they were both exhausted, and they were found in this state by another patrol nurse. This patient, in her frenzy, on more than one occasion mistook one of the medical officers for a relative, implored him to protect her, and clasped hold of him so tightly that he was with great difficulty removed from her clutches. Cases of this type do not form a special variety, but grade insensibly into those already described.

As has already been stated, relapsing cases frequently suffer from impulses. Some cases snatch at everything within their reach, either from acquisitiveness or mischief; others destroy out of wantonness any article in their vicinity; and others, again, are violent and dangerously impulsive, rushing suddenly to smash windows, &c., and keeping those guarding them in a continual state of tension. The most serious impulse, however, is that prompted by fear or misery, namely, an unpremeditated attempt at suicide by, *e.g.* drowning, jumping out of windows, cutting the throat, or strangulation. In some instances the act appears to be carried out either without any motive at all, or from an entirely inadequate one, as in the case of a patient who awoke feeling that he could not go to his work and that everything had gone wrong, and who straightway ran downstairs and attempted to cut his throat. It is quite probable that in some cases the motive for a sudden attempt at suicide is elaborated after the act has been unsuccessfully accomplished, and that at least a number of successful suicides "during temporary insanity" are unrecognised examples of this type of case.

As the cases described in this section recover and are discharged, it is only to be expected that during their residence in asylums they are useful workers. Of the 6 males referred to as belonging to this class, 4 worked well; 1, an educated and eccentric man, refused to work usefully; and one, who suffered from phthisis, was unable to work and eventually died. Of the 13 females, 12 were good workers, and one,

who suffered from chorea, was therefore unable to work usefully, and, after discharge, soon relapsed and was readmitted.

Class (b). *Relapsing Cases who are under permanent treatment.*—This class contains 28 cases, of whom 11 are males and 17 are females.

The chief constituents of the class are cases in whom the lucid intervals have become too short to make their discharge possible, or who rapidly relapse in consequence of the change of environment following discharge. The class also includes several examples of fairly-marked degeneracy who have succeeded in passing for normal individuals during a part of their lives, and who have, in consequence of prolonged confinement in asylums, become degraded to a much lower mental level. These cases have, in fact, lived in a refractory ward like beasts for so long a period that they have practically become lower animals without actual loss of intelligence. This condition of degradation finds its sane homologue in the case of well-bred "ne'er-do-weels" who, *e.g.*, join the army as privates, and, after years of rough-and-tumble existence in this capacity, resemble, except for occasional glimpses of culture, the class with which they have mixed, in their actions and speech and in the general coarseness of their moral tone.

These degraded cases in many instances exactly resemble other types in symptomatology, and only differ in the fact that they have once been "sane" individuals and were originally of the relapsing class. A difficulty thus arises, in the absence of a personal history, in distinguishing them from certain cases belonging to Classes (*a*), (*b*), and (*c*) of Group I; and similarly cases belonging to Classes (*c*) and (*d*) of Group I are often with difficulty distinguishable from many of the systematised delusional cases described under Group V. Far, however, from being a flaw in the general argument I have advanced, this gradual shading of type into type is important evidence of the relationship which exists between all the cases described under the term "high-grade amentia," since the separate groups into which the cases are divided are employed for convenience of exposition rather than with the object of suggesting that these several groups contain specific types of mental disease.

The recurrent cases of higher type than the preceding differ from these in possessing periodic intervals during which they are medically though not legally "sane." The prominent symptoms in these cases are maniacal excitement and melancholic depression; and the time relationship of these to one another and to the lucid interval varies in different cases, but is usually fairly periodic. Some cases may suffer from excitement only, and some from depression only, or the maniacal stage may last a longer or a shorter period than the melancholic. It

is even possible, as has already been remarked, to make the general statement, with reference to the cases contained in both the present and the preceding classes, that the shorter the duration of the lucid intervals is, the more the relapses resemble one another, in any individual case, in both symptomatology and duration ; and the longer the duration of the lucid interval is, the less the relapses may be expected to resemble one another in either symptomatology or duration.

In their capacity for useful work, the cases in this class, during their lucid intervals, resemble those in the preceding. Of the 11 males, 9 were good workers, 1 refused to work, and 1 was permanently mentally incapable of work ; and of the 17 females, 5 were good, 3 were ordinary, and 2 were poor workers, 3 refused to work, and 4 were permanently mentally incapable of work.

The following notes well illustrate the type of "cerebral racing" which is exhibited by recurrent cases :—

Extremely Acute Recurrent Mania

Female, married, housewife, æt. 39. Previous attack seven years ago. Father and sister insane. An excited, violent, impulsive, and mischievous woman, whose attention it is almost impossible to fix even for a moment. She at once asks me why the b—— h—— I don't shave myself. Then she picks up the admission book, tries to get hold of my stethoscope, pulls my ear, rubs my hair, and then rapidly reads her admission paper aloud. She is as lively as a monkey and as mischievous, but is also dangerous. Whilst I was taking her case she twice slapped my face, and once struck me on the jaw. She at times gesticulates in a vicious manner, and at times sings and talks continuously and inconsequently, but not incoherently. When asked to write her name, she takes the pencil and complies with the request, ending with some violent and irregular strokes of the pencil, which she finally hurls in my face.

The case rapidly recovered. She became clean and tidy and well-behaved and a good worker, and she was discharged recovered after a residence of some months.

Recurrent Mania of Periodic Type since the Climacteric

Female, married, housewife, æt. 57. Previous attacks at the ages of 49 and 53. An excited, restless, noisy, and violent woman, who shouts, sings, laughs, and throws her limbs about. She at times plays with her fingers, tries to tear the sheet with her few remaining teeth, pats her limbs, and at the same time utters rapidly, with occasional pauses, such phrases, &c., as the following : "What can I do ? My boys are all girls. I can get nowhere. I'm a beggar outside Calvey. I say, my boys, I'm proud of you, George IV and Henry VIII. You've got to meet the one you hate. Salome, I hate you." She covers her head with the sheet, and than speaks of "dark things and light things." . . . "Covered again in No. 2 and revealed in No. 3, and bless and kiss in No. 3 the Royal." Then she lies quietly for a few moments. "Cover A B C, Cover. Cover what you never did, though. Incline my daughter

unto me. Incline. Decline. Recline, my fair lady. I'll fair lady you." She takes practically no notice of her surroundings, and her attention is very difficult to retain even for a moment. She does not always react to external stimuli, but at times she responds with extreme rapidity. Once she suddenly snatched my handkerchief from me, but she otherwise took little or no notice of my presence.

The patient recovered steadily, and was a good and willing worker for several weeks. She was then discharged—as it turned out prematurely—for she relapsed at once. She again rapidly recovered, and was again discharged—this time successfully—some months later.

Group III.—HYSTERIA

In the following discussion the symptoms under consideration are subdivided, solely for the purposes of convenience, under the terms neuropathic and psychopathic.

By this I do not wish to imply that the latter alone are of cortical incitation, for it is probable that all the symptoms to be referred to originate in subnormal cortical evolution and activity, and are therefore psychopathic rather than neuropathic.

The subdivision into classes is chiefly convenient in order to separate the more obvious physical or motor symptoms from the less obtrusive psychic or mental.

Paraplegia, for example, when based on an idea of inability to use the legs, may for convenience be spoken of as a neuropathic state, although it joins hands with the behaviour and conduct which are based on the idea that the face is that of a monkey.

A sufferer from the former would by many be called neurotic and one from the latter insane, although in cortical origin and in curability by suggestion the cases are homologous.

Again, the motor symptoms of a hysterical attack bear a relationship to the lethargic and cataleptic stages of hypnotic suggestion similar to that borne by states of hysterical automatism or of double personality to the somnambulistic stage of hypnotic suggestion. All are equally of cortical origin, although the former may be described as neuropathic and the latter as psychopathic.

Neuropathic symptoms commonly regarded as hysterical, though not of sufficient importance to justify a diagnosis of hysteria, occur in many cases of high-grade amentia. Put broadly, it may be stated that any of the motor symptoms occurring in the hypnotic state may be

reproduced in isolated form in high-grade amentia. The more common are, however, resistive and anergic stupor and cataleptic phenomena.

These symptoms exhibit a close resemblance to the stupor and cataleptoid states which occur in such examples of premature dementia as exhibit motor phenomena (catatonia). This resemblance is often so marked as to render a diagnosis as to whether the case is in its nature purely developmental (high-grade amentia) or developmental and dissolutive (catatonia in premature dementia, Chap. XIV) extremely difficult and at times impossible. Some alienists would, I know, regard all such as examples of catatonia, an excusable error in view of the fact that cases of catatonia are at times discharged "recovered." If, however, such cases have been intimately known before and after the occurrence of the catatonia, the mental enfeeblement which exists after the attack readily enables a diagnosis of premature dementia to be made. I have known several cases in which careful study resulted in a definite conviction between hysteria and catatonia (which proved correct) in spite of the absence of even poor evidence in its favour. In others better evidence is obtainable; *e.g.* a case of flaccid stupor may secretly feed herself and yet wet the bed, or *vice versâ*. Another patient, who was a profuse salivator, was stupid and resistive, threw herself on the floor, often asked for a cold bath and then tried to drown herself, usually lay curled up like a fœtus *in utero* but, very rarely, sat up sensibly and took her food, on which latter occasions when noticed she made faces and at once curled herself up like a hedgehog, at times verbigerated the same word or phrase for hours at a time, and, lastly, had a habit of blinking with her eyes, particularly when noticed by one of the opposite sex. This case wasted to a shadow, and died curled up in a ball. Her cerebrum showed no morbid appearances. Another case, a man, was unhesitatingly diagnosed to be a case of developed premature dementia (catatonia): one day, out of the numerous persons he had the opportunity of attacking, he suddenly assaulted the superintendent of the asylum. The subsequent course and the post-mortem appearances proved that the case was not a dissolutive one.

Again, one at times meets with recurrent cases which might be, and have been described as, examples of manic-stupor. At the time of writing this description I have such an one under my care, a tailoress aged 38 years, who since the age of 15 years has been six times under treatment, and who is entirely free from dementia and is again almost fit to be discharged recovered. In this case, when the stupor is well marked, it can often be made to dissolve into a broad and erotic grin by suitable suggestion.

Such examples are after all merely illustrations, from the obvious aspect of coarse motor phenomena, of the general truth that nearly any

symptom of insanity may equally occur on the sub-evolutionary and on the dissolutive sides of the curve whose highest point is the average normal. In other words, most of the symptoms presented by cases of amentia may be found in cases of dementia, and especially so if the cases of dementia are to any obvious degree mental degenerates.

From the psychopathological, rather than the neuropathological, aspect, many cases presenting hysterical symptoms are to be found amongst "borderland" cases of mental disease, and quite a number amongst asylum examples of high-grade amentia.

Many of these cases may be covered by the term psychasthenia and under suggestion, or the more elaborate modern term of psycho-analysis, certain of them readily regain their normal mental tone and make temporary or permanent recoveries.

A young girl, for example, moped about, frequently wept, was unable to work and eventually, unknown to her relatives, set off without any outfit and with practically no money to try and get a situation in a distant village where she was unknown. She was found and brought home, and was for a while a source of great anxiety to her friends. It appeared that she was engaged to an artisan who had some time before joined the police force and been drafted to a town a good distance away. The source of the girl's trouble was found to be her invincible repugnance for the occupation of policeman, which she had systematically hidden from her *fiancé* whom she had come to regard herself as having thus greatly wronged. She was made to write a full confession and to break off the engagement. Her dictum was accepted by her *fiancé*, and, in spite of the severe temporary depression which ensued, she rapidly regained her normal mental tone. Unfortunately most cases of the kind, though capable of treatment, are less capable of publication than the example given, as usually unpleasant and unhealthy sexual ideas form either their basis or part of their content.

Such cases, in my experience, rarely enter public asylums except by accident, lack of friends or relatives of suitable social position, &c.; I presume that they get well outside (and I have seen many such), or that they eventually become really insane. If the former, such a result would cast doubts on the value of the, at present, much vaunted methods of psycho-therapy. If the latter, their original state certainly does not obtrude itself during their asylum treatment.

Of the simpler cases of the mental type of hysteria which are sometimes met with in asylums, the following are examples. A well-educated woman of sensitive disposition, with a somewhat hairy face of which she had long been ashamed, for many years held the delusion that she had the face of a monkey, and had therefore become repulsive to her friends. She constantly kept her face covered up with a shawl or a

handkerchief, would allow no one to look at it, and never went near a looking-glass. Under the repeated and prolonged employment of the method of suggestion, she at last allowed her face to be inspected ; later on she examined it herself with great heart-burnings ; finally she suddenly one morning informed me that the idea had been a delusion, and appeared for the first time since her admission with her face uncovered. She was discharged recovered a few weeks later, and did not relapse. Such cases are rare, and the prognosis is very favourable. In others, say a case with the delusion that he has been infected with some foul disease which shows no concrete signs of its existence and of the symptomatology of which he is ignorant, recovery of a permanent nature is less likely. The following case is a simple one of a different nature. A man suffering from semi-stupor was fed by tube for a considerable time. He then took to passing the tube on himself, and continued this practice for some two years. He one day suddenly took his food in the normal manner, and in explanation of his conduct stated that he had been under a vow not to let food pass his lips for a certain time which had just been completed. This case did not relapse.

On the other hand, cases of a hypochondriacal cast occur in which a solitary fixed idea of an unlikely nature exists, *e.g.* that a frog or a worm exists in the stomach and eats the food, or that the arm contains a cockatoo, or that the patient has been changed into a serpent. The patient suffering from the last delusion in her behaviour and conduct acted up to the fixed idea with as much persistence and success as would a case suffering from hypnotic somnambulism, and for several months she really looked a dreadful sight. Cases suffering from such delusions may be temporarily relieved by some form of suggestion, but they are incurable ; and these delusions are usually or invariably found in cases of mild or moderate dementia, and not in cases of pure amentia.

Certain more complex psychopathic cases, though they exhibit symptoms which may be regarded as hysterical, may according to the prevailing symptomatology be examples of hysteria, epilepsy or delusional insanity.

The two former types possess as the common symptomatological feature some modification of time-related experience or personality. Such time-related experience may be separated into blocks which are complete in themselves, the patient thus possessing two or more egos which live two or more apparently individual, though in reality mixed, lives, as in the well-known cases of Morton Prince and Albert Wilson. In simpler cases, however, certain time-related experiences are recorded apart from the total which constitutes the conscious personality or ego ; but such are not of sufficient individual value to occupy the position of an alternate ego, and are merely periods of automatism of which the

normal conscious personality is ignorant. In these cases a person, whether hysteric or epileptic, may act in an automatic manner for considerable periods exactly as if he were in the somnambulistic stage of hypnotic suggestion, and be entirely ignorant of his actions during such periods. Such a joining of hands of hysteria and epilepsy is even more complete in cases of high-grade amentia who suffer from epilepsy during the night and from hysterical attacks during the day (see p. 205).

On the other hand, in cases of delusional insanity, the mental dissociation is usually of a less complex type and does not involve the time-related experience or personality, though (see pp. 270–272) unharmonious or aberrant action of certain of the regions of lower association may make the individual regard himself as two persons *at the same time*, or, more frequently, as interfered with by another imaginary person or even possessed by a demon. For example, hyperactivity of the auditory word-centre of association may result in every thought being apparently repeated aloud, with the result that the subject imagines that some other person is constantly reading or stealing his thoughts from inside his head. In such cases of "possession" the subject is not amenable to suggestion, it being only in the case of the higher grades of cerebral association where time-related experiences may crystallise into an ego, and under hypnotic influence or in the subjects of hysteria and epilepsy, that this is possible.

As a summary to the above discussion, it may be broadly stated that from the neuropathological aspect, if cases are excluded which merely present symptoms falling under the category of the hysterical, patients suffering from hysteria are rare in asylum practice.

From the psychopathological aspect, it may similarly be remarked that cases of hysteria are not often to be found in asylums, and that such consist of a few odd cases of psychasthenia, of simple delusion or fixed idea, and of multiple personality.

To turn now from the discussion of symptomatology to the consideration of actual cases of asylum hysteria, in the series of cases employed for the general purposes of this description, there are but six instances of hysteria amongst the 728 patients, and all these are of the female sex. This sex distribution agrees with my general experience, though I have seen a number of cases of genuine hysteria in the male sex.

The cases contained in this group are examples of the more severe forms of hysteria which either are unmanageable at home, or, possessing no suitable home, drift into workhouses and eventually into asylums. As would *a priori* be expected, all are recurrent cases, and have been previously in asylums, and in those instances where a satisfactory history

exists, the patients had shown symptoms for years before their first certification.

Of the 6 cases, 5 are single women and 1 is married. The last shows marked stigmata of degeneracy, has defective articulation, is simple-minded and of low intelligence, and is very unstable, emotional, and hysterical. How she succeeded in getting married is a mystery. Two of the 6 cases are good workers, 1 is an ordinary worker, 2 refuse to work, and 1 is physically incapable of work of any kind.

In general symptomatology, apart from hysterical manifestations, the cases grade on the one hand into those of Group I, Class (*b*), namely, "simple emotional chronic mania," and on the other into those of Group IV, Class (*b*), namely, "high-grade amentia with epileptic mania."

As from the aspect of pure hysteria the number of cases in the group under consideration is too small to justify any form of clinical grouping, I have necessarily to fall back on my asylum experience in order to obtain a basis for the following general statements concerning the clinical types of hysterical patient which are found in asylum practice.

The following varieties of case, which are not to be considered either as distinct varieties or as representing all the types which occur in asylums, fairly completely summarise my experience of asylum hysteria.

(I) **Neuropathic types**:—

(*a*) Cases of marked hysteria or hystero-epilepsy who suffer from attacks of maniacal excitement much resembling those which occur in cases of "high-grade amentia with epileptic mania" (see p. 204).

(*b*) Quieter cases, who at times work industriously, but who are emotional and unstable, possess more or less marked hysterogenic zones, and suffer from hysterical attacks. These patients somewhat resemble, and grade into, cases of "simple emotional chronic mania" (see p. 174).

(*c*) Cases whose symptomatology is somewhat analogous to a hystero-epileptic state with a duration of weeks or months. These patients may be relatively or apparently sane for considerable periods. They then suffer from trance-like conditions, also lasting for considerable periods, during which they are as flaccid and inanimate as a recent corpse and have to be fed and attended to in every way. They may be wet and dirty, or they may secretly get up and use the commode. They, after a variable period, may exhibit grand movements and emotional attitudes, during which they alternate between this mental state and the previous one. Such a patient, when in bed, has been seen to hold her arm vertically towards the ceiling, with the forefinger pointed upwards and the whole limb rigid, for hours at a time, and has for similar periods performed movements of wide range with an utter disregard of consequences.

(*d*) Lazy, well-nourished patients, who sit all day like dements or cases of stupor and never work, but who are very erotic in the presence of members of the opposite sex. Their eyes are bright and wakeful, and they readily smile. They manifest hysterical phenomena on stimulation of the various hysterogenic zones, and their physical development is surprisingly good.

(*e*) Cases who show various types of "functional" paralysis, *e.g.* monoplegia, paraplegia, &c. This condition has usually lasted so long that organic changes, which render cure impossible, have occurred in the muscles, tendons, and joints. In some instances, however—in one of my cases, after seven years of functional paralysis of the lower limbs—the patient improves, walks again, and may even be discharged recovered. A rather different type, at present under my care, invariably walks on her knees, though, if secretly watched, she may be seen to stand and walk, and even to climb a step-ladder.

(II) **Psychopathic types**:—

(*a*) Cases of psychasthenia who are fit subjects for treatment by suggestion, or, to use the modern terminology, psycho-analysis and psychotherapy.

(*b*) Cases with simple fixed delusions, which are in reality exaggerations of certain normal worries of sensitive persons. Such, for example, are redundant hair, wrinkles, freckles, &c. These, when exaggerated and supplied with a simple delusional content, form the origin of attacks which are at times amenable to suggestion, and thus differ from apparently allied cases of depression with fancied loss of the soul (the actual existence of which is accepted on faith), on the one hand, and hypochondriasis with fancied disease or alteration of the equally unknown (to the lay person) internal organs, on the other.

(*c*) Cases of double or multiple personality. Such may be regarded as examples of hysteria with intercurrent attacks of insanity, or as instances of recurrent hysteria with sane intervals. They bear a degree of relationship to recurrent insanity. Whilst subject to symptomatic modification under suggestion, these cases, in my experience at any rate, are incapable of real relief or cure.

The following notes of two of the six cases of the series illustrate respectively the simpler and the more complex types of asylum hysteria :—

Hysteria in a Case of marked High-Grade Amentia

Case 229.—E. W., female, single, no occupation, æt. 31. Has shown symptoms for eight or nine years, and, previous to these, she had a "seizure,"

which curved her to the left side. Was in an asylum three years ago for several months.

Face expressionless. Forehead smooth. Silly vacuous grin. On being watched she soon becomes hysterical. Her eyebrows begin to act, her eyes suffuse, and her carotids throb. Just as she is beginning to weep I suggest, "Which is it to be?" and she at once shakes with laughter. Soon, however, this emotional storm ends in a fit of weeping, which stops abruptly under pressure on the left infra-mammary hysterogenic zone, and leaves her composed.

She then gives her name and age, and when she came and where she has come from, but not the name of this asylum (she was admitted yesterday). She knows the day and the name and part of the month, but not the exact date. She was previously in an asylum, but she "never put the date down when I went." She was there six months, and it must be "free or four" years since she left. She is childish in speech and behaviour. She says her mother remarked that she was much better when she left the asylum, and then adds, "but I never went in the town in B——," meaning that she was not upset by seeing people.

She has at times typical hysterical attacks, which are readily stopped by suggestion, and she is readily put to sleep at night, when troublesome, in the same way. On the other hand, the suggestion of a swelling in her throat brings on an attack.

During her residence she was clean in her habits, and easy to get on with, but she never did any work. She washed her head in cold water every morning, and attended, more or less, to herself. She was very noisy, but was never spiteful, and was fond of singing and dancing. When in the airing-court, if notsitting or standing, she used to run about rather than walk. When excited she would knock her head about, and bang it on a window-frame, or she would do extraordinary things, *e.g.* say she was a "lady sanitary inspector," and go round pulling the plugs, pulling doors off their hinges, and trying to pull down the water-pipes, &c. She at variable intervals suffered from convulsions, which were sometimes hysterical and at others hystero-epileptic.

Hystero-Epilepsy, Double Personality, Mental Degradation

Case 232.—E. G. M. B., female, single, domestic servant, æt. 37. Certified since the age of 25, and previously in an asylum at the age of 24. Maternal uncle insane.

A very neurotic-looking woman, with blinking eyes, a narrow, peaked forehead, and a small jaw. She usually puts on a sardonic grin when noticed. Her voice is thick and lisping, as if she had a perforated palate, but this is not the case, though there is a scar in the middle line.

She is a marked case of hysteria, and exhibits a condition which amounts to an alternating personality.

At rare intervals she is quiet and well-behaved, denies her name, reacts readily to suggestion, and suffers from attacks of typical hystero-epilepsy, which can be readily induced or cut short in the usual way. When in this mental state she says that her age is twenty-one next Christmas day. Her name is not really M——, but this name was given to her by a slave-dealer, who stole her away. She is the wife of a member of a noted firm of brewers. She has had "a large number of children." Married? "Yes." In church?

"Church and chapel, and drawing-room too." She was in the asylum from which she has come for twenty months (really twelve years). She has never been there before, but E. M. was there, and she (the patient) was brought from the South African war, and changed for E. M.

Usually, however, this patient is in a very different mental condition. She is excitable, emotional, and quarrelsome, and suffers from frequent hysterical attacks, which either do not react at all to suggestion or only stop for seconds or minutes. She is troublesome and noisy, and though she at times does a certain amount of floor-polishing and rough ward work, she is destructive, banging the deck-polisher about, tearing the casing off the heating-coils, &c. On one occasion she broke off the head of a deck-polisher, an act which must have required the exercise of quite a remarkable amount of force in the case of a woman. She is untidy and careless of her appearance. She becomes hysterical and bangs herself about if no notice is taken of her when one walks through the ward, whereas, if she is noticed, she either falls into a hysterical fit, or acts in a generally emotional and erotic manner. Under these circumstances she does not deny her name, and is too emotional as a rule to reply at all to questions.

The latter of these mental states is the common one, and the former is relatively rare—so rare, in fact, that it was impossible to determine, during the time she was under observation, whether or not a sharp line of demarcation exists between the two states.

Group IV.—EPILEPSY AND MENTAL DISEASE

As a preliminary to the discussion of the next group of cases, namely, of the subject of Epileptic Insanity, I purpose to introduce here certain general considerations bearing on the relationship which exists between epilepsy on the one hand, and the entire subject of amentia and dementia on the other.

It might at first sight appear that such could be dealt with more satisfactorily in a special chapter later in the volume. I feel certain, however, that my present course is the correct one, since, for a proper appreciation of the nature of the cases classed under the term "epileptic insanity," the reader requires to have laid before him as early as possible such data as are available with regard to the relationship of epilepsy to mental disease.

Epilepsy occurs in association with mental disease in two separate groups of cases in the general table which is inserted in the introduction to the subject of amentia, namely, under low-grade amentia, and in the fourth (epileptic insanity) division of high-grade amentia. It also exists as a separate group in the third division of dementia (see Chap. XVI).

The numerical relationship which exists between the cases in these three different groups is as follows :—

	M.	F.	T.
Amentia, low-grade.			
Idiocy and imbecility with epilepsy, Classes (*d*), (*e*), (*f*)	16	19	35
Amentia, high-grade, Group IV.			
Epileptic insanity	6	18	24
Dementia, Group III, Class (*b*).			
Dementia following epilepsy	12	8	20
Total . . .	34	45	79

The percentage of cases suffering from epilepsy out of the total of 728 is, therefore, 11 in the males, 10·6 in the females, and 10·9 in the whole series; and this does not differ markedly from the generally accepted average of about 10 per cent.

If, however, the groups of low-grade amentia, of high-grade amentia, and of dementia be considered separately, the following interesting relationship regarding the incidence of epilepsy in these different groups is obtained :—

Low-grade amentia . . .	94 cases,	37·2 per cent. of epilepsy.
High-grade amentia . . .	189 cases,	12·7 per cent. of epilepsy.
Dementia	445 cases,	4·5 per cent. of epilepsy.
Total . .	728 cases,	10·9 per cent. of epilepsy.

It is clear, therefore, that, where cerebral degeneracy is greatest, epilepsy most frequently occurs in association with mental disease.

This truth is still further demonstrated when the group of epileptic insanity is divided into the following two classes :—

	M.	F.	T.
Higher-grade amentia without marked stigmata of degeneracy	2	6	8
High-grade amentia with marked stigmata of degeneracy .	4	12	16
Total	6	18	24

for there are more cases in the more markedly degenerate class than in the less. It would, of course, be more satisfactory if these classes could be percentaged against the actual number of high-grade aments, without and with marked stigmata of degeneracy, who were homologous with the epileptic cases. This being impossible, the value of the figures would be greatly impaired were it not possible to produce two large groups of high-grade aments which sufficiently correspond with the two classes of

epileptics as to be comparable with them with approximate accuracy. Such groups are the " recurrent " and " excited " groups, and the incidence of these is as follows :—

	M.	F.	T.
High-grade amentia, Group (II), Recurrent cases . . .	17	30	47
High-grade amentia, Group (I), Excited and " moral " cases .	22	64	86
	39	94	133

Both in group and in sex incidence these two classes agree so closely with the two epileptic classes as to render valid the employment of the latter in support of the conclusion drawn from the percentage table given above.

The coexistence of epilepsy and mental disease is thus of such a character as to indicate that both conditions are symptomatic of cerebral degeneracy. Further, the view that epilepsy, when occurring in the subjects of mental disease, results in the occurrence of cerebral dissolution is negatived, since epilepsy is relatively rare in the subjects of dementia, not only in percentage but in actual incidence.

Certain considerations will now be adduced which tend to show that epilepsy, though not a producer or precipitator of dementia, nevertheless exerts a harmful influence on all the subjects of mental disease who suffer from it.

An important difference exists, in the symptomatology following fits, between the cases of epilepsy and amentia and those of epilepsy and dementia. The former either rapidly recover from the convulsions, or exhibit more or less psychic disturbance ; and in neither of these types is there much, if any, mental confusion. The first of the types resembles in this respect certain ordinary " sane " epileptics ; and the second those " sane " epileptics who, in a condition of post-epileptic automatism, are responsible for many eccentric acts and even crimes, of the commission of which, on recovery, they are entirely ignorant.

In the case of epilepsy and dementia, on the other hand, the fits are followed by more or less marked mental confusion, which lasts for hours and even days ; and after successive series of fits the existing dementia becomes gradually more profound. Some such cases, in fact, resemble examples of chronic general paralysis (dementia paralytica) in the point that numerous and severe fits result in an obvious increase in the degree of the permanent mental enfeeblement.

It is thus evident that epilepsy acts, in relation to the subjects of mental disease, in a similar manner to that of the various forms of " stress," which determine the times of onset of first attacks or of relapses in high-grade aments—and therefore precipitate their confine-

ment in asylums—and the occurrence of mental confusion, with resulting mental enfeeblement, in cases which possess neurones of deficient durability.

The psychic phenomena, which occur in association with epileptic fits in all types of mental disease, also afford an illustration of the general law that cortical neurones of deficient or subnormally aberrant development are not only less capable of resisting "stress" than are those of higher development, but are also more durable under the influence of such "stress" as that to which they may happen to be subjected, and that neurones of high development but deficient durability are more able to bear "stress" without interference with their functional activity, but, when the point of breaking-strain is passed, tend to undergo dissolution.

The influence of epilepsy on the psychic processes of the subjects of mental disease may, therefore, be thus summed up. In amentia of all grades, coexisting epilepsy accentuates the psychic abnormalities which are characteristic of cases of cerebral subnormal or subnormally-aberrant development; and, in dementia, it increases the tendency to and the progress of mental enfeeblement in cases possessing cerebra of deficient durability.

The general effect of coexisting epilepsy is, therefore, harmful in all types of mental disease. The epileptic idiot or imbecile is more spiteful and degraded, the epileptic high-grade ament is more vicious and impulsive, the epileptic maniac is more treacherous and dangerous, and the epileptic dement becomes progressively more demented, than occurs in the cases of the corresponding types of mental disease when this complicating factor is absent.

Epileptic Insanity

The 24 cases included in this group have been divided, for convenience of description, into the following classes :—

	M.	F.	T.
(*a*) Epileptic mania in cases of higher-grade amentia which do not exhibit marked stigmata of degeneracy	2	6	8
(*b*) Epileptic mania in cases of high-grade amentia which exhibit marked stigmata of degeneracy . . .	4	12	16
Total	6	18	24

The essential characteristic of the first of these classes is relative or complete sanity, interrupted more or less periodically by attacks of mania, which at times is unspeakably acute, or by states of automatism.

Such precede, follow, or replace typical epileptic fits; and the patient often, in fact usually, has no clear recollection of his behaviour and conduct during the maniacal phase, and has no knowledge whatever of the existence of the state of automatism when this is the symptom exhibited. The resemblance of the periodic attacks to, and the frequent practical identity of these with, the somnambulistic phase of hypnotic suggestion, or the psychopathic symptoms of hysteria considered in the last chapter, must be too evident to need further reference. This class contains the most treacherous and dangerous examples of an asylum population, together with the cases who at times serve as foci of rebellion. Such is naturally to be expected when one considers that the patients are sane or nearly so during their lucid intervals, and that they are ignorant of what has happened during the period of mania or of automatism, and therefore tend to regard themselves as falsely accused and generally persecuted beings.

On the other hand, the chief characteristic of the second class is childishness or "softness"—one might even say "mental defectiveness"—which often exists in association with epileptic fits at night and the equivalent of neuropathic symptoms of hysteria (to employ the term used in the last chapter), including "sensations" and hysterical attacks, during the day. Amongst such cases are to be found certain of the more spiteful, vicious, and impulsive cases of high-grade amentia, who often persecute the nurses by making frequent and at times childishly foolish charges of ill-treatment.

These two classes shade into each other, but typical examples of each differ markedly from one another.

Class A.—Higher-Grade Amentia, with Epileptic Mania

Under this heading are grouped 8 cases, of whom 2 are males and 6 are females. One of the latter differs from the remainder in the fact that senile involution of the cortical neurones with consequent mild dementia has begun to develop.

The cases at present under description agree in the possession of ordinary intelligence and in the practical absence of stigmata of degeneracy. In the examples in which a personal history has been available, the incidence of the epilepsy has been delayed till puberty or even adult life has been reached.

The symptomatology of these cases is so well known that only the briefest reference here is necessary. Such, however, is the case, not owing to the number of the patients who exhibit it, since this probably

constitutes but some 1 per cent. of an asylum population, but owing to its extremely dangerous character.

The patients are, many of them, quite sane apart from the psychic disturbances associated with the fits ; and a large asylum usually contains a few examples of " sane " epileptics, who have as a rule a bad record.

As a whole, however, such epileptics are unstable, irritable, and quarrelsome ; and especially after, but at times in association with, fits they are liable to maniacal excitement, with outbursts of impulsive violence. They are, as a rule, religious ; and they are fond of attending services or of reading books dealing with spiritual matters. They associate together like ordinary sane individuals, and at times make plans and plots against asylum government ; and they frequently make enemies, often as the result of jealousy. On the whole they differ from the average sufferers from mental disease in being less selfish, self-absorbed, and callous to the troubles of others, and in being more self-conscious. They are often happy and talkative and exuberant, and the most dangerous patients are often the most plausible. They in some respects resemble criminals rather than lunatics, and may be described as degraded rather than degenerate.

The violent psychic disturbances which are characteristic of these cases may occur after or in association with fits, or they may follow " sensations," which are probably attacks of *petit mal*. The expression " sensation " may refer to an aura preceding momentary loss of consciousness, but in some cases it is apparently used to denote a mere feeling of *malaise* without visible loss of consciousness. The severity of the psychic disturbances bears no necessary or definite relationship to the type or severity of the epileptic attacks. Cases with severe or frequent fits may show slight mental symptoms only, and others with mild, non-apparent, or infrequent epileptic attacks may suffer from severe psychic disturbance. These cases as a class are probably homologous to the group of " sane " criminals who suffer from " masked " epilepsy, and who, in a condition of post-epileptic automatism, commit murders and other crimes.

In general symptomatology cases of epileptic mania resemble certain other groups of high-grade amentia. They most resemble cases of recurrent insanity (Group II), and also, but to a less extent, they show a resemblance to certain types of excited and " moral " cases (Group I). In some instances, in fact, the difference between the types appears to lie solely in the presence of epilepsy, which acts as the exciting cause of, and increases the violence of, the recurring psychic disturbances which are characteristic of these cases.

The type of case under consideration shows, as a rule, less resemblance to cases with systematised delusions (Group V), though examples,

e.g. No. 237, occur which might almost be spoken of as cases of abbreviated paranoia.

Cases of epileptic insanity are frequently good workers. Both the male cases worked well, and of the 6 females, 4, apart from occasional refusals, were excellent workers. The remaining 2, owing to age and physical infirmities, were unable to do useful work.

The following cases are inserted as illustrative examples, not of the average higher-grade insane epileptic, but of certain types which may be found in any large asylum, and can best be described in the form of case notes :—

Higher-Grade Amentia. Epilepsy, with very slight Secondary Psychic Disturbance

Case 235.—J. W., male, single, bricklayer, æt. 34. Certified since the age of 27. In asylums at the ages of 26 and 25, and has shown symptoms since the age of 23. Mother suffers from paralysis.

A smiling man of pleasant appearance, who at once looks at me and asks if he is to sit down. He gives his name, his age, and his birthday. He knows the day, the exact date, when he came here, where he came from, and the exact date of his admission to that asylum, together with the period of his residence there.

He had his last fit five to six weeks ago. He usually has about one a month. They occur the first thing in the morning as he is getting up, or occasionally at night, whilst he is in bed. When the fit comes on he simply drops down, and he can get up and go to work directly the fit is over. If he has three or four fits in succession he feels "weak." He states that at the time of his admission to his last asylum he was violent after fits, but has since been well-behaved. He passed the fifth standard at school, and the fits began at about the age of 14, the second or third year after he started work. He worked in the garden at his last asylum.

The patient, whilst under observation, was a useful and willing worker. He suffered from occasional fits, and psychic accompaniments were slight or entirely absent.

Higher-Grade Amentia. Delusional State resembling Paranoia, Epilepsy

Case 237.—A. S. M., female, widow, no occupation, æt. 42. Certified one year, and was twice in an asylum at the age of 26, and once later. Father insane.

A garrulous, excited, and highly neurotic woman. She gives her name and age and the date of her birth, and then asks, "Why don't you look up things instead of asking me ?" She knows the day and the date, where she has come from, and the date of her admission to that asylum. She states that her mother died five days before the last date. Then she asks me for a pair of scissors, as she says she would like to cut off my hair and beard. On further examination, she states that she was the first of the Talbot family to be born on Rushton Park estate. They are somehow a Royal family. She was chris-

tened on the same day as some important person or other, and she then continues to repeat all kinds of inconsequent coincidences. She appears quite unable to appreciate the proper relationships to one another of external facts and occurrences. She strongly objects to my questioning her. She was married at the age of 26 (? true, as she was in an asylum that year), and has one son. She states that her husband left her a million pounds. She frequently calls me "fool" and "idiot." She is extremely egotistical. Whenever she sees the name "Talbot" (her maiden name) she fancies that it has somehow something to do with her. She is most abusive, and she is extremely garrulous. Her mental conditions much resemble a kind of abbreviated paranoia.

The patient rapidly became acutely maniacal, and continued so for several weeks till she was nearly worn out physically. She then improved, and settled down into a stationary condition, which lasted during the time she remained under observation.

She is, on the whole, quiet and well-behaved, but she is at times garrulous, fussy, and hypochondriacal, and at others grandiose. She would dress fantastically if she dared. She is not at all religious. She does not hoard rubbish. She is very clean and looks after herself. She dusts the dormitory and makes several beds, and, at times, does a little needlework. If allowed, she would never leave the ward, and she is not anxious to go either to church, to entertainments, or even into the airing-court. Every few days she becomes more or less abusive, but she soon settles down again. She frequently complains about her food, &c. This is especially the case when she is menstruating, and, for about a week at this time, the egg is invariably bad, or the beef-tea is short in quantity, &c. In her business letters to her lawyers she tends to keep away from the point, to write inconsequently and verbosely, and to complain of persecution. She frequently, in her letters to strangers, writes about her private affairs. Her fits are rare, but she frequently suffers from "sensations." The latter often occur about dinner-time, and she had from three a day to nine a week. She "feels them more than fits." They cause severe headaches, and make her feel "weak." In conversation she is intelligent, and at times interesting. Her memory is perfect. She would often during a prolonged conversation pass for a perfectly sane woman.

Class B.—High-Grade Amentia, with Epileptic Mania

This class contains 16 cases, of whom 4 are males and 12 are females. One of the latter is intermediate in type between this class and that of mild imbecility with epilepsy.

These cases occupy an intermediate position between the last class, *i.e.* "higher-grade amentia with epileptic mania," and that of "mild imbecility with epilepsy" (low-grade amentia, Class (*f*)).

The fits as a rule begin during the early years of life, and the cases usually show marked stigmata of degeneracy. The patients in many respects resemble overgrown children, and hardly a single example of the class would be capable at any time of passing as a sane intelligent adult, in this respect markedly differing from the cases of the preceding class.

In many instances these patients are bad-tempered, spiteful, quarrelsome, violent, and even dangerous. Other cases, however, are emotional and hysterical; and many of the "fits" from which these latter patients suffer, but especially those occurring during the day and under the influence of emotion, are indistinguishable from hysterical attacks. The fits which occur during the night are, however, more or less typically epileptic in character.

These patients as a class are often very troublesome, but they quarrel together rather than combine in action. They, however, make friends as do sane people, and they are often favourites with the attendants and nurses. They are usually vain, and they are fond of decorating themselves with trifling articles of finery. They are frequently religious.

A large proportion of these cases are useful workers. Of the 4 males, 1 was a good, 2 were ordinary, and 1 was a poor worker: of the 12 females, 8 were good workers, and the remaining 4, who were all very violent and dangerous patients, were unemployed.

The following 3 cases are inserted for the purposes of general illustration:—

High-Grade Amentia. Epilepsy, with slight Secondary Psychic Disturbance

Case 242.—S. A., male, single labourer, æt. 34. Certified at the age of 28, and was previously in an asylum at the age of 24. Has suffered from fits since his birth.

An intelligent-looking man, with a receding forehead and chin, bright eyes, and a generally neurotic appearance. He gives his name and age, and the date of his birth. He knows the day and date in full, when he came, where he is, whence he has come, and how long he was there. He earned his living from the age of 11 years up to that of 24, when he first went to the asylum. He has suffered from fits for "some time, only just before I went to H——." (This is his only incorrect statement.) Before a fit comes on he feels as if he were going to faint. If the fit is slight he remembers everything. If it is strong, "I loses my senses." He has no other aura. As soon as the fit is over he "feels all right," and shows no mental confusion. He speaks as a rule in rather a childish manner, *e.g.* Can you read and write? "Yes." Have you been to school? "I went when I was a little boy, *but I haven't been since.*" He writes well, he is generally intelligent, and he is a useful and willing worker.

High-Grade Amentia. Epilepsy, with slight Secondary Psychic Disturbance

Case 251.—K. L. J., female, single, no occupation, æt. 35. Certified since the age of 30, and previously in an asylum at the age of 29.

A dark-complexioned, neurotic-looking woman, who smiles pleasantly. Teeth irregular and projecting. Palate very high and narrow. She gives her name and age, and says she has "been afflicted twenty years." She was "not unwell till 17." The fits came on at the age of 13 or 14 years. She knows the

day and date, and where she is and where she has come from. She was previously in an asylum for four and a half months at the age of 29. Her illness "came on as screaming fits, and upset the neighbours, and my doctor sent me there." She has only had two or three fits during the day. "They came during my sleep." She feels quite clear in her head in the morning, but sometimes is sick, has a headache, and feels too ill to do anything.

Her memory is good, but she is childish, simple-minded, and hypochondriacal. She is sensible, well-behaved, clean, and a good worker. She is very obliging and does her work well. She is very religious, and always remembers the text of the sermon in order to send it to her mother. She has no special friends among the patients. She, however, does a good deal of private needlework, and writes home regularly. She has had no fits for over a year, but she frequently has headaches at the menstrual periods, and "suffers in my back." At these times she often loses her memory for short periods or forgets things, and she is more than usually hypochondriacal.

High-Grade Amentia. Epileptic Mania

Case 252.—A. S. P., female, single, no occupation, æt. 31. Certified since the age of 27 years, and previously in asylums at the ages of 17, 21, and 22 years.

A pleasant-looking woman of pale appearance. She gives her name, age, and date of birth. She knows where she is, when she came, where she came from, and the present day and date. She has been in "a place like this nearly 22 years." She has been three times previously in asylums, and three times in workhouses and hospitals. On the first occasion, shortly after her eleventh birthday, she fell into the fire, was severely burned, and was sent to the hospital. After her discharge from the hospital she had only been at home a few days when she was sent to the workhouse, and she has since spent her life in workhouses or asylums.

When under sedatives she rarely has fits. She usually has one or two a month, and they, as a rule, occur during the night. When the new moon is about she has "sensations." She feels them most about her heart. The "sensations" do not always end in a fit, but when they do "I feels lost and hears myself laughing, and cannot stop it." When she has a severe fit she has no "sensation" at all, but falls down suddenly. She dreams a good deal at night, but especially at the time of the new moon. She says she feels disagreeable at times. She is very hypochondriacal and garrulous.

As a rule this patient works well, and she is very clean and attends generally to herself. She is, however, very spiteful and interfering. She makes friends amongst the patients, but cannot keep them. She is very jealous when other patients are taken notice of. She is extremely religious. Real fits are rare, but she frequently has "sensations." When they come on she begins to cry and sob. They are not followed by confusion, and when they are over she often says, "I feel better, and that's for a few days more."

Group V.—CASES WITH SYSTEMATISED DELUSIONS (PARANOIA)

This group contains 10 male and 16 female cases, the predominant characteristic of which is the existence of a subnormally aberrant type of ideation which results in the development of a systematised series of delusions. Throughout the following description the term "paranoia," for purposes of convenience, will be used in a generic sense with reference to the whole of these cases, irrespective of the age-period of incidence, for the mode of evolution is the same whether the case develops in a person whose mental equipment is below the average of that of his age and station, or in one who has been more or less of a success in his particular line but who has succumbed either from prolonged overwork or owing to the onset of presenility. The former, or developmental, type remains undemented for long periods or even until death: the latter, or dissolutive, type slowly becomes mildly or even moderately demented, particularly if the onset has been precipitated by alcoholic excess or severe illness.

As all cases of paranoia sooner or later develop ideas of grandeur which at first sight closely resemble the "delusions of grandeur" common in cases developing or suffering from dementia, a few remarks differentiating between these conditions will not be out of place.

The ideas of grandeur at present under consideration appear in consequence of developmentally aberrant processes of cerebral association. On the other hand, those to be referred to later in the volume in the section dealing with Dementia occur as a result of imperfect processes of association in cerebra which are undergoing degeneration, or which are maimed, and consequently unable to perform their functions normally owing to previous degenerative processes.

In the former type ideas of grandeur develop in consequence of definite and systematised processes of association, however aberrant or abbreviated these may be; and, if the premisses were correct, the conclusions, except for exaggeration, would follow.

In the latter type, the processes of association resulting in delusions of grandeur are largely unsystematised, and in many cases the mode of development of the idea of grandeur is simply a process of "going one better" by relative association as the result of a feeling of well-being.

For example, a case of dementia paralytica, on being asked if he possesses a hundred pounds, may reply, "A hundred? *Hundreds, thousands, millions,*" and an indefinite number of similar "delusions of grandeur" may readily be manufactured by appropriate interrogation.

This statement suggests the remark that all cases suffering from delusions of whatever variety are of the "intellectual" or introspective type of mind: further, the older such patients are, and the richer their psychic experience is, the more complex and detailed are the delusions whether systematised or unsystematised.

As a preliminary to the consideration of the group of cases here referred to under the term "paranoia," since these in several respects resemble certain of the "cranks and asylum curiosities" described in Group (I), Class (*d*), it seems desirable to compare these groups, not only with one another, but also with their respective sane prototypes. By this comparison it will be found possible to give a clearer indication of the mode of evolution of the respective types than would otherwise be possible.

The "crank," whether sane or insane, grades into the paranoiac, also whether sane or insane; and the essential difference between the two types lies in the process by which the idea of grandeur is developed. In the former type the evolution is simple and rapid, and the result may even appear spontaneous, whereas in the latter the process is complicated and gradual, being in the sane variety the natural consequence of a real hard time, and in the insane that of a lengthy and grotesquely exaggerated system of persecution, which may, or may not, have any basis in fact.

The sane "crank" accepts or originates an idea which is contrary to accepted usage or scientific fact, *e.g.* positive as militant suffragettism, vegetarianism, &c., or negative as anti-vaccinationism, anti-vivisectionism, anti-taxationism, &c. He glories in his peculiarity, courts persecution, is insusceptible to argument or proof, develops a sense of responsibility as a reformer or an innovator, and, as a natural result, evolves ideas of grandeur.

The insane "crank" is simple-minded, peculiar, and erratic, or he possesses ability in association with grotesque ideation and the resulting weird actions and eccentric general behaviour. Both types, in consequence of petting and spoiling, markedly develop their inherent vanity; and their aberrant association of ideas, occurring in the absence of any criteria of comparison, readily results in notions of grandeur. Even a patient with intelligence little above that of an imbecile will, for example, believe in his royal lineage, in spite of the existence of a living father and mother, if he is told that he resembles the Georges, and, particularly, such a personage as the late Queen Victoria, in appearance; and the

development of ideas of grandeur, when a patient actually possesses a certain capability for painting or poesy, naturally follows still more readily.

The sane "crank," apart from his fixed idea, may, or may not, be a useful or even a prominent member of society. The sane "paranoiac," on the other hand, is frequently a person of ability, and not rarely has risen in social status by his own efforts.

Such an individual as the latter may be described shortly by means of the one word "upstart," or of the three words "beggar on horseback." Men who have risen from the ranks in the army are at times domineering to their former compeers, and suspicious of and insolent to their present more cultured associates. Women who have risen from the position of domestic servant may become dictatorial, domineering, insolent, and unjust to their present inferiors. Such cases are, to say the least, not of a high intellectual grade, or they would not so exaggerate their own performances and would be less ignorant of their own ignorance.

Examples of sane paranoia in persons of higher capabilities or social status are, however, probably more numerous. A type of the sane professional paranoiac is, for example, a medical consultant who has for years had the greatest difficulty in earning his livelihood, or even in keeping the wolf from the door. He has during this period associated with successful men of his own grade, and his vanity has been fed by the adulation of students and nurses, and by the feeling of pride that he is *not* an ordinary general practitioner but is a member of the higher grade of the profession. The lower the actual intellectual status of such an individual, the higher, when success eventually crowns his efforts—and these more often consist of obsequiousness, tact and diplomacy than merit the name of scientific achievements—is his opinion of his position and importance. He is grandiose, domineering, consequential, and dictatorial, and his juniors or inferiors find it almost impossible to work harmoniously with or for him.

A more common type of sane paranoiac than the professional is the social variety. An individual manages for years, by the exercise of thrift and tact, to live on the fringe of "society." He carefully cultivates certain people, who are perhaps most undesirable or even unpleasant acquaintances, simply because of their social connections; he submits to any number of rebuffs and indignities; and he exercises an amount of tact and discrimination in his management of different people who may be of use to him from the social point of view, which, if employed for business purposes, might make him a fortune. The greater the difficulties such an individual experiences in continuing on terms of acquaintanceship with those whom he considers the elect, and the severer the hardships he has to suffer, the more he looks down on the common people—who, not being in society, have necessarily been manufactured by the

Great Artisan from inferior materials—and the more arrogant and insolent is his behaviour towards them.

The sane paranoiac is thus an individual who, owing to his limited mental range, views his personal experiences and capabilities through convex lenses, and therefore develops intellectual stereotypism with ideas of grandeur. Whilst the "crank" concentrates his energies primarily on the accomplishment of an eccentric object which is not directly connected with his own welfare, and the pursuit of which, as he may be fully aware, may even result in his ruin, the paranoiac devotes himself to the consideration of his own personality from the aspects of both experience and accomplishment, as if he were the one individual with brains in a world of fools.

The insane paranoiac occupies the status amongst cerebral degenerates which is filled by his prototype amongst the sane. He begins his life as a sane individual, and becomes out of accord with his environment at some period of adult life.

An example of the younger and more degenerate type is a man who, owing to real, but personally unappreciated, intellectual incapacity, drifts from employment to employment without realising that his services are dispensed with owing to his inability to perform his duties in such a manner as to justify their retention. Sooner or later such an individual develops the idea that he is badly treated, or that some former employer has actively endeavoured to deprive him of his situation. The particular idea of persecution which first develops necessarily depends on accident of environment, and many different imaginary wrongs may be considered and rejected before the basis of his future content of delusions is laid. He may, for example, see a younger brother placed in his father's business, whilst he himself is unable to keep in any permanent employment, and may, consequently, seek a reason for his father's fancied prejudice against him, and discover his traducer in a family friend or medical adviser.

The essential feature of such a case is a suspicion of others which will sooner or later foster definite ideas of persecution; and these, as the result of introspection, become gradually more intense, more systematised, and more likely to form part of the content of a permanent delusional state.

Cases of paranoia developing at mid- or late adult life agree in essentials with those occurring at an earlier period, but differ somewhat in their mode of origin.

The latter (or developmental type) arise in consequence of a developmental incapability, the sufferers being thus below the mental level of their sex and station.

The former (or dissolutive type), on the other hand, ensue in consequence of the individual having "passed his best," either owing to

overwork without adequate encouragement in the form of success, or to the onset of presenility.

A clerk, for example, after several years of hard drudgery in a city office, becomes, owing to the monotony of his life and the constant mental strain of his duties, nervous and fidgety, and fearful of making mistakes. He may merely be afraid lest his uneasiness be noted by his colleagues; or they may actually talk about and even make a butt of him. Further, when in the streets, his nervous and absorbed manner or his furtive glances may cause people to look at him as they pass. He thus readily becomes suspicious and watchful, tends to apply to himself looks and remarks which really do not concern him at all, and eventually develops the mental condition referred to in the preceding description.

A married woman, again, who has for years lived a secluded and monotonous life, may, as the result of real or fancied trouble with her neighbours, develop the idea that they try to annoy her in various ways. Every action performed by them, every noise produced in their house, or every alteration made in the outside decoration of their premises, may appear to her to be done on purpose to annoy her; and eventually a similar train of ideas of persecution develops.

In such cases, when the mental condition has already become such as to afford a suitable soil for the growth of the delusional state, this may spring up as the result of accidental occurrences, which would be without permanent ill effects on a normal individual, such as alcoholic excess, severe illness, monetary losses, or family troubles. In the cases of the first and second of these exciting causes, ideas of persecution may develop as the result of hallucinations of hearing, &c., which are secondary to cerebral toxæmia; and the disorder may thereupon run a more rapid course.

Many examples might be added to illustrate the various modes of development of what is finally a delusional state, but the above are probably sufficient to demonstrate the nature and origin of this condition.

The delusional state has at first no definite, or at any rate no fixed, content; and the actions of the patient in some respects resemble the watchful and suspicious behaviour of an animal which has at one time suffered ill-treatment, and is therefore inclined to look upon every stranger as a probable foe. The content of delusions develops more or less rapidly *pari passu* with the evolution of the delusional state. The patient lives in an atmosphere of suspicion, and everything said or done in his presence is subject to misinterpretation, and in some way or another is applied to himself. He broods over his fancied wrongs, and is constantly associating together expressions and actions which have nothing in common. The earlier delusions of persecution may constantly change until one or more of these is finally accepted and

adhered to. Whilst the exact content of delusions at the beginning thus depends on accident of environment, this original basis is then constantly added to by a combination of the results of experience and introspection until a whole systematised superstructure of possible and impossible persecutory ideas is eventually elaborated.

An individual, for example, accepts the idea that his wife has committed adultery with some particular individual, and becomes gradually so suspicious and violent as eventually to require certification. He appears to lose the idea, and is discharged from the asylum. During his detention his wife has earned her living by taking in lodgers. On his return the patient finds this out, and he concludes that she has been keeping a brothel during his absence, and has even been training her daughters in immoral practices. He says little or nothing, but watches her conduct, suspecting her all the time of immoral behaviour with every man she happens to be alone with. In consequence he develops the idea that even tradesmen and vagrants calling at the house have come for immoral purposes; and, if his wife when out of doors speaks to a male acquaintance, he suspects her of making an assignation. Finally, after more or less domestic trouble, associated perhaps with violence on his part, the patient is again certified, when without delay he begins to accuse his wife of causing his incarceration in order to remove him from her path. He then proceeds to suspect certain of the attendants of going to visit his wife when they are off duty, and either attacks them or endeavours to make such complaints against them as will secure their dismissal. Such a simple type of case, if at large, would be likely to commit homicide sooner or later.

Almost any idea of persecution may serve as an accidental basis for the development of a systematised content of delusions, but in the more typical cases the original persecution has been carried on by some particular individual, and in at least many instances the idea contains an exaggerated and misinterpreted basis of fact. The patient then, as the result of prolonged introspection, succeeds more and more in blackening the character of the persecutor, who eventually becomes in his eyes an incarnate spirit of evil. The more diabolically ingenious the persecutor proves himself, and the wider the net which he has spread for the unfortunate patient, the more and more persistent becomes the question, "Why is he so persecuting *me?*"

At this point the patient becomes almost desperate; and, during alternating periods of grotesque exaggeration of his ideas of persecution, and of comparative sanity during which he laughs at the opinions he has expressed, the grandiose stage of the delusional state begins to make its appearance. The patient has often hitherto been more or less reserved regarding his "case," but he now becomes abnormally

garrulous, and repeats a minutely detailed description of this whenever he can obtain a listener. He worries everyone around him, and especially strangers, with a full account of his sufferings; and endeavours to obtain their opinion and advice. According to the temperament, the previous experience, and the present environment of the patient, the persecutor may be employing secret-service agents, who later are associated with secret societies of world-wide influence, or detectives, who are Jesuits in disguise, and who gradually come to employ the whole mediæval power of the Roman Church to compass his destruction, or secret police, who watch him lest he should by chance escape and influence the political situation in England, Europe, or the world. One patient, when almost despairing of finding an explanation why his enemy had obtained his incarceration in an asylum, suddenly remembered an illegitimate child of his who was at that time about twelve years of age. He knew nothing definite concerning the history or connections of the mother of the child, and eventually, after thinking the matter out, concluded that she was probably of royal or august parentage, and had been stolen in infancy, and hidden away under the guise of poverty. He hence concluded that *he* was incarcerated lest he should discover these facts and claim the throne on behalf of his daughter. He acted up to this idea, for, when the news of the death of Queen Victoria arrived at the asylum, he at once became violently excited, and ordered me to wire for the Horse Guards to take him to Buckingham Palace in order that he might be proclaimed Regent of the realm.

When the persecutory ideas of the patient have thus passed from the possible to the impossible, accident of environment will soon cause him to develop some definite idea of grandeur. The death of a king or queen, the Pope, or an important political or social personage, &c., at once leads him to apply for the vacancy; and after several tentative titles he eventually fixes on one, and the case is then fully developed.

As the result of constant repetition and introspection, the personal history of the patient has by this time become stereotyped and abbreviated; and his description in some instances becomes almost unintelligible without the key furnished by a previous knowledge of the case. The patient is an emperor, a general, the Prime Minister, &c.; and round his grandiose account of himself are fossilised the remains of, usually, his later delusions. At this, the fully-developed stage of the disorder, it is common to find patients willing to work usefully, whereas during the earlier and persecutory stage they frequently refuse to do any work whatever.

The period of time required for the full development of the paranoiac varies from a few to very many years, and numbers of patients die before they reach the final stages of the disorder. Frequently the presenile

or even the senile period of life is reached before the case is fully developed, and it may then be complicated by the incidence of involution of the cortical neurones, with consequent mild dementia.

Both the mode of development and the general characters of the mental symptoms of paranoia are markedly influenced by the degree of education possessed by the individual sufferers. Educated persons reason well and even acutely, whilst uneducated subjects find great difficulty in expressing themselves, reason in a faulty manner, and make weird mistakes from ignorance both of the terms they use and of the exact connotation of these. Such patients, on the advent of a new invention or discovery, at once apply this to their own case, and not only get hold of the new word inaccurately, but also apply the process or fact in some grotesque manner, which, however, is in strict accord with their own limited knowledge and experience. Errors of this nature have to be carefully allowed for during the study of the mental processes occurring in this class of patient.

From what has already been stated, the existence of aberrant forms of the general type of case which exhibits systematised delusions is readily intelligible; and unusual exciting causes, particularly when hallucinatory phenomena result from these, frequently give rise to an unusual symptomatology and to an entire modification of the general course of the case. It is also especially difficult to determine where the group of "asylum cranks" ends and where that of systematised delusional cases begins. In this respect, however, the group of cases under consideration resembles the other groups into which cases of amentia have been divided. All the groups grade insensibly into one another; all excepting the first, which contains idiots and imbeciles, possess their sane prototypes in the outside world; and all agree in exhibiting to a greater or a lesser degree the essential characteristics of deficient or subnormally aberrant cerebral organisation, and, apart from senile involution of the cortical neurones or degeneration of these from accidental extraneous causes, of absence of cerebral dissolution and consequent dementia.

Of the 26 cases which are included in the present group, and of which a considerable proportion had reached their full development, the majority were useful workers. Of the 10 males, 8 worked very usefully, and, of these, 3 were early cases and 5 were more or less fully developed; 1, an early case, refused to work; and 1, a fully-developed case, suffering from senile involution of the cerebrum, was an ordinary, but useful, worker. Of the 16 females, 8 were good workers, and, of these, 2 were early cases and 6 were more or less fully developed; 1 early and 2 developed cases refused to work; 1 early and 2 developed cases were ordinary workers; and 1 fully-developed case, suffering from senile involution

of the cerebrum, and 1 fully-developed case, owing to bodily illness, were poor workers.

The following 6 illustrative cases are inserted owing to the importance of this group from the aspect of pathological cerebral function rather than because the cases exhibit any specially remarkable features. They, however, well indicate the varied clinical types which fall into this group of cases.

Delusional Insanity of Dissolutive Type. Pseudo-Hallucinations. Mild Dementia

Case 258.—D. E., male, married, labourer, æt. 62. Certified since the age of 57, and exhibited symptoms for some time previously.

An intelligent-looking old man, who is very deaf, and therefore shouts loudly during conversation. He says that his deafness is due to a blow on his head from a shovel. He makes a whistling noise with his tongue and teeth as he talks. He gives his name and age, and the day and date, and he knows where he came from and where he is. He strongly objects to the name "*Hel*lingly." He thinks the name "*Heaven*ly" might trend to the good of the inmates, but that the present name of this place is blasphemous. He thinks "people ought to be very careful in giving names to places. There is plenty of obscenity on the earth without making it by such names. There is too much dancing, &c., at music-halls. People transmit disease from hand to hand, and breath to breath, while dancing." He then continues for some time to protest strongly against the obscenity of dancing. He will not believe that the practice came from the East, either from the Holy Land or the Mohammedans. I then interrupt him with a question or two about dates, and make a remark about newspapers. This causes him to begin again, and he makes severe remarks on the abuses of asylums, and about newspapers in general, and the favouritism of giving newspapers to some inmates and none to others. He does not blame all the officials, though most are of no use. A few are, however, valuable, and one was kind to him. After a few personal questions, he tells me that he hears voices at night. His mother comes and talks to him then. She weeps over him, as he has found her tears on his cheeks; and this recollection or inference causes him to become emotional. He then tells me that some time ago he was listening to her late Majesty Queen Victoria and Mr. Gladstone. They were speaking in a little chapel, and he could see them most clearly. In confirmation of this he tells me that he knows the site, &c., of the chapel in question. This occurrence was before the late Queen died. A few days after it, Mr. Gladstone died. He says that long before she died he prophesied the exact day and date of the death of the Queen. This remark *à propos* the subject of prophecy causes him to say that he has seen it raining fire from heaven in Eastbourne. "Oh, it was something fearful, and a Divine punishment for drinking so much evil spirits." He now becomes grandiose rather than dictatorial and prophetic, and he states that his father was a prince, and his mother the rightful heiress to the crowns of Spain and England. Her name was Jane, Jeanne, &c. He himself is the Earl of Sapton, Duke of Clarence, Kent, and Lancaster, by right. He, however, was proscribed. He has a scar on his right side (correct), which is like a crown (imagination), and he says that it is upside down for this reason (*i.e.* he thinks that the scar looks like a crown upside down, and that it is placed thus both to identify him and

also to show that he is proscribed). His mother "was buried in a gold crown, and the Crimean war was fought over her poor carcase."

When the patient gets excited, his ideation becomes rapid, and he gesticulates and discourses as the result of vivid pseudo-hallucinations. He is a decent old man, and is fairly a useful worker in the tailor's shop and the ward. He is most punctilious in the performance of his duties, and does his work slowly and very carefully. He is, however, so interfering and fault-finding, when in contact with other patients, that he only works satisfactorily for any length of time when kept quite by himself.

Matured Paranoia of Developmental Type. Onset in Early Adult Life

Case 261.—T. H. T., male, married, musician, æt. 39. Certified since the age of 32 years.

An intelligent-looking man of dark complexion, and with elevation of the outer canthi. He gives his name and age; and his knowledge of time and place and general intelligence and memory are normal. When asked if he is a musician, he replies "Three right sides" (*i.e.* he is a man with three accomplishments), "recitation, singing, and violin-playing. Taste for poetry-writing, and so on." He has a pretty good all-round talent, if he is allowed to get it up. He then offers to give the asylum people two millions. "No limit, I think, scarcely" to his possessions. A hundred thousand is enough for his own pocket. He is above crowned heads in finance, but keeps in a medium position to stop jealousy. He hears "a sort of muttering, a little by-play, a way they have of explaining a little roundabout affair over this long-life system." Asked what this is, he says that people can call him the "rightful prolonger' on account of the long-life system he has started. "A man can live a thousand years through bleeding, as the anatomy gets harder every year one lives, from the pulp of a baby to the hardness of a man, by keeping from all diseases, as one's whole anatomy hardens, barring one's teeth, unless attended to." He says that these ideas arose from a dog-bite when he was a youth. He bled a basin of blood, and felt so well after that he "has tried and proved these ideas correct," but then he has a "very penetrating mind." When questioned with the object of eliciting a persecutory phase to his mental state, he replies that all through his life certain people and the police have had a modified way of annoying him. They castrated him to a certain extent, making his testicles nearly as small as a hazel-nut, but they are now improving. He thinks "a little trick was going on," but he does not know who his persecutors were.

The patient is a good worker, and is an excellent player on the violin. He is a member of the asylum band, and at times plays solos. He is solitary in his habits, and is liable to become violent and dangerous if interfered with.

Long-standing Paranoia of Dissolutive Type. Abbreviation Stage. Onset at the Presenile Period of Life

Case 264.—J. H., male, married, farm bailiff, æt. 64. Certified since the age of 53, and was previously in an asylum at the age of 49. Brother insane.

The patient is a pompous-looking old man, with a long white beard. He gives his name, age, and birthday; he knows the exact day and date, where he is and where he has come from, and when he came; also the exact date when

he first went to an asylum, and the exact dates when he was transferred from asylum to asylum during the past eleven years. His memory and intelligence, in fact, appear normal, and the former is acute.

He then, observing that I am taking notes, slowly dictates as follows :— "The 17th of August was the day, in the year 1825, when old Farmer Gilbert Henry Thomas Fowler used the means of getting mother Ann Longley, daughter of William Longley, and in due time her first-born son was born. He signed a cheque 'Henry Carrington Smith' for me, and was really J. W. Fowler Longley." He tells me this "to show what a beastly bad fellow that a' been." On careful inquiry I find that he does not suffer from hallucinations, but "everybody seemingly is my enemy. . . . Why should I not have my liberty, but herd with a lot of notorious whores, rogues, and vagabonds?" . . . "John William Fowler Longley is the man who will have his way. He killed two children in the docks at G——. I didn't see him, but I am sure that he did so. He also killed three in the docks at L——. He tried to shoot me, and got other folks as was lunatics to do so, and I had to sleep in the same dormitory at H—— with them." On further examination, patient states that his mother "was used by three lions, two lions and a lioness, after being knocked down at Gloucester, Wombell's show," and that therefore he is "Coer [Cœur] de Lion." He is also the first cousin of the King of England, as his father and the King's father were own brothers.

The patient is an extremely decent and intelligent old man, and is a good and willing worker. His mental condition has now obviously long been stationary.

A study of the above description shows that the patient has got to the "abbreviation" stage in his delusional state. He is, however, still continuing to add to his content of delusions, as he refers to the *King* of England (when this mental state was taken the late Queen Victoria had not long been dead).

Developed Paranoia of Dissolutive Type. Onset at the Presenile Period of Life

Case 271.—M. H., female, single, lodging-house keeper, æt. 66. Certified since the age of 57. States that she has a sister insane.

A pleasant, but dignified-looking, old woman with an expressionless forehead which does not move when she smiles.

She at once begins to tell me that she was kidnapped at W——, in place of someone else, eleven years ago, and was placed in F——. She had a sister there also, and the latter was quite well enough to be out. "Nothing much the matter with her." Patient gives the following account of her own incarceration. She was in W——, and heard a voice saying, "Go to the Town Hall for your ticket." She also heard a gentleman asking her what she was doing there at that time of night, and then heard someone say it was a detective. She thereupon went to a police-station at W——, and asked if there was a letter or papers for Miss H——. She indignantly repeats that she "never asked for money" (? accused of soliciting). She was then taken to the Infirmary. She denies that she ever had anything to do with any sailors. She insists on the respectability of her lodgers, and says she had many enemies who wanted to get her out of her house and keep her out of prospective money. She talks then a good deal about money and legacies and cheques which were to be, or might be, obtained by her. She gives a long and somewhat rambling, but perfectly coherent, account of her incarceration, the striking feature of which is that,

whilst she will talk on indefinitely if left alone, she will not attend in the least to what is asked of her, but at once abruptly denies it or refuses to reply. The reason for her behaviour is that every word one says is understood by her to mean that one is trying to get at her in some way or other, in order to obtain evidence of her insanity by misinterpretation of the remarks.

After spending a little time in reassuring her in this respect, one is able to get her to reply to ordinary questions. She then gives her full name, and states where she is, when she came, where she has come from, and the day and date. She also states how long she was in her last asylum. To a question concerning her age, however, she whispers that the patients near are noticing ; it is better, as she is sane, that they should not know.

During her residence she was very dignified and grandiose ; she decorated herself with ribbons and pieces of dress material, and she was very careful about her hair. She made her bed, and attended most carefully to herself and her belongings, of which she possessed a quantity. She sewed very well and neatly, and was very industrious, but she absolutely refused to do any ward work. She was at times abusive and disagreeable, and was very eccentric and disinclined to make friends. She misconstrued what was said to her when spoken to, and she was very suspicious. She considered the people around her spies sent to watch her, and at times remarked that other patients were wearing articles of clothing belonging to her. She would never have a second helping at meal-times unless she herself handed her plate to the charge nurse.

On one occasion when excited she was ordered a dose of calomel, which was given in a cup of tea (!) by an inexperienced nurse. There were, she noticed, eight patients at the table, and also eight cups were set out. The nurse brought in a ninth cup and set it before her. She at once became suspicious, examined the tea, found the calomel, refused to take her meal, and, when she saw me, accused the nurse of attempting to poison her. This incident is a good example of her general shrewdness, and similar instances of this were noticed on many occasions.

Paranoia of Developmental Type passing into the final Stage : Onset in Early Adult Life

Case 278.—K. L., female, married, housewife, æt. 35. Certified since the age of 34. Was, shortly before this age, in an asylum for some weeks, and has shown symptoms since her youngest child was born, four years ago.

A smiling, but fatuous-looking woman, with bright eyes, an expressionless face, and many fine horizontal lines on her forehead. She gives her name and age, and the day and date in full; and states exactly where she is, when she came, where she has come from, and the exact dates of her detention in asylums. She states that she went to the asylum to visit a friend, and that they kept her there. She does not know how the mistake arose, as both her husband and her brother want her out. In fact, she says, her husband has many times brought her clothes to the asylum, but the authorities would not let her go. She says that "a man next door" wanted their cottage for a friend of his, and that he sent her to the asylum in order to get rid of her, and so get her husband, when the housekeeper was gone, out of the cottage. The "man next door" began to get things at shops in her name in order to get her into trouble. He went by the name of Fred Bray. She seems to doubt whether this is his real name, as he only gets 23s. a week and a cottage, and still went to Brighton and to theatres, &c.

People thought that she was interfering with other people's affairs. She has not done so, unless they know her thoughts, and her thoughts wouldn't do any harm to anyone. She thinks that the "man next door" hypnotised her husband and then herself, as her husband once gave her a black eye, and he had never done so before. This man had power to do an injury to anyone who wished her well. "These people had no business to write to other people about me; it's forgery. If he has killed me he has killed hundreds. He outraged my little Bessie, aged eight, a pretty little girl. Such fellows deserve roping. It's a pity God lets them live I think. If he hadn't something he wished to hide, why did he try to pass my friends off as his? He has taken our name and passed in a sense as my husband." She is very garrulous, and has a rather childish way of talking. She is extremely suspicious, and, when I ask questions about her children, &c., she wants to know why, and then asks if I have any children myself. When I reply "No," she says, "Perhaps you are like the man next door," and "Perhaps you have plenty in the workhouse."

During her residence she was often excited, and she was extremely garrulous and suspicious. She frequently wrote long letters dealing with her case, and the ill-treatment to which she thought she was subjected. At times she would work hard, but, as a rule, she refused to work. Latterly, as her mental state was passing into the next phase, she used to think at times that she was really the medical officer, and used to ask for her salary and her uniform, and to state that it was her intention not to undertake her duties until these were provided. At other times, again, she denied all this, and made her more usual demands for her liberty, and for large sums of money on account of her detention, threatening all kinds of criminal proceedings and penalties.

Developed Paranoia in a Patient of Deficient Education

Case 281.—E. K., female, æt. 40–50 approximately, but difficult to judge. Certified five years.

A phlegmatic-looking old woman, who screws up her mouth and smiles. Very stout. Lateral spinal curvature. Palate deep and narrow in front. Enormous lobules to ears. When asked her name says: "I'm known by that name" (pointing to admission paper), "but it's not my name." "I take Black as a surname." Christian name? "Victoria." "I sit next the crown. I have the income equal to the position, a thousand a year and a fortune." "I accepted ten thousand as a settle, waiting so long, kept out of it so long." Her memory and general intelligence are practically or quite normal for an uneducated woman. She was in her last asylum "five years and a half quite, not for any lunacy, political." There has been an "immense plot to keep me out of my rights, almost from birth, not quite." She states where she is, "H——, I'm told, but not the original." (Hellingly—Hell.) How not? "Because they reversed the station for bettering political matters. I recognised as I came along that it was so." She hears voices at night. "Some friends of ours followed me here on political matters, and we have verified the case that I carried the crown. *It came out grandly last night.* We've really conquered the whole of Europe through coming here. The last is a great Richard's king case of course." Regarding her capability for work, she states that she sews well, but "I'm a first-class certificated mistress by profession."

During her residence she was dull and phlegmatic, and did very little work. Her mending often had to be unpicked, and she would work at a gar-

ment for weeks without finishing it. She used to tear up music and new newspapers, and was careless of her belongings, and left them about. She made her bed and attended to herself. She often wrote letters, especially to the Commissioners in Lunacy or the King. She thought that the charge nurse, when she went out of the building, received messages for her from different parts. She was very grandiose, but was quite satisfied with the food and with her surroundings. She never interfered with other patients, but got on her dignity if anyone interfered with her.

(*B.*) DEMENTIA

CHAPTER XIII

CAUSES AND SYMPTOMATOLOGY OF MENTAL CONFUSION

THE present and final part of this volume contains a description of those types of mental disease which I class under the heading "Dementia." Under this term I include all cases which agree, from the psychic aspect, in the possession of a decreased or decreasing mental capacity, and from the physical, in the existence of a distinct and permanent loss of cortical substance in those regions of the cerebrum which especially serve as a physical basis for the carrying on of (voluntary) psychic processes.

Whilst a large number of such cases are examples of natural involution of the cortical neurones, occurring at such individually diverse periods of life as are determined by their inherent capacity of resistance to the process of decay, in many, perhaps even in the majority of the cases falling into the group, both the actual point of time at which the process of dissolution commences, and also the extent and degree to which it proceeds, are largely influenced by extraneous factors.

These consist, on the one hand, of the various influences which combine to produce the normal and relatively harmless environment of sane individuals, and, on the other, of more variable and accidental factors of, usually, a toxic or a nutritional nature. If the process of neuronic dissolution be one of normal involution, or if it be excited by permanently existing and progressive factors—*e.g.* degeneration of cerebral vessels, &c. —it continues more or less slowly until death occurs. If, however, it be excited by non-progressive, temporary, or removable causes, whether these belong to such extreme types as cerebral lesion, alcoholic excess, or puerperal toxæmia on the one hand, and what constitutes the normal "stress" to which all healthy cortical neurones are subjected in a civilised community on the other, cessation of the causative influence may result in an arrest of the process of neuronic dissolution, and the patient may live for years in a practically stationary condition of mental enfeeblement.

I thus employ the term "dementia" to connote in the widest sense

the mental condition of patients who suffer from a permanent psychic disability due to neuronic degeneration following insufficient durability.

During the consideration of the subject of **Amentia,** the 283 cases, classified as suffering from deficient or subnormally aberrant neuronic development, have been grouped on a symptomatological basis, as these types of mental disease are of developmental origin, and, apart from the incidence of cerebral dissolution, possess no morbid anatomy. Cases of amentia, however, viewed from the standpoint of developmental anatomy, exhibit various types and grades of cerebral deficiency, which future research will in all probability associate with the differences in symptomatology which are clinically observable in the various groups under which they have been provisionally classified. Further, in the case of high-grade amentia, for reasons which have already been sufficiently elaborated (p. 163), neither the age of the patient nor the emotional tone of the general symptomatology possesses an essential significance.

In dealing with the subject of **Dementia,** however, an entirely different method of treatment is necessary, for reasons which will now be briefly detailed.

In the first place, cases of dementia exhibit naked-eye post-mortem morbid appearances which vary in severity according to the degree of dementia present. From the naked-eye point of view, this statement holds good in a general sense, even when the progress of the mental enfeeblement has been very rapid, and when, therefore, the removal of the products of the neuronic degeneration is incomplete. In the case of apparent exceptions to this general statement, it can be demonstrated by histological methods that degenerative changes of an acute nature exist, and that these correspond in degree with the grade of dementia present.

Further, dementia differs from amentia in the facts that its symptomatology varies in degree rather than in kind, and that the type of its precursory symptomatology (mental confusion) depends to some extent on its immediate causation. On the other hand, in the case of amentia, the symptomatology depends rather upon the cerebral organisation of the individual than upon the exciting cause of the attack of insanity.

Again, the times of onset in cases of dementia, where the neuronic degeneration is of the nature of a primary involution, or is precipitated by a temporary or removable cause, are largely focussed at, and associated with, certain "critical" periods of life, namely, prematurity (puberty), maturity, presenility (climacteric), and senility. In the case of amentia, on the other hand, the attacks are excited by accident of environment, and are in many cases merely exaggerations of the permanent mental conditions of the patients.

Moreover, the occurrence of dementia, where the neuronic degenera-

tion is of a secondary and progressive nature, largely depends upon the time-onset of the exciting cause—*e.g.* infection with syphilis, senile or presenile vascular degeneration, &c.

Further, certain dementias of special origin—*e.g.* those following sense-deprivation and cerebral lesions—require different treatment from that meted to the analogous types of amentia, as in the latter these influences either occur at such an early period of life that the mental symptomatology is not peculiar, or they result in the incidence of dementia.

It is thus evident that, as dementia differs from amentia in possessing a morbid anatomy, in its uniform symptomatology, and, lastly, in its more intimate relationship to definite causative or precipitating agents, one of which is the age of the patient, the former subject requires different treatment from that which has been adopted in the case of the latter.

The subject of dementia can conveniently be divided, for descriptive purposes, into two portions.

In the first instance I purpose to consider at length the symptomatology which results in the (stationary) mental state indicated by the term "dementia," and to which, for want of a better term, I shall apply that of "mental confusion."

I shall then in subsequent chapters complete the subject by giving a general description of the clinical varieties of dementia. Included in this description will be inserted such special details of morbid anatomy and pathology as were necessarily omitted from the general account given in Chapter X, Part II.

I shall now attempt the first and more difficult part of this task, namely, the description of the special symptomatology definable as the psychic equivalent of those physical states of the cerebrum which are the necessary precursors of dissolution of the cerebral neurones. There being no suitable word in use for the description of this symptomatology, and it not appearing desirable to coin a new one for the purpose, I shall, as I have just stated, employ the term "mental confusion" to connote, in the broadest sense, *the mental symptoms which occur in association with certain pathological states of the cortical neurones which may be followed by the recovery or by a more or less extensive dissolution of these elements.*

I have already indicated the types of case in which the latter of these sequelæ ensues, and no further remark is, therefore, needed in this connection. With regard to the former, I will here merely state that it occurs in cases in which the cause of the pathological state of the neurones is of a temporary or removable nature, and has been neither so prolonged in duration nor so severe in degree as to cause irreparable damage to more than a negligible number of the nervous units of the cerebrum.

Patients suffering from mental confusion may thus recover, or, at

any rate, may recover sufficiently to pass as " sane " individuals. If, however, the mental confusion is profound, more or less weak-mindedness is probably an invariable sequela ; and, in cases where neuronic dissolution is the result of a normal process of involution, or is due to a progressive or irremovable cause, the ensuing grades of dementia are each preceded by a degree of mental confusion the duration and severity of which bear a direct relationship to the amount of dementia which follows.

As I have already pointed out when dealing with the subject of amentia, the aberrant symptomatology manifested by cases of ordinary high-grade amentia or of recurrent insanity does not pass beyond a psychic stage which might be mistaken for mental confusion, but which is really allied, on the one hand, to the inability to think which occurs in some persons owing to nervousness—*e.g.* a student at a *vivâ voce* examination—and, on the other, to the thoughtless remarks of children or persons who happen to be " talking through the backs of their heads." This mental state may be conveniently referred to under the term " psychic resolution " ; there is no reason to suppose that it is associated with other than functionally aberrant neuronic activity ; and recovery occurs sooner or later.

The phenomena to be described in the present chapter under the term " mental " or " psychic confusion " differ from those just referred to in being the result of definite pathological states of the cortical neurones. If the neurones recover, the mental confusion disappears : if irreparable damage to an appreciable number of the cortical elements has ensued, a proportionate degree of permanent psychic disability, or " psychic dissolution," or " dementia " is the necessary consequent.

CAUSES OF MENTAL CONFUSION

The major proportion of cases of mental confusion are examples of natural involution of the cortical neurones, which occurs in the reverse order to that of their evolution, and ensues at such individually diverse periods of life as are determined by their inherent capacity of resistance to the process of decay. In such cases, whilst it is usual for both the actual point of time at which the process of dissolution commences, and also the extent and degree to which it at any particular time proceeds, to be largely influenced by extraneous factors, a well-marked grade of dementia is the invariable final sequela.

It is, nevertheless, common to meet with cases of mental confusion which are directly produced by extraneous causes at a time prior to the period when normal involution of the cortical neurones is imminent. If such cause be temporary or removable, more or less complete recovery

of the cerebral neurones (and from the mental confusion) may ensue; or more or less widespread destruction of the cortical units (with for the time being a stationary amount of dementia) may follow. If, on the other hand, the extraneous cause be of a permanent and progressive nature, the ensuing neuronic dissolution and consequent dementia progress until death occurs.

It is thus evident that foremost amongst the causes of mental confusion must be placed what is, in at any rate a very large proportion of the cases in which it occurs, the necessary precedent to this psychic state, namely, a subnormal durability of the higher neurones of the cerebral cortex.

It is true that a general toxæmia of sufficient intensity is able to produce a temporary state of mental confusion even in normal cerebra —*e.g.* the deliria of infectious diseases, of certain organic and inorganic poisons, &c. In these cases, however, the neurones of the cerebrum suffer from pathological changes which are similar to those occurring in the other vital units of which the body is composed; and the exact incidence and intensity of the lesions differ in different cases according to the special selective action of the particular toxine under exhibition.

In the types of mental disease which are at present under consideration, influences to which normal cerebra may be without injury subjected frequently produce widespread dissolution of these elements with a corresponding degree of permanent mental enfeeblement; and in a considerable number of cases a rapid or slow premature dissolution of the cerebral neurones occurs in the reverse order to that of their evolution and in the apparent absence of any extraneous causative agent.

This inherent durability or capability of resistance to the process of decay, which varies so greatly in the case of the cerebral neurones of different individuals of the race, is not peculiar to the cerebrum, though, owing to the great complexity and consequent instability, and to the relatively recent evolution, of the higher elements composing this organ, it is probably much more variable in degree in the case of the cerebrum than in that of any of the other tissues or organs of which the body is composed.

It is therefore necessary, amongst the causes of mental confusion, to place first the physical basis, which in at least all severe cases is the necessary precedent to this psychic state, namely, a *deficient durability of the higher cortical neurones.*

Next on the list of causes, owing to the fact that, though secondary or exciting causes only, they are not pathological in nature, may be placed the *various forms of physical and mental "stress"* which, especially at the "critical" periods of life, often excite morbid changes in cortical neurones of deficient durability, although they would be rela-

tively or absolutely without prejudicial influence on normal cortical neurones.

Lastly, the chief exciting or secondary causes which are pathological in nature must be detailed. These may be classed into two groups, namely :

(1) **Direct Action of Toxines.**—Of these the most important, and also the most common, are alcoholic excess, which produces the symptom-complex described as " Korsakow's disease," and the toxæmia which frequently follows childbirth, and which is responsible for the " confusional " varieties of puerperal insanity. The different organic poisons, toxæmias and infections, when acting on suitable cerebra, are probably equally capable of producing pathological changes in the neurones of the cortex, but such causative agents act more rarely than do the two first cited.

Whether the cases which arise in consequence of the action of one or more of these causative agents recover or develop dementia depends on the resistance of the affected neurones and on the extent and severity of the pathological changes which have been produced.

(2) **Indirect Action of Toxines** resulting in deficient nutrition of the cortical neurones and, therefore, tending to interfere with their vitality and functional activity.

(A) *By vascular and neuroglial* (and chiefly secondary neuronic) *changes, which follow prolonged action of the toxine*, and which are probably largely of the nature of secondary proliferation after, or of reaction to, the injury produced by the toxine, or by adverse influences occurring at any subsequent period of life.

The chief variety under this heading is the dementia paralytica (general paralysis) which is a frequent sequela of systemic syphilis in degenerates, and which rapidly or slowly passes on to a fatal issue. I remark " sequela," because there is no proof, and no reasonable likelihood, in spite of the researches of McIntosh and Fildes and of the discovery by Noguchi of spirochætes in the brains of a number of cases of general paralysis, that dementia paralytica is often, if ever, produced even largely by an actually existing spirochæte infection. Syphilis, past or present, is the necessary precedent of general paralysis, but I hope to demonstrate that, whilst in certain very acute cases active syphilis may be a dominant factor, it in many others is subordinate in action and in all likelihood acts entirely by its after-effects.

The course taken by cases of dementia paralytica depends largely on their respective degrees of degeneracy.

In the under-developed and poorly-constructed neurones of the

imbecile variety of juvenile general paralysis, the process of dissolution is slow, and the neuronic changes, as was first shown by Watson but is now a matter of common knowledge, are proportionately more extensive than are the vascular and the neuroglial.

On the other hand, in the better-developed cerebra of the ordinary juvenile general paralytics who are infected with syphilis at birth or thereabouts, the process of dissolution is more rapid, and vascular and neuroglial proliferation is more pronounced.

Further, in adult cases of general paralysis the course is usually chronic in degenerates, who readily break down under the influence of external "stress," and who, therefore, require early segregation, with the consequent relative absence of this factor; and it is commonly more rapid in the less degenerate subjects who, before break-down occurs, are frequently subjected to the severest forms of mental and physical "stress," and whose neurones are therefore strained to the utmost before asylum *régime* becomes necessary. In both these types, as the syphilitic infection at the time of its occurrence had acted on already developed neurones, and therefore had not induced still further developmental disabilities in these, vascular and neuroglial proliferation is pronounced.

Finally, in senile cases of general paralysis, in which reparative reaction is naturally more feeble, the course of the process of dissolution is variable, and the general type of the symptomatology and of the morbid anatomy and histology approximates towards that which exists in senile progressive dementia.

Though previous syphilis is usually the important extraneous factor in the production of (secondary) presenile dissolution of the cerebrum, other influences, particularly certain of the slowly-acting metallic poisons —*e.g.* lead—produce a progressive cerebral dissolution of similar character; and about 25 per cent. of such of the insane as are the subjects of epilepsy suffer from a similar progressive disintegration of the elements of the cerebrum. The pathological changes which exist in the cerebra of such epileptic cases have been elaborately detailed by Turner.

It may be added that such devitalising factors as prolonged alcoholic excess, &c., play an important part in the development of many of the cases referred to under this heading.

(B) *By the vascular degeneration accompanying senility or premature senility*, which similarly results in secondary toxic and nutritional affection of the cortical neurones. In cases of this type, also, the dementia which supervenes progresses rapidly or slowly until death ensues.

SYMPTOMATOLOGY OF MENTAL CONFUSION

I propose in the following description to deal with the subject of mental confusion from the psychological rather than the purely symptomatological aspect, and therefore neither the mode of presentation nor the actual subject-matter under consideration will be found to conform to the standard description of the symptom-complex which is usually referred to under such various names as " confusional insanity," " Korsakow's disease," &c.

This mode of treatment is adopted as it is my purpose to demonstrate that *mental confusion* is not a special symptomatological feature of a certain type of mental alienation, and that it not only occurs in many recent cases of insanity which terminate favourably, but also *is the necessary precedent to the onset and progress of dementia* in all cases which eventually suffer from cerebral dissolution.

The subject will be discussed, for purposes of convenience, under certain headings; and descriptive cases which illustrate the special psychic disturbances under consideration will be introduced into the text.

The general description will fall under two main subdivisions:— (1) *psychic phenomena due to pathological conditions of the regions of association;* and (2) *psychic phenomena due to pathological conditions of the regions concerned with the evolution of sensation and recognition,* together with allied products of aberrant cerebral association.

Under the former heading, simple mental confusion will first be referred to (p. 228); the description of this psychic state will be followed by an account of the symptoms usually spoken of as " confabulation " or " pseudo-reminiscence " (p. 237); and reference will then be made to the more aberrant processes of (lower) association which result in the production of " delusions " (p. 247).

Under the latter heading the nature and mode of development of " illusions " and " hallucinations " will receive consideration (p. 254); and the mode of evolution of certain more complex psychic products which occur under the local influence of the latter phenomena will also be referred to (p. 269).

(A) Psychic Phenomena due to Pathological Conditions of the Regions of Association

(1) Simple Mental Confusion.

In profound mental confusion, whilst the subject takes no voluntary notice of his surroundings and pays no attention to the calls of nature, if he is able to exhibit any evidence of mental activity whatever, a simple question is obviously understood. Unless such a question requires a

familiar reply, and this reply is made with reasonable rapidity, the impression produced fades; and the patient forgets that the question has been asked. Sometimes a question, though understood, is forgotten before the reply is forthcoming; and the patient responds with such remarks as "What do you say?" "I don't know," &c.

It is hardly necessary to remark that such an extreme abeyance of psychic function even for a short period of time naturally results in an entire loss of such fundamental perceptions as those connected with time and place, which in the normal individual depend upon his cognisance of sequence of sensations, and permanence or change of position, respectively.

If the confusion be less profound, the patient may, apart from his ignorance of time and place, converse in an apparently normal manner for a considerable period. He is, however, largely or entirely unable to retain recent impressions for any reasonable period of time, and he frequently forgets different pieces of information almost as soon as he has acquired them. He may, for example, be repeatedly told where he is, the time of day, &c., at intervals of a few minutes, and at the end be as ignorant on these particular points as he was at the beginning of the conversation.

Whilst the rapid fading of mental impressions is especially obvious with reference to time and place, it exists, in well-marked cases, with regard to all varieties of new information.

It is hardly necessary to add that in severe cases the patient confines himself to the giving of replies to questions or to the acknowledging of information, and makes no attempt at voluntary conversation, for the rapid fading of new mental impressions entirely bars the formation of further associative combinations.

In the following case of profound confusion the patient was successful in giving his name and age, but further questioning caused him to be unable to do so, probably through the rapid onset of fatigue, though it was quite obvious that he still understood the question. When later, after an interval for rest, he was again able to give his name, he voluntarily followed this by a statement of his age, which demonstrates that a remnant of the power of association by contiguity was existent. To other questions he replied, "Yes," "No," or "Don't know", but a question concerning syphilis, which so commonly induces an indignant denial, made a sufficiently lasting impression to obtain a definite response of "Never had it."

Case 1.—*Admitted November 18th*, 1904 (Hellingly Asylum). Father insane. Cause, intemperance.

Male, married, licensed victualler, aet. 57. Present notes taken on admission.

A pale, miserable-looking man. He gives his name and says his age is forty. To questions of day, date, month, year, &c., he says "Don't know, sir," and he makes the same reply to that of the time of day. He knows no one here, and doesn't know where he lives or where he is. Then he tells me that he doesn't know his name, and when I say that he has already told me he says "Have I, sir?" After an interval for rest he is able to give his name, and then he voluntarily adds his age is forty. He then to all questions says "Have I?" "I don't know," and "No," and "Yes." He "doesn't know" what anything is that is shown him. He denies alcoholic excess. When asked his business he "ain't got one." Ever had? "No." Married? "No." Ever been? "No." Children? "No." Ever had? "No." How long ago syphilis? "Never had it." He looks dull and sleepy, but replies readily enough. He understands, as far as can be made out, all that is said to him, and does as he is told in every way.

After physical examination he voluntarily says: "You've been very good to me." You are a funny customer! "I am?" You weren't born yesterday! "Wasn't I?" No! "I thought I was." When he is got to laugh, he laughs in a most fatuous and uninterested manner.

Pupils equal, 1 mm., and absolutely immobile. Ears very plain. Palate very long and large. Tongue catarrhal and finely tremulous. Plantars dull. Knee-jerks absent. He lifts and moves his legs freely. There is no apparent sensation of any kind in his legs, and yet there is no inco-ordination. When told to put the left heel on the right great toe, he crosses the left leg over the right. When asked to repeat it, he crosses the right leg over the left. He can at once touch together the big toes and the heels. He shows Romberg's sign well, but there is no marked stamping when walking, and no wide base. Abdominal reflexes present. Severe double aortic disease, with much hypertrophy and dilatation of the heart.

Patient died three and a half months after admission.

In contrast to the above case is the following, which, however, still exhibits such marked inability to retain recent impressions that, though the patient had only had his dinner a few minutes, he thought that "it is getting on to dinner-time" He was almost unable to originate remarks of his own, but he replied readily enough to questions, and paid a certain amount of attention to his surroundings, as he asked for a light for his pipe and tried to look at my note-book. He had no idea how long he had been in the asylum or even of the time of the year. In spite of his advanced age and general feebleness, he was anxious to go out to work, and he believed that it was his custom to work every day.

Though not a single one of these symptoms affords definite evidence of present dementia, they indicate, in a man of seventy-eight, that dementia is (almost) certain to supervene, even though they should have been directly produced by alcoholic excess, of which there is no evidence in this case.

Case 2.—*Admitted November 30th*, 1903 (Hellingly Asylum). Previous attack of unknown date. Duration prior to admission stated to be about two years.

Male, æt. 78, labourer, admitted five days ago.

Patient smiles pleasantly, and asks me for a light for his pipe. He tries to see what I am writing. He gives his name, and his age as "getting on for eighty." He "cannot say justly when I came here, but I have been here a tidy while." He thinks he is in a "Union." He doesn't know the day, "as I have been here so long." When asked the time of year he replies that "it is getting on to the back end of summer" (beginning of December). He had his dinner a few minutes ago, but still thinks that "it is getting on to dinner-time." He tells me that he works here every day.

He frequently asks to be allowed to work out in the garden. He wanders about the corridors, and endeavours to find his way outside. He dresses himself, but is slow over it. As a whole he acts quite intelligently, but he owns that at times he "gets a bit lost and wants to go away."

Patient died thirteen months after admission.

The following case also exhibits much mental confusion; but the patient is better able to originate remarks, and also can perform simple acts of mental association, which, however, are chiefly concerned with the events of long ago. She cannot, however, state her age correctly, and she does not appreciate that her eldest daughter is nearly as old as herself if her information is correct. She also states at different times that she has had six children, that she has buried five, and that she has brought up twelve.

These features of the case, as will be pointed out later, demonstrate that considerable cerebral dissolution has already occurred. That she suffers from illusions of identity points, on the other hand, as will be shown later, to the existence of *recent* pathological changes in the neurones of the cortex.

Case 3.—*Admitted November 16th*, 1903 (Hellingly Asylum). Mother died in an apoplectic fit. Duration prior to admission stated to be three years.

Female, æt. 74. Admitted twenty hours ago.

Patient gives her name, and states that her age is "one or two and twenty." She states that she has had six children: the eldest is about eighteen and the youngest "just runs alone. She's a picture, and she'll run after any man. Her brothers learned her to run after 'em." She laughs heartily and childishly after this remark. "Yes, I've buried five. That's a good many, wasn't it?" Married? "It is in the book, I know. I couldn't tell you." Who is that?—pointing to the nurse. "I don't know her. Oh! Yes, I think I do! *Of course* I do! How are you?" Sits up and shakes hands. "I'm pleased to see you, quite pleased. I keep on cough, cough, cough, cough. It's such a jarring complaint for your head, ain't it?" She does not know the day, and when asked the time of year replies, "My girl could directly, I dare say, only she's gone out." She thinks she is at "Mount Pleasant." Later on she says that she has brought up twelve children, and that the Asylum head nurse is the youngest of them. She is garrulous, and she volunteers such remarks as "Like herrings? I'll bring you some."

Patient died eleven months after admission.

The next case exhibits an equal amount of mental confusion, but shows less signs of dementia. The patient is thus better able to appreciate her condition, and shows *consciousness of confusion* by the remarks : "I forget, poor old wretch that I am. I'm good for nothing," and "Blessed if I can tell you. It confuses me when I get two or three things on my mind at once, but I shall remember." She exhibits illusions of identity, and she is lost to time and place.

It is noteworthy that her attempts at mental association, as would be expected, deal with recent experience rather than with the events of long ago, and thus differ somewhat from those of the previous case.

Case 4.—*Admitted December 10th*, 1903 (Hellingly Asylum). No history. Duration prior to admission stated to be about six weeks.

Female, æt. 81, widow. Admitted twenty-four hours ago.

Restless, fidgets with the bed-clothes, and smooths them out, &c. She asks me how I am, and when I make a remark she at once asks me what I say. She has met me before "close to home. I know you by sight." She thinks the nurse is called "Haverdale." She is in a hospital, "almost close to the top of the street. I came this morning." "I forget, poor old wretch that I am. I'm good for nothing." The day is Tuesday (Friday). It is about November 3rd (December 11th). She has been here since the beginning of the week. She does not know the time of day. The month is "September or October ; yes, October ; but I came here in September." She thinks she came on Tuesday (Thursday). She had tea an hour ago, "two nice cups," and thinks it is about eight o'clock (6.15 P.M.). She came here in "October, yes, September ; October. I forget the day of the month. I haven't been here long, have I ? I shall try to do everything I can whilst I am with you." She has a husband, D. R——, who is "not quite so old as me. Blessed if I can tell you. It confuses me when I get two or three things on my mind at once, but I shall remember. I hardly ever go from home anywhere."

The patient is extremely restless, is very apprehensive, and is wet in her habits.

Patient died eight months after admission.

The following presenile case shows on the one hand much less loss of the capability for association of ideas, and on the other such marked illusions and hallucinations that a degree of apprehensiveness and depression is produced which causes the patient to be at times almost frantic.

Whilst it might, perhaps, be argued that in such a case apprehensiveness is the primary feature, and that both the illusions and the hallucinations are secondary developments, a careful study of this and many similar cases, and also of numerous types of the delirium of acute alcoholism, has convinced me that the interpretation I have given is correct. I am of opinion that, in at any rate the vast majority of cases, gross emotional disturbances, which occur in conjunction with aberrant sensory or associative phenomena, are modifications of the normal emotional tone of the individual which are produced by these. It is

commonly observed that cases of confusion where the associative functions are largely in abeyance exhibit little or no emotional disturbance : also extremely marked illusions and hallucinations often occur together with both consciousness of confusion and a capability for the performance of mental association, and the patients may or may not suffer from severe emotional disturbance.

Case 5.—*Admitted March 24th*, 1904 (Hellingly Asylum). Duration prior to admission stated to be about one month.

Female, married, wife of a farm labourer, æt. 52. Admitted twenty-four hours ago.

A dull but perplexed woman, who asks, " What is this all about, doctor ? What am I here for ? Whatever have they brought me here for I can't think." Are you miserable ? " I feel awfully miserable. I haven't seen nothing or done nothing. Everything seemed to go wrong, work and everything ; washing and everything seemed to be all just anyhow. The things I put on the line seemed to be changed, sometimes things with no names on. I wish they had given me some poison before I came here. . . . Oh, dear, dear ! . . . I fancy someone has tried to do me harm, but they say not. They say they don't wish me no harm, and yet I fancy they do. . . . Sometimes I don't know my husband, I think it is somebody else. Sometimes he don't look like my husband and another time he do. I think he came with me yesterday, as it was his overcoat he used to wear " (*i.e.* the relieving officer).

She knows the day when she came. " Friday, or is it Saturday ? " (Friday correct). She knows the month, but not the date. The year is " 1893 or is it 1894 ? " (1904). She hears people talking at night. She has seen " funny-looking things in the beds with horns on their foreheads rolled up," and they looked at her all night, and she couldn't sleep, and there were funny noises, " sissing," going on (probably from the steam-pipes). When at home she thought that people tried to get into her room, and she heard them talking, and they threw things about to drug her, and make her go to sleep. " I wish someone would give me some poison, and get me right out of it. I don't want to live, I want to die." She is very depressed and extremely apprehensive.

Patient was discharged " recovered " six months after admission.

The next case is of a different type. The confusion is severe, but simple, in that neither numerous aberrant sensory phenomena nor marked aberrations in the processes of association are present.

In this connection it may be noted that an exciting cause existed in the physical illness of the patient, and that the mental confusion, though marked, was not associated with grave pathological changes in the neurones of the cortex, for the physical and mental conditions improved together.

As frequently occurs in such cases, the patient was conscious of her confusion, and during her examination she made distinct efforts, which were often successful, to overcome it.

This variety of mental confusion, in fact, much resembles the mental confusion which frequently follows the medicinal administration of sedatives to sane individuals.

CASE 6.—*Admitted December 21st*, 1904 (Hellingly Asylum). Maternal aunt insane. Exciting cause lactation. Duration prior to admission, one week.

Female, single, domestic servant, æt. 33. Notes taken three days after admission.

A dull, vacant-looking woman, who appears pale and ill. She gives her name, and says her age is 32. Day? "I'm confused; I couldn't tell you truly; Thursday. Is it Saturday?" (Correct.) She came at the beginning of the week. Date? "Don't you know? I am so confused, I don't know, but I think someone said the 21st. To-day is the 24th, if Christmas Day is to-morrow and falls on the 25th." (Correct.) She knows the nurse, but not by name; and she has, she thinks, seen me before, and says, "It wasn't you that rode with me, was it?" (*i.e.* the relieving officer). Time of day? "They gave me no breakfast, so I can't go by that, and the winter is generally so dark. If I guessed it I should think it was about—it's no use saying—ten o'clock on a winter morning, don't it?" (9 A.M.)

On admission patient was restless and excited, and screamed with the pain from her distended left breast. She is now taking her food, and is fairly comfortable. She was wet once last night.

She gets very distressed during physical examination. Hair and eyes dark brown. Pupils normal. Tongue catarrhal. Teeth good, but separated by gaps. Palate very high both back and front. Ears plain, and possess abnormally large lobules. Reflexes brisk. Right breast contains milk; left is very distended, hard, and painful. Patient is very pale and anæmic.

Patient was discharged "recovered" five and a half months after admission.

The following case exhibits the preliminary symptomatology of one of the types (usually described under the term "catatonia") of the dementia of prematurity.

The confusion is severe. The patient thinks that he is at home. He knows neither the day nor the date. At different times he states that he came here "Just now," "Three years ago," and "Oh, about a week", and he exhibits well-marked illusions of identity. His method of writing his name is very characteristic of that seen in cases of, or developing, the dementia of prematurity, and differs entirely from the often rapid and always certain mode adopted by the non-confused high-grade ament.

The marked history of alcoholic excess is the only feature which renders it uncertain whether the case will recover from the present attack or will remain as a permanent inmate. This history renders the immediate probable prognosis more favourable than would otherwise be the case.

CASE 7.—*Admitted May 8th*, 1906 (Rainhill Asylum). The patient was born and educated and served his apprenticeship as a draper in Ireland. He then came over to England, and earned his living as a barman in a public-

house for three years, after which he acted as steward on an American liner during four voyages. He then drank fairly heavily, chiefly of wine, for a month, and required removal to an asylum.

Male, single, steward, æt. 22. Notes taken the day after admission.

A young man who is at times restless and excited, and at others quiet. He frequently strikes attitudes, and as a rule his limbs are in a condition of cataleptic rigidity and may be placed in almost any position, from which, however, they slowly fall under the influence of gravity. His face is greasy, and his forehead, even during excitement, is quite expressionless.

Since admission he has been very restless, noisy, destructive, resistive, and wet and dirty ; and he only slept two hours last night.

He gives his name and age. He came here " Just now," and on repetition of the question " Three years ago." He is now at " 18 S—— Street, L——." The attendant near him is " like my aunt, she's living here, 18, and my mother, sisters, and brother, brother Jack." The head attendant is " a chap from America, Leonard, that's his name, like him anyhow." He has never seen me before (untrue). The day is Friday (Wednesday). The date is " 4th of . . . 1st of May, isn't it, 1906 ? " (9th May). Asked again where he is, he says " L——, S—— Street, 18, you know, 18, 18, S—— Street, L——, England." Asked when he came, he says " Wednesday the 2nd," and how long here, " Oh, about a week." He writes his name and address ; and, before writing each word, twists the pencil in his fingers, makes an elaborate commencement, and doctors up each word afterwards as if he could not leave it alone.

His teeth are good, but irregular. His palate is a mere deep chink. The upper part of the pinnæ of the ears is irregular, owing to deficiency and crumpling up of the cartilage. The deep reflexes are dull and the superficial brisk.

June 14th, 1906.—The mental condition of the patient is unchanged since admission.

February, 1907.—Patient was discharged " recovered."

The last case of this series is also an example of the dementia of prematurity, but is of the type usually described as " hebephrenia." It is inserted in contrast to the case last described, as it is probable that mild dementia was already present on admission, although considerable confusion was still existent.

The method of writing her name adopted by the patient is as characteristic as is that of the preceding case, and her knowledge of time and place is greatly deficient. She exhibits a certain consciousness of her inability to think and a generally lively manner which, quite apart from previous history or future development, suggest on the one hand that mental dissolution has not occurred to any great extent, and on the other that the morbid process is still active.

Case 8.—*Admitted November 30th*, 1904 (Hellingly Asylum). Duration prior to admission is about one month, and patient is stated to have had previous attacks at home.

Female, single, domestic servant, æt. 24. Notes taken half an hour after admission.

A simple-looking, smiling girl with horizontal wrinkles on her forehead. She gives her name. Age ? "Don't know, I'm sure." Think ! "Can't think." She eventually says "Near thirty." She "fancies it is Wednesday" (correct). Month ? "December, I fancy" (November). Year ? "Don't know. I have no sense at all." Where are you? "At home, I fancy." Then she states that she was sent away for "frightful sensitiveness." She replies that she never had a sweetheart. She "fancies" she has nine brother and sisters, and that she is the fourth. She grins and smirks in reply to questions. She has done no work for three or four years. In writing her name, which she does in a slow, careful, and halting manner, she puts down her surname first and then begins to write the Christian name before it without having sufficient room. As a result, the latter is partly written on the top of the former. She looks the name up and down, and then adds to it "thirty ages." She came with a nurse and the relieving officer half an hour ago, but tells me that she is "supposed to" have come with her mother. She whispers to herself, plays with her fingers, and smiles inanely. Suddenly she springs out of bed, bows to me, seizes the nurse round the waist, and says that she doesn't mind amusing us and that we may make fun of her.

Her hair is brown and nitty. Her eyes are large, grey and mobile. Pupils equal, dilated, and react normally. She frequently blinks. Mouth and lips large. Palate very high and narrow. Teeth irregular and decayed. Tongue catarrhal. Superficial reflexes normal. Knee-jerks ++ p.c. Breasts virginal.

May 27th, 1906.—The patient is still in the asylum in a condition of "chronic mania."

May 2nd, 1913.—The patient is in exactly the same state.

I hope that the cases which have been described above, and which are examples of many common types of mental disease, are sufficient to illustrate one aspect of the basis on which I have originated the thesis that mental confusion, though not necessarily resulting in mental and cerebral dissolution, is the necessary precedent to the appearance of dementia.

Amongst these cases are examples of mental confusion in senile, presenile, adult (mature), and adolescent (premature) subjects. Further, one at least of the cases illustrates mental confusion produced by alcoholic excess, and another that following early lactation and precipitated by severe distension of the mamma.

The cases which exhibit more or less profound simple mental confusion may, therefore, be placed in three categories. A considerable number recover, permanently or temporarily, from this psychic state without obvious mental deterioration ; others, perhaps the majority of the cases under consideration, pass into a stationary condition characterised by the existence of mild or moderate dementia ; and in the remainder an active and progressive process of cerebral dissolution continues until death in a condition of gross dementia.

From the ætiological aspect, the cases in the first group are precipitated by one or other of the first class of exciting or secondary causes of mental confusion referred to on page 226 : those contained in the

second group arise from similar causes and also from the influence of one or other of the forms of mental or physical "stress" during one of the "critical" periods of life: finally, the cases in the third of these groups develop under the influence of one or other of the second class of secondary or exciting causes of mental confusion referred to on pages 226–7.

In all cases of mental confusion, however, except perhaps in certain of the less severe and recoverable types, the essential physical basis of the morbid phenomena under description is a deficient capability of resistance to pathological influences on the part of the neurones of the cortex cerebri, and in all cases which develop dementia a deficient durability of these elements.

(2) The Milder Psychic Phenomena which arise in consequence of Pathological Conditions of the Regions of Lower Association. "Confabulation," "Pseudo-reminiscence."

Under this heading I propose to describe and illustrate certain psychic phenomena which occur in many of the less profound types of mental confusion, and which are due to pathological conditions of the regions of lower association, the higher (prefrontal) region of co-ordination, correction, and selection being in a still more markedly morbid state.

These phenomena consist in essence in the repetition aloud of certain associated remnants of former experience. Whilst these remnants, to a greater or a lesser extent, are combined into a sequence according to the normal laws of mental association, it is common in the severer cases to find that the description is apparently a mere repetition of one or more long past sequences of events. In some examples, in fact, the patient appears to be involuntarily unburdening himself, in a more or less lengthy manner, of all the groups of associated memories which happen, owing to pathological conditions of the particular cortical regions of lower association which are concerned, to rise into the necessary prominence. Whilst such series of associated memories are frequently excited by illusions based on an erroneous recognition of the surroundings of the patient, they certainly in many instances arise in the absence of extraneous exciting causes.

In cases where the confusion is still less profound, and where, in consequence, recently acquired memories are available, the patients frequently, in a more or less voluntary manner, and often with the aid of illusions regarding the identity of the persons or objects surrounding them, form new groupings of associated memories which, whilst they are individually based on experience, may or may not, when linked into series, be possible as descriptions of experiences or of phenomena.

The associative phenomena which are exhibited by the last and mildest type of case gradually and imperceptibly grade into those occurring in many examples of high-grade amentia, and particularly in certain cases of recurrent insanity during their relapses. They also resemble the associative phenomena which occur during the dreams and reveries of the normal sane. These phenomena are, in fact, merely the result of wayward and involuntary processes of lower association, which occur in the absence of the selective and corrective control of the cortical region of higher association.

Fairy tales, which indiscriminately combine the possible and the impossible, delight the young owing to their resemblance to the results of the wayward and uncontrolled processes of association which occur in these individuals. The analogue of both occurs during sleep in the adult in the form of stray memories, which for various reasons arise one by one into consciousness. These stray memories combine, thereby raising into consciousness other dormant memories according to the normal laws of association ; and they eventually result, in the absence of selective and corrective control, in the frequently grotesque and often impossible sequences of associated memories which are known as " dreams."

These phenomena, when occurring during sleep or " dreamy states," are aberrant, but not pathological in nature.

They also are aberrant and non-pathological in nature when exhibited during certain types of relapse in cases of recurrent insanity, and during the course of ordinary high-grade amentia.

When, however, they occur in cases of insanity which exhibit the various phenomena of mental confusion, and particularly when the series of associated memories is induced or modified by illusions of identity, they are due to pathological rather than to functionally abnormal states of the neurones concerned with the performance of the processes of lower association.

As the extent and severity of the pathological process increases, the associated memories consist more and more of mere reminiscences of examples or groups of former associative phenomena.

Finally, in the severer grades of confusion, the processes of association are in abeyance ; the patient is often unable voluntarily to recall even individual and stable memories ; and, in some cases, as, for example, that cited in Case 1, pp. 229–30, a sensory stimulus may even fade away without arousing the usual sensori-memorial unit. Such cases are further characterised by the rapid fading of impressions even when these are repeated, and therefore, as has already been stated (p. 229), by an entire absence of appreciation of time and place.

The first case which will be employed to illustrate the above descrip-

tion is not a case of mental confusion at all, but is one of recurrent insanity. It is inserted with the especial object of giving point to the remarks which have been made on the subject of dreams and allied psychic states, in their bearing on the less aberrant psychic phenomena which arise from pathological conditions of the regions of lower association.

The patient describes a "vision" or dream which appears to have been of remarkable vividness. Her description is obviously accurate, and bears no traces of the involuntary confabulation for which, in a case of mental confusion, the several questions which were put to her would have afforded as many suggestions. She states the exact night on which this particular "vision" was experienced, and she clearly believes that she is describing what actually occurred to her. Her description of a material Paradise, in which many of the inhabitants wear modern attire, whilst somewhat grotesque, is probably as good an imaginary picture as could be elaborated by any other religious enthusiast of her education and station. It is of interest that during the "vision" she possessed some consciousness of personal orientation, as "I could see as if I could see all over the earth, through the roof, and on each side." In this detail the case again differs strikingly from examples of mental confusion.

Recurrent Insanity. Vivid Dream

Case 9.—*Admitted November 14th*, 1904 (Hellingly Asylum). The duration of the case is about one year. Patient was discharged "recovered" from the asylum some weeks prior to her present admission, after a residence of some months. The exciting cause is stated to be "religion."

Female, wife of a gardener, æt. 60. Present notes obtained on admission.

A dull and very apathetic and phlegmatic woman. Memory and intelligence average. When she had been home a few weeks her strength seemed to fail, and she got "low-spirited and down," and felt she had no strength, and slept badly. She says that she has "beautiful visions." "Last Friday" (to-day is Monday), "I was in Paradise quite. It was something lovely. It's real. I don't think it's any delusion." She saw "all the beautiful saints," but in reply to a question does not know whether they had wings, "and I could see as if I could see all over the earth, through the roof and on each side, lovely marble places, I couldn't describe." It was like heaven. No one spoke to her. She "saw lots of spirits. They've all been round me, and I've never felt frightened. Some were all in white, and some were in colours, as if dressed as they were on earth. Some were women and some were men, dressed men, long coats and hats. All were dressed in beautiful white. Some, of course, were in coloured dress, men too, in clothes, as if you'd wear yourself. I felt happy enough. It was a lovely, night, Friday night. Something grand, something beyond describing." Patient apart from the above is quite sensible; she talks sensibly and

without emotion, in a manner which is something between preaching and repeating a lesson.

May 27th, 1906.—The patient is still in the asylum and suffers from a mild degree of dementia.

May 2nd, 1913.—The patient remains in a stationary condition of mild dementia, and is still in the asylum.

The next case is an example of mental confusion due to alcoholic excess, and exhibits many details of interest. Though the patient is practically lost to time and place, he states his age accurately, or rather —and this is more important—he gives it wrongly by ten years and then corrects himself. He shows marked illusions of identity, one of which is worthy of note. The mental state was taken after his arrival in a small admission-room, and the uniform of the attendant and the general surroundings of the patient made his conclusion that the attendant "looks like one of the yachtsmen" not at all unnatural. This mistake in identity served as the basis for many of his remarks. His description of the process of admission, namely that he had just been "down and waited on board ship an hour and then his majesty the officer called you, and you told me to lie on my back, and then I was undressed, and then you came here," would be quite unintelligible without the necessary key. The patient was extremely apprehensive, and owing to this became quite insulting to the attendant who removed his shirt: "With a face like that I wouldn't look at an Englishman. . . . You don't look a bad old sort all the same."

In this case the symptomatology is of recent type, and none of the signs of unfavourable import which are present in the examples which follow later are visible.

Mental Confusion following Alcoholic Excess

Case 10.—*Admitted November 30th*, 1904 (Hellingly Asylum). Cause, intemperance. Duration prior to admission one month.

Male, married, innkeeper, æt. 58. Notes taken on admission.

A dull, restless, garrulous man, who at once asks me to let in the woman in the passage who has come to clean up this room and always does it for him. (His first idea of place is thus that he is in his own personal apartment.)

He gives his full name, and says that his age is "forty-nine nearly." He then plays with the bed-clothes a little, and adds "Fifty-nine, I said forty-nine, sure, dear." He knows the day and the month, but not the date. He has been here over five years. This place is St. Innes. He knows me by sight very well. I live in Leicester Square. He says that the charge attendant "looks like one of the yachtsmen" (apparently from noticing the uniform). Business? "Up and down the cellars and in and out, you know." Before he came to see me he went to Denmark to see a ship (*cf.* the yachtsman). He makes a good guess at the time, namely, 4.15 and then 3.45 (correct). He says he hasn't had his dinner yet. He has just been "down and waited

on board ship an hour, and then his majesty the officer called you, and you told me to lie on my back, and then I was undressed, and then you came here." (Patient thus thinks from the attendant's uniform that he is on board ship, and he is describing his admission.) He went to sea both yesterday and this morning, when he went to see a ship which is ashore and ought to be got off; and he is ashore to make arrangements to get it off. He has been captain, mate, and master, and has been at sea twenty-nine years or so. Though he came in a cab this afternoon, he states that he has not been in one lately.

During physical examination he gets excited and shouts "Murder!" and asks people outside to come and help. He asks the attendant if he wants to give him a smack on the nose. "With a face like that I wouldn't look at an Englishman. . . . You don't look a bad old sort all the same." Suddenly he shouts out, "D'you hear? The King knew I was in Southend to-day. He was a witness that I was in Folkestone to-day," *as if to someone he sees or hears.*

Pupils normal. Tongue catarrhal and tremulous. Palate high and shelves forward, and has a narrow, deep chink along the centre. Brachial arteries thickened. Plantars dull. Varicose veins on left leg. Knee-jerks present but dull, and L>R. Abdominals present.

Patient was discharged "relieved," five weeks after admission, to the care of his friends. He was a private patient.

The following case has also been precipitated by alcoholic excess, but signs of previous syphilis are present. Though the physical signs suggest that the case may become one of chronic general paralysis, the age of the patient and the consequent improbability that extensive reparative reaction will follow the death of the affected cortical neurones suggest rather that it is one of presenile breakdown precipitated by alcoholic excess, in which a fairly stationary condition of moderate dementia will result.

The following details are noteworthy. Contrary to what occurred in the previous case, the patient at different times gives his age as "forty-eight," "forty-six; I've been married twice, and have four children," and "I'm turned thirty-eight, sir"; and the decreasing age in the successive replies is probably a psychic phenomenon analogous to, though less grave than, those results of uncontrolled cerebral association which are described later (pp. 252–254). This observation points definitely to the existence of an actively progressing process of neuronic dissolution. Further, the remarks of the patient consist chiefly of semi-voluntary descriptions of his daily work as a scavenger, and are relatively independent, for their incitation, of illusions of identity. Again, though he has been in bed since his admission, "I been out this morning"; he has been here "about an hour, not an hour quite I don't think"; he went out "about six o'clock," "I was in W—— Road this morning about seven o'clock . . . and got back here about dinner-time, about twelve o'clock"; "I slept in P—— Road, I believe"; and

he came here " this morning about nine o'clock." These remarks point to the same conclusion as do the different ages he states. He replies that the time is " 11," " about 3," and " between 3 and 4 o'clock." Finally, he confabulates on illusions of identity. Though he calls the patient in the next bed by his correct name, he says, " I've known that chap a good bit, sir. He's a sailor-man, I think. I've drank with him once or twice " ; and there is no reason to suppose that this is the case.

The case as a whole exhibits acute mental confusion and also signs of existing dementia, and therefore, judging by the mental state alone, the patient will not recover.

Mental Confusion. Already existing Dementia. Alcoholic Excess. Former Syphilis

Case 11.—*Admitted October 18th*, 1905 (Rainhill Asylum). Mother and brother died of phthisis. Duration prior to admission three months. Cause intemperance (beer).

Male, married, scavenger, æt. 53. Notes taken on the day after admission.

A determined-looking man with compressed lips. He gives his name, and states that his age is forty-eight. (He looks at least sixty years of age.) To-day is Wednesday (Thursday), and he came seven days ago (yesterday). " I have been out this morning, I went to H—— Street, and up to E——, and then down here again to A—— Street and S—— Street " (obvious description of part of his daily work). This place is " H—— Street, A—— Street, skating rink it used to be called at one time, this place." He thinks the head attendant is well known to him. He has often met him in the park, but doesn't know his name. Asked who the attendant near him is, he remarks : " Well, I couldn't call the gentleman by name, sir. I've seen the gentleman about the park for four or five months. I only work in A—— Street here " (*i.e.* quite near the park) ; " I know a lot of folks about the park, but I couldn't call 'em by name, sir." How long here ? " In town here ? About . . . over thirty years." How long in this place ? " This morning, you mean ? About an hour, not an hour quite I don't think." Time ? " It'll be running after eleven, won't it ? " (10.45). Age ? " Forty-six. I've been married twice, and have four children." Day ? " Wednesday, isn't it ? " Where have you come from ? " Betwixt N—— Street, and D—— Street." When did you go out this morning ? " About six o'clock." Where ? " To L—— Street first, then past W—— Street, and then from there to W—— Street, and from there up to M—— Road, down L—— Lane, over as far as W——, and that way back again. I belong to the 2nd L—— Militia going on sixteen to seventeen years." He then says hat he came from Ireland about 1860, and that he was only a boy then. (Present year 1905.) What time did you arrive here this morning ? " I was in W—— Road this morning about seven o'clock. I stopped in C—— a good while, and then I was over in S—— Street a bit and down here in A—— Street, and I got removed from there to W——, and from there to W—— Street, and I was up in W—— and got back here about dinner-time about twelve o'clock." Time now ? " Oh, about three, isn't it, three or four ? "

On now being asked the names of different objects, he at once gives correct replies. After this (considerable) interval, he is asked where he slept last night. "I slept in P—— Road, I believe." When did you come here? "This morning about nine o'clock, and then I got removed up to A—— Street and then down here again." Time now? "It'll be about three or four o'clock, I should think." Day? "Wednesday, isn't it, sir?" How old are you? "I'm turned thirty-eight, sir." When did you come to England? "In somewhere about 1830, I think, sir." He voluntarily recognises the patient in the next bed by name. "I've known that chap a good bit, sir. He's a sailor-man, I think. I've drank with him once or twice." Patient states that he works for the Corporation as an ashpit cleaner, and receives £1 a week. He, as a rule, drinks beer, and on an average about four pints a day, but often much more.

Ears plain. Pupils absolutely fixed and R>L. Tongue tremulous. Palate high. Arteries tortuous and calcareous. Knee-jerks and plantars dull. Marked shotty glands in groins. Scar on penis. Numerous punched-out scars on legs and thighs. Dense scar on back of neck.

June 14th, 1906.—The patient is still in the asylum. He shows very little change mentally except as regards increasing dullness. He works out of doors at purely manual labour.

January 12th, 1912.—Patient died to-day from dysentery. The case showed well-marked intracranial morbid appearances with large excess of subdural fluid. Convolutional pattern average. There was well-marked general wasting in the fronto-parietal and upper temporal regions with rather more in the prefrontal. Encephalon, 1245 grammes, R.H., 548 grammes; stripped, 515 grammes. L.H., 533 grammes. Cbm., &c., 155 grammes. Granulations in the lateral sacs. Moderate atheroma of the larger vessels.

The rest of the body was relatively healthy. There was tubercle, nearly healed, of both upper lobes. The thoracic and abdominal aorta contains a number of pale fibrotic patches, and but little calcareous change.

The post-mortem appearances confirm the diagnosis which was made many years earlier, and no change has been needed in the remarks which precede the case and which were written at the same time.

The final case of this series possesses a complex etiology, alcoholic excess, senility, and former syphilis all playing their part. As is usually the case in senile patients, in whom the capability of the tissues for reparative reaction is relatively slight, none of the characteristic symptoms of general paralysis are present.

The patient is in a condition of marked mental confusion, which is not so profound as to prohibit confabulation. In this case, however, the results of the processes of cerebral association often differ from those obtaining in the last case *in their inherent improbability*. For example, he remarks, "I'll see my mother in a minute, and she'll tell me," and "Mother says downstairs she doesn't think she'll rear me, I'm sixty-one."

This particular mode of harking back to the remote past is, as has already been stated, one of the characteristics of active cerebral dis-

solution in senile cases. A similar example has already been given (Case 3), where a patient, æt. 74, remarks that her youngest child " just runs alone. She's a picture, and she'll run after any man. Her brothers learned her to run after 'em." As a further illustration may be mentioned the case of a patient, æt. 61, who had been in bed since admission, but who stated, " I was out at the General Post Office at seven this morning to save my father going out."

In the case under consideration, confabulation is readily directed by suitable questions—*e.g.* the part of the case following the remark of the patient that he had been " up to the market twice this morning " and had " bought some fish." By a normal process of association he later changes the subject by speaking of having " five calves to sell " ; and this matter has evidently a stable memorial basis, as long afterwards he voluntarily returns to it and proceeds to confabulate further on it.

It may finally be added that, as commonly occurs in cases of progressive cerebral dissolution, in contradistinction to a temporary morbid condition of the cortical neurones, certain groups of stable memorial units remain relatively intact—*e.g.* he gives a presumably correct description of the manner in which he acquired his attack of syphilis.

Mental Confusion. Existing Dementia. Alcoholic Excess. Senility. Former Syphilis

Case 12.—*Admitted December 23rd*, 1905 (Rainhill Asylum). No history. Male, married, hawker, æt. 60. Notes taken two days after admission.

A dull-looking, restless man, who grumbles away to himself, and then puts out his tongue and coughs. He gives his name, and states that his age is fifty-one. He is " living in N—— Road, no, not living there. I want to think on a minute, . . . *and yet I can go straight to the house.* I believe it *is* N—— Road. I'll see my mother in a minute, and she'll tell me." When did you come here ? " I came here this day week." The day is Saturday (Monday). He does not know the date (December 25th). Month ? " Yes, September." Year ? " September, October, November, December. Them months mix one up what with having two Christmases." When was the last ? " Why, there was one afore this " (therefore he evidently appreciates that it is Christmas). When is Christmas Day ? " 21st February." He says he has been " up the market twice this morning," and mutters to himself about having " bought some fish, and I come straight down home and bought nothing after that." How much did you pay ? " I paid eighteen pence a stone for it, that's three-halfpence a pound." How many stone ? " Two stone." He bought it for himself, and is going to sell it. " I generally have a fish or two over. Well, I've got five calves to sell. They'll want reckoning up. I've got to go up and get 'em killed, and then sell 'em." He is a hawker. I remark that he cannot make much money, and he replies, " Oh ! you can make some out of meat." He is

garrulous, and talks so much that it is difficult to get replies from him. He evidently remembers the previous questions in a vague way, for he suddenly remarks, "I feels well and all right. It's February, 25th February," and then talks about February and December. He tells me that I am a doctor, and "I knows you well by sight for many years." "I've knowed your face many long years, since I was a little lad." When asked the time he replies that it is 2.20 P.M. (11.15 A.M.). He, however, says that he has not had his dinner yet. He went to bed at 8 P.M. last night, and got up "just after eleven" (he has not got up since admission). He went to bed so early "because I didn't want to go out and get any more drink. It would be a foolish idea." "Our little Lizzie had her leg broke, and I went to bed to care it. I won't be too drunk to care that child," &c. He then seems to remember his calves, as he remarks, "I mightn't kill them there till Monday. They've plenty of good hay to eat." Three or five? "I think five on 'em'. I then ask him the day, and he says "Friday" (Monday). When asked the time he says, "Getting on for 2.30. I've been up since five this morning." He states that he has been married nine or ten years, and that he has a child aged ten years. When I ask him if it was born before marriage he says, "No, you fellows you pull a fellow to pieces with questions. It's ten years born. I daresay you can remember that." He had "pox" about the age of sixteen. He had a sore "at the proper place," "a brown spot came when I'd been with a girl, but I expect she'd been a bit over-heated. It was servant an' all."

During physical examination he remarks, "Mother says downstairs she doesn't think she'll rear me, I'm sixty-one."

Fixidity of lower face when speaking. Tongue tremulous. Palate high and narrow, and shelves forwards. Pupils below medium, equal, react to accommodation, and also distinctly to light. Arteries thickened and tortuous. Plantars very brisk. Knee-jerks brisk. Pigmented scar on dorsum of glans penis.

He is very feeble and shaky, and is restless and rather resistive. Last night he was wet and dirty several times, and destroyed two coir beds.

June 14th, 1906.—Patient is still in the asylum. He is developing dementia; and is unemployed, very shaky on his legs, and in feeble health.

October 15th, 1907.—The dementia is progressing steadily. Patient is still clean in his habits, and does a little mechanical work. He is now in better physical condition, but is still shaky on his legs.

October 5th, 1910.—Patient died yesterday from senile decay. Gross intracranial morbid appearances with great excess of subdural and large excess of subarachnoid fluid. Very marked prefrontal wasting. Marked frontal and superior parietal wasting. Complexity of pattern average. Encephalon, 1370 grammes; R.H., 605 grammes; L.H., 590 grammes, stripped, 540 grammes; Cbm., &c., 155 grammes. Ventricles much dilated. Granulations in lateral sacs of fourth ventricle. Main cerebral arteries much dilated and thickened, and show many local fibrous patches but little calcareous change. Smaller vessels dense. Peri-vascular spaces dilated.

Double broncho-pneumonia. Organs generally dense. Much fibrosis of aorta, with numerous areas of dense fibrosis of irregular shape in thoracic aorta, and less numerous but more rounded similar areas in abdominal aorta. Very little calcareous deposit.

The post-mortem appearances confirm the diagnosis which was made many years earlier, and no change has been needed in the remarks which precede the case and which were written at the same time. The exhumation

of long-written descriptions, of which this chapter largely consists, thus serves my purpose much better than would a recently written exposition of my views on the question under discussion.

In the above description it has been impossible to avoid referring, as occasion served, to the differences which exist between the psychic phenomena which occur in cases where the pathological conditions of the regions of lower association are recoverable on the one hand, and are associated with more or less extensive destruction of cortical neurones on the other. The latter subject will, however, receive special consideration both at the end of the present chapter and during the remainder of this section of the work.

This mode of treatment, though undesirable from a purely psychological standpoint, is, however, unavoidable. Cases in which mental confusion is slight, transient, and brought about by temporary causes, rarely come under the observation of the alienist ; and therefore the detailed consideration of the psychic phenomena which arise in consequence of such purely temporary pathological conditions of the regions of lower association must necessarily be left to other observers. On the other hand, in asylum cases in which the pathological process is more severe but has not such a general distribution as to cause practical abolition of the processes of lower association, a more or less extensive destruction of the neurones of the cortex cerebri is the common result : in fact, the majority of such cases possess an etiology which derives factors from both the groups of exciting or secondary causes referred to on pp. 226–7. My personal observations, therefore, necessarily deal rather with the psychic differences between the recoverable and partially recoverable types than with the exact psychic phenomena manifested by the former.

From the symptomatological aspect the three cases last cited present differences which enable definite conclusions to be drawn with reference to prognosis. Case 10 exhibits no psychic phenomena which are inconsistent with relatively complete recovery : Case 11 shows distinct evidence of active mental dissolution, but there is no reason to suppose that temporary arrest of the pathological process, with a stationary condition of moderate dementia, is improbable : and Case 12 is in a condition of active mental dissolution which will steadily progress till death ensues.

The post-mortem notes which are appended to the last two cases, and for which I am indebted to Drs. Cowan and Watson of Rainhill Asylum, entirely confirm these prognoses, which, as has already been stated, were made many years ago.

(3) The grossly aberrant Psychic Phenomena which arise from severe pathological conditions of the Regions of Lower Association. Delusion.

Under the above heading I propose to consider certain psychic phenomena of grave import which accompany severe and progressive pathological conditions of the regions of lower association and are indicative of an active process of cerebral dissolution.

Whilst the psychic phenomena described under "Simple Mental Confusion" may be, and frequently are, recovered from more or less completely, and whilst those referred to under the subject last considered may also, in their milder and more recent grades, disappear without any very obvious degree of mental enfeeblement, the phenomena which are at present under examination are, except in rare cases, evidence of a process of active cerebral dissolution which ends only at death. Further, in the rare cases in which arrest of the pathological process has occurred, obvious mental enfeeblement is a necessary consequence; and the arrest is probably always temporary, the inevitable progress of the case to complete dementia being merely delayed. I would, in fact, suggest that such temporary and partial recovery occurs in consequence of the pathological process having been prematurely induced by mental or physical "stress" or by temporary toxæmia, with the result that the vicious circle of neuronic degeneration and active reparative proliferation, which is necessary for inevitable progress to gross dementia, does not at the time develop.

Though the formation of three distinct groups is only desirable for purposes of convenience, and is not entirely justifiable, this division of the subject serves a useful purpose from the etiological aspect, and therefore from that of prognosis.

The group described as "Simple Mental Confusion" (p. 228) contains the bulk of the cases which, being caused by a temporary toxæmia, are usually recoverable. In it are also included nearly the whole of those cases of insanity which have been precipitated at one of the "critical" periods of life by one or other of the different forms of mental or physical "stress," and in which a certain amount of degeneration of the cortical neurones and a stationary condition of mild or moderate dementia will ensue. This group further contains a number of cases of rapid cerebral dissolution and progressive dementia, in which the mental confusion is from the first so profound as to prohibit the exhibition of the psychic phenomena described under the second and third headings.

The second group is smaller and contains a proportion of the less profound examples of mental confusion which are precipitated by alco-

holic excess, and by the abuse of such drugs as morphine, cocaine, and hyoscine, all of which tend to make the individual say what he would subconsciously wish from the aspect of self-preservation, rather than what is true. It also includes many of the more slowly progressing cases which arise in consequence of senile and presenile degeneration of the cerebral blood-vessels. In such latter cases the causative influence is often itself incited, or at least increased in severity, by previous syphilisation or by prolonged alcoholism, &c. Frequently, also, though by no means necessarily, the characteristic psychic phenomena occur in patients who are suffering both from degeneration of the cerebral blood-vessels and also from the effects of recent alcoholic excess.

The third group, which is about to be considered, contains the larger proportion of such cases as suffer from progressive and inevitable cerebral dissolution. The characteristic psychic phenomena are, as a rule, best developed in the cases of dementia paralytica (general paralysis) which occur during adult life, as at this period all the factors which are required to produce the more fulminating types of cerebral dissolution—namely, intense mental and physical " stress " and the different toxæmias, violent and profound pathological changes in the neurones of the cerebral cortex, and intense vascular and neuroglial reparative reaction—are able to exert their maximum influence. The group also contains many cases of progressive senile dementia, a number of examples of juvenile and senile dementia paralytica, and certain of the rarer types of progressive dementia. In other words, the cases which exhibit in the most characteristic manner the psychic phenomena to be here referred to are those in which the pathological process is most complicated and therefore of most severe local incidence, rapid degeneration of cortical neurones being followed by intense reparative proliferation of the blood-vessels and neuroglia, and this again by further degeneration of neurones and by still further proliferation of blood-vessels and neuroglia—a vicious circle which continues throughout the remaining life of the patient.

Whilst the higher co-ordinating, corrective and selective functions of the cerebrum, which are performed by the region of higher association, are in temporary or permanent partial abeyance in the cases exhibiting the psychic phenomena hitherto considered, in the group now under description more or less complete dissolution of this region has already occurred.

In the psychic state under consideration, not only the phenomena of simple mental confusion, frequently including illusions and hallucinations, but also indications of a morbid activity of the regions of lower association are present. The latter presentations, however, differ markedly from the phenomena which have last been described, and

which consist largely, and in many cases entirely, of groups of more or less stable associated memorial units.

Whether as the result of extraneous excitation, or frequently in consequence of actual morbid states of the regions of lower association, memorial units or associated groups of these rise into consciousness. Owing to the morbid condition of the region concerned with the higher co-ordinative, corrective, and selective functions, the patient—except for a *consciousness* of the ego, which is relatively unimpaired, and is, in fact, often abnormally prominent owing to the cessation of higher corrective control—is capable merely of such semi-conscious psychic processes as are developed by the morbid activity of his regions of lower association. In consequence, such simple or associated memorial units as arise into consciousness, whether through external stimulation or internal morbid incitation, are unquestioningly accepted as facts connected with himself, however grotesque this conjunction may be.

The psychic state I am endeavouring to describe is thus somewhat analogous to that during an ordinary dream, in which *consciousness* of the ego is unimpaired but in which corrective and selective control of the cerebral associative processes is lost. In a "dreamy state," on the other hand, an active ego—in contradistinction to a mere consciousness of the ego—exists, as is shown by the feeling of personal aloofness or non-participation which is experienced.

However aroused into activity, the memorial units or associated memories under consideration are limited in number and complexity solely by the actual or excitable content of the mind of the patient. Whether or not he has had actual *experience* of the possession of money, goods, or power, the patient owns, according to his previous *knowledge* of such things, hundreds, thousands, or millions of pounds, or all the money in the world or universe: he possesses houses, palaces, cities, or countries, and yachts, ships, fleets or navies: he is a baronet, a peer, a king, or the ruler of the world: he can play any instrument, perform any acrobatic or athletic feat, &c., &c. His capability is only limited by his knowledge, and whatever subject is brought to his notice or arises in his mind is straightway elaborated by one or other of the fundamental modes of mental association. He is not bound by the possible, for, when the morbid process is well developed, mere contiguity of ideas results in the immediate association of these together. If, for example, he is speaking of jumping, he can jump over a house or a church; if of running, he can run round the world, or at the rate of a thousand miles a second; if of possessing, he possesses all he thinks of or sees. *Bien-être* is consequently in many cases the prevailing emotional state. The emotional tone is, however, dependent primarily on the normal

emotional tone of the individual, and secondarily on the particular associated memory of the moment. The emotional state may, therefore, vary from minute to minute, and may be as evanescent as are the ideas from which it arises. The actual physical condition or capability of the patient naturally bears no relationship whatever to the psychic state. The performer of wonderful athletic feats may be unable to walk or even stand alone, and the king or God may be patiently washing floors.

According to the activity of the morbid process and to the rapidity and special characteristics of the processes of association, the "delusions" may vary from minute to minute or from day to day. When, however, mental association, owing to the destruction of the physical basis of this, becomes impossible, psychic remnants frequently remain as more stable "delusions." Many cases, in fact, at the time of observation have already advanced to this stage; and in others the mental confusion is of so pronounced a character that relatively little capability for association of ideas exists. Frequently, therefore, instead of the psychic phenomena which have been described being readily elicited and well marked, occasional examples of such associated memories can alone and with difficulty be obtained.

From the above description it will be evident that, in my opinion, "delusion," as here considered, is an entirely different psychic entity from the systematised and fixed "delusions" of the paranoiac, and the less systematised, equally fixed, and at times accidentally produced, "delusions" of the more marked degenerate.

It differs also from the "delusions" which are not infrequently developed in cases of existent but non-progressive dementia, as the result of aberrant ideation in a maimed cerebrum.

The "delusions," however, which occasionally appear during the mental confusion which precedes the development of non-progressive, mild, or moderate dementia, are of a similar nature to, and are evolved in a similar manner as are, the "delusions" which have just been considered.

Certain typical illustrations of these psychic phenomena will now be inserted: and, for purposes of comparison, a case of insanity (emotional and excited type of high-grade amentia), which bears a superficial resemblance to these in the psychic phenomena presented, but in which no mental confusion exists, will first be described.

In this case the points of note are the absence of mental confusion and the otherwise general resemblance to an example of early dementia paralytica (general paralysis).

Such a case illustrates more clearly than would pages of description how the various types of mental dissolution possess their psychic analogues in the varieties and grades of mental sub-evolution.

High-Grade Amentia. Simple Mania

Case 13.—*Admitted November 30th*, 1903 (Hellingly Asylum). Paternal uncle died from apoplexy. Duration prior to admission stated to be three weeks.

Male, æt. 23, draper's assistant. Admitted five days ago.

An exalted and excited young man with large staring eyes. He at once begins to tell me that he sent six telegrams the other day, but doesn't think that any of them went. He proposes to summon eight people, including the medical superintendent, for unlawful detention. He smiles at me in a superior way during conversation. He says that he was "put here for jealousy and nothing more." He gives his name and age, the day and the date when he came, how long he has been here, and the name of the asylum. He talks on rapidly and inconsequently. He says that he is the Liberal candidate for Parliament for a neighbouring town, and he offers to bet me £5 that this is the case. He has been here about a week "tanning patients and acting as a keeper." He tells me with pride that he spent fifteen months in London, and "kept my eyes open." When I remark that I lived there as many years as he did months, he tells me that I must be a fool and have wasted my time. He states that he can "do any trade, carpenter, plasterer, bricklayer, art-furnisher, window-dresser, motor-car driver, zither player, English concertina, singing, and speak French, and boxing." A few minutes later, after further conversation, inquiry elicits the *same* list of employments. I then ask him to sing, as this is the most available of his accomplishments, and without the least self-consciousness he begins "The Holy City." His voice is decent, and he has an idea of singing, but he has absolutely no idea of pitch, and the performance is, to say the least, grotesque in spite of his evident self-gratulation.

During his residence he continued quite unchanged, and he afforded much amusement to both patients and staff. He fell violently in love with and proposed marriage to one of the officers, and his friends in all seriousness brought him an engagement ring to present to her. They were unable to appreciate that he was insane, and four months after his admission removed him (private patient) "not improved." He afterwards wrote several letters to members of the staff, and on one occasion actually called at the asylum and requested to be allowed to see his *fiancée* !

To pass now to the actual subject-matter of this chapter, the following case affords a typical illustration, in their more recent phase, of the psychic phenomena under consideration. The case is a recent one, and the pathological process, though extremely active, is not very far advanced. The patient is confused, but it is evident that the morbid process in the cerebrum is active and also recent, as he replies readily to questions, and he is at times able to provide answers to these which at others he cannot supply. Though he is not voluntarily garrulous, he readily elaborates, chiefly by the method of association by similarity, any group of associated memorial units which is aroused by extraneous stimulation. It is worthy of note, as might be expected, that as the investigation continues the usual earlier results of physiological or patho-

logical stimulation appear, the processes of association becoming more lengthy and the results more elaborate. In order to avoid unnecessary repetition, certain of the examples of this elaboration which occur in the description of the case are printed in italics.

Whilst the results of the processes of mental association rise at each new attempt to the impossible, it will be observed that they do not, as occurs in the next case to be described, pass into the entirely absurd. The factor, therefore, which is lacking in the existing phase of the case under present description, is the corrective and selective action of the region of higher association : and the pathological process has probably, so far as regards the regions of lower association, resulted in acute changes in, rather than in extensive dissolution of, the neurones of these portions of the cortex cerebri.

Early General Paralysis. Grandeur. Marked Mental Confusion

Case 14.—*Admitted August 1st*, 1902 (Claybury Asylum). No history.

Male, married, glass beveller, æt. 37. Notes taken three days after admission.

Patient says he had syphilis twelve years ago. Scar on penis. Palate very high. No lobules to ears. Ordinary physical signs of general paralysis.

Patient is excitable and restless. He jumps out of bed, and makes grimaces, &c. He is happy and self-satisfied. During conversation he is at times more confused than he is at others ; and therefore he is sometimes able to reply to questions, the answers to which he has been previously, or becomes later, unable to give.

He states that he came here ten months ago (three days), and that his age is thirty-four years. He appreciates that he is in an asylum, but he calls it by the wrong name—that of an institution several miles off. He is not voluntarily garrulous, but he readily elaborates his replies to such questions as are put to him. Married ? He has been married twelve years, and has one child, aged ten years, a girl (she is adopted, and is not his own child). She is a professional player on the piano *and the harp and every instrument* . . . Money ? He is worth thousands, *and millions*, and made it by mining in Australis. He would be glad to take me on a sea voyage. He has *three or four yachts of his own, very large ships* . . . Athletic ? He is a strong man and can do "anything, don't matter what. I am a butcher by trade and a beveller and silverer." . . . Sporting ? He has done racing, backing Arab horses. He has always backed them for a million. He has *hundreds of horses, wild animals, and everything.* I shall soon see if I come down to his place. He has *the finest house ever built*, all bevelled plates and embossed work. *It is an enormous size and everything is made of gold*, shoes and everything else but the bricks, and these he could coat with it. . . . He is a runner and jumper, and can jump about six feet, and has got several prizes. He *could run fifteen miles in twenty minutes.*

This patient died of general paralysis two and a quarter years after admission.

The next case differs markedly from the last in the details that the

confusion is more profound and that the processes of lower association result in psychic phenomena of a most grotesque and impossible character. A merely cursory examination of these, in fact, at once demonstrates that the regions of lower association, as well as that of higher co-ordination, correction, and selection, are undergoing an active process of dissolution. The patient is garrulous, both in response to extraneous excitation and in the absence of this; he talks and whispers away to himself; at times he pays no attention to questions; and as the examination continues he develops visual and auditory hallucinations. In his descriptions, more or less stable memorial groupings are inextricably mixed with psychic phenomena resembling those of the preceding case; and as the investigation of his mental state proceeds, the result of the fulminating morbid processes in his regions of lower association is a mere heterogeneous mass of all kinds of partially associated psychic phenomena, including hallucinations. At this stage his region of higher association is obviously in entire abeyance; and further extraneous stimulation is needed to arouse this region into temporary partial activity.

Well-advanced General Paralysis. Grandeur. Mental Confusion. Dementia

Case 15.—*Admitted March 26th*, 1902 (Claybury Asylum). No history.

Male, married, provision merchant, æt. 49. Notes taken two days after admission.

The patient exhibits definite physical signs of former syphilis. The left leg is covered on both sides with the punched-out scars of former ulcers. Some of these are pigmented. There are fewer on the right leg, but still a large number. These vary in size from a threepenny-bit downwards, and the larger ones are pigmented. The right testicle is large and irregular and adherent to the skin, on which are several scars from former incisions. The scrotum on the right side, and the right side of the skin of the penis and of the glans penis, are covered with varicose veins due to venous obstruction. The glands of both groins are shotty. There is a chronic sore on the right side of the lower lip, which bleeds. It shows no induration, and there are no enlarged glands.

The ordinary physical signs of general paralysis are well marked.

The patient knows neither the day, nor the date, nor when he came, though it is only two days ago. He is Sir Frederick William M——, the Emperor of the World. Every place in the world belongs to him. He says that he bought this place yesterday for a million millions, and then mutters "Millions, trillions," &c., to himself. Know anyone here? All the officials here are his friends. He and Dr. M—— (name unknown) are great friends and are always together. He has seen him in the corridor this morning. Married? He is married, and every child in the world belongs to him and his wife. She is the most handsome woman in the world, a most beautiful lady, Empress of the World, and was a Miller. Her family is very large, as so many were born. They were always taken to Marlborough House.

The Princess of Wales, and the Queen, and all the nobility, are all his wife. There are thousands of himself and his wife, but only one Emperor of the World—himself. Clap ? He got "clap" when eight years old. They had two servants at home, and one of them had the "flowers." He used to cuddle them. He got very sore and had much pain, and couldn't pass water. After that they had a beautiful servant, Kate, and his mother caught him in bed with her. He was taken to St. G—— Hospital and treated there, and he was shown to everyone in the hospital as a prodigy. When I remark on his youth, he explains that it was not really early, as when children are born now they are born *him*, and are fifty years old and know everything. . . . He then remarks that he earned five, seven, ten shillings a week, and was then manager of a cheesemonger's shop. He did £200 a week, and then took in the next door, and was paid £1 a week. The takings rose to £400 a week. He lent £200 a week to two men. The money was put in the bank, and he didn't get credit for it, so when he bought the world he had £800,000,000,000, and double, double that. . . . He then goes on talking to himself as if he were replying to questions from somewhere, and he looks up as if he could see the speakers. To arouse him, I suggest that he has a good voice, and he replies that he sings on the stage, sings everything, and acts on the stage with everyone. He is a member of Parliament and of the House of Lords. He always calls himself an honorary member. He says that he knows Chamberlain well, and that Gladstone (dead for some time) and himself are always together, as both are very fond of wood-cutting. I suggest that Gladstone is dead, whereupon he calls me an ass. On being asked a question about the sea, he says that he goes round the world every day of his life and owns all the ships. I then ask him, finally, to say "rural artillery." He at once repeats the words as if he did not understand them, and immediately adds that he *speaks all the languages* in the world.

The patient dies of general paralysis sixteen months after admission.

(B) Psychic Phenomena due to Pathological Conditions of the Regions concerned with the Evolution of Sensation and Recognition, and Allied Products of Aberrant Cerebral Association

(1) Illusion. Hallucination.

Under this heading I propose to consider certain psychic phenomena which bear a more or less close relationship to the normal psychic products of the processes of sensation and recognition. Whilst the simpler of these phenomena, namely, "illusion" and "hallucination," will receive especial attention, certain more complex psychic products, which appear to arise in consequence of an unharmonious action of the regions of lower association under the local influence of the former simpler phenomena, will also be referred to.

Though, at any rate, the less complex of these psychic manifestations usually form part of the ordinary symptomatology of mental confusion, their mode of origin, and the fact that in their milder degrees

they frequently occur during the performance of normal processes of cerebral association, form sufficient reasons for their consideration apart from the general phenomena of mental confusion, and at greater length than is necessary from the point of view of this condition alone.

Whilst the usual definitions of "illusion" and "hallucination," which describe the former as a false or imperfect recognition of an actual sensation and the latter as a psychic phenomenon which may be spoken of as a recognition in the absence of an actual sensation, serve a convenient purpose from the point of view of alienistic terminology, it is frequently difficult in practice to decide whether a particular psychic product should fall under the one term or the other. Further, as is clearly demonstrated by Case 18 (pp. 265–6), an illusion may form the basis of an associated memory around which are grouped more complex psychic products which, under misinterpretation, may readily be regarded as "hallucinations" as above defined, though they are in reality merely vivid reminiscences which are more or less modified owing to imperfect reproduction. Again, as is seen in Case 15 (pp. 253–4), a riot of lower associative processes, which is primarily caused by gross pathological changes in the physical basis of these, evolves psychic products which can only be regarded as "visual and auditory hallucinations," though there is no reason to suppose that they are accompanied by actual consciousness of these phenomena on the part of the patient.

It is thus extremely doubtful whether the usual definition of "hallucination" is in any sense a correct description of the psychic phenomena which will be referred to under this term. I therefore purpose, whilst accepting the above definition of "illusion," to employ the word "hallucination" merely as a convenient term for the description of certain psychic products, which may be either solitary vivid reminiscences, or the result of aberrant processes of cerebral association, consequent or not on illusions, and which can rarely or never be described as the equivalents of the normal psychic products of the recognition of sensorial stimuli.

I do not wish to suggest that a special "centre" for recognition exists. A sensorial impression may reach its appropriate memorial unit either with or without the cognisance of the subject. In the former case an attempt at, or an actual, recognition occurs, and the new memorial unit can usually be voluntarily revived at a later period. In the latter case recognition does not occur, and the memory of the individual sensorial impression, as superadded on the more stable memorial unit, cannot, as a rule, be voluntarily revived. The necessary precedent to recognition is, therefore, a fixation of attention on the attempted conjunction of the sensorial impression with the memorial

unit. By the term "recognitive field," which will later be employed, I thus merely wish to express, in a general way, the seat of the memorial units towards which the attention of the subject is, or becomes, directed.

Before, however, I pass to the actual subject of "illusion and hallucination," it is necessary to insert a few remarks bearing on the psychophysiology of the cerebrum from the aspect of the reproduction of words, since these, in both sane and insane, play a large part in the evolution of illusions and hallucinations, and an essential part in the performance of the more complex processes of cerebral association.

Words arise into consciousness in one of three ways, of which the first is voluntary and personal, the second is normal but non-personal, and the third is common, but only normal in the sense that the majority of, if not all, normal persons are, to some extent, its subjects.

Words, when voluntarily reproduced in thought, are awakened through the action of the prefrontal cortex on the psychomotor area, this commonly being followed by activity of one or more regions of special lower association, and often by that of the whole region of general lower association. Such are therefore regarded as normal products of thought of *personal* origin.

The other normal, and in this case non-personal, mode of origin, which applies to all types of sensation, is of course that of sensory stimulation.

A third mode of origin of words, and also of other varieties of sensori-memorial images, is, however, common in normal persons; and, if the mode is not more common, the results of it are at any rate more obtrusive in the subjects of mental disease. I refer to the spontaneous arising of words or other sensori-memorial images in the auditory or visual regions of lower association. From my experience of these phenomena in the subjects of mental disease, I have no hesitation in classing all such as hallucinations, which hallucinations may or may not be distinguished by the subject from true auditory or visual sensations. A homologous phenomenon to such a hallucination may be observed during the stimulation of the psychomotor area of a monkey which has recovered from anæsthesia. Such an animal regards the movement, say, of the arm, with great surprise, and at once performs a voluntary and opposite movement, exactly as it would if the limb had been moved by an external agency. The resemblance between this response and the behaviour of a lunatic who is replying to "voices" is striking.

In the normal wide-awake condition, such phenomena are, I believe, commonly discounted as memories or illusions: and when they occur during partial sleep or dreamy states and during sleep, the term "dream" is regarded as a sufficient explanation. In dreamy states these phenomena are very common, and are as a rule largely of a visual nature. In

such, in my own case, whilst all kinds of complicated experiences occur in which I appear to take part, I have usually a more or less definite consciousness of personal aloofness from the phenomena, although, however impossible, they appear to be quite real. During sleep, on the other hand, this consciousness of personal non-participation is not present; and the phenomena, whether visual or auditory, whilst as a rule they are based on recent experience, often derive more of their content from the past. A very common experience of mine during the last general election, when graphic representations of the state of parties appeared in the papers, was based on a combination of these illustrations and of the illustrations of cortical measurements which I was preparing about the time. I seemed continually to be discovering that my measurements did not agree with my clinical cases, or that I had made mistakes in my deductions, only to find on awakening that I had been discovering columns indicating the state of parties in my tables, or erroneously comparing such columns with my cases. At the moment of awakening such discoveries were absolutely definite and clear, and the relief afforded by them was intense.

In some instances psychomotor activity ensues, and such persons may hear a reply to responses made to their remarks, and may even keep up a short conversation, of which they know nothing when they awaken. Again, in the case of some persons, including myself, the first word or two spoken by the subject awaken him, and he remembers vividly what he has said and also the remainder of the phrase he was about to reproduce. On the other hand, many lunatics will talk to themselves, and reply to voices, for long periods of time, until their attention is attracted, after which they may revert to the former state of non-voluntary or semi-voluntary sensori-psychomotor activity.

Whilst most sane people interpret all such phenomena as "dreams," many instances nevertheless occur in which the subject, though otherwise sane, regards them as actual experiences of another world and strongly denies that he has merely been asleep and dreaming. In such cases credulity appears to be followed by belief, in a similar manner to that in which expectation results in increased sensitiveness to external impressions and often in the experience of illusions.

All these phenomena I regard as the homologues of, and as thus affording the explanation of, the more marked phenomena which are exhibited by the insane. Since such phenomena are in practice at times difficult to distinguish from, and in fact are often associated with, illusions, I shall refer to these before proceeding to remark on the subject of hallucination in the insane.

Illusions are common in sane individuals, and develop after a sensory stimulus which is of sudden occurrence and also either of short duration

or of low intensity, especially when this stimulus is applied to a recognitive field which is in a hyper-excitable or expectant condition.

An example of the former is the sudden meeting, in a crowded street and under conditions which preclude a second and confirmatory sensory stimulus, of someone closely resembling a known individual. After such an experience, either doubt or certainty as to the correctness of the recognition may exist, although the individual seen may really have been a stranger ; and in this case at least an illusion has been experienced.

The commonly cited example of the latter mode of development of an illusion is the recognition, in a faint illumination, of a window-blind or a white object as a ghost, which false recognition is, as a rule, readily corrected by further examination of the source of the sensory stimulus. It is perhaps, however, more common to meet with illusions of this type in the case of auditory stimuli, as when unexpected sounds are heard at night, or when certain expected footsteps or other sounds are being intently listened for. Such illusions are, as a rule, temporary. They cease if an increasing or a fading away of the auditory stimulus leads to the rejection of the false recognition ; but they may persist if a fading away of the auditory stimulus occurs in association with a highly expectant condition of the recognitive field, and in the absence of additional and corrective visual or other sensory stimuli.

Illusions in the insane are similar in their psychic characteristics to those in the sane, but are more common, and on the whole are more likely to be accepted as true. This is especially the case when they occur in patients suffering from mental confusion or from dementia.

Hallucinations may be defined as normal or aberrant groups of associated memorial units which possess such an abnormal vividness as to resemble the psychic products of the recognition of external stimuli, and which therefore, in patients incapable of exercising the higher corrective and controlling faculty, are to a greater or a lesser extent liable to be confounded with or mistaken for the latter. It may in fact be stated that, considered generally, cases of amentia respond to illusions and hallucinations as do sane individuals, whereas cases of mental confusion or of dementia accept these as true without examination.

For instance, in certain examples of recurrent insanity these psychic phenomena do not suggest objective reality to the sufferer, who can, according to his degree of intelligence and his command of language, describe their characters and their mode of origin. As an illustration, I will cite the following remarks : " I thought my earthly father appeared in a flash under the fire-escape at the front. A man I was working with went under it, and like as if he appeared to me in that man. That's where the idea sprang from." . . . " I hear my father's spirit at night, my earthly father's, guiding me, not like a voice but a spirit : whether

it's a memory of his voice I don't know, like what I've heard him saying, sayings of his, and he tells me to believe in a God above, a Supreme above, and that he's in heaven, so it 'uld be a good job for me so long as he is safe in heaven—let me be safe, you know."

Again, a patient in a letter to me remarked : " I object to my muttered thoughts being known. I object to people being employed to pour nonsense into my ears. This treatment has a bad effect upon my nerves. It results in my muttered thoughts not invariably reflecting my views, desires, and intentions."

As a further instance, I will cite the following remarks of a man who was actively suicidal : " Evil thoughts overwhelm me which are wrong to God and me, evil thoughts about God even, which I don't believe in, as if an evil spirit was in me flashing an evil thought, if you understand what I mean. These thoughts have now, for the time being, become almost a part of myself, if you understand, and I feel the longer I am alive the greater is the punishment within myself, and the punishment in the future will be greater." From this description it would appear that the patient is gradually becoming more and more desperate owing to the activity of certain parts of his auditory zone of association, which spontaneously generates these particular verbal groupings he describes as thoughts.

In other examples of amentia, and especially in individuals who have little capacity for or habit of thinking, these phenomena possess a more or less objective reality, although by suitable interrogation it is, as a rule, easy to determine that the " voices " or experiences differ considerably in character from the normal products of the recognition of sensory stimuli. This difference is also evident from a consideration of the observation that the sufferers usually endeavour to determine the source of the phenomena, and, in their inability to do this, refer them to agencies of the action of which they are ignorant—*e.g.* X-rays, telephones, cinematographs, &c.

On the other hand, in certain cases of mental confusion with marked tremor, which leads to aberrant visual stimuli, or confusion occurring in association with blocking of the external auditory meatus, or with disease or disorder of the middle ear—either of which may lead to the occurrence of aberrant auditory stimuli—the psychic phenomena are very largely caused by these aberrant sensory stimuli, although it is probable that in at any rate a large number of cases a definite part is played by deficiency or aberration of the processes of reproduction of associated memories under the influence of different sensory stimuli. Further, in many cases the sensory stimulus is probably relatively or entirely normal, but illusions result in consequence of certain associated memories, out of the enormous number of psychic units which may

possibly be revived under the influence of external stimuli, being exceptionally liable to recrudescence. Whilst any of these psychic phenomena come under the definition of illusion, those of the latter type gradually shade into the phenomena which are regarded as hallucinations.

Lastly, examples of illusion and hallucination are common during actively progressing cerebral dissolution, as the result of the consequent riot of the processes of lower association which exists in patients suffering from this pathological condition of the cerebrum. Whilst to the observer these phenomena appear from the actions of the patients to possess an objective reality, it is probable in such cases that they are almost or entirely unaccompanied by consciousness, since in such cases extensive dissolution of the prefrontal region of higher association has, as a rule, already taken place.

It is thus evident that illusion and hallucination grade from, on the one hand, the simple false recognitions of the normal sane individual, to, on the other, vivid associated memories which arise by processes of lower association, in the absence of sensory stimuli, and which, in the absence of control over the processes of cerebral association, may present such a resemblance to the psychic results of the recognition of sensorial stimuli as to be mistaken for these and projected externally.

Normal illusions thus occupy one end of the series, and the purely psychic phenomena described as hallucinations occupy the other, the numerous intermediate types of illusion possessing greater associational and less sensorial components until purely hallucinatory phenomena are reached.

The simpler grades of illusion are common in most cases of simple mental confusion, whether this is of a primarily toxic, &c., and recoverable type, or is the forerunner of cerebral dissolution but is of too profound a grade to admit of complex processes of cerebral association.

The more complex grades of illusion, requiring as they do for their development more or less activity of the processes of lower association, occur usually in the cases of less profound confusion, which as part of their symptomatology exhibit the phenomena commonly spoken of as "Confabulation."

Finally, the purely psychic phenomena described as hallucinatory occur either in cases exhibiting marked hyperactivity of the processes of lower association—especially certain cases of recurrent insanity during their relapses—or in cases of active dissolution of the regions of lower association, in which occur fulminating associative processes and consequent extraordinary and grotesque complexes of associated memories.

When the psychic phenomena are the result of a pathological process (whether this is of a temporary nature or will result in neuronic dissolution) which is widespread and causes, at any rate, considerable

mental confusion, the illusions may occur in association with aberrant sensorial stimuli of any kind, though visual greatly predominate, probably because in such patients visual stimuli are the most numerous.

When, however, these phenomena occur in cases in which active pathological conditions of the cortical neurones are slight or absent—*e.g.* cases of high-grade amentia, of recurrent insanity during relapses, and of non-progressive dementia (*i.e.* cases of "maimed brain"), &c.—the psychic phenomena as a rule occur at night, and in association with imperfect or aberrant auditory stimuli. The cause of this relative prominence of auditory psychic phenomena appears to be twofold. On the one hand, in at any rate most ordinary individuals, the usual channels for the reception and transmission of knowledge are hearing and speech, sight, except in the case of special psychic acquisitions, occupying a subordinate position. Further, the majority of people think in words as spoken rather than in words as seen. On the other hand, fear or apprehensiveness is naturally greater when the subject is alone at night, or in the dark, than it is by day: and hearing, which is then the only sense available, is therefore preternaturally active. It is thus possible to give a simple psychological explanation of the prominence of auditory illusions and hallucinations in such types of case as high-grade amentia and non-progressive dementia.

Certain illustrative examples of the various psychic phenomena under consideration will now be cited. In the case of the less complex varieties which occur in most cases of mental confusion, it is unnecessary to insert special illustrations, as many examples exist in the cases already referred to and described. Certain of these will now be reproduced.

Case 3, a senile patient, æt. 74, presents a good example of a simple illusion of identity. On being asked whether she knows the nurse, the patient remarks, "I don't know her. Oh yes, I think I do! Of course I do. How are you?" She then sits up and shakes hands, and adds, "I'm pleased to see you, quite pleased."

Case 4, a woman, æt. 81 years, goes a step further from the associative aspect. She tells me that she has met me before, "close to home. I know you by sight." She also knows the nurse, and says that her name is Haverdale, and that she is in a hospital "almost close to the top of the street."

Case 5, a presenile patient, æt. 52, who was later discharged "recovered," exhibits a different type of illusion. "Everything seemed to go wrong, work and everything; washing and everything seemed to be all just anyhow. . . . The things I put on the line seemed to be changed, sometimes things with no names on. . . . Sometimes I don't know my husband. I think it is somebody else. Sometimes he don't look like my husband, and another time he do. I think he came with me yesterday, as it was his overcoat he used to wear" (really the relieving officer). She states that she hears people talking at night. She has seen "funny-looking things in the beds, with horns on their foreheads rolled up," and they looked at her all night, and

she couldn't sleep, and there were funny noises, "sissing" (probably from the steam pipes), going on.

In this case the capability of correct recognition was largely in abeyance; and at night matters were even worse. The patient was a woman who probably did relatively little thinking of any kind; and the earlier aberrant psychic phenomena were naturally those connected with the concerns of her everyday life. Later on, however, and especially at night, illusions of identity of a similar type, but grotesque in character, appeared.

Case 6, a female, æt. 33, in a condition of acute toxic mental confusion, also exhibits a simple type of illusion of identity. She knows the nurse, but not by name, and she has, she thinks, seen me before. She remarks, "It wasn't you that rode with me, was it?" (*i.e.* the relieving officer).

Case 7, æt. 22, an example of adolescent confusion (of the type usually termed "catatonia"), but with a severe alcoholic history, presents illusions of identity which possess more complex associative components than the last. The patient states that he is at present at "18 S—— Street, L——." The attendant near him is "like my aunt, she's living there, 18, and my mother, sisters, and brother—brother Jack." The head attendant is "a chap from America, Leonard, that's his name—like him, anyhow."

Case 10, a man æt. 58, who is suffering from acute alcoholism, exhibits marked activity of the processes of lower association, together with much confusion. His illusions of identity thus possess complex psychic components. He knows me by sight very well, and tells me that I live in Leicester Square. He states that the charge attendant "looks like one of the yachtsmen." (The attendant's uniform was not very dissimilar from that of a yachtsman, and the examination was conducted in a small admission room.) He describes the process of admission thus: He has just been "down and waited on board ship an hour, and then his majesty the officer" (*i.e.* the "yachtsman" or charge attendant) "called you, and you told me to lie on my back, and then I was undressed, and then you came here." As the patient got more excitable, and his associative processes became still more active, he suddenly shouted out as if to some one he saw or heard: "D'you hear? The King knew I was in Southend to-day. He was a witness that I was in Folkestone to-day." This remark apparently occurred in the absence of any sensorial stimulus, and as the consequence of vivid processes of cerebral association (see Case 15, pp. 253–4).

Case 11, a male, æt. 53, who is suffering from alcoholic excess and from the effects of former syphilis, exhibits similar psychic features. The pathological process is, however, of a more chronic nature. The psychic phenomena are complex, but are largely based on fairly stable associated memories which concern the everyday work of the patient; and the illusions of identity depend upon an aberrant psychic rather than upon an abnormal sensorial component.

The head attendant is well known to him. He has often met him in the park, but doesn't know his name. He remarks, concerning the attendant near him: "Well, I couldn't call the gentleman by name, sir. I've seen the gentleman about the park for four or five months. I only work in A—— Street" (*i.e.* quite near the park). "I know a lot of folks about the park,

but I couldn't call 'em by name, sir." He voluntarily recognises the patient in the next bed by name: "I've known that chap a good bit, sir. He's a sailor-man, I think. I've drank with him once or twice."

Case 12 is of complex etiology, alcoholic excess, senility, and former syphilis all assisting in the production of an active process of cerebral dissolution. The psychic phenomena in this case are based on associated memories of all ages and all degrees of stability, and the groups of memorial units are therefore often impossible as descriptions of fact or experience. He tells me, for example, that I am a doctor and "I knows you well by sight for many years. I've knowed your face many long years, since I was a little lad." As the patient was old enough to be my father, it is evident that in this case the higher functions of co-ordination and of selective and corrective control of the processes of lower association are practically in abeyance, and that the psychic phenomena exhibited (see also Case 12, p. 244) are due to a semi-voluntary riot of the latter processes.

The above examples of the various grades of illusion illustrate the more important of the simpler psychic phenomena under consideration. I shall therefore now pass on to the description of certain cases which exhibit the nature and mode of development of those more complex psychic products which are grouped under the term "hallucination."

The five cases to be referred to fall into two groups. Of these the first contains three cases of recurrent insanity (Cases 16, 17, and 18), and these agree in the important detail that the patients *voluntarily* give more or less clear indications of the mode of development and general characters of the hallucinatory phenomena. This is probably due to the details that the psychic disturbance is of a temporary and functional nature, and that the phenomena experienced by the patients are therefore more or less capable of interpretation by them the moment that normally-controlled ideation becomes re-established. Such examples are naturally very rare, and are obtained by accident, because leading questions, owing to their suggestive influence, are entirely inadmissible. The remaining two cases (19 and 20) are types of confusion due to acute alcoholism, and therefore fall into a different category.

The first of the cases to be cited is an example of recurrent insanity during an acute relapse, and exhibits the clinical features of "acute mania." There is hyper-excitability of the special senses, and intense reaction to, and rapid cerebral association as the result of, sights and sounds. The patient vividly sees his former actions repeated on the slightest suggestive sensory foundation, and develops delusions in consequence of the prominence of certain associated memories. During examination he gradually loses ideational and motor control, and his processes of cerebral association so fulminate as to render it impossible to fix his attention. In order that unnecessary repetition may be avoided, the more prominent features of the case, to which I wish to draw special attention, are printed in italics.

CASE 16.—*Admitted May 8th*, 1906 (Rainhill Asylum). Brother and maternal uncle insane. Previous attack in 1891. Duration prior to admission three days.

Male, married, labourer, æt. 53. Notes taken the day after admission.

A restless, excited man, who at once says that he was here before in '91, and offers to write his name. He is rather slow of comprehension, but gives a good account of himself. At times he hesitates for a reply, puts his hand to his forehead, tries to think, and remarks that he feels confused in his head. He "hears voices using filthy talk and sees them rub their fingers and pull their eyelashes. *I used to do it myself, you know. They do it by telephones, and in the streaks of gaslight, and all such as that*" (*i.e.* he associates what he hears and sees with what he happens to recall). He then remarks, "I'm just trying to think of the youngster's age" (a question previously asked him). *He does not know the people, but they are "mostly men in the building, but I came with a couple or three women when I came here"* (correct). He did not see them after they left him here. He then volunteers "*There's nothing to moider me when there's nobody there. Brain gets worried.* Knocking and banging and pulling things about. Can't stand it. I've left all them tricks off." *I happen at this point accidentally to rub my eyelash, and as I do it he remarks that they do it too, and says that what he says they repeat*, and as an example he repeats the alphabet and says they do it too. *He then states that the other two patients who are in bed in the dormitory watch his every movement* (correct). He then gradually loses control of himself, and his association of ideas becomes rapid and uncontrolled. He says the red counterpane resembles blood, and he then passes on to talk of painting. As he gesticulates the bed shakes, so he talks of spring mattresses. Later, he mentions prayers; and he thereupon gets up, stands on the bed with clasped hands and uplifted head and eyes, and repeats the Lord's prayer. He then suddenly gets into bed again, and says "fish of air, birds and seeds, everlasting life, amen." Then he makes a remark about hell, which arises in consequence of his bumping himself and happening to swear, and he remarks, "I could bear to have my throat cut as that's blood" (pointing to the red counterpane). . . .

He has an old left hæmatoma auris, but shows no stigmata of degeneracy.

May 27th, 1906.—Patient is rapidly recovering from his acute attack. He is still excitable and unstable, but he is improving daily.

December 22nd, 1906.—Patient was discharged "recovered."

The next case is inserted owing to the definiteness with which one important detail concerning the source of purely hallucinatory phenomena is illustrated. The patient states that the "voices" which he hears are "my own family in particular, and those I've come in contact more closely with." It is therefore clear that his "voices" are reminiscences of groups of associated memories.

CASE 17.—*Admitted November 26th*, 1903 (Hellingly Asylum). Duration prior to admission about three months. Exciting cause stated to be religious excitement.

Male, æt. 26, auctioneer's clerk. Admitted nine days ago.

A neurotic-looking, restless man who appears very depressed and worried. He gives his name and age. He says that he came here last October. (November), and that the date is December 4th (5th). He does not know

the day of the week (Saturday), but says that it is four days since Sunday. He has not been "acting quite up to the mark," and has been depressed about "some religious matters partly." He is as comfortable as he ought to be under the circumstances. *He suffers from auditory hallucinations. Voices tell him "to do the right thing," and he hears both men and women speaking to him. They are "my own family in particular and those I've come in contact more closely with."* Whilst talking, he fidgets to such an extent that it is painful to watch him, and the intervals between his replies are so long that it is difficult to obtain much information from him.

May 27th, 1906.—Patient was discharged "recovered" on June 28th, 1904. His friends sent him into the country, and he continued well-behaved for five months, though he was distinctly feeble-minded in comparison with his original mental condition. He was readmitted on November 20th, after creating a commotion in a church and attempting to injure the altar furniture. He was again discharged on July 3rd, 1905, and has not since been heard of. He was a private patient.

The last, and by far the most important, of the three recurrent cases is that of a male, æt. 35, who gives a remarkably clear account of the mode of development of the psychic phenomena which he exhibits. The mode of origin of the idea that his father is superhuman is extremely interesting, and is presumably correctly stated. The patient was probably vividly impressed by some familiar attitude of the man under the fire-escape, and, instead of, as an ordinary normal individual would do, noting a resemblance to his father as a temporary illusion of identity, reacted to the sensory stimulus after the manner of a religious fanatic. His description of his nocturnal hallucinations is proof that these are merely elaborations of vivid reminiscences, though the patient obviously finds great difficulty in discovering suitable terms in which to express what he wishes to explain.

Case 18.—*Admitted August 25th*, 1905 (Rainhill Asylum). Father intemperate and insane. Patient was admitted in May 1902, and was sent out on trial in September 1902. He was brought back at the end of a month, and was discharged "recovered" in March 1903. According to his mother, he relapsed almost at once, but she kept him at home till his present admission.

Male, married, painter, æt. 35. Notes taken two days after admission.

A pale man of very worried appearance. His eyes have the strained appearance of a case with acute hallucinations.

His memory is normal, and he gives a good account of himself. When asked what special reasons have brought him to the asylum, he gives the following description in an even monotone: "I've been believing in my father to be Almighty God, and if I'd done what I was told I'd not have been here now." . . . "I was told not to believe in my father, but to believe in someone above him, an Almighty God above, our heavenly Father, and I was believing in my earthly father." His wife and his mother told him to believe in a heavenly Father. He gives a vivid description of how he first thought his father to be superhuman. Whilst he was in the asylum the first time, he was working with a party of patients near the administrative

block of the Institution, and "*I thought my earthly father appeared in a flash under the fire-escape at the front. A man I was working with went under it, and like as if he appeared to me in that man. That's where the idea sprang from.*" *This idea has been "getting more and more strong ever since I went out.*" Now, however, since he has been in the workhouse infirmary during the past three weeks, he has begun to believe in the Power above. "*I hear my father's spirit at night, my earthly father's, guiding me, not like a voice but a spirit, whether it's a memory of his voice I don't know, like what I've heard him saying, sayings of his,* and he tells me to believe in a God above, a Supreme above, and that he's in heaven, so it 'uld be a good job for me so long as he is safe in heaven—let me be safe, you know."

He has been married over ten years, and has six children. His wife has been very good to him in working for their living. He "chucked work just after Easter" (about four months ago), "owing to the ideas I got into my mind."

Patient was discharged "recovered" on April 28th, 1906.

These three cases demonstrate that the simpler type of psychic phenomena which are grouped under the term "hallucination" are the products of vivid association of ideas, and are thus capable of simple psychological explanation. Many more recent, and in some respects better, examples could of course be cited, but I have thought it wiser to keep to my original illustrations.

The next case exhibits phenomena of association which also are readily explicable, but which are of a somewhat different type from those just described. The patient, a woman, æt. 39, with a history of intemperance, associates the nocturnal ticking of a clock, which appears in her case to have been a prominent sensory stimulus, with the psychic products of her processes of cerebral association (*cf.* Case 16, p. 264). Such groups of memorial units as arise into the consciousness of the patient are associated with the ticking of the clock, and thereby projected externally. The resemblance of the "voices" to a telephone is merely a further stage of association by similarity; and such terms as "voices," and the clock "talking" and "saying," are merely instances of the modes of expression which the patient finds available for the purposes of description.

Case 19.—*Admitted December 2nd*, 1903 (Hellingly Asylum). Cause, intemperance. Duration prior to admission, one week.

Female, æt. 39 (?) years, cook. Admitted twenty-four hours ago.

Appearance dull; face expressionless; memory and general intelligence good. No illusions of identity. She states that she has been working in a hotel during the season, and that when she left they could not pay her her wages. This upset her. During the past week she has heard voices at night. She heard the clock talking "a communication from New Cross." "*It was my brother and cousin talking, and like a telephone.*" "*Two nights ago,* first the clock said 'Think of me on Wednesday.' *I was frightened. My mother-in-law and sister were in the bedroom, and she was crying as they are going to the workhouse, and she said that my brother had been keeping another*

woman during the past seven years. That's what I was told distinctly by that clock." Last night she "didn't hear enough to disturb me, and I don't remember it now." (There is no clock in the dormitory.)

Patient was discharged "recovered" on June 14th, 1904.

The last case, that of a man, æt. 60, with a history of intemperance, is a similar example to the previous one, but the psychic phenomena are more complex. The description given by the patient is so clear as hardly to require any explanation. The preliminary symptom developed was a loss of higher control over the processes of lower association, which occurred in consequence of the exhibition of indecent photographs and of the resulting emotions of suspicion and jealousy. Later on, as the case progressed, the patient's processes of lower association acquired an involuntary and uncontrolled prominence which resulted in the psychic phenomena he so well described.

Case 20.—*Admitted January 14th*, 1905 (Hellingly Asylum). Cause, intemperance. Duration prior to admission, fourteen days.

Male, married, no occupation, æt. 60. Notes taken on day of admission.

An intelligent man, with rather a heavy appearance about his eyes. He gives a good account of himself, and his memory is normal. He does not know why he is here, but says that he has had a lot of worry during the past two weeks with his wife, who would not do as he wished; and he has been brooding over this. His wife was a servant, and one day he saw a German waiter show a servant in the establishment a lot of indecent photographs. He thought that these might be shown to his wife, so he made her leave, but she persisted in going back again. They then "had words," and she left him. She is his third wife, and he is not married to her, as his second, who is "more like a wild beast than a woman," is still alive. *He has lately heard "voices" at night.* He thinks "the Salvation Army has had a lot to do with it." "*Funny noises in the ears*," *probably due, he thinks, to living near the sea for thirty-five years*, "like a man talking like Punch." *A few nights ago it sounded "like the old-fashioned Punch and Judy shows*, and was behind my head through the wall and acting as detective from Scotland Yard, and calling out things about the Duke of Devonshire and the King." In former years he "used to go a lot to market" and meet these individuals at cattle-shows, &c., "*so it might have come up again and revived itself.*" "I haven't heard any of these noises to-day since I've been out here." He has only heard them since his trouble two or three weeks ago, and he has slept badly during this time. He is a moderate drinker, and at times he has drunk heavily.

Patient was discharged "recovered" on July 29th, 1905.

In the above illustrations the psychic phenomena described were *accompanied by consciousness*, and this is the case in the majority of the patients who exhibit these symptoms. As has already been stated, it is rarely difficult to determine, by suitable interrogation, that *these phenomena do not possess a true objective reality.* Whilst the sufferer is only too vividly conscious of their existence, they are of a different

order from the normal psychic products of the recognition of sensorial stimuli, and they are not mistaken for these in spite of their projection externally. They may be described as "voices," or as "interference," or as "torture;" or the patient may go a step further and endeavour to determine their source. If he be of low intelligence and poor education, he develops the idea that these phenomena are caused by wireless telegraphy, X-rays, cinematographs, electricity, or telephones, or by some other agency he does not in the least understand. If his intelligence and education be considerable, such causes will naturally be unsuitable and even unthought of, and the patient has therefore to fall further back upon the unknown and to appeal for a suitable or possible origin for the phenomena to hypnotism, occultism, theosophy, and various mysterious and other-world agencies.

I am thus of opinion that many "delusions" may be regarded merely as evidence that the patient more or less clearly recognises that the hallucinatory phenomena from which he suffers are of a different order from the normal psychic products of the recognition of sensorial stimuli. In other words, the hallucinatory phenomena very obviously possess a non-personal origin, and they often exhibit a considerable degree of objective reality. In a search for their source, the only normal choice of the patient lies between "dreams," "day-dreams," and "recollections" on the one hand, and sensations on the other. The patient more or less clearly recognises that these hallucinatory phenomena conform sufficiently closely to neither of these; and therefore more or less definitely appreciates their abnormal nature.

The last variety of (simple) hallucination to which I wish to refer is of a different nature, and occurs in cases of progressive cerebral dissolution, as one of the phenomena which result from riotous processes of lower association.

An example is given in Case 15 (p. 253). In this patient advanced dissolution of the prefrontal region of higher co-ordination, correction, and selection has occurred, and the processes of lower association are in consequence being performed in an almost entirely automatic manner. Fatigue consequent on the stimulation of questions therefore results in a very fulmination of these processes. The psychic products, which arise by aberrant and maimed processes of association in the actively diseased physical basis, are inco-ordinate and jumbled together. The patient mutters away in what is necessarily quite an unconscious manner. He speaks as if in reply to questions, and looks up as if he were reacting to external stimuli, in automatic accordance with the recrudescence of such associated memories as resemble the normal psychic products of the recognition of sensorial stimuli.

Such a psychic state is solely due to a riotous action of the processes

of lower association in the practical absence of consciousness, which, however, can be temporarily aroused into existence by a further question.

This variety of hallucination completes the types of psychic phenomena which occur in cases of profound mental confusion. It is particularly interesting owing to its relationship to the types of hallucination which have been previously illustrated, since this is similar to the relationship which the various types of illusion, occurring in profound mental confusion, bear to the simpler and semi-normal varieties of illusion referred to at the commencement of the present description.

(2) Certain complex Phenomena of Association which arise under the Influence of Local Disorders of Lower Association

I shall now, in conclusion, refer briefly to certain more complex psychic products which appear to arise owing to an unharmonious action of the regions of lower association, under the local influence of the simpler phenomena which have just been considered.

Cases are occasionally met with in which the psychic phenomena manifested appear inexplicable except on the hypothesis that the different regions of lower association are acting independently of, or at least unharmoniously with, one another.

To illustrate my meaning, I will cite an example. A single man, æt. 44, by occupation a clerk, and exhibiting signs of former syphilis, was admitted suffering from apprehensiveness associated with ideas of persecution by his fellow-clerks. He had for some time been failing in his work, and had felt doubtful of his capability to continue to perform his duties as usual. His prominent ideas at the time were that he was falsely accused of sodomy and of uttering forged cheques. After a residence of some months, during which he was quiet and well-behaved but very apprehensive, introspective, and solitary in his habits, he developed certain interesting psychic phenomena. During the period in which the patient was under observation the following progression of phenomena was observed: (1) The words which the patient spoke seemed to him to be repeated inside his head. (2) Later, whatever he read also appeared to be repeated aloud, word for word, by a voice within his head, even when he read silently. (This phenomenon worried him greatly, as he was afraid of disturbing the other patients, and he therefore became still more solitary in his habits.) As a means of describing his symptoms, the patient referred to the "voice" as the "Speaker." (3) Later still, the "Speaker" not only repeated aloud what the patient

said and what he read, but also what he thought. The patient then became still more worried, and very depressed when in the presence of others. All kinds of associated memories—dealing for instance, with actions performed whilst the patient was a boy, with sexual matters, with everything, in fact, which he most wished to keep secret—were, as they happened to be recalled, thundered aloud by the "Speaker" for everyone in the room to hear; and the existence of the patient was thereby rendered unendurable.

The order of spread of these auditory hallucinations of words exhibits a correspondence with the order of acquisition of the normal functions of language, in that the hallucinatory phenomenon attaches itself first to the earliest acquired and most stable associate of the auditory word image.

Such a case is readily explicable on the hypothesis that *the region of lower association for the hearing of spoken words was in a condition of hyperactivity*, and that vivid associated auditory word-memories were aroused whenever the corresponding vocal or visual word-memories were stimulated by speaking aloud, or by reading to himself, and eventually even by thinking to himself.

An example will now be given in which a hyper-excitability or unharmonious action of the physical basis of auditory associated memories so influenced the region of higher association as to cause the development of a fixed delusion, which eventually dominated the whole of the processes of cerebral association.

The patient, a man, æt. 39, had followed various occupations, including that of a cattle slaughterer. He was an individual of relatively little education, but of considerable—in fact of marked—intelligence, and at the time he came under observation he had already been several years in an asylum. Before his admission he had served a term of six months' hard labour for assault, and when he was admitted he suffered from severe hallucinations, which were chiefly of a sexual nature, with reference to one of the prison warders. As his case progressed, and his hallucinations became more vivid and numerous, he still continued to refer to this individual as their source. When he came under observation, careful investigation of his hallucinations demonstrated that these consisted entirely of groups of associated memories which were *not* projected externally by the patient. He considered that the prison warder or, as he termed him, "the mystery" or "the man underneath," apparently because he had satisfied himself that the source of his associated memories was certainly not anywhere *on* the earth, had some occult method of putting thoughts into his mind, and not only into his own (*i.e.* the patient's) mind, but into the minds of everyone else. He, in fact, believed that "the mystery" was the source, not only of nearly

all the thoughts which arose in the minds of men, but of all the evil which resulted from these. "I am writing you a few lines. The Yankee mystery is shoving things into the butchers' heads and putting them on to pilfer things to get him into trouble, and he is shoving into my head that I know all about my masters, and said that I had seen him pilfering many a time and trying to force lies out of your mouth. My mother in L—— can see everything that's done in the asylum, and the doctors of the asylum can see everything that's done outside if they have one of the cinnamatic machines in the asylum they can see everything but still keep it all to themselves." The above is an illiterate description of the methods employed by "the mystery." Occasionally the patient got fellow patients to write from his dictation. "When I was in Ward ——, the patients received tobacco and cigars off the mystery to charge me wrongfully, and they furthermore gave him instructions not to give me justice unless I spoke the truth concerning myself. This is a made-up thing on the patients' part before I came from prison, and I know that the majority of them are jealous because I speak up for the attendants a little, knowing where all the destruction comes from. . . . *When asked by the doctors in the morning as to how they feel they are afraid to tell all that is in their mind lest the doctors might say it was their own.*" (Note the distinction made between what "the mystery" puts into the patients' minds and what they think themselves.) "*Also, when saying their prayers it is from the lips and tongue only, whereas the actions of the other man*" (*i.e.* "the mystery") "*is on the lips and tongue as well as the mind.* All the speeches from men in the side-rooms and dormitories go through my head at night-time, and this is why the patients and the attendants who have left got the mystery to try and knock the truth out of me, and so cause the mystery to shout out everything himself, but I have not done anything that the mystery says, or else the companions whom I used to work and sleep with would have written to me and told me all. But all this is done to make a liar of me and other people with whom I am acquainted. The mystery puts lies into people's heads in order to do them an injury." One more extract will be given to show how widespread was the influence of "the mystery" or the "other man's mind." "The mystery" interfered with the beef trade between England and South America in order to give Germany the benefit. "The importation was stopped owing to foot-and-mouth disease amongst the cattle, but it was not their own at all, but that of the South American Board of Agriculture under the earth. They are in a position to shove the disease in and take it off again at pleasure. On the arrival of the last cattle-boat in this country there was, according to the statement of the veterinary inspector, no disease at all on board; and I can vouch for this myself, looking after the offal, and finding the

heart, lungs, and liver of the cattle quite sound. The German Inventor having a spite against this country, caused the cattle to be forwarded to his own country to be divided amongst forty thieves in like manner that they do in this. This would have the effect of bringing all the trade to themselves. They would like to obtain all the offal trade if possible, but my advice is to ignore them and say that you are in the know. The German butchers have been trying to ruin this country for years, but we have found them out at last. It is to be hoped that all the English, Welsh, Irish, and Scotch men in and around New York will look after the German Inventor, who is the cause of all poverty and starvation ; but no one living on this earth ever dreamt of his being underneath the same, and having his big mansion there."

It will be observed that this patient differs from the last in having, after the manner of the group of cases suffering from systematised delusions (Chapter XII, Group V, p. 207), extended the scope of the imaginary cause of his hallucinations, or abnormally vivid associated memories, until he applied this cause to nearly all his own personal products of cerebral association, then to nearly all those existing in other people, and, lastly, to all the intrigues and evils in the world.

From an accusation of masturbation by a prison warder, he developed the idea that the warder was the real offender, and left the results in his (the patient's) bed in order to substantiate the false charge. He then considered the warder to be the cause of the prominent auditory associated memories from which he suffered, and later on of nearly all the associated memories of whatever kind which arose into his consciousness. He finally developed the idea that this person, whom he eventually described by such titles as " the mystery," the " South American Board of Agriculture," the " German Inventor," the " man underneath," the " other man," the " other man's mind," &c., &c., was the one power of evil.

The case differs from paranoia in an important detail. *The patient was able at times to detach himself, so to speak, from the aberrant products of his disordered cerebral associative processes.* Thus he frequently, with *his own mind*, originated certain practical ideas—*e.g.* when using ointment for internal piles he invented a tube by means of which the ointment could be neatly applied to the affected region ; and he used to speak of " *telling the mystery* " about such inventions or suggestions in order that they might be put to some general use.

This case, therefore, illustrates how morbid psychic phenomena evolved in the regions of lower association may eventually by introspection result in widespread anomalies involving the whole of the mental functions.

It will be observed that both the cases which have been described suggest

a simple and by no means improbable explanation of such phenomena as alternating, double, or multiple consciousness.

Though many similar cases might be adduced, the above are sufficient to illustrate how local lesions of the regions of lower association may eventually, by the persistent influence of the psychic phenomena they excite, result in unharmonious interaction of these regions, and even in a general involvement of the whole of the cortical regions of association. In my experience, a greater degree of dementia develops in cases of this kind than is found in the primarily non-hallucinatory types of paranoia which were described under " Amentia " in Chapter XII, Group V, p. 207.

It is probable, therefore, that persistent hallucinatory phenomena, when of such abnormal vividness as to acquire a more or less marked degree of objective reality, and therefore to be projected externally by the patient, are indicative of neuronic dissolution in the particular regions of lower association which serve as their physical basis.

I would, therefore, draw attention to the difference which exists between the types of cases under consideration and cases of pure paranoia.

In the latter the region of higher association is the cortical area primarily at fault in that it is unable to exercise its normal functions of co-ordination and of corrective and selective control of the regions of lower association.

In the former various local disabilities exist in one or more of the regions of lower association, and these lead either to unharmonious action of these regions in relation to one another or to more generally aberrant associative processes involving also the region of higher association.

In these cases, considerable neuronic dissolution and dementia frequently occur; in those, relatively little cerebral disintegration may ensue even in cases of long duration.

SEQUELÆ OF MENTAL CONFUSION

As has already been stated, the sequelæ of mental confusion are recovery, a stationary condition of dementia, and dementia which more or less rapidly progresses till death ensues.

In any individual case the particular sequela depends on the cause and the severity of the pathological process of which mental confusion is the psychic expression.

Recovery.—It is doubtful whether any attack of insanity associated with, at any rate, moderate mental confusion ever leaves the patient in exactly his previous mental condition—*i.e.* in the possession of an entirely intact cerebrum. A study of the after-history of cases dis-

charged "recovered," in fact, only too frequently demonstrates that a certain degree of feeble-mindedness has ensued, although for practical purposes the patient is again "sane."

This is particularly the case when patients who possess neurones of deficient durability have broken down, usually at one of the "critical" periods of life, under the influence of such a degree of mental or physical "stress" as would have produced no ill effects on normal cortical neurones.

In cases of mental confusion which have been induced by the direct action of toxines, recovery is more often relatively complete. In such patients the pathological process in the cerebrum is more general and the confusion is more profound than occur in the former types.

It is usual, therefore, to find that either practically no dementia, or else a very appreciable degree of dementia, is the sequela when the acute neuronic changes have subsided.

In cases of this kind recovery, if it occurs at all, is, as a rule, not delayed longer than a few weeks or months. From the pathological aspect, the subsidence of the acute neuronic changes in the cortex probably resembles that, which ensues in "peripheral neuritis" without destruction of nerve-fibres, in other parts of the nervous system.

Occasionally, however, recovery occurs after one or two years in cases which appeared to be hopeless, and therefore, especially in mental confusion following alcoholic excess, experience suggests a guarded prognosis. It is probable that such cases are analogous to severe examples of "peripheral neuritis," in which actual destruction of nerve-fibres has occurred, and which only recover after these have had time to undergo regeneration. In cases of this kind it is at least conceivable that relatively little actual destruction of cortical nerve-cells has occurred, but that severe though more or less reparable damage, which is only recovered from after a considerable period of time, has been done to their fibrillar ramifications. This is at any rate a preferable hypothesis to the alternate one, namely, that "spare" neurones exist in sufficient quantity to take on the functions of those destroyed, for in this case the mental functions would be re-established on a neuronic basis which would be to a large extent a *tabula rasa* as regards associated memories, and also recovery from prolonged mental confusion would be much more common than it is.

A Stationary Condition of Dementia.—This is the common sequela in a large proportion of the cases which are precipitated by the causes referred to under the last heading.

The usual condition of the patients is one of moderate dementia, and this is perhaps largely due to the frequency with which patients suffering from the milder grades of dementia are eventually discharged

" recovered " or to the care of their friends. A difference is often noticeable between the mental condition of the patients who have developed dementia as the result of the direct action of toxines and that of the remainder.

It is frequently observable that the former cases exhibit a greater degree of dullness, apathy, and lack of initiative than the latter, though they are often very useful mechanical workers. This difference is, however, not so common as to merit description as a constant distinction between the types. It is probably due to the more general involvement of the neurones of the cortex which occurs under the influence of toxines, and to the consequent greater dissemination of the neuronic destruction. It may be added that patients suffering from a stationary condition of dementia, however this has been induced, are, in comparison with any of the types of high-grade amentia, especially prone under the necessary causative agents—the chief of which is senile or presenile degeneration of the cerebral vessels—to develop progressive dementia.

The commoner *symptoms* of stationary dementia which occur in all cases, however induced, will now be briefly detailed. These are—general dullness and apathy, a loss of initiative, and an indifference to their surroundings : a marked degree of stereotypism of all the mental processes, and an inability to learn new acquirements : a mechanical method of performance of known acquirements, a general stupidity and inability to understand when an attempt is made at correction of any kind, and a tendency to revert to accustomed modes of speech and action : finally, there is a tendency to the repetition of accustomed actions which often shows that these have been performed in the entire absence of intelligent volition. As an example of the last may be mentioned an action of a certain patient who had been accustomed in her previous asylum to go for coals every day. On the morning after her admission she was discovered standing patiently at the door of the ward with a slop-pail in her hand. She could not give any explanation of this, but it was obvious that she had picked up the nearest thing to a coal-pail that happened to be available, and had gone and stood at a door which more or less corresponded with that through which she was accustomed to pass on the way to the coal-house.

Progressive Dementia.—In very many cases of mental confusion this symptom-complex is the indication of a more or less rapidly progressive process of cerebral disintegration and mental dissolution.

The causes of such progressive dementias are cited on pp. 226–227, and need not here be further referred to. It is, however, desirable again to draw attention to certain details of symptomatology that distinguish such cases from examples of simple mental confusion which are presumably capable of recovery. These have already been referred

to, as occasion served, in the remarks on Cases 3, 12, 14, and 15, &c., but many of them are exceptionally well exhibited in the example now to be described.

The following case, in fact, illustrates, better than would any general description, the chief differences which exist between simple and presumably recoverable mental confusion and the mental confusion of progressive dementia.

The chief of these are as follows: The patient does not know the time of year; she gives her first married name instead of her present one; she states that she is "getting on for forty," whereas she is seventy-five; she confabulates readily, but the psychic phenomena evolved are on the whole impossible, and are largely based on groups of memorial units dealing with her early life; she has well-marked illusions of identity, but she continually makes use of the same name, "P——r," in her identifications.

In all these points the case differs from one of presumably recoverable mental confusion, and shows evidence of the mental confusion of progressive dementia.

Case 21.—*Admitted September 22nd*, 1904 (Hellingly Asylum). Exciting cause, intemperance. Duration prior to admission said to be fourteen days.

Female, married, nurse, æt. 75. Admitted four days ago.

A wrinkled old woman, who says that her name is "Sarah C—x; a large family we are." This is her married name, and her maiden name was H—s. She then states that she married again, and that her present name is W—m. Isn't your name Mrs. B—d? "I am, sir, because I was a widow and married Mr. R. B—d." She recognises the nurse as "Mrs. W—m's daughter. Mrs. P—r it was once, I know. Wasn't your grandmother's name P—r?" She then tells me that the nurse is "Mrs. P—r's granddaughter, isn't it? I know the old lady, and I know your mother." She states that she has seen me before at Bishopstoke. She does not know whether my name is P—r or not. "I know Mr. P—r and Mrs. P—r, and thought you were Mr. P—r." She calls a patient named M— B—d "Mrs. T—r," and another named S— P—x "Mrs. P—r," and a nurse "Mrs. P—r's daughter." She thinks to-day is Sunday (Monday), and that the date is the 25th or 26th (26th). She replies that the month is "Not February, is it?" (September), and that the year is "I don't know whether it is 101 or 102" (1904). Age? "I'm getting on for forty. It's a nice little age, isn't it? I suppose *you're* beginning to shave it, aren't you?" Out to-day? "Yes, I've been out to see the cricket match to-day." She states that she saw her husband at Bishopstoke this morning. She brought her husband's breakfast home with her—bread, butter, and oysters. I tell her that I don't know a *soul* in Bishopstoke, and she remarks "A *soldier* there, are you?" She replies that she has children at home. The youngest is five or six, and she has twenty-five living, and thinks it likely that she will have another to make twenty-six. When asked where she is, she replies that it is "About one mile from Bishopstoke station here." When again asked the same question, she remarks "Very nice place. I like it very well. I should think it was a bonny place myself." I then ask her if she is a country-woman, and she

replies "Southampton woman." She answers questions quickly and apparently rationally, but as a whole does not volunteer much information about herself. She laughs and looks about slyly from face to face, as if she thinks that she is amusing. She has evidently lived a rather dissolute life, as she says, "I went to Bishopstoke this morning. I enjoyed myself, I can tell you. I always do when I go on the spree. I was along with your nephew last time I saw you, and with his father this morning." She is very erotic. When I touch her chin to get her to open her mouth, she tells me I am a rascal, and that "He thought he'd tickle me under the chin." She is wet and dirty in her habits, but is quiet and no trouble, and takes her food well.

This patient died two and a half months after admission in a condition of advanced dementia.

Examples of the more fulminating types of progressive cerebral dissolution, as in certain of the varieties of general paralysis (dementia paralytica), have already been given in Cases 14 and 15 (pp. 252–254); and the reader is referred to these, as they could not well be improved upon. In addition to showing certain of the characteristics presented by the above case, they also exhibit numerous phenomena of lower association which are still more markedly aberrant.

CHAPTER XIV

CLASSIFICATION OF CASES OF DEMENTIA

THE present and following chapters contain a general account of the subject of dementia under headings which will subsequently be detailed. The description is, as before, based on the clinical classification of 728 cases of mental disease referred to in Chapter XI, p. 166 ; and this series of cases is, I think, sufficiently large for the grosser purposes of illustration. I would, however, repeat that I am employing the series because it is fully representative of the total insane of a particular (largely rural) district at a particular time, and because all the cases were personally taken by myself on a definite and constant plan within the period of a few months. This series is thus merely illustrative, and is not in any sense either an indication of my general experience of the insane or the basis on which the generalisations contained in this volume are founded.

As has already been stated, under the term " dementia " are included all cases which agree, from the psychic aspect, in the possession of a decreased or decreasing mental capacity, and, from the physical, in the existence of a distinct and permanent loss of cortical substance in those regions of the cerebrum which especially serve as a physical basis for the performance of (voluntary) psychic processes. The term *dementia* is thus employed to connote in the widest sense *the mental condition of patients who suffer from a permanent psychic disability due to neuronic degeneration following insufficient durability.*

In previous chapters I have dealt at length with the symptomatology that is the psychic equivalent of those physical states of the cerebrum which are the necessary precursors of dissolution of the cerebral neurones. To describe this symptomatology I employed the term *mental confusion*, which, thus used, connotes in the broadest sense *the mental symptoms that occur in association with certain pathological states of the cortical neurones which may be followed by the recovery or by a more or less extensive dissolution of these elements.*

Of the three necessary sequelæ of mental confusion, namely *recovery*, *stationary dementia*, and *progressive dementia*, the latter two will now receive consideration ; and the description of the varieties of dementia which follows will be illustrated by examples derived from the 445 cases

of mental disease which have been classed under the heading of "dementia" as above defined.

For reasons that will appear during the description which follows, it has been found undesirable to classify the cases into groups of stationary and progressive dementias; and I have therefore based the classification on certain broad lines suggested by the general causes of mental confusion which have already been cited and discussed.

Three groups of dementias, namely, "primarily neuronic," "progressive and secondary," and "special," have in consequence been employed as a basis for the classification under which these types of case will be considered.

Under the first group are included all cases in which a more or less extensive dissolution of higher cortical neurones of deficient durability has occurred, either as the result of actual *wearing out* of these structures, or in consequence of *the application of one or more of the various forms of physical and mental "stress"* or of *the direct action of toxines.*

In the former case the process of neuronic dissolution is more or less slowly progressive and the degree of dementia gradually increases, whereas in the latter, after the acute pathological changes in the higher cortical neurones have subsided, the resulting dementia may be relatively or entirely stationary in degree until senile or presenile "wearing-out" of these structures ensues. It may be added that, in cases which have arrived at the individually necessary age, both factors may take part in the precipitation of involution of the higher neurones of the cortex.

The second group contains the cases which, owing to the coexistence of definite and irremovable extra-neuronic morbid states of the encephalon, necessarily progress more or less rapidly towards complete dissolution of the higher cortical neurones and gross dementia. In all these cases deficient nutrition of the cortical neurones, with consequent interference with their vitality and functional activity, results from *the indirect action of toxines;* and this, reacting on neurones of deficient durability—and especially when acute pathological changes have been precipitated in these by physical or mental "stress," alcoholic excess, and the like—results not infrequently in the development of the most fulminating forms of cerebral dissolution.

It is convenient for practical purposes, and owing to differences in etiology, to divide such cases into two classes.

In the one, the result is achieved by vascular and neuroglial (and chiefly secondary neuronic) changes, which follow prolonged action of the toxine, and which are probably largely of the nature of secondary proliferation after, and of reaction to, the injury produced by the toxine or by adverse influences occurring at any subsequent period of life. In

such cases the greater the capacity of the non-neuronic elements of the encephalon for reparative reaction, the more fulminating and extensive is the process of neuronic dissolution. The chief variety under this heading is the dementia paralytica (general paralysis), which is a frequent sequela of systemic syphilis in degenerates of any grade, but especially in those of the highest, and which rapidly or slowly passes on to a fatal issue.

In the other, gross dementia more or less rapidly develops, at the senile or the presenile period of life, in consequence of the onset of degeneration of the cerebral arteries, which similarly results in secondary toxic and nutritional affection of the cortical neurones. This morbid condition, when occurring in cerebra in which some degree of neuronic dissolution has already occurred at some former period of life, or in which deficient durability of the higher cortical neurones exists, causes the supervention of a more or less rapidly progressive dementia which only differs from dementia paralytica in the relative absence of active reparative reaction in the non-neuronic elements of the encephalon.

Finally, in the third group of cases are classed certain special varieties of dementia which, in cerebra possessing higher neurones of deficient durability, are precipitated or directly produced by sense-deprivation, epilepsy, or cerebral lesions. This group is necessarily of a provisional and residual nature ; and its subdivisions will be considered later under the appropriate headings.

Of the 728 chronic and recurrent cases of mental disease which I am employing for descriptive purposes, 283 have already been referred to under " Amentia " in Chapters XI and XII of this volume. The remaining 445 cases are now classified in the table which follows.

Such remarks as are needful in explanation of the various classes into which the three main groups have been divided will be inserted in the descriptions of the several classes.

DEMENTIA

	M.	F.	T.
I. Primarily Neuronic (age, stress, or both).			
(*a*) Senile or " worn-out " dementia.			
Higher grade amentia (without marked stigmata of degeneracy, and with original intelligence of average grade) :			
(1) Melancholia with dementia	12	8	20
(2) Mania with dementia	6	8	14
(3) Cases with previous attacks and now chronic dements	9	23	32
(4) Chronic insanity with dementia . . .	6	7	13
Carry forward .	33	46	79

	M.	F.	T
I. Primarily Neuronic— *Brought forward* .	33	46	79
High-grade amentia (with marked stigmata of degeneracy, and with original intelligence of below the average grade, but greater than in imbecility):			
(5) Recurrent insanity with dementia . .	4	12	16
(6) Chronic insanity with dementia . . .	16	12	28
(*b*) Presenile or "climacteric" dementia.			
(1) Melancholia with dementia	6	20	26
(2) Mania with dementia	7	12	19
(3) Chronic insanity with dementia . . .	1	11	12
(4) Simple dementia	4	4	8
(*c*) Mature or "adult" dementia (chiefly from intemperance, childbirth, &c.)	26	34	60
(*d*) Premature or "adolescent" dementia.			
(1) Without motor phenomena . . .	32	32	64
(2) Exhibiting motor phenomena . . .	23	18	41
(3) Delusional or paranoid	2	5	7
II. Progressive and Secondary.			
(*a*) Dementia senilis.[1]			
(1) Melancholia with dementia	3	2	5
(2) Mania with dementia	—	5	5
(3) Simple dementia	6	8	14
(*b*) Dementia paralytica (general paralysis).			
(1) Juvenile	1	—	1
(2) Ordinary	11	9	20
(3) Senile	2	—	2
III. Special Varieties of Dementia.			
(*a*) Dementia following sense-deprivation[2] . . .	6	4	10
(*b*) Dementia following epilepsy	12	8	20
(*c*) Dementia following cerebral lesions:			
(1) Cerebral syphilis	2	—	2
(2) Other lesions (gross)—			
(*A*) Old standing (embolism, &c.) . .	1	2	3
(*B*) From vascular degeneration . .	—	3	3
Total	198	247	445

I. PRIMARILY NEURONIC DEMENTIA

This group contains 360 cases in which an attack of mental disease, precipitated by one or more of the general causes above referred to, has resulted in a greater or lesser degree of cerebral dissolution and dementia.

[1] The systematised or semi-systematised delusional types with senile dementia come under subdivison I (a).

[2] A distinct class from amentia of deprivation.

The group of cases has been subdivided as follows :—

	M.	F.	T
(*a*) Senile or " worn-out " dementia	53	70	123
(*b*) Presenile or " climacteric " dementia	18	47	65
(*c*) Mature or " adult " dementia (dementia of maturity) .	26	34	60
(*d*) Premature or " adolescent " dementia	57	55	112
Total . . .	154	206	360

Though these terms almost explain themselves, a further word regarding them may perhaps be permitted.

The senile or " worn-out " class is a large one, containing as it does all types of case in which the involution of senility has commenced. As will be seen later, it contains numerous cases which earlier in their asylum residence would have been classed under " Amentia." The age at which senile involution commences varies within wide limits, depending as it does on the inherent vitality of the neurones of the particular brain. For instance, an example of low-grade amentia may develop prematurely senile involution of the cerebrum at the age of 40, and a sane and healthy individual may die at 80 or 90 of old age without its occurrence.

The presenile or " climacteric " class contains the cases who develop dementia when " past their best." Such cases are particularly common in the female sex, and their onset so often coincides with the climacteric that the term " climacteric insanity " is almost justifiable as a generic term for the whole class.

The mature or " adult " class contains the cases who break down at the period of full cerebral development and at the height of their physical and mental activity. Such cases are, as will be seen later, homologous with " text-book " examples of general paralysis, and would have been such if they had acquired syphilis. They usually require, for their evolution, factors additional to the mere " stress " of environment, such as intemperance, toxæmia following childbirth, &c.

The premature or " adolescent " class contains the very large group of cases whose cerebral neurones are of such insufficient durability that involution and dementia occur at or about the period when the brain is about to take on its adult functions. Such cases are relatively very numerous, they commonly possess a heredity of mental disease, and they exhibit mental and physical symptoms which are partly of developmental and partly of dissolutive origin. In their early evolution recovery with relapse is not uncommon ; and until mental confusion or actual dementia is found to be present, they may be regarded as examples of (recurrent) adolescent insanity. Such, when fully evolved, are often described as cases of " secondary dementia," in contradistinction to the

even larger number in this class who suffer from gradual mental deterioration and are often called examples of " primary dementia."

In these four classes the degree of mental enfeeblement in average cases is usually more marked in " premature " than in " mature," and in " mature " than in " presenile " dementia. Further, as a rule in premature and in mature dementia, and often for years in presenile dementia, the cases remain in a stationary condition of mental enfeeblement until senility occurs. Lastly, in cases of " senile " or " worn-out " dementia, the mental enfeeblement gradually becomes more and more marked, though in cases of the class under consideration it is not as a rule at the time of death more than mild or, at the most, moderate in degree.

In this respect both the stationary and the progressive cases in this group differ markedly from the cases—to be later described under the heading of " progressive and secondary dementia "—in which extensive cerebral dissolution and dementia ensue.

It is unnecessary to refer here to the cardinal symptoms of dementia, as these are well known and have already been briefly summarised.

It is, however, desirable again to remark on the difference which is often noticeable between the mental condition of the patients who have developed dementia as the result of the direct action of toxines (including those of certain specific diseases) and that of the other cases included in the present group. It is commonly observable that the former cases exhibit a greater degree of dullness, apathy, and lack of initiative than the latter, though they may be useful workers of a mechanical type. It is probable, as I have already remarked, that in such primarily toxic cases there is a more general involvement of the neurones of the cortex, and a resulting greater dissemination of the neuronic destruction, than occurs in cases in which the process of dissolution has been precipitated in deficiently durable higher neurones under the influence of " stress."

It may further be noted, as a supplement to the above observation, that of all the types of " primarily neuronic " dementia, the presenile and senile forms, when due to natural involution of the neurones of the cerebral cortex, are undoubtedly the mildest in spite of their inevitable progression on grade.

CLASS (A). Senile or "Worn Out" Dementia

	M.	F.	T.
Higher grade amentia (without marked stigmata of degeneracy and with original intelligence of average grade):			
(1) Melancholia with dementia	12	8	20
(2) Mania with dementia	6	8	14
(3) Cases with previous attacks and now chronic dements	9	23	32
(4) Chronic insanity with dementia	6	7	13
High-grade amentia (with marked stigmata of degeneracy, and with original intelligence of below the average grade but greater than in imbecility):			
(5) Recurrent insanity with dementia	4	12	16
(6) Chronic insanity with dementia	16	12	28
	53	70	123

This class includes 123 cases of various types, and, as a practical working basis, the above 6 sub-classes have been found more convenient than subdivisions based on purely symptomatological distinctions.

A large proportion of the included cases are old asylum inhabitants who have survived under asylum *régime* until, with the onset of senility, the cortical neurones have begun to undergo the normal process of involution. This has resulted in the development of dementia, or in an addition to a long-standing grade of stationary feeble-mindedness.

In the remaining cases—many of whom had earlier in life suffered and recovered from one or more attacks of insanity—the onset of senile involution of the cortical neurones resulted in their admission to and permanent residence in an asylum.

A comparison of the average age of the patients in these sub-classes, and of the average duration of their insanity, reveals certain interesting details.

Sub-class (1), "melancholia with dementia," occupies the most favourable position in the series, with an average present age of 70 years and an average period of residence of 6 years.

Sub-classes (4) and (2), "chronic insanity with dementia" and "mania with dementia," come next in order with, curiously enough, a common average present age of 66 years, and an average period of residence of 14 and 16 years respectively.

Sub-class (3), "recurrent insanity with dementia," has an average present age of 65 years, and an average present residence of 7 years, and an average period between the first onset of insanity and the present age of 23 years.

Sub-class (5), "high-grade amentia with previous attacks and dementia," has also an average present age of 65 years, an average present

residence of 29 years, and an average period, between the first onset of insanity and the present age, of 36 years.

Finally, sub-class (6), "high-grade amentia with dementia," has an average present age of 61 years, which is lower than in any of the other sub-classes—probably in consequence of an earlier onset of senile involution of the cortical neurones in association with the greater degree of degeneracy—and an average period of residence of 26 years.

Whilst such necessarily rough data do not justify definite deductions, they are sufficiently suggestive to merit attention. A detail which is especially worthy of note is the increasing grade of degeneracy which occurs in the several sub-classes when in the above order, since this is precisely what would be expected on purely *a priori* considerations.

In nearly all the cases the grade of dementia is mild or moderate only, and the progress of the neuronic involution is slow and in many instances imperceptible. There is, therefore, as would be expected from a consideration of the previous chapter which deals with "mental confusion," a relative absence of this symptom-complex and a prominence of the cardinal symptoms of dementia.

Such cases, in fact, find their sane homologues in ordinary examples of normal healthy senility, and bear to the latter the same relationship as that which has already been shown to exist between the several varieties of low- and high-grade amentia and their sane prototypes in the outside world (see Chapters XI and XII).

This group therefore merits, and will be found to receive, more lengthy consideration and illustration than that accorded to the remaining varieties of primarily neuronic dementia.

Sub-class (1).—Higher-grade Amentia. Melancholia with Senile Dementia

This sub-class contains 20 cases, of whom 12 are males and 8 are females.

All are cases which were originally possessed of average intelligence, and which at present are examples of senile melancholia with dementia, this latter symptom being mild in degree in 16 cases and moderate in 4. In some cases the melancholia is simple, and in others it is associated with hypochondriasis.

The average age of the patients, 70 years, is higher than in any of the sub-classes of the present group of cases of primarily neuronic dementia.

With the exception of 2 cases, who respectively suffered from periodic melancholia from the age of 28 for 35 years and from the age of 32 for 26 years, and then began to develop senile involution and dementia,

this condition set in between the ages of 56 and 81 years, and at the time of observation had lasted from one to 19 years (average 6 years).

Of the 20 cases 11 were workers (5 good, 1 ordinary, and 5 poor), and 9 were incapable of work.

In the capability for useful work and the relatively small amount of dementia which is present, in spite of the advanced age of the patients, such cases present a marked contrast to the examples of senile progressive dementia which will be considered later.

Two illustrative examples of the contents of this sub-class will now be cited :—

Senile Melancholia (Hypochondriasis), with Moderate Dementia ; æt. 83 ; insane fourteen years

Case 329.—S—— S——, male, single, labourer, æt. 83. Certified since the age of 72, and previously, without real recovery ; insane since the age of 69.

A lost-looking old man, with bleary eyes. The hair has been nearly all rubbed off from the front part of his head. He gives his name, and states that his age is 60. Asked where he is, he says that he is " this side H——, that's all I know." He came " two days ago about " (four) from H——. When asked how long he was in that asylum, he very irritably replies, " Don't know, I can't tell you." He informs me that " a lot of shot has got into my head some way, I can't say how. It goes in at the crown of my head and comes out at my inside. Whores do it somehow." He tells me that rubbing his head eases the " rattle " in it. He has several sores on his legs, and he tells me that there is glass in them. He suffers from chronic conjunctivitis, and he states that " a lot of rotten pins comes out of 'em." He finally informs me that his head does all the rattling which is heard in the wires in the asylum.

He is clean in his habits, and dresses himself. He is very surly and irritable, and is unable to occupy himself owing to his age and infirmities.

Senile Melancholia, with Mild Dementia ; æt. 78 ; insane one year

Case 332.—T—— B——, male, single, farm labourer, æt. 78. Certified one year. Family very eccentric.

A shaky and dull-looking old man, with staring eyes and a very wrinkled face. He gives his name, and his age as 78 " just before next month's out." He knows the day and the date in full. When asked when he came here, he mistakes the question for when he went to his first asylum, and replies, " First come, I don't know justly, but end of January " (approximately correct). He came " down here Tuesday, I think " (Monday) from " H—— I think " (correct). He does not know what is wrong with him, but he " can't get praying or finding the right way of dying." " I often thinks I will drop dead, the influence of another world is so strong in my soul." " I often thinks I would rather have some stuff and go to sleep than worry so

much about it, owing to the influence and impossibility of getting the right way to get saved." He would like "to get a pious man who's gone through distress to pray with me." Patient does not suffer from hallucinations.

He is unemployed both from inability and unwillingness. He is at times garrulous, but as a rule is quiet and well behaved. At times he becomes fiendishly and desperately excited, noisy, violent, and destructive, and shows a strength remarkable for his age.

Sub-class (2).—Higher-grade Amentia. Mania with Senile Dementia

This sub-class contains 14 cases, of whom 6 are males and 8 are females.

All the patients, so far as can be ascertained, were originally possessed of average intelligence, and at the present time are examples of chronic mania with senile dementia, which latter is mild in degree in 10 cases and moderate in 4.

The average present age of the patients in this sub-class is 66 years.

Contrary to what occurred in the sub-class which has just been considered, where with two exceptions the age of onset was 56 years and upwards, in the present sub-class 9 of the 14 cases became insane between the ages of 26 and 54 years, and only 5 after the age of 56.

The duration of the attack varied from 3 to 36 years, the average being 16 years.

Of the 14 cases 8 were workers (3 good, 1 ordinary, and 4 poor), and 6 were unable to work.

The present sub-class therefore, taken as a whole, consists of patients who, apart from the incidence of senile involution of the cortical neurones and consequent slowly developing feeble-mindedness, might have been classed under the second group of cases of amentia ("Excited and Moral") in Chapter XII, Group I.

Several reasons may be given for the great difference which exists between the present and the preceding sub-class.

Excited cases are naturally, as a rule, certified early owing to the trouble they cause to their friends. Depressed cases, on the other hand, may either (and judging from newspaper reports probably often do) commit suicide at home, or, if of mild type, may be looked after for lengthy periods by their friends. Further, such cases are likely, owing to their general habits, to die under asylum *régime* of tuberculosis, &c., before arriving at an advanced age. Finally, large numbers of cases of hypochondriasis, even when advanced, frequent the out-patient departments of hospitals and dispensaries, and are often never certified at all.

The following two cases are inserted as illustrative examples of the contents of the present sub-class :—

Chronic Mania, with Mild Senile Dementia; æt. 62; certified nine years

Case 356.—E—— B——, female, married, housewife, æt. 62. Certified since the age of 53.

An excited and garrulous old woman. She at once asks me if I know who she is, and says "Countess of England, Samson the Great, the old King's grandfather; the marks on me correspond with my leaflets." She tells me that this place is worse than the last. "You help to do it all, and then pretend to cure 'em afterwards." "Why didn't they burn me with my royal uncle? They don't know who I am, and have sent me here. I didn't know the Isle of Wight belonged to my family. King's doctor and vaccination on the right shoulder and royalty on the left arm." (She has a small sebaceous cyst on the right clavicle which is "royal vaccination," and a scar on the left arm "from a silver knife.") She says that this asylum is a new part added to the Bluecoat School, when asked where she is. She knows the day (Sunday), and when she came; and then remarks that she is a Jewess, and that Saturday is the Jew's Sunday. She continues to the effect that the King gave her beauty spots on both eyes, and they have turned to cataracts (early cataract exists in each eye). She knows where she has come from, and says she was there four or five years, and was previously for twenty-eight years a married lady at N——. Age? "If you can trace to the distressing Egyptian war in Palestine I was born then, called 'Old Christmas-Day.'" She was born in 1874 and has four royal names, of which three are Grace Darling, Martin Gould, and Ethel Darling. Her mother was Lady C——, and her father Lord A——, and the Prince of Wales is her royal cousin.

Whilst under observation she continued to be garrulous and abusive, but, in spite of this, she was nearly always amusing in conversation and was a favourite. At times she was spiteful and even violent. She frequently accused different people of impersonation. She thought I was a woman and said she had seen me disguised in feminine clothing. She told me to change clothes with a nurse, as I must be petticoated owing to my previous filthy behaviour. She used to blame me for her lameness, telling me to "put your foot round my leg again as I have been tortured for years." She heard "all the voices in the pavilion, a cabinet of curiosities. They are quite under your bed and quite distinct." She constantly talked irrationally and in a persecutory vein, *e.g.* about women giving birth to lions; about chairs moving and fire flashing under her at night; about being robbed of her life as Queen of Scots and locked in here; and about the Bluecoat School, when it was pulled down, being found to be built on purgatory, &c.

She washed her head every morning and was fairly tidy. She made several beds each day, cleaned brasses, and took blind patients to the lavatory; and she paid especial attention to a certain feeble old woman. Though variable in temper, and apparently enjoying "speaking her mind" in the form of violent and even indecent and foul abuse, she was on the whole good-natured, and she was very good to those more feeble than herself.

Chronic Mania, with Mild Senile Dementia; æt. 79; certified twenty-two years

Case 359.—L—— B——, female, married, housewife, æt. 79. Certified the age of 57.

A pleasant-looking old maniac, who talks most rapidly, and, as a rule,

entirely incoherently. Her husband is Crown Commander under the King. She was brought up under Lord A——. She caught people stealing waggons belonging to him. A trial came on, and they said she was a gay lady, and sent her to the asylum. General P—— was her grandfather. Her age is "over 70 a good way." She knows where she is, when she came, the day, and the date correctly to a day or two, but "never sees an almanac." She was "forged in here from E——, and my lord begged for protection for his just servants, and so Dr. W—— protected me." She was twenty-three years at her previous asylum. Whilst there she used to do folding, &c., in the laundry, and M—— J—— was very kind to her, and shook hands when she came away.

During the time she was under observation the patient worked in the laundry at sorting, and, though slow, was useful. She was very irritable and excitable, and at times extremely garrulous. Whenever I spoke to her she became violently excited, shouted "Murder," &c., and ran to the window and called loudly for the police. She seemed to think I had unlawful intentions towards her, and if I did not go away she became almost frantic.

Sub-class (3).—Higher-grade Amentia. Cases with Previous Attacks and now Chronic Senile Dements

This sub-class contains 32 cases, of whom 9 are males and 23 are females. Each case has been considered individually, and has been inserted on its merits as an example of senile involution of the cortical neurones in a patient of intelligence which was originally of average degree.

The average present age of the cases is 65 years, and the list includes 4 cases of premature senility,[1] in which the first attack of insanity occurred at the respective ages of 16, 21, 24, and 32, and the present ages are 50, 51, 48, and 51 years respectively. The oldest patient is 84 years of age, and in her present attack has been certified 28 years.

The duration of the present and final attack of mental disease varies from 1 to 38 years (average 7 years). The age of onset of the first attack of certified insanity varies from 16 to 59 years. In cases with two attacks only, the longest interval between these is 35 years, and the shortest is 1 year. The longest interval of time between the date of the first certification and the present age is 56 years, and the shortest is 3 years (average 23 years).

A number of the patients suffered from several attacks of insanity, and these cases as a whole were permanently detained at an earlier age than were the remainder.

The above figures, though valueless for statistical purposes, demonstrate that the present sub-class contains all types of relapsing case. (Chapter XII, Group II.)

The clinical features thus necessarily vary considerably in the different

[1] *i.e.* senility occurring earlier in life than usual; a different condition from "presenility," which is a normal state in all individuals.

cases, but the one common characteristic of the sub-class is the incidence of senile involution of the cortical neurones, with resulting dementia, in cases of relapsing insanity.

Of the 32 cases, 15 were workers (6 good, 6 ordinary, and 3 poor); 3 refused to work; and 14 were unable to work, owing in the majority of instances to advanced age and feebleness.

The present sub-class, therefore, for the age of the patients, contains a high proportion of workers.

The following two cases are inserted as illustrative examples :—

Mild Senile Dementia; æt. 65; certified one year; first insane thirty-six years ago

Case 285.—G—— P——, male, widower, gardener, æt. 65. Certified one year on admission, and previously insane at the age of 29.

A rather depressed-looking old man with a constant frown. Eyes close together, face long, forehead low.

He gives his name, and, to a question concerning his age, replies, "I couldn't tell you, to be sure, sir. It's between 60 and 70." Asked where he is, he replies, "I don't know where I are sometimes. I can't make out what they want to bring me here to a place like this, I don't want to hurt anybody." He knows where he has come from, but, on being asked when he came, replies, "It doesn't seem long I've been here. Oh, Saturday it was, Saturday" (correct). What is the day to-day? "Wednesday" (correct). Date? "8th or 9th of September—9*th* I heard somebody say." Year? "100—no, surely, 1000—1902 or ——3 ——3, surely, ——3. It must be ——3, sure" (correct). Was at the previous asylum "not more than 12 months; less, I think. I seem to forget the time, you know, sir." He used to "hear things and see things and think about things at night," but does not see why he should have been taken away, as he never harmed anybody. He feels rather miserable, and at times for some days as if he could *not* work. "I sinned so that I felt I must give up. I seemed overburdened on my mind." Why? "Well, I couldn't tell you," and sighs deeply, adding, "This is a funny world to live in and no mistake."

Patient for some time after his admission was unemployed, but later on he at times did a little useful ward work.

Well-marked Senile Dementia ("Second Childhood"); æt. 66; certified one year; almost continously insane for forty-one years

Case 308.—E—— M——, female, widow, no occupation, æt. 66. Certified since the age of 65. First insane at the age of 25, and "off and on" ever since.

A dull-looking old woman, with many fine horizontal wrinkles on her forehead. Right pupil 2 mm., left pupil 3 mm. React somewhat to both light and accommodation. Ears enormous. Palate flat, and possesses a deep chink along the medium raphé. Right knee-jerk +, left knee-jerk dull. Heart dilated and somewhat hypertrophied. No skin-cracks on abdomen. Vessels extremely calcareous and tortuous.

Patient at once remarks, "I want taking home and putting in a box

like I came here in, a letter-box with the lid pushed down. I think I broke my nose with trying to push the lid." She then sobs and says, "A baby in a cradle, and I couldn't rock him any more." She gradually becomes excitable and her eyes suffuse. "The one that licked me in a box is not the first mother I did see." When asked where she is, she looks up at me and says, "Dada, you knows where I am." She gives her name as N—— O——, and later as P—— M——, neither of these in any way resembling her present name. Married? "Don't know whether I am or not; to my doll I think I am." She replies that she is 100 years old. Asked whether she knows anyone here, she says, "A milkman when he comes with the milk. He puts a little in the bottom of a can and I drink it, and my throat feels *so* nice. But they won't have me anywhere. I can't sit on my bottom, it burns and is so sore, and I can't sit anyway else." "I wish I was at my own home with my fader and mother and baby in a cradle." "They tried to get my head into fader's Wellington boot one night. It *did* hurt." During physical examination she remarks, "I don't shave myself down there" (pubes) "like fader does his face."

During the time the patient was under observation she continued unchanged; she could do very little for herself, and she was unable to do work of any kind.

Note.—This case is an almost unique example of "second childhood." The patient had obviously possessed considerable intelligence, as she is a widow. She is now mentally a child; and the process of involution must have been very slow and complicated in order to result in such an exact reproduction of a long anterior state.

Sub-class (4).—Higher-grade Amentia. Chronic Insanity with Senile Dementia

This sub-class contains 13 cases, of whom 6 are males and 7 are females.

The cases are examples of senile involution of the cortical neurones in patients who were originally possessed of average intelligence. The clinical symptom-complex exhibited is mild or moderate dementia, with or without delusions, which when present are only semi-systematised. It is therefore evident that in such latter cases the regions concerned with lower association are involved in the process of involution. In some cases this has occurred *pari passu* with the incidence of senile dementia, and in others these regions of the cortex cerebri may have been subjected to pathological changes earlier in the course of the attack of insanity.

The average age of the cases is 66 years, and the duration of asylum treatment varies from 3 to 39 years (average 14 years).

Of the 13 cases, 5 were workers (1 good, 2 ordinary, and 2 poor), 4 refused to work, and 4 were unable to work. The proportion of potential workers is, therefore, very high.

The following case is inserted for the purposes of illustration.

Senile Delusional Insanity, with Mild Dementia; æt. 71; certified six years

Case 323.—E—— D——, female, married, housewife, æt. 71 years. Certified since the age of 65.

A pleasant-looking old woman, who smiles happily and tells me that her name is "E—— D——, Lady Heiress." Her age is 50 years. She is "in premises of my own, and my son is superintendent of its being built." She gives the names of several large neighbouring towns in which she states that she possesses property. She informs me that her husband "is living with Mrs. S——, and ought to be with his lawful wife." She thinks that "Mr. P—— has caused all this set out." She objects to any more questions as "you are here with your lady wife" (evidently the nurse) "to attend to the place. I have doctors and others in my hospital at H—— also." In spite of this, however, she calls me "sir." She has only been in this place a few days (three days), as she hires people "to attend to these places." "I have had such a lot of worry through my husband's going on with Mrs. S——, and also P——. . . . I hear my sons calling out and crying how he ill-uses them and murders them, and I am very wild of how insulted I and all are by this man. He has done this for years. I blame my sons for putting up with it. He has been very rude to me in his low talk. Sometimes I have sent a word or two down to let him know I hear what he is saying." She thinks the sounds "come from below, but it depends on where they are, on roofs and all sorts of places. The nurses think they are mistress here instead of me." She hears the voices night and day, and all over *where she is*. She identifies the voices with me, and insists that I am a humbug when I cannot hear, or say that I cannot hear, them too. She refuses to reply to ordinary questions on the ground that, being her paid servant, I am taking a liberty in asking them.

Whilst under observation she continued mentally unchanged, and she persistently refused to do any work on the ground that she paid for it to be done for her.

Sub-class (5).—High-grade Amentia. Recurrent Insanity, with Senile Dementia

This sub-class contains 16 cases, of whom 4 are males and 12 are females.

These cases are the homologues of those included in Sub-class (3), all the patients being examples of recurrent insanity. The contents of the present sub-class, however, consist of distinct degenerates who suffer from a degree of original mental deficiency (high-grade amentia) which is less marked than that in imbecility, whilst in Sub-class (3) are included cases of recurrent insanity which were originally possessed of average intelligence (higher-grade amentia).

The average age of the cases in the present sub-class is 65 years, which is identical with that in Sub-class (3).

Eleven of the cases were first certified between the ages of 19 and

38 years. The average interval between the first and last certified attacks is 7 years (5 to 13), and the average length of residence in asylums during the present and final certified attack is 29 years (21 to 41).

Of the remaining 5, 1 case had suffered from relapses all her life, and was first certified at the age of 60 years; and the other 4 had each several relapses during an average interval, between the first attack and the present age, of 40 years, and an average present residence in asylums of 13 years.

The average period, in the cases in this sub-class, between the first attack and the present age, is 36 years.

The cases all suffer from commencing or progressing senile involution of the cortical neurones. The individual symptomatology is various, but original feeble-mindedness combined with dementia of a mild or moderate grade is a common feature to all.

Of the 16 cases, 6 were workers (5 good and 1 ordinary), 1 refused to work, and 9 were incapable of useful work.

The following two cases are inserted as illustrative examples of this sub-class :—

High-grade Amentia. Mild Senile Dementia; æt. 65; certified nine years; ten previous attacks

Case 365.—T—— M——, male, farm labourer, æt. 65. Certified since the age of 56. First attack at the age of 24, and the present is the eleventh; sister insane.

Head low and broad. Eyes close together. Ears prominent and with adherent lobules. Palate extremely high, and very narrow and deep in front.

A dull and rather depressed-looking old man. He gives his name, and is "turned 60." He knows the day and the exact date, but not the year. He knows when he came, and what asylum he has come from. He was there this time for about eight years, and had previously been confined there about eight times. He worked on the farm, and received 2 oz. of tobacco a week for his services.

He is simple-minded and childish, but a very decent old man. He is comfortable and contented, but says that he would have liked to have got out of the asylum again. He is a very willing and useful worker.

High-grade Amentia. Mild Senile Dementia; æt. 59; certified seventeen years; several previous attacks

Case 368.—E—— F——, female, married, laundress, aged 59; certified since the age of 42, and first insane at the age of 27. She was several times insane between these attacks.

A pleasant-looking, garrulous woman, with a very high palate, a lisp, and a meek and almost pathetic expression. She at once rapidly informs me that the wicked people at her previous asylum hit her on her poor face and hurt her, and becomes lachrymose. She knows the day when she

came here, and where she came from. She can tell me the month, but neither the date nor the present year. She "could not say the year, as I am only a patient, and I like my medical doctors to know best." She talks rapidly, and in a very childish manner. Her age is "about 55 last January." She remembers her first incarceration in an asylum, and says that she was there two years. She went shortly after her youngest child was born, "a dear little son, who died at the age of 5½ months."

She hears "those that are not believers in God" at night, and tells them not to talk to her. She says that she has repeatedly reported to her "medical doctors" that she has "not even seen those wicked people." She is sure that it is really people who are speaking, and she frequently asks them to "please use better language." They are invariably women who speak. She tends to repeat her stories, &c., over and over again, and especially to refer to her "dear little son, aged 5½ months."

Whilst under observation she was clean and neat, and a hard worker in the ironing-room of the officers' laundry. She was willing and obliging, and her bird-like chatter was, within limits, pleasant to listen to. She was intensely religious in a child-like manner, and was exceedingly devout.

Sub-class (6).—High-grade Amentia. Chronic Insanity, with Senile Dementia

This sub-class contains 28 cases, of whom 16 are males and 12 are females.

These cases are examples of senile involution of the cortical neurones in high-grade aments possessing marked stigmata of degeneracy and an original degree of intelligence which was below the average, though above that of imbecility.

Patients of this kind are naturally difficult to classify, as in some examples it is not easy to distinguish between congenital and acquired feeble-mindedness, and in others the result of senile involution of the cortical neurones is liable to be confounded with dementia which had occurred earlier in life and is now stationary. Each case has, however, been classified after individual study, and I am therefore of opinion that I have arrived at a result which for practical purposes is satisfactory.

The average age of the cases is 61 years, which is lower than that in any of the previous sub-classes. Three of the cases are between 47 and 49 years of age, 11 are between 50 and 60, 10 are between 60 and 70, and the remaining 4 are between 72 and 94. Several of the patients, therefore, as is fairly common in the case of more or less pronounced degenerates, are suffering from premature senility.

The age of certification is very variable, ranging from 16, the patient now being 50 years of age, to 76, the patient now being 94.

The average duration of residence in an asylum is 26 years, but the individual duration is very variable. Two patients who had been feeble-minded all their lives had only been certified 2 and 4 years respectively, and 3 other cases had been certified 41, 43, and 44 years respectively.

Both the age of certification and the duration of residence in asylums are, in fact, of relatively little importance in cases of this kind, depending as they do on the home environment of, and the degree of trouble caused by, the individual patients.

The degree of dementia is on the whole of a mild or moderate grade.

Of the 28 cases, 12 were workers (8 good, 1 ordinary, and 3 poor), 2 refused to work, and 14 were incapable of work.

The following two cases are inserted for purposes of illustration :—

High-grade Amentia. Mild Senile Dementia ; æt. 94 ; certified seventeen years

Case 385.—J—— R——, male, widower, hawker, æt. 94. Certified since the age of 77.

An excited, garrulous, and violent old man. Many fine transverse wrinkles on forehead. Huge ears without lobules. Palate high. Genital organs undeveloped. When asked his age he shouts, "J for John R. Pollard." When I question the accuracy of the name, he yells out that he would like to know whether I "think I'm going to tell you a d—d lie, because my father was named Pollard and my mother was ————" (a lot of foul names). Age ? "Six hundred years old and seven or eight days," and shrieks this over and over again, and each time louder than the last, and tells me to put it down right. He is "the cousin to the Almighty Power of God." He becomes violently excited when I ask him what he says, and he howls his remark over and over again, and says, "You're a b——r" (&c., &c.), "and won't hear because I have been a hard-working man all my life. You want to get at me." He uses most foul language. and has a habit of repeating what he says three or four times or more, each repetition being more loudly and more viciously spoken than the previous one. At times he becomes nearly black in the face owing to his vocal exertions. On being asked where he is, he says, "Some d—d old 'sylum, I expect." He has heard of the name of the asylum from which he has come, and he went there "about corn for people that sow on the land."

He is a most irascible old man, and is remarkably strong and wiry considering his advanced age. He is both unable and unwilling to work.

High-grade Amentia. Mild Senile Dementia ; æt. 59 years ; certified thirty-one years

Case 398.—M—— V——, female, single gentlewoman, æt. 59 years. Certified since the age of 28, and showed symptoms from the age of 25.

A marked degenerate, with a narrow head. Eyes close together. She smiles in a childish manner, and tells me that her name is M—— D——. She denies the name of V——. Her age is 27, and she is unmarried. She knows correctly where she has come from, when she came, where she is, the day, and the month. She knows the date within a week, and the year within five years. She says she has been in an asylum fourteen years (thirty-one), and that that place is "quite eighty miles away from here" (nearly correct). Whilst at her previous asylum she tells me that she made all the beds and spread the table-cloths, and helped to get the dinner things. She was

there " so many years that it turned out very expensive." She says that she had a " good bit of money left her—thousands—£500,000—but it has been spent at random by her brother. She laughs in a childish manner as she gives me this information. She tells me that she was " two or three and twenty " when she went to her last asylum, that she is now " twenty-six or seven," and that she was there " twelve or fourteen years." When I point out the discrepancy, she laughs and remarks : " We have to make it fit somehow, don't we ? " She says that she was quiet and well-behaved in her previous asylum, " but they didn't altogether consider me so." She also states that she has " a sister and a brother or so " in that asylum (untrue), and adds, " for all that were at home." She writes her name " M—— D—— " in an educated manner.

Whilst under observation she persistently refused to work, and she was often noisy and garrulous, and also at times impulsive and spiteful.

CLASS (B).—Presenile or " Climacteric " Dementia

This class contains 65 cases of *presenile dementia—i.e.* of insanity ending in dementia, and occurring between the periods of maturity and of senility. Of the 728 cases of insanity under consideration, the present class, therefore, includes 9 per cent., and of the 445 cases of dementia 14·6 per cent. Though attention has already been drawn to the distinction which is necessarily made between " presenility," an age-period in all individuals, and " prematurely-induced senility," it is perhaps permissible to remark here that cases of the latter type have been included in the class of " senile or ' worn-out ' dementia," which was described and illustrated in the last section.

The present description is, therefore, concerned solely with such cases of dementia as occur at the presenile period of life and do not present indications of the premature onset of senility. These cases, at any rate when of the female sex, are, as a rule, referred to as " climacteric " ; and, as a considerable proportion of them exhibit some type of melancholia as the prominent symptom-complex, they are commonly referred to as examples of " climacteric melancholia."

Cases of " climacteric depression," it is true, were classed by Kraepelin as a special mental disease " melancholia " ; but of late his pupil Dreyfus has endeavoured, and successfully as regards Kraepelin, to show that such are all really non-dementable examples of the " maniacal-depressive " group of Kraepelin. Whether a case is mildly demented or not is, however, often a matter of opinion ; and, if the generalisation of amentia and dementia, which it is largely the purpose of this work to elaborate, is in its essentials true, such questions as the above are merely of academic symptomatological interest, and do not touch the root of the matter.

As a matter of practical classification, all the presenile cases which, owing to the occurrence of mild dementia, I exclude from one or other of the "excited and moral," "recurrent," and "paranoiac" groups of amentia, fall under the class of presenile dementia. Under the present class I have thus included not simply melancholias, but all the cases which I consider to be examples of involution of the cortical neurones at a date *prior* to the age-period at which this process may normally occur, but *after* these neurones have successfully resisted the maximum "stress" which necessarily accompanies their mature activity. In other words, in this class are included those examples of neuronic involution which occur at the period of life when the sufferer has "passed his best" and begun to go on the down-grade.

It is probable that in many patients of the female sex the grave metabolic disorders which occur at the "climacteric" may largely contribute to the onset of the process of neuronic involution. This is rendered the more likely owing to the occurrence in both sexes of similar metabolic disorders during puberty and adolescence, which at these periods undoubtedly influence profoundly—and in some instances directly precipitate—the development of premature involution of the cortical neurones. The generative organs, in fact, attain to functional activity later than the other organs of bodily function, and, at any rate in the female sex, normally retrogress earlier than these: and during their development and retrogression they induce general metabolic disorders, which necessarily often exert serious strain on such highly evolved and unstable elements as the neurones of the cerebral cortex.

Whilst it is not desirable to lay too great a stress on the *necessary* influence of retrogression of the generative system over the onset and course of presenile involution of the cerebrum, this factor is undoubtedly an important one in many cases, and probably more commonly exerts a causative or contributory influence than do any of the other varieties of "stress" to which post-mature cortical neurones are subjected.

From the general argument with reference to the physical basis and nature of amentia and dementia—so far as it has up to the present been elaborated—the reader will be prepared to find that many types of case are included in the class of presenile dementia. These types, however, readily fall, as a practical working basis, into the following four subclasses:—

	M.	F.	T.
(1) Presenile melancholia with dementia	6	20	26
(2) Presenile mania with dementia	7	12	19
(3) Presenile insanity with dementia	1	11	12
(4) Simple presenile dementia	4	4	8
Total	18	47	65

Of these sub-classes the first, that of "presenile melancholia with dementia," predominates, but not unduly when the numerous types of symptomatology which are associated with mental depression are taken into consideration. One far from rare type of case, for example, is that which I have elsewhere referred to as "dissolutive paranoia."

Though the number of cases (65 only) in this class is not large enough to justify elaborate statistical deductions, certain interesting details are readily elicited by an analysis of the data at my disposal; and these will now be briefly considered.

Age.—The average age, on the approximate date of onset of symptoms, in the 65 cases is 47 years, and it varies little either in the sexes or in the sub-classes into which the cases are divided. This is shown in the following table:—

	Average Age in Years.		
	M.	F.	T.
(1) Melancholia with dementia	47·0	47·5	47·5
(2) Mania with dementia	48·0	45·5	46·0
(3) Insanity with dementia	45·0	47·3	47·0
(4) Simple dementia	50·6	46·0	48·0
Average age of total cases . . .	48·0	46·8	47·0

It will thus be seen that, whilst employing a clinical basis for selection, I have included in the presenile class cases of a fairly corresponding age in both sexes, and have not, as is the common usage, taken an artificial male "climacteric" about ten years in advance of the female. I feel justified in this course, as I am not aware that the average duration of life in males is correspondingly longer than that in females, or that senility ensues in civilised races several years earlier in females than in males.

That females arrive at sexual maturity at an earlier age than males, and that the capability for procreation ceases in the former at a much earlier period of life than in the latter, do not appear to me to justify the assumption that the presenile and the senile periods of life differ markedly in the two sexes. I prefer rather to associate the greater frequency of female presenile (in the sense here understood) cases with the grave metabolic disorders which occur at the female "climacteric"; and hence I employ the term "presenile" (rather than "climacteric") to describe the cases here referred to.

The *average duration of residence* in an asylum does not differ markedly in the two sexes, being 5 years in the case of the males, and 6·5 years in the females. The common average duration of residence is 6·2 years; and the individual duration in the case of the males varies from 1 to 19 years, and in that of the females from 1 to 23 years.

Previous Attacks.—The percentage of cases with previous attacks

is 24·6, and these are distributed through the several sub-classes as follows :—

	Per Cent.
(1) Melancholia with dementia	34·6
(2) Mania with dementia	5·2
(3) Insanity with dementia	16·6
(4) Simple dementia	50·0

Without attaching undue importance to these figures, it seems permissible to suggest that the percentages perhaps represent to some extent the respective facility with which the friends of the different classes of patient would be able to obtain their discharge from the asylum. This seems probable, because in only six instances was the interval between the attacks sufficiently long (7, 9, 10, 20, 22, and 24 years) to be evidence of actual "recovery." In all the other cases the interval was 2 years or less.

Degree of Dementia.—The cases fall readily into two types, as regards the existing degree of dementia, about two-thirds of the patients suffering from mild and slowly-progressing dementia, and about one-third from a more marked but still only moderate grade.

When considered from the point of view of the incidence of dementia in the four sub-classes, the following interesting result is obtained :—

	Mild.	Mod.	Total.
(1) Melancholia with dementia	19	7	26
(2) Mania with dementia	14	5	19
(3) Insanity with dementia	9	3	12
(4) Simple dementia	2	6	8
Total	44	21	65

In other words, in the first three sub-classes three-quarters of the cases exhibit mild dementia only, whereas in the fourth sub-class three-quarters of the cases exhibit moderately severe dementia.

Considered as part of the general argument which has been developed throughout this part of the volume, this result is only to be expected, as the cases in the first three sub-classes should possess a distinctly greater degree of degeneracy and a relatively less proneness to the development of dementia than those in the fourth sub-class, in which obvious symptoms of "insanity" are replaced by those of "loss of mind." These last cases should, on the thesis already elaborated, have been precipitated by definite extraneous (primarily toxic) causes of undue severity, or should not have become insane at all. Such a cause is only too readily revealed by a study of the personal histories of the

cases included in the four sub-classes, for ascertained intemperance in alcohol existed to the following extent :—

	Per Cent.
(1) Melancholia with dementia	7·7
(2) Mania with dementia	10·5
(3) Insanity with dementia	16·6
(4) Simple dementia	37·5
Total	13·8

It is therefore likely that both the actual existence of the sub-class of "simple dementia," and the higher grade of dementia occurring in it, are associated with this high percentage of ascertained alcoholic excess in the included cases.

Capacity for Work.—The percentage of actual and potential (*i.e.* patients who refuse to work) workers agrees with what would be expected from the above remarks on the comparative grades of dementia in the different sub-classes. It is as follows :—

	Per Cent.
(1) Melancholia with dementia	73·0
(2) Mania with dementia	79·0
(3) Insanity with dementia	75·0
(4) Simple dementia	62·5
Total	74·0

Social State.—An estimate of the percentage of unmarried persons in the four sub-classes reveals the following interesting differences :—

	Unmarried. Per Cent.
(1) Melancholia with dementia	12·5
(2) Mania with dementia	30·0
(3) Insanity with dementia	63·6
(4) Simple dementia	42·8
Total	30·6

No explanation of these differences is attempted beyond the obvious one that the cases of melancholia were perhaps by normal temperament and general conduct more likely to obtain partners than were the members of the other three sub-classes.

Heredity of Insanity.—The percentage of ascertained heredity of insanity in the 65 cases is 33·8. It is distributed as follows in the four sub-classes :—

	Heredity of Insanity.
(1) Melancholia with dementia	42·6
(2) Mania with dementia	31·6
(3) Insanity with dementia	25·0
(4) Simple dementia	25·0

As in many of the 65 instances no family history was available, these figures hardly possess even a relative value. It may be here remarked that a history of heredity of *insanity* is always unsatisfactory, as family and social conditions so largely decide whether a person should be sent to an asylum or not. The equally and often most important evidence of *family or parental degeneracy* is frequently not available, and is usually not easy to obtain.

I have, however, thought it worth while to insert the above figures, although I am personally indisposed, except in the case of families which possess a number of well-marked examples of high- or low-grade amentia, to attach undue importance to an ascertained heredity of insanity.

I think it more probable that isolated cases of insanity arise from the intermarriage of ill-assorted couples and mild degenerates—and that the severer grades of family degeneracy follow the intermarriage of definite degenerates—than that isolated examples of insanity in either parental stock will be followed by insanity in the offspring.

I would, in other words, place the percentage of heredity at 100, with regard to the offspring of either degenerate or "normal" individuals; and, without going so far as to say that non-traumatic cerebral under-development or dissolution *cannot* occur in the absence of hereditary causes, would emphatically express my doubts with regard to its occurrence with any degree of frequency.

Sub-class (1).—Presenile Melancholia with Dementia

This sub-class contains 26 cases, of whom 6 are males and 20 are females.

The degree of dementia is mild in 19 and moderate in the remaining 7. The general symptomatology is that commonly described as "melancholia" or "climacteric melancholia," and all the usual types of hypochondriasis and melancholia are represented. In many, in fact in the majority, of the cases the regions of lower association are more or less involved in the process of neuronic dissolution, this in some instances extending even to the simpler grades—*e.g.* in certain cases of hypochondriasis.

The average age of onset of the attack is 47·5 years, and it differs little in the two sexes.

The average duration of residence is 5 years, varying from 1 to 16 (average 7) in the case of the males, and from 1 to 13 (average 4) in that of the females.

In marked contrast to the rare incidence of these in the next following sub-class, no less than 9 of the 26 cases had suffered from previous attacks; and this is considerably above the average frequency in the

presenile class as a whole. This is an interesting detail, and especially so owing to its bearing on the views of Kraepelin and of Dreyfus.

The interval between the attacks was, in 6 of the cases, from 1 to 2 years. Of the remaining 3 cases, in the first the patient was insane at the age of 25, and the present attack began at the age of 47; in the second the previous attack occurred at the age of 42, and the present at the age of 51; and in the third the patient was insane at the age of 21 and then at the age of 45, the present and final attack beginning at the age of 46.

As regards the social state, the cases in this sub-class differ from those of the other types of presenile case in including only 12·5 per cent. of unmarried persons, whereas the average for the whole class is 30·6 per cent. I have already suggested as a possible explanation of this that persons suffering from melancholia have probably been by normal temperament and general conduct more likely to obtain partners than would be the members of the other sub-classes.

Of the 26 cases, 14 were workers (11 good, 2 ordinary, and 1 poor), 5 refused to work, and 7 were unable to work.

Owing to the great variety and interesting nature of the included types, and to the fact that I regard a correct understanding of my position by the reader as important, I have thought it desirable to insert a larger number of illustrative cases than usual. It is worthy of note that two of these, No. 433 and No. 434, are sisters.

Presenile Hypochondriasis with Mild Dementia; certified 16 *years*

Case 426.—J—— H——, male, married, æt. 64. Certified since the age of 48. Nephew insane.

A moderately healthy man, with a large epithelioma of the left cheek. Face congested.

He speaks rather thickly owing to his deformity, but quite intelligently. He gives his name, and states when he came here and where he came from; and he knows approximately where he is. He gives the day and can reckon out the exact date. His age is 63, and he was at his previous asylum 15 years. He has had his face bad for 6 or 7 years. It was originally inside the cheek, and grew through the skin. At his previous asylum he has done work at bed-making and dusting up to about a month ago, and since then has not felt so well. When asked about voices he replies, "I don't think I have very much." Before he went to his previous asylum he "took some medicine, and it sealed down tight and exploded through my head, and caused a drain off in my face. When the medicine exploded, it broke my left arm, and this arm is off now." (Untrue.) "My legs have been out of place, not very much. Sometimes it works off my bowels when an extra lot of it comes off. I was quite coated with it, and it is dropping off by littles. It was taken as medicine. I was cured at the time with it, but it laid all on me, and takes some time to ripen and fall off by littles. I can feel

it now coated on my heart and lungs. That that leaves the heart and lungs is the strongest, and physics me the most. I can smell that which comes from my heart."

Whilst under observation patient was dull and apathetic, and at times somewhat depressed. He was a moderately useful worker, but was very willing to do what he could.

Presenile Hypochondriasis; "Pseudo-hallucinations"; Mild Dementia; certified 8 years

Case 427.—D—— B—— D——, male, married, photographer, æt. 54. Certified eight years, and also a year previously at the age of 45. Paternal aunt insane.

A vacant-looking and phlegmatic man, who, when I ask whether it is morning or afternoon, says "Well, I hardly know." He says that he has been told the name of this place, but doesn't know where it is. He came "from G——, I know that." He cannot say how long he was there, as "I feel in a dirty idiotic state, nasty and wet, and day and night is a terror." He hears filthy, indecent, and obscene words very frequently, and "*It comes to me* and makes me feel perfectly rotten." *The words come into his mind, and it is not as if anyone was speaking—they arise in his mind day and night.* He doesn't know whether his appearance is altered or not (in reply to leading question), for he has never thought of it like that. He has been married, but doesn't know whether his wife is alive. He doesn't know the day or date, but knows the month and year. "I look at the paper from time to time to see the date. I have not looked lately, and so do not know it." His "insides feel rotten, and brain all rotten, all rattle rattle, rattle. Cannot think of anything—all jumbled up." He owns to fairly frequent masturbation, which habit he explains by saying that it was the common thing at G—— to find people in bed doing it, and so he did the same. "Feeling got so strong seeing 'em all at it, and nothing to do, that I did it. Of course it's a shameful thing to say, but there you are. I did it everywhere, in water-closets, bedrooms, and outside and all over the place."

Whilst under observation he was hypochondriacal, and at times very worried and depressed. He was irritable, and if not left alone was quarrelsome and impulsive. If, however, he was not interfered with he was a willing and useful worker, and he was very amenable to discipline when treated kindly.

Presenile Melancholia, with Moderate Dementia; certified 4 years; sister of Case 434

Case 433.—H—— C——, female, single, laundry-hand, æt. 54. Certified since the age of 50, and previously between the ages of 48 and 50. Sister of Case 434.

A dull and somewhat depressed woman, whose face is covered with fenestrated scar-tissue from former confluent smallpox. Palate very high, narrow, and deep in front. Knee-jerks absent. She gives her name, and knows where she is, and where she has come from, also the day on which she came, and the present day, the month, and the year. She has no idea as to the date, although it is only the second of the month. She thinks her age is 52 or 53. She cannot say how long she was in her previous asylum,

but was certainly there several weeks (four years). Before going to work in the laundry, she kept house for her brother. Whilst in her previous asylum she did a little county needlework. She cannot give any clear account of herself, and she is very dull and slow in replying to questions. She owns to at times being depressed, but denies ever having thought of injuring herself.

Whilst under observation patient continued dull and quiet, was at times depressed, and did not occupy herself in any way.

Presenile Melancholia, with Moderate Dementia; certified 7 years; sister of Case 433

Case 434.—F—— M——, female, married, housekeeper, æt. 49. Certified since the age of 42. Sister of Case 433.

A dull and phlegmatic woman, with many fine horizontal wrinkles on an otherwise perfectly smooth forehead. Palate high, and becomes narrow anteriorly. Finger-nails bitten into the quicks. Patient gives her name, and knows where she is, where she has come from, when she came, and the day to-day. She had been at her previous asylum some 3 or 4 years (nearly 7). Her age is 56. She is married, and has a son and two daughters. She cannot remember the year in which she was married, and when asked the colour of her wedding-dress she states that she knows, but that it doesn't matter now. She is very slow indeed in replying to questions. She remembers going to her previous asylum, and thinks she must have been low and depressed when she went there. She was only in two wards during her residence in that institution. She did a little needlework there, but not much, as her eyesight had become so bad. She is better able to give information about herself than her sister is, but she is, if anything, still more slow in replying to questions.

Whilst under observation she was as a rule mildly depressed, and was very dull and apathetic. She at times did a little work, but was not of much use.

Presenile Melancholia; "Resistive Stupor"; Apprehensiveness; certified upwards of a year

Case 440.—E—— A——, female, married, housewife, æt. 53. Certified upwards of a year.

A restless, fidgety woman, who objects to sit down. She is unable to attend to herself; she has to be washed and dressed; and she is wet and dirty in her habits. She is on mince diet and feeds herself, which is practically the only thing she does. She strongly and violently resists examination, and eventually says "Don't, don't do that!" She notices what is going on around her, and at times looks round. She will not reply to questions or give any account of herself. She is quiet, except for restlessness, if left alone, but if interfered with in any way she at once becomes resistive, and struggles.

Patient continued unchanged whilst under observation.

Presenile Melancholia, with Mild Dementia; certified 1 year; and also twice previously

Case 445.—C—— E—— T——, female, married, housewife, æt. 47 years. Certified one year. Previously certified at the ages of 54 and 21. Grandfather and cousin (paternal and maternal) insane.

A dull-looking woman, with Mephistophelean eyebrows and a surly expression. She gives her name and age, and knows when she came, and the day, the date, the month, and the year. She knows where she has come from, and she was there eleven months. She did no work at that asylum, as she thinks she is "lost, and it makes me feel so wretched that I can't work. I feel that I'm eternally lost. *Something tells me inwardly*, my heart says that I'm lost for ever." The feeling came on her 18 months ago quite suddenly (it is 2½ years since she went to the asylum for the second time, and a few days under a year since she was certified this time). She was in business with her husband, who is a butcher, and "it came to me in the night that I was lost for ever. I feel in a dreadful state. I don't know how to sit still. Such a dreadful feeling within. I can't read or anything. If I'd done anything I could have confessed it and got it off my mind, but I don't know what I've done."

Right from the time of her admission patient was obviously a chronic case. Whilst under observation she continued unchanged, and she persistently refused to work, at any rate continuously. She became rather more dull; and her depression, and its expression, became more mechanical.

Presenile Melancholia Agitata, with Mild Dementia; certified four years

Case 446.—S—— H——, female, married, housewife, æt. 47. Certified four years. Mother and maternal cousin insane.

A very restless and depressed woman, who pays no attention to questions, but, in a state of uncontrollable agitation, rapidly makes such statements as the following: "Oh! my God! will they burn me? Oh! dear! Oh, dear! I took the Sacrament wrongfully when I was 13 years old, and I must be burned!" . . . "Oh! my God! my God! Don't think anybody should be burned, do you? They shouldn't throw a cat on the fire. I was first-hand dressmaker in B—— thirteen years." . . . "My mother was in H—— three times." . . . "I think to be burned must be dreadful. I used to make Miss B—— fourteen yards of lace at a time, like that" (showing me some). . . . "Oh, dear! If they burn me! My God! my God! Oh! my God! My God! Oh, dear!"

After a time she settles down a little, and tells me where she is, when she came, where she came from, the day, the month, &c. The last fact causes her to add that she was married in the month of October (the same month), and has a husband 6 ft. 2 in. in height and 17½ st. in weight. Her agitation continues during her replies to questions.

Whilst under observation she, during the first few months, spent most of her time wandering to and fro restlessly, and loudly bemoaning her fate, whilst all the time she was engaged with almost inconceivable rapidity in making lace. Later, after several methods of treatment had been adopted in order to decrease the nuisance she caused, but without success, and after she had been tried in nearly every ward in the asylum, she was placed on bromide. She shortly afterwards became quiet and feverishly industrious, and developed into a useful sewing-room worker, though she was still somewhat unstable and liable to restlessness, but rarely to noisiness. She was then well-behaved and very useful, but somewhat childish.

Sub-class (2).—Presenile Mania with Dementia

This sub-class contains 19 cases, of whom 7 are males and 12 are females.

The dementia present is of mild grade in 14 of the cases, and of moderate grade in the remaining 5. The general symptomatology is variable, and comprises one or more of the usual symptoms of mania—*e.g.* instability, excitement, restlessness, exaltation, garrulity, and incoherence, combined usually with unsystematised or partially systematised delusions of a religious, grandiose, or persecutory character, and in some examples with hallucinatory phenomena. In the more complex cases, therefore, the process of neuronic retrogression involves not only the region of higher association but also the regions of lower association.

The average age of onset of the attack is 46 years, being 48 in the case of the males and 45·5 in that of the females.

The average duration of residence is 6 years, and varies from 1 to 7 (average 3·5) in the case of the males, and 1 to 19 (average 8) in that of the females.

Only one case, a married female, had suffered from a previous attack. This occurred at the age of 51, the present and final attack commencing at the age of 53, and the duration of this, when the case came under observation, being 9 years. Previous attacks are, therefore, rare in the present sub-class, as the presenile cases as a whole show a percentage of previous attacks which amounts to 24·6.

Of the 19 cases, 10 were workers (6 good, 1 ordinary, and 3 poor), 5 refused to work, and 4 were incapable of work. The proportion of actual and potential workers is thus slightly above that in the presenile class as a whole.

The following two cases are inserted for the purpose of illustration :—

Presenile Mania, with Delusions of Persecution and Mild Dementia ; certified five years

Case 411.—A—— O——, male, married, retired ship's steward, æt. 59. Certified five years, and has shown symptoms since the age of 51.

A dull-looking man of florid complexion, who tries to see what I am writing. He gives his name, and states that his age is 60 next March. He knows where he is and where he has come from and when he came, and also the present day and the approximate date. He is "right in every way and as straight as a man can be. I wish to earn my living. My forehead is very tender." He was at his previous asylum five years, and was 23 years in the L. & B. S. C. service. He is very garrulous with reference to the persecution from which he suffers. He says that he was attacked by a patient just before coming here, and since then has been badly attacked by, and undressed by, two attendants. He also complains of the dirty clothes he has

to wear. He has had his face all smashed to pieces by people in the asylum, and his eyes have been filled with blood many times. He boasts of his cleanliness of body and mind. "I wouldn't be in such a place so long if I hadn't enemies. There's something hanging me up that shouldn't be here." He suffers from auditory hallucinations. "Filthy rattle and chirrup that disturbs people's rest. Them that does the harm should suffer if there's any penalty." He hears women "talking a good part in jokes." He has "never harmed a woman or given any chance to a woman to harm me." He is very garrulous, excitable, and querulous.

Whilst under observation, patient was restless, excitable, and quarrelsome. He constantly complained of persecution and ill-usage, and persistently refused to work.

Presenile Mania; Inconsequence; Sham Deafness; Mild Dementia; certified twelve years

Case 424.—C——E——R——, female, married, housewife, æt. 63. Certified twelve years, and has shown symptoms since the age of 47. Cousin insane.

A wrinkled old woman, who at once shows me her husband's address on a letter, and says that she lives "on the estate." She gives her name, and tells me that her husband didn't put her away, but that she was brought away and stripped of all her possessions. She is very anxious for me to read the addresses on a number of letters. She informs me that "all people are not Jews, but I know you are one." "I got deafer since I came away, but I know the meaning of the world." She states that her husband's employer is cousin to the old Marquis of Salisbury who is dead. She talks on rapidly and inconsequently about this peer, the "young lord," &c., and becomes very excited. Eventually she remarks that the secretary of the Marquis was a Jew, and then becomes still more inconsequent, and her association of ideas becomes very rapid and difficult to follow. Accidentally using the word "son," she says "sun, moon, and stars, frost and dew; it proceeds from our mothers and fathers. That's what the world is." She still, however, inserts such phrases as "Some of the Jews was but to think they done such things," and "There's no craziness in me." These suggest ideas of persecution. She pretends to be quite deaf, but, as I somehow suspect that this is not so, I repeat quietly, "I'll swear you've stolen those letters," with reference to the bundle of letters in her hand. She then at once looks up, says, "You're a liar! you work underground, you do," and gets violently excited and abuses me roundly.

Whilst under observation she was excitable and unstable, and at times garrulous, but she was a good and useful worker.

Sub-class (3).—Presenile Insanity with Dementia

This sub-class includes 12 cases, of which 1 is a male and 11 are females.

The grade of dementia is mild in 9 cases, and moderate in 3. The general symptomatology is variable, and abnormality of the emotional tone is not a prominent feature. Certain of the cases, which possess a greater degree of degeneracy than the remainder, present a symptomatology similar to that of the class of "cranks and asylum curiosities"

which has been described under High-Grade Amentia; and in nearly all the cases of the sub-class there is at least some degree of dissolution of the regions of lower association.

The average age of onset of the attack, 47 years, is that of the presenile class as a whole.

The average duration of residence is longer than that of the whole class, namely 9 years, and it varies from 1 to 23 years.

Only 2 of the cases suffered from previous attacks. In 1 of these this occurred 1 year and in the other 12 years before the present and final attack.

As regards social state, this sub-class differs markedly from both the preceding, and also from the presenile class as a whole, in containing no less than 63·6 per cent. of unmarried persons. The majority of the cases, in fact, are spinsters of eccentric habits.

Of the 12 cases, 8 were workers (3 good, 4 ordinary, and 1 poor), 1 refused to work, and 3 were incapable of work.

The following two cases are inserted for purposes of illustration :—

Presenile Insanity, with Mild Dementia; Garrulity, Inconsequence, Eccentricity, Delusions; certified seven years

Case 454.—O—— N——, female, single, dressmaker, æt. 52. Certified since the age of 45, and previously very peculiar in her behaviour.

A garrulous woman, with much loss of facial expression and a very assertive manner. She at once tells me that she is "*Miss* O—— N——," and that she got this name "right from the Queen of England and Empress at B——." When I call her by her Christian name she objects, as she could not be spoken so to when going out to her work at B——. She asks me if I am copying down what she is telling me, and on my replying in the affirmative she states that she was mistaken at B—— (her previous asylum), for people called by names similar to her own, but different in the spelling. She gives me no less than six methods of spelling similar names, sees that I write them down, and solemnly warns me against anyone and everyone possessing such names. She tells me that many people have taken the name of N——, as she spells it herself, because they know that she had "got into no scrapes," and they therefore thought that they would thereby become possessed of her spotless character. She talks rapidly and almost inconsequently, but in a very grandiose manner; and seems to have numerous ill-defined ideas of persecution. When asked the name of the asylum in which she now is, she reads it on the sheet and asks me where it is. On my replying that it is near E——, this remark at once brings up a host of reminiscences, and it is difficult to get her to allow me to ask her further questions. She knows when she came and where she has come from. She knows the date within a couple of days, and when asked the day says yesterday was Tuesday and to-day is Wednesday; and then remembers that yesterday was Wednesday and says that to-day is Thursday (correct). She informs me that "people at times get out of their prison-specks and fly about like birds, but if you discover who they are and say, 'Is that you, Mrs. So-and-So?'

you break the spell and they have to go back again." She also tells me that people outside are able to see what is in one's pockets, &c., and she most strongly and indignantly complains about this.

Whilst under observation she was usually quiet and well-behaved, but was most peculiar and old-maidish in her habits. She refused to work, and was often aggressive and dictatorial. She used to persist when going out of doors in wearing something white, *e.g.* a sunshade or a white veil, &c., and if prevented would get violently excited and insist on staying in.

Presenile Insanity, with Mild Dementia; Eccentricity; Delusions and Hallucinations; certified eight years

Case 456.—L—— T——, female, single, domestic servant, æt. 62. Certified since the age of 54.

A curious-looking woman, with a Mongolian head and a somewhat "death's-head" appearance. Hair short, chronic seborrhœa capitis. She gives her name, and states that her age is nearly 60. She knows where she has come from, was there about 7 years, and was previously in a situation. She knows when she came here, and the day and date. She informs me that poison was put in her food by her mistress, "who was told by someone, under pretence of religion, to do it." It was a woman, not a man, who did this. Her mistress used "West Indian poison pencils," and several modes of persecution were also adopted towards her before she went to the asylum. Occasionally, whilst there, poison was put in her food, and she thinks that "someone came into the house to perjure Miss D——, the matron." A little jackdaw talks to her, and says he was a Scotch priest when he was on earth. If there is anything wrong with her at night "he will tell me pretty quick, if not at other times. He speaks very well. He was burnt at C——, and was told to stay about a certain number of years. He came down with the other tame birds when they were at dinner. He said there were some birds, and about 30 were little 'Gurds' which have a different nail. These are little God-birds." She thinks she has seen him once here. "He said just now 'I can see you, but you can't see me.' They are very smart in looking after poisoners and robbers' gangs." He tells her that he christened her, and so has a right to look after her. The eczema on her scalp was put into her stomach, and was discharged on to her head. She passes by the name of T——, and has been brought up under this name, but he tells her that he christened her "Panella."

Whilst under observation this patient continued mentally unchanged. She was a quaint and interesting old woman, and a great favourite. She was a very willing and useful worker, but a great chatterbox, and very childish in some of her ways.

Sub-class (4).—Simple Presenile Dementia

This sub-class contains 8 cases, 4 of whom are males and 4 females.

The grade of dementia is mild in 2 cases and moderate in 6. In this sub-class, therefore, the dementia is well marked in three-quarters of the cases, whereas in all the other sub-classes it is mild in no less than three-quarters.

As has already been stated, it is likely that alcoholic excess has at any rate contributed to this difference, as the percentage of ascertained intemperance in the four sub-classes is respectively 10·5, 7·7, 16·6, and 37·5.

It is hardly necessary to remark that in this sub-class the process of neuronic dissolution is both more advanced and more generally diffused than is the case in the other sub-classes.

No less than 4 of the 8 cases have a history of previous attacks, which occurred at the respective intervals of 1, 2, 7, and 20 years prior to the present and final one.

Three of the 8 cases were workers (1 good, 1 ordinary, and 1 poor), 2 refused to work, and 3 were unable to work. The proportion of workers is therefore lower than in any of the other sub-classes, as might be expected in view of the greater amount of dementia which is present.

I draw attention to these facts because the number of cases in the sub-class is so small as to preclude valid deductions, unless, as happens to be the case, such facts as are available are found to be exactly those which would be expected on *a priori* grounds.

The following two cases are inserted as illustrative examples of the contents of this sub-class :—

Simple Presenile Dementia of Moderate Grade ; Intemperance ; symptoms for one year

Case 467.—T——K——, male, widower, general labourer, æt. 48. Certified some months. and has shown symptoms for one year.

Face blank, eyes restless, nose greasy, marked flush on face and forehead. Pupils 4 mm. and react rapidly to light and accommodation. Tongue is protruded by instalments. Palate high average ; much pigmented scarring of legs, especially the right. Frenum has been badly torn. Knee-jerks, + +. Plantars normal. Patient is at present wet, although he was only examined a few minutes ago.

Patient gives his name, and says that his age is 26 and that he has not been married. He came "the other day." He neither knows what day nor the day to-day. He thinks it is "somewhere about winter" (September). He does not know where he is. He came from "B—— way somewhere" (approximately correct). He does not know the time of day, and has not had his dinner (3.45 p.m.). When asked about his previous asylum by name, he says he "has done in my time" (*i.e.*, has heard of it), but has never been there. When again asked his age he repeats "26," and also repeats that he has not had his dinner when the question is again asked him. He does not deny intemperance. He is dull and unemotional, and appears to suffer neither from illusions nor from hallucinations.

Whilst under observation patient was dull, apathetic, uninterested in his surroundings, and unemployed.

Simple Presenile Dementia of Moderate Grade; Intemperance; certified one year

CASE 470.—E—— B——, female, married, housewife, æt. 53. Certified one year. Cause stated to be intemperance. Father committed suicide.

A dull-looking woman, with a very congested face and nose and a greasy skin. Pupils dilated and act sluggishly. Tongue and lips very tremulous. Palate narrow, high behind, and shelves very markedly forwards. Knee-jerks absent. Both plantars brisk and right > left. Radial arteries thickened and tortuous.

Patient is feeble and dull, and is hardly able to give any account of herself. She gives her name, but in a shaky voice, and when asked her age says, "I couldn't tell you exactly my age." She does not know where she is or where she has come from. She owns that she has heard the name of the asylum from which she has come, and also that she has been there. She knows neither the day, date, month, nor year, and as far as can be made out she has no illusions of identity and no hallucinations. Pain? "Not particular." Married? "Yes." How long? "Don't know." Any children? "No." The only voluntary remark she makes is to the effect that she could sleep well if she could be quiet.

Patient whilst under observation improved somewhat in general health, but continued dull, listless, apathetic, uninterested in her surroundings, unemployed, and practically lost to time and place.

CLASS (C).—Mature or Adult Dementia (Dementia of Maturity)

In this class are included 60 cases which exhibit various types of symptomatology. These cases agree, however, in possessing the two necessary characteristics of the class under consideration, namely, (1) an attack of insanity during the period of maturity, and (2) a greater or lesser degree of dementia as its sequela.

From what has already been stated with reference to the classes of "senile" and "presenile" dementia, which contain cases in which involution of the cortical neurones has occurred at a period of life *later* than that at which they were subjected to the greatest degree of "stress," namely, that associated with "mature" activity, it is to be expected that the present class should present important differences from these both as regards immediate etiology and general symptomatology.

In the senile and presenile classes an actual "wearing out" of the cortical neurones is the primary cause of their involution—which term is perhaps more suitable to these cases than "dissolution"—and the "stress" required to precipitate this retrograde process is, therefore, in many cases much less than that through which for many years they have passed unharmed. The ensuing dementia is thus, on the whole,

as has been shown, relatively slow in development and relatively mild in degree, with the single exception of the last class of presenile dementia, in which the additional influence of alcoholic excess has apparently precipitated a more severe grade.

In the cases in the present class, however, the cortical neurones, at the time of breakdown, are being subjected to the " stress " of mature activity. In those examples in which involution occurs under the influence of a degree of " stress " which is equivalent to that constituting the normal environment of the sane adult cerebrum, it is obvious that the durability of the cortical neurones is lower than that in cases which survive undemented to the presenile or the senile periods of life. Such cases exhibit relatively little dementia, as will shortly be pointed out, and may be considered to be the analogues of senile and presenile cases.

In the majority of the cases of the present class, however, involution —which here may, perhaps, be more properly termed " dissolution "— does not occur at maturity under the mere " stress " of normal activity, but requires in addition for its precipitation the presence of extraneous (toxic) factors. Of these the most potent, in the male sex, are intemperance, and, in the female, intemperance and the toxic and metabolic disturbances associated with child-bearing.

In other words, direct toxæmia of the cortical neurones is, during their period of mature or adult activity, an important, and, indeed, almost a necessary, factor in the determination of at any rate the severer grades of dissolution which occur at this period of life.

It is evident from these considerations that a proportionately greater amount of dementia is to be expected in the cases of " mature " than in those of " presenile " and " senile " dementia.

The evidence which has been derived from a study of the cases included in the present class, and which will now be presented in summary, amply supports the above introductory remarks.

Of the 60 cases, 26 are males and 34 are females. Even a cursory comparison of the clinical notes with those of the cases in the preceding classes shows that the amount of dementia present is greater than in these. Further, the cases can only with difficulty be subdivided into types, and these are of such an entirely artificial nature that any hard and fast line of demarcation is obviously undesirable. Dementia, in fact, in the present class is as prominent a feature as is psychic aberration.

Of the 26 male cases, a moderately severe grade of dementia exists in 10, and of the 34 female cases, in 18 ; a total of 28, or nearly one-half, of the 60 cases thus exhibit dementia of a moderately severe grade.

On the other hand, in the class of " presenile " cases, 21 out of 65, or barely one-third, suffered from this grade of dementia. As, however, the fourth sub-class of presenile dementia, which includes 8 cases of

simple dementia with a high percentage of ascertained intemperance, contains no less than 6 cases of moderately severe dementia, it may, therefore, without impropriety be considered that in 57 examples of the purer types of presenile dementia the grade of dementia was moderately severe in 15 only, or just over one-fourth.

There is, therefore, considerably more dementia in the present class than in the presenile.

Though I do not propose to divide the present cases into sub-classes which would, owing to the degree of dementia and the consequent obscuration of the symptoms of alienation, be largely artificial, it seems worth while from the aspect of dominant symptomatology (not of special type of case) to introduce the following table :—

	M.	F.	T.
Depression	5	4	9
Excitement	7	22	29
Unsystematised delusions	12	4	16
Simple dementia	2	4	6
	26	34	60

Nearly one-half of the male cases thus possess unsystematised delusions alone, and more than two-thirds of the female cases exhibit excitement. These proportions are naturally without intrinsic value, but they approximately accord with the general experience of alienists, and are therefore inserted.

The *average age on certification* of the 60 cases is 37 years, being a few months higher in the case of the males and a few months lower in that of the females.

The *average duration of residence* is 9 years in the case of the males and 10 years in that of the females, and varies in both sexes from 1 to 28 years.

Previous Attacks.—No less than 11 of the 26 males (42 per cent.) had been previously certified, but in 5 of these there is a history of intemperance, and 2 of the 5 had been previously certified on three occasions each.

Of the females, only 4 of the 34 cases (12 per cent.) had suffered from previous attacks, and in none of these particular cases is there a history of intemperance.

Social State.—Of the males 56 per cent. and of the females 35 per cent. are unmarried.

Etiological Data.—Certain details bearing on the etiology of the present class of cases will now be summarised. The percentages are, as previously, prepared on the total number of cases, and thus represent *ascertained proportions only*, as in many of the cases no facts whatever which bear on personal or family history are available. Though these

data thus possess merely a relative value, they are useful for comparative purposes, as the relatively gross method by which they were obtained was at any rate a constant one throughout the whole series of cases included in the present description.

Ascertained Intemperance.—The percentage of cases with a history of intemperance is 32, and is thus more than double that in the class of presenile cases, which is 14.

This exciting cause existed in the case of the males to the extent of 42 per cent., and in the case of the females to that of 24 per cent. On classification of the cases from the aspect of dominant symptomatology, the following interesting result is obtained :—

	Percentage of Intemperance.
Depression	22·2
Excitement	27·6
Unsystematised delusions	25·0
Simple dementia	83·3
Percentage of Intemperance in total number	31·6

These percentages may be usefully compared with the lower percentages in the sub-class of presenile dementia, which are as follows :—

	Percentage of Intemperance.
Melancholia with dementia	7·7
Mania with dementia	10·5
Chronic insanity with dementia	16·6
Simple dementia	37·5
Percentage of Intemperance in total number	13·8

It will be seen that, whilst a similar relationship exists, the percentage in the fourth line being much the highest, the actual amount of intemperance in the " mature " class is more than double that in the " presenile."

In view of the introductory remarks to this section, this larger proportion of intemperance in the " mature " class, as compared with the " presenile," is at least highly suggestive that alcoholic excess is an important exciting cause of the breakdown of cases of " mature " dementia. It is not suggested that intemperance is the cause of the higher percentage of cases of moderate dementia in the " mature " class, though cases with a history of intemperance, and *in which the dementia is simple*, certainly do more often develop the profounder grades.

The " stress " required for the determination of the onset of dissolution of the cortical neurones is necessarily greater in cases of the present class than in the presenile cases, in many of which natural involution

is imminent; and therefore a greater degree of dementia, in the "mature" class generally, is *a priori* to be expected.

This observation falls under the general law that the greater the "stress" required to produce dissolution of the cortical neurones, the greater is the amount of this when it occurs. Conversely, in cases which readily break down under "stress," *e.g.* high-grade amentia, the injury which results is negligible; and in patients whose cerebra possess such a low functional capability (low-grade amentia) that "stress" cannot intervene to any material extent, dementia, except in consequence of "senile," or "presenile" wearing out of the cortical neurones (or of gross destructive lesions) does not occur.

Child-bearing.—In 6 of the 34 females (18 per cent.) the onset of the attack was precipitated by child-bearing, this term being here employed to include all the usual types.

Syphilis.—A history or physical evidence of a former attack of syphilis was present in 4 of the 26 male cases (15 per cent.), and in all these cases the degree of dementia was mild. This is to be expected in view of the remarks to be made later in the chapter on Progressive Dementia, for, in my experience at any rate, a higher grade of dementia is incompatible with a history of syphilitic infection unless the patient suffers either from one of the forms of dementia paralytica (*i.e.* general paralysis of the insane) or from cerebral syphilis.

Ascertained Heredity of Insanity.—After the remarks inserted under this heading in the section on presenile dementia, it is merely necessary here to state that the percentage of cases with a family history of insanity is 25, being 19 in the males (*cf.* the greater percentage of ascertained intemperance in this sex) and 29 in the females. It may be added that, as in the case of the previous etiological data, the percentages are made out from the total number of cases, in many of which no facts whatever which deal with personal or family history are available.

The present description will now be completed by a brief reference to the *capability for work* exhibited by the individuals who compose the class of "mature" dementia.

Of the 60 cases in the class, 42 were workers, 11 refused to work and 7 were incapable of work. The high proportion of workers is worthy of attention. It is probably due partly to the age of the patients, which is not beyond that of useful activity, and partly to the amount of dementia, which is large enough to curtail the exhibition of the more marked phenomena of mental alienation, and at the same time is not of so severe a grade as to prohibit the performance of useful work.

The proportion of workers is similar in the two sexes. Of the 26 males, 17 were workers (16 good and 1 ordinary), 7 refused to work,

and 2 were incapable of work. Of the 34 females, 25 were workers (11 good, 7 ordinary, and 7 poor), 4 refused to work, and 5 were incapable of work.

The following six cases have been selected as illustrative examples of the contents of the class under consideration. In the absence of specific sub-classes, the cases are inserted, for convenience of reference, according to their predominant symptomatology, in the order of depression, excitement, unsystematised delusions, and simple dementia.

Melancholia ; Mild Dementia ; certified one year

Case 508.—S—— T——, female, single, dressmaker, æt. 32. Cause stated to be intemperance ; certified one year. Two aunts and a sister insane.

A dull and vacant but somewhat depressed woman. Tongue tremulous. Palate very high and very narrow in front. Knee-jerks absent. Superficial reflexes dull. She gives her name, and states that she was in her previous asylum "about a year, but I do not exactly remember." She came yesterday (correct), and thinks that to-day is Wednesday (Tuesday). She knows neither date, month, nor year, but thinks that it is summer (correct). She states that her age is 32. She was sent to the asylum because she was ill and gave up work. Whilst there she "helped a bit to wash up and wipe." She spent most of her time there "sitting and looking like the rest of 'em." She says that she was depressed when she first went there. She is dull and uninterested in her surroundings, and speaks in a peevish and dissatisfied way. She tends, where possible, to reply in a contrary or contradictory manner. She does not suffer from hallucinations.

Whilst under observation this patient showed no sign of mental improvement. She continued dull, listless, peevish, and generally dissatisfied. She did a moderate amount of work, and performed it in a slow, mechanical, and perfunctory manner.

Mania ; Moderate Dementia ; certified fifteen years

Case 484.—E—— F——, female, married, housewife, æt. 49. Cause, puerperium. Certified fifteen years. Two brothers insane.

A dull-looking woman, with a fatuous smile. Several coarse, horizontal wrinkles on forehead. A small moustache and imperial.

She does not know where she is, or when she came, although she has only been here two days. She knows neither the day nor the month, but remarks that it is summer (correct). She volunteers that her age is 53. She states what asylum she has come from ; and says that she was there three years, has been from home ten years, and was 51 years of age when she left home. When I point out that these statements do not agree, she remarks that she thought she was ten years away from home, as it is ten years since she left her husband. She then informs me that she has been married twenty-two years, and that she has had ten children ; also that her youngest child is ten years old this year, and that it was two months old when she was taken to the asylum.

Whilst under observation she was as a rule dull and quiet, and at times she did a little work, but she was often bad-tempered, excitable, quarrelsome, and even impulsive. If not watched she would, apparently without suicidal

intent, swallow different articles. On one occasion, for example, she swallowed a bottle of ink, and on another a quantity of washing soda, and she stated, as her reason for doing this, that she was suffering from wind in the stomach. She was a more difficult case to treat than an actively suicidal patient would have been, as her degree of dementia was such as to make it easy, though inexcusable, for her attendants to neglect their instructions.

Unsystematised Delusions; Mild Dementia; certified six years

Case 510.—N—— A——, male, married, gardener, æt. 48; cause, syphilis. Certified six years, and showed symptoms for no less than ten years previously. Father intemperate.

An excitable and wide-awake man of considerable intelligence. He knows where he is, where he came from and when he came here, and also knew beforehand where he was coming. He knows the day and the approximate date, and, after thinking a time, tells me the year. He knows how long he was in his previous asylum. He gives his age as 45. He has been married twice. By his first wife he had two children, a boy now eighteen years of age, and one who died. He has had no children by his second wife.

His pupils are equal, and do not react to light. Tongue tremulous. Palate very high. Knee-jerks brisk. Superficial reflexes normal. Left inguinal hernia. Testicles large. No visible scar on penis. Arteries tremulous and very rigid. Patient states that he had a "chancre a lot of years ago, and about four runnings during eight years in the merchant service."

He worked in the garden during his last four years at his previous asylum, and was only in three wards during his residence there. He hears voices from the "orb" in the air. They are "chiefly sounds, and what they say depends on what they want to say." When asked if they tell him to do things, he becomes excitable and speaks so rapidly as almost to be unintelligible. "We don't take their orders from the orb. We don't belong to B——, but to the town of H——," &c. When asked why he says "we," he replies that there were several men in his previous asylum waiting for their discharge, "who used to hear the orb," and that "it seems more natural-like to say 'we' than 'I.'" They are in this asylum to "take up our discharge as well as signed for discharge," and at the previous asylum they were "there as discharged patients, but couldn't get out. We know we were discharged from the doctors, and the attendants were much chastised and prosecuted for keeping us in," &c.

Whilst under observation this patient was excitable, and quarrelsome if provoked, and was very garrulous on the subject of the "orb." He was a good and useful worker, but was distinctly feeble-minded, and childish, in spite of his generally excellent memory.

Note.—As will be pointed out in the chapter on Progressive and Secondary Dementia, this case, in my opinion, has avoided the onset of dementia paralytica owing to the possession of neurones of average durability. Such cases as the present, who have been infected with syphilis, either develop little or no dementia, or become examples of dementia paralytica. In my experience, therefore, an attack of syphilis

in either a sane or an insane individual whose neurones are of average durability does not cause either stationary or progressive dementia. In all cases, however, in which the durability of the cortical neurones is deficient, an attack of syphilis sooner or later results in one or other of the numerous types of dementia paralytica—a *progressive* dementia.

Unsystematised Delusions; Moderate Dementia; certified eleven years

Case 514.—R—— W—— A——, male, æt. (?) 45. Cause, intemperance. Certified eleven years, and also a year earlier at the age of (?) 33.

A man of hypochondriacal appearance, who knows where he is, where he has come from, and the day he came. He also knows the month and the year, but he does not know the present day although he has only been here five days. "I was reading a paper yesterday, but forgot to look at the date." He states that he is single and that he is 46 years of age on October 29th next. He exhibits much mental apathy, but when he has got worked up to it he talks rapidly and minutely, and also as far as is known fairly accurately, regarding his history and previous whereabouts. He states approximately the number of years he lived in the different asylums to and from which he was transferred, and remarks that the cause of his original incarceration was "a mere nothing, a bit of drink and no serious offence." When his present troubles are discussed he informs me that "the cushion I lie on at night plunges and makes my head sore." He cannot recollect any words, but he says that he certainly hears people talking to him. The "cushion comes on and off. It can leave off and go on at times as if it were alive itself." It is "only the cushion" at night and not his bed clothes, and it has appeared in any bed in which he has slept. It never troubles him during the day, nor does any similar thing. He remembers that when asked the other day by the Superintendent about voices he denied them, and remarks, "I did not think of the cushion from that point of view." In different asylums he has slept both in side rooms and dormitories, and in each bed he was troubled by the "cushion."

Whilst under observation the patient continued mentally unchanged. He was often noisy at night, but was, as a rule, quiet during the day. He was able but unwilling to work.

Unsystematised Delusions; Mild Dementia; certified nine years

Case 524.—M—— T——, female, married, housewife, æt. 48. Her present illness commenced as melancholia during pregnancy, and she has been certified nine years.

A healthy-looking woman, with a low forehead and a wide-awake appearance as regards the eyes. Palate high, and narrow in front. Marked corns on both knees. She gives her name, and her age as 49. When from her watchful appearance she is asked about hallucinations, she says that she has "not heard voices for months." She then remarks that she used to think that she heard people swearing at her, but "it was only fancies, and was people in the ward." She is obviously here trying to hide something from me, as she remarks, "I used to try not to hear them, and not to tell the doctor; and I used to try hard to get home, but I am not at home yet. I

worked very hard in that asylum." She did ward-work there, and also some needlework. She used to help another patient, for whom she appears to have great respect, if not awe, to do the latter. She can give the day, and the date within a day, and she knows how long she was incarcerated in her previous asylum. "My husband put me in the asylum as I tried to drown myself—I don't know what for. I had a baby three months after going there, and it died."

Whilst under observation she was simple-minded, childish, facile, and easily led, and was an excellent worker. She was, however, easily upset by injudicious treatment or environment, and at times, owing to her hallucinations being particularly obtrusive, was suspicious and secretive.

Moderate Dementia; certified eleven years; three previous attacks

Case 527.—W—— R—— B——, male, married, grocer and gardener's labourer, æt. 47; cause, intemperance. Certified eleven years and previously, with very short intervals, at the ages of 32, 33–4, and 35–6. Mother insane.

A stout man, with an expressionless face. Ears without lobules. Right knee-jerk just present, left absent. Pupils react normally.

Patient comes up to me with a fatuous smile and shakes hands. He informs me that he came here a "little more than a month ago" (two days). The day is Wednesday (Saturday). He then remarks, "I've been bucking up with another brother." . . . "The last rice we packed up wasn't so good." Work? "I can drive, good drive, steady reins." Anything else? "Sleep. I can sleep." . . . "I've come all the way. A good many in the Albert Edward, they say. I was off my beer and lots of things.' What is this place? "Thornton Heath." . . . "I've always heard it highly spoken of—madhouse." Why were you brought here? "Fast wife." He says he has been married nine years, and has "just about" two children. He hears people talking to him "all day, Sunday, Monday, and Tuesday when I came out on the round. They said 'coffee.' . . . Bar going out of business on my round." He does not hear them "quite so bad" at night. He has not drank so much, but he has "looked after a drink place." He can tell the time of day to within an hour. When again asked the day he now says "Thursday." He has been in this asylum "five years with the major. Hack mare won several plates on this county." When asked who sent him to the asylum, he replies that "Mamma put me here. She thinks a good deal of making a slight change in the family."

Whilst under observation the patient continued mentally unchanged, and was a good and useful worker, and quiet and well-behaved.

CLASS (D).—Premature or Adolescent Dementia

The present class, to which I apply the term "premature dementia," differs from the three classes of primarily neuronic dementia, which have already been considered, in the fact that, owing to its recognition by Kahlbaum and to the attention drawn to it by Kraepelin, its types and their symptomatology, even to the minutest detail, have been

described and detailed in an extensive literature. It is not my purpose to give a complete historical account, or even a general description, of this variety of dementia ; my object is rather to treat it as the compeer of the other three classes of primarily neuronic dementia which have already been dealt with. I therefore propose to limit myself to a general reference to those especial details of symptomatology which for my purpose are of importance, and to certain generalisations on the entire subject of premature dementia. Where I agree with the observations and conclusions of previous writers, I do not claim priority by omitting reference to these, for I take it for granted that readers of this volume are necessarily familiar with, at any rate, the more important literature on the subject, and where I differ from present opinion I trust that the general trend of my reasoning will be to uphold the views I express. Such a course is the only possible one to adopt in dealing, not so much with a particular symptomatology, as with the psychopathological meaning of this and at the same time with the position which, in the classification of mental disease which is at present under consideration, is occupied by cases exhibiting this symptomatology. The relative baldness of the descriptions, in view of the immense literature available, is thus intelligible, and I hope excusable, for my account of the variety of primarily neuronic dementia at present under consideration is merely intended to run *pari passu* with those of the preceding classes, which classes are, in my opinion, equally important from the psychiatric aspect, though hitherto they have not received adequate recognition.

The term " dementia præcox " has of late years been employed so extensively with reference to almost every type of insanity occurring between puberty and maturity, and so much doubt therefore exists as to its exact connotation, that I have considered it desirable to here make use of the alternative cognomen of " premature dementia " for a group of cases which is in large part identical with those commonly grouped under the former term.

Many cases of adolescent insanity, with relatively little mental confusion, recover sufficiently for discharge either as " recovered " or to the care of their friends, and are then often able, on a lower mental level, for long periods of time, or permanently, to sustain without injury the ordinary environment of the sane. I remember, for example, a man who for nearly thirty years worked as a sort of partly sleeping partner with his two brothers. During this period he was not worth his keep, without any question of wages, as a clerk ; but he was quiet and well behaved and, according to his capability, industrious. When about fifty years of age he developed depression with confusion which soon passed into presenile dementia, with resulting permanent detention

in an asylum, since neither of his brothers was anxious to have him under his care.

Other cases, which are really examples of high-grade amentia of relapsing type—though, except for the absence of mental confusion they bear a close resemblance to certain of the confused cases—also recover, at any rate for a time, I have recently had under my care a beautiful example of "maniac stupor" who started at 15 years of age and has recovered from her sixth attack.

Further, a few examples of the "hysteria" class of high-grade amentia, which exhibit cataleptoid phenomena but no mental confusion, also recover; and thus even the grave symptom-complex commonly referred to as "catatonia" is credited with a number of recoveries. Such a case, at present under my care, has just recovered after a cataleptoid condition of several years' duration, in the course of which two or three partial attempts at recovery occurred. Time will show whether this case can be discharged recovered or whether she will develop some other hysterical symptom which will justify her detention.

The first only of these types furnishes examples of mild premature dementia, but cases belonging to all three are often referred to as "recoveries" from dementia præcox, and thus certain writers object to the employment of the term "dementia" to connote a symptom-complex which furnishes a quota of, for the time at any rate, complete cures.

As will be seen later in this chapter, I am strongly of opinion that uncomplicated examples of premature dementia (in which the preliminary mental confusion is not precipitated by a primarily toxic, and therefore removable, cause) invariably exhibit a degree of mental confusion during their initial phases, which is roughly proportionate to the grade of dementia which ensues, and that recovery without some grade of dementia does not occur. I therefore employ the term "*premature dementia*," as a co-ordinate of the terms "mature," "presenile," and "senile or 'worn-out' dementia," to describe the *cases of primarily neuronic dementia which occur during the period of life which is limited by puberty on the one hand and maturity on the other, and which exhibit during their initial phases a certain, and often a severe, grade of mental confusion.*

The class of premature dementia, as thus defined, includes all cases which undergo a greater or lesser degree of neuronic dissolution, with consequent stationary dementia, between the ages of puberty and maturity.

A large proportion of these cases break down, not only under the influence of the metabolic disturbances which are associated with the former and "critical" period of life, but also, and probably more often, under the mental "stress" involved in the general change in the func-

tions of the cerebrum from the mere acquisition of information to the performance of the higher processes of mind—namely, the orderly aggregation and selection of facts, the co-ordination of these into suitable sequences of ideas to enable judgments to be evolved, and the turning of acquired information to practical uses—which change of cerebral function also commences about the period of puberty. Under this "stress," cases possessing higher cortical neurones of deficient durability go to the wall.

It is thus readily intelligible, in fact obvious, that this class must include, not only cases of relatively high mental capacity, which cerebra have, by over-study and intense application, been strained beyond their breaking-point, but also numbers of degenerates who, under the influence of "stress," which would be sustained without injury by normal subjects, have similarly over-strained what, in this instance, are deficiently durable cortical neurones.

The former type of case occurs not only in asylums, but also in the outside world. It is, for example, common knowledge that only a proportion of the brilliant students of medicine, who, during their course of study, carry all before them, attain in later life to eminence, this term being employed in a scientific rather than in a popular or in a pecuniary sense. In the remainder, over-strain has reduced their mental powers to a more ordinary level, and though of, perhaps, average intelligence, "push," and business capability, they are nevertheless, in the strict sense, examples of premature dementia. This condition is not, however, limited to individuals of unusual mental power. I am not aware that I am stating anything original when I remark that I have seen many examples of premature dementia in men in the possession of ordinary mental powers, who, by dint of exceptional perseverance, have obtained the more coveted medical qualifications, and who afterwards exhibit, not more, and often less, ability than is possessed by quite ordinary individuals. I am convinced that such cases are true examples of premature stereotypism or premature dementia, which has developed under the influence of a degree of mental strain that could not be submitted to by these individuals without irretrievable damage to an appreciable number of the cortical neurones; and that the phenomena referred to are not, as is so commonly stated, due simply to lack of what is so often described as a "capacity for affairs," or a practical, in contra-distinction to a theoretical, type of mind.

Between such cases and those who require asylum *régime*, and often develop enough dementia to require their permanent detention, there is merely a difference of degree.

In the case of definite degenerates, the onset of insanity, followed by premature dementia, is more readily intelligible, and is, in fact,

appreciable even to the layman; and during the past few years the question of the care and control of the "feeble-minded" has attracted a degree of attention which has recently resulted in definite legislation for such of this class as are not already in asylums for the insane.

It is unnecessary, therefore, from its general aspects, to enter into a discussion of this subject, though a few remarks on the origin and course of the particular type of case which commonly drifts into asylums is, perhaps, not out of place. Of such patients, some, after leaving school, pass from situation to situation, becoming duller after each change, either until no employer will keep them, or until definite symptoms of insanity supervene; others, under the influence of stronger minds, leave home for the large towns, or even for distant countries, and return some years later as premature dements; others, by morbid introspection and the (in many instances secondary) development of masturbation, acquire perverted sexual and hypochondriacal ideas, which undermine their powers of application and result in their isolation in asylums, &c. In other cases the resistance of the cortical neurones is exceeded by intemperance in alcohol, and, in the case of girls, married or unmarried, by the "stress" involved in ordinary or illegitimate pregnancy and confinement. Any variety of mental or physical "stress" may, in fact, act as the last straw, or precipitating agent, in determining the onset of an attack of insanity; and the question of whether or not enough dementia for the permanent detention of the patient supervenes, depends entirely on whether a sufficiency of cortical neurones have, or have not, undergone irretrievable damage.

Many cases of the kind recover sufficiently to gain their discharge from confinement, and return to their former environment with mental powers of a feebler order than they possessed before their attack of insanity. It is needless to state that such cases usually in the course of time return to the asylum, and, according to circumstances, repeat the process or remain as permanent inmates with dementia. Such cases, it may be remarked, are not to be confounded with examples of true recurrent insanity who do not develop dementia, but return again and again to their accustomed avocations with unimpaired mental powers, commonly, it is true, when in later life retrogression of the cortical neurones occurs, to become permanent inmates with, however, relatively little dementia.

The remainder of the cases under consideration do not recover, but develop either a mild or a moderate degree of dementia, remaining in this condition—owing to the absence, whilst under asylum *régime*, of enough "stress" to produce further mental deterioration—until normal retrogression or "wearing out" of the cortical neurones ensues. Such cases differ from the types of pure high-grade amentia, described in

Chapter XII of this volume, solely in the fact that the latter still possess cortical neurones in a generally unimpaired structural condition, whereas the cerebra of the former have undergone a greater or a lesser degree of dissolution.

It is not my purpose to deal in an exhaustive manner with the preliminary symptomatology of premature dementia, as the subject of the general relationship of mental confusion to dementia has already been considered at length (Chap. XIII, pp. 273–277). It is, however, necessary for the purpose I have in view to introduce certain general remarks on this subject in order to emphasize some of the especial characteristics of the dementia of prematurity.

Mental confusion, in my experience, exists to a greater or a lesser degree in all premature cases which are about to develop dementia, provided that the psychic state of the patient is not such (*e.g.* in certain cases of deep stupor, &c.), as to preclude, for the time at least, the exhibition of this symptom-complex. I have, in fact, observed, as my experience has year by year increased, that the proportion of cases exhibiting negative motor symptoms, in which it is not possible to determine the existence of mental confusion, has steadily decreased as I have paid more and more attention to such motor phenomena as the patient has been capable of originating. It has been a relatively rare experience to meet with cases of stupor which, on recovery, have been able clearly to describe what has happened whilst they were in a condition of lethargy, during which they were unable to initiate any motor response, even to intensely painful stimuli; and such cases have hitherto been examples, not of premature dementia, but of recurrent or relapsing insanity. I thus feel justified in expressing the opinion that mental confusion exists to a greater or a lesser degree in the preliminary stages of all cases of premature dementia. Further, I consider that mental confusion is a symptom of especially grave import in cases of premature or adolescent insanity, and, except in the small proportion of cases in which primarily toxic, and therefore removable, causes (*e.g.* intemperance in alcohol and puerperal toxæmia, &c.) exist, is invariably the precursor of a degree of dementia which is roughly proportionate to the amount of mental confusion present. I am thus of the opinion that the exhibition, with the above-mentioned restriction, of mental confusion by cases of premature or adolescent insanity is of such significance as to justify an unfavourable prognosis, and at the same time to remove the most important objection to the employment of the term "dementia præcox," provided that this cognomen were employed, as is here that of "premature dementia," solely to denote cases of premature or adolescent insanity which exhibit a more or less marked degree of mental confusion as part of their "acute" or "recent" symptomatology.

Whilst premature dementia, from this particular aspect of preliminary symptomatology, falls into line with the other classes of primarily neuronic dementia which have already been considered, it differs from these in the frequent exhibition of such characteristic phenomena, as render it not a matter for surprise that its study should have vastly overshadowed, both in extent and in detail, that devoted to these other varieties, with the sole exception, perhaps, of the particular well-known symptomatological type now usually designated by the name of " Korsakow's symptom-complex."

Though the necessary references to these characteristic phenomena will be made under the appropriate sub-classes into which the cases of premature dementia under consideration will for convenience be grouped, I purpose here to interpolate a few remarks which are intended to suggest a probable reason for their especial exhibition by the cases belonging to this class.

This is, in brief, in my opinion, to be found in an immature condition of the regions of association of the cerebrum. In cases belonging to the previous classes of " senile," " presenile," and " mature " dementia, whatever be the respective degrees of involution or dissolution which later on result, the regions of association, both lower and higher, have by frequent repetition necessarily acquired a capability for relatively stable neuronic groupings as the physical basis of the psychic processes performed by the respective patients ; and this statement especially applies to the neuronic groupings in the psychomotor area, which serve as the physical basis for the performance of " skilled " voluntary accomplishments. In other words, in these classes, considered for the moment from the purely physical aspect, the cerebra are completely built and thoroughly tested machines in full running order at the time when the breakdown is precipitated by too rapid running or by " wearing out."

In the case of the class of premature dementia under present consideration the state of affairs is very different. Here there is, in the first place, a highly-deficient durability of the cortical neurones ; or, to continue the simile, imperfectly tempered material has been employed for the construction of the parts ; and the neurones, or the parts themselves, are, in many instances, imperfectly constructed. Further, though most of, or all, the individual parts are placed in preparatory juxtaposition, even the simpler complexes of construction have only recently and experimentally been grouped into series. This is, in fact, the case even in the more highly endowed patients, in whom the higher complexes of neuronic association have already been tentatively produced.

It is thus only to be expected that, when such a machine is set

running at high speed, all kinds of local breakdown will ensue. In the human cerebrum, owing to a structure which in its complexity of construction overshadows any machine of human manufacture, and to the numerous sources of motive power which exist through the medium of the different varieties of sensorial stimulation, complete breakdown is relatively rare, though local stoppages, local anomalous groupings of the simpler complexes, and particularly local repetitions or irregularities of action, are of common occurrence. This is especially obvious, though not peculiar to these, in the case of the more fundamental motor exhibitions, the patient either performing, or not performing, or often repeating, certain actions, and exhibiting, as the essential characteristic of these motor performances, on the one hand a tendency to uncertainty, and on the other a tendency to repetition, of action.

It is an obvious deduction from the above considerations that a more scientific classification of the types of premature dementia should be possible than obtains in the case of the "senile," "presenile," and "mature" classes of primarily neuronic dementia. In the latter, some, at least, of the symptomatological sub-classes are without a real, or even perhaps a possible, pathological basis—*e.g.* such symptom-complexes as mania or melancholia, which probably are merely gross exaggerations of the normal emotional tone of the individual patients—though they sufficiently serve the purposes of clinical description. In the case of premature dementia, however, it is possible to make a subdivision of the cases into those which do, and those which do not, exhibit phenomena which originate in sub-evolutional or dissolutive conditions of the psychomotor area of the cerebral cortex. It is doubtful whether a further subdivision of the latter class into simple hebephrenic and paranoid types possesses, in the present state of our knowledge, an equally trustworthy pathological basis; but, in spite of a gradual shading of the cases into one another, such a separation of types is, if not justifiable, at any rate convenient, from the clinical standpoint.

In the present chapter, therefore, the cases under consideration will be approximately classified into the commonly accepted "hebephrenic," "catatonic," and "paranoid" types.

As I have already stated, the descriptions which follow are not intended either to illustrate the general symptomatology of the types, or to include all the more obvious clinical features which they present. They merely contain such details as I especially desire to bring into prominence in order to serve the purpose I have in view—namely, to demonstrate that premature dementia is not a simple clinical entity or a specific disease of the cerebrum, but is merely the dementia which develops at the earliest of the four most common periods of life at which primarily neuronic dissolution of the cerebrum occurs.

The class at present under consideration contains 112 cases, which will be classified as follows :—

	M.	F.	T.	Per Cent.
Sub-class (1) approximately— "hebephrenic"	32	32	64	57
Sub-class (2) approximately "catatonic"	23	18	41	37
Sub-class (3) approximately— "paranoid"	2	5	7	6
Total of cases of "premature dementia" . .	57	55	112	100

As might be expected in primarily neuronic dementia at the premature period of life (and as is also illustrated in the homologous but *progressive* dementia of juvenile general paralysis), the sexes are approximately equally affected, for at this period the predisposing factor—deficient durability of the cortical neurones—overshadows in importance the various exciting factors, which later in life not only acquire a greater relative value but differ both in kind and in degree in the two sexes.

The average age on certification, which is the only age available in the whole series, differs but little in the several sub-classes, being as follows :—

	Average Ages of Sexes and of Total Cases.		
	M.	F.	T.
Sub-class (1)	23	25	24
Sub-class (2)	26	24	25
Sub-class (3)	21	25	24

Sub-class (1).—The age on certification varies from 15 to 30 years in the males, and from 16 to 30 in the females. The earliest age of onset, on such information as is available, is 15 years in the case of the males and 14 years in the case of the females.

Sub-class (2).—The age on certification varies from 15 to 29 years in the males (with the exception of one patient, who was kept at home from the age of 28 years to that of 34 years, at which age he was sent to an asylum), and from 19 to 27 years in the females. The earliest age of onset, on such information as is available, is 15 years in the case of the males and 17 years in the case of the females.

Sub-class (3).—The age on certification varies from 20 to 22 years in the males, and from 23 to 28 in the females. Owing to the small number of cases in the "paranoid" sub-class, these ages are, however, valueless for statistical purposes.

It is probable that few of these figures possess much real value, as the time of certification depends so much on the degree of trouble caused by the patient in his home or workhouse environment, and as few opportunities existed for the obtaining of really satisfactory personal histories, because in the case of admissions consisting of chronic patients the

obtainable information varies in amount conversely with the duration of the certification of the individual patients.

Previous Attacks.—The ascertained number of cases which had been previously certified is as follows :—

	M.	F.	T.	Per Cent.
Sub-class (1)	7 in 32	3 in 32	10 in 64	16
Sub-class (2)	8 in 23	5 in 18	13 in 41	32
Sub-class (3)	0 in 2	1 in 5	1 in 7	14
Total	15 in 57	9 in 55	24 in 112	21
Percentage . . .	26	16	21	

Though this information is necessarily incomplete, the error of omission is presumably equally scattered throughout the series, and hence it may be deduced, as a crude observation, that previous certifications are more common in the male sex than in the female.

It may also be inferred that previous certifications are more common in the "catatonic" than in the "hebephrenic" and the "paranoid" types; and this inference is supported by the common clinical observation that "catatonic" cases often progress in a relapsing manner rather than as a slowly advancing mental deterioration, and are therefore more likely to be sent out "recovered" or to the care of their friends.

Heredity of Mental Disease.—The ascertained heredity of mental disease, though it possesses no actual value, leads at any rate to the inference that little or no difference in this respect exists between the different types. It is as follows :—

	M.	F.	T.
Sub-class (1) . . .	34 per cent.	34 per cent.	34 per cent.
Sub-class (2) . . .	26 ,,	44 ,,	34 ,,
Sub-class (3) . . .	50 ,,	20 ,,	29 ,,
Total cases	32 per cent.	36 per cent.	34 per cent.

Though the percentages differ in the two sexes, it is probable that no deduction can safely be drawn from these, as such would not be justified by the number of available cases.

The average duration of residence in an asylum at the time of observation is as follows :—

	M.	F.
Sub-class (1)	10 years (1–34 years)	10 years (1–29 years)
Sub-class (2)	8 years (1–21 years)	9 years (1–30 years)
Sub-class (3)	9 years (7–11 years)	12 years (2–17 years)

These figures demonstrate that the average duration of life is not appreciably affected by the clinical type of the symptomatology, for the 112 cases represent the "premature dementia" population of an asylum at a *particular time*, and are not a series of cases selected during a special *period of time*.

As I have already remarked, a frequent symptomatology associated with the development of tuberculosis is one presenting many resemblances to stupor. This is probably the explanation of the fairly common opinion that cases of "catatonia" are especially prone to the development of tuberculosis—a view contradicted by the above data, which show that the average duration of residence of these cases differs little from that of the other types of premature dementia.

Degree of Degeneracy.—Important conclusions have been derived from a study of the 112 cases from the point of view of physical and mental degeneracy, as the three types differ markedly in this respect.

In the following table are given the actual numbers and the percentages of degenerates—*i.e.* of high-grade aments who exhibit marked stigmata of degeneracy, and in many cases evidence of developmental feeble-mindedness, which is almost sufficiently marked to cause them to be classed as cases of imbecility (the mildest type of low-grade amentia).

	Males.		Females.		Total.	
	Proportion of Degenerates.	Percentage.	Proportion of Degenerates.	Percentage	Proportion of Degenerates.	Percentage.
Sub-class (1)—"hebephrenic" .	20 in 32	62·5	13 in 32	40·6	33 in 64	51·6
Sub-class (2)—"catatonic" . .	7 in 23	30·4	7 in 18	39·0	14 in 41	34·1
Sub-class (3)—"paranoid" . .	2 in 2	100·0	1 in 5	20·0	3 in 7	42·9
Total	29 in 57	50·9	21 in 55	38·2	50 in 112	44·6

From this table the following inferences may be drawn :—

(1) In the 112 cases under consideration, the proportion of degenerates is greater in the male sex than in the female.

(2) The proportion of degenerates is greater in the "hebephrenic" type than in the "catatonic."

(3) In the "hebephrenic" type the proportion of degenerates is especially high in the male sex.

It is doubtful if the number of cases justifies more detailed deduc-

tions, and this remark especially applies to the " paranoid " type, which includes but 7 of the total of 112 cases.

The relative proportions of degenerates in the four classes of primarily neuronic dementia will now be considered. After what has already been stated in earlier chapters, it is hardly necessary to remark that important differences exist in this respect.

From the aspect of pure high-grade amentia, as has been remarked in the introduction to Amentia, Chapter XI (p. 163), the age on certification, or the age at which the degenerate with neurones of average durability becomes unable to withstand the normal environment of sane individuals, depends on two factors—the resistance of the individual cerebrum, and the " stress " to which this is subjected—and is therefore an accidental detail which is of slight importance from the point of view of classification. In such cases an attack of certifiable insanity either adds another non-demented permanent inmate to the asylum population or results in the return to the outside world of a potential lunatic who is liable, under the influence of a relatively slight degree of " stress," to again become an asylum inmate.

When, however, the degenerate also possesses neurones of deficient durability, it is obvious that age-incidence possesses a greater significance, and that the proportion of degenerates to non-degenerates in the demented insane must be smaller at each successive period of life. In such degenerates a permanent loss of mind results from an attack of mental alienation, and therefore necessitates their certification sooner or later, whereas pure high-grade aments, with neurones of average durability, may suffer and recover from many attacks of insanity in their home environment before their friends are tired of the trouble they cause, or become unable to look after them.

The proportion of degenerates is therefore greater in premature dementia than in the other classes of primarily neuronic dementia.

This is clearly shown in the following table :—

Primarily Neuronic Dementia.	Males.		Females.		Total.	
	Proportion of Degenerates.	Percentage.	Proportion of Degenerates.	Percentage.	Proportion of Degenerates.	Percentage.
Class (D)— " premature " . .	29 in 57	50·9	21 in 55	38·2	50 in 112	44·6
Class (C)— " mature " . . .	6 in 26	23·0	3 in 34	90·0	9 in 60	15·0
Class (B)— " presenile " . .	2 in 18	11·1	5 in 47	10·6	7 in 65	10·8
Class (A)— " senile " . . .	20 in 53	37·7	24 in 70	34·3	44 in 123	35·8

In the above table the " senile " or " worn-out " class contains a high proportion of degenerates, as it not only includes the ordinary senile cases and senile high-grade aments, but also the hitherto non-demented old asylum inhabitants and the cases of hitherto stationary " premature," " mature," and " presenile " dementia, who, with the onset of senility, have developed " senile " or " worn-out " dementia (see pp. 282 and 284). As it is impossible satisfactorily to distinguish between all these types, the senile class is thus a somewhat mixed one, and the percentages given represent the proportion of physical and mental degeneracy which existed at a particular time amongst the cases of primarily neuronic dementia who had arrived at the senile period of life.

Degree of Dementia.—The degree of dementia existing in the class of premature dementia under consideration is represented in the following table :—

Premature Dementia.	Males.		Females.		Total.		Total Percentage.	
	Mild.	Moderate.	Mild.	Moderate.	Mild.	Moderate.	Mild.	Moderate.
Sub-class (1)— " hebephrenic "	15	17	14	18	29	35		
	32		32		64		45	55
Sub-class (2)— " catatonic " .	6	17	5	13	11	30		
	23		18		41		27	73
Sub-class (3) " paranoid " .	1	1	4	1	5	2		
	2		5		7		71	29
Total . .	22	35	23	32	45	67		
	57		55		112		40	60

Hence the " catatonic " form contains the highest percentage of cases which exhibit a moderate grade of dementia, namely, 73 ; the " hebephrenic " shows the lower percentage of 55 ; and the " paranoid " possesses the least proportion of the three, namely 29 per cent. The total percentage of cases exhibiting a moderate degree of dementia in the class of " premature dementia " is thus no less than 60.

The relative proportion of cases possessing a moderate degree of dementia in the four classes of primarily neuronic dementia.—As has already been stated in the introduction to the description of this variety of dementia (p. 283), and under the headings of the different classes which it contains, the actual amount of dementia is greater in the " premature " than in the " mature," and in the " mature " than in the " presenile " classes. The " senile " class, as has already been stated above, under the subject of degeneracy, falls under a different category, including, as it does, not

only ordinary senile cases and senile degenerates with "worn-out" neurones, but also hitherto non-demented old asylum inhabitants, and cases of hitherto stationary "premature," "mature," and "presenile" dementia, who, with the onset of senility, are also suffering from "worn-out" neurones. The actual amount of dementia in the senile class is thus relatively high.

For simplicity of description, as the dementia in all the cases, with the exception of a small number belonging to the senile class in which it is well marked, is of a mild or moderate grade, the number and the percentage of cases which exhibit a *moderate* degree of dementia will alone be detailed in the following table.

Primarily Neuronic Dementia.	Number of Cases exhibiting Moderate Dementia.	Per-centage.
Class (D), "premature"	67 in 112	60
Class (C), "mature"	28 in 60	47
Class (B), "presenile"	21 in 65	32
Class (A), "senile"	68 in 123	55
Total	184 in 360	51

A further question will now be briefly considered—namely, whether degenerates or ordinary patients develop the greater proportionate amount of dementia. The ordinary high-grade ament, as has frequently been stated, but especially in Chap. XII of this volume, develops an attack of insanity so readily under the "stress" of "normal" environment that he does not over-reach the durability of his cortical neurones, and consequently, according to circumstances, either recovers or becomes a permanent asylum inmate without the development of an appreciable degree of dementia. When, however, the high-grade ament *does* overstep the limit of neuronic durability, it is a matter of uncertainty as to whether a greater or a lesser degree of dementia ensues than that which occurs in an ordinary "normal" individual who has similarly overstepped the limit of neuronic durability. It is with the object of furnishing a reply to this question that the following data are inserted.

Primarily Neuronic Dementia.	Proportion of "Normal" cases exhibiting Moderate Dementia.	Proportion of High-grade Aments exhibiting Moderate Dementia.
Class (A), "senile" .	37 in 79 = 47 per cent.	31 in 44 = 70 per cent.
Class (B), "presenile"	20 in 58 = 34 ,,	1 in 7 = 14 ,,
Class (C), "mature" .	23 in 51 = 45 ,,	5 in 9 = 56 ,,
Class (D), "premature"	38 in 62 = 61 ,,	29 in 50 = 58 ,,
Total . . .	118 in 250 = 47 per cent.	66 in 110 = 60 per cent.

In the preceding table, the cases of primarily neuronic dementia are grouped, under the four classes into which this type of dementia has been subdivided, into "normal" patients and high-grade aments. As all the cases, except a few of the senile class in which the dementia is well marked, suffer from a mild or a moderate degree only, the latter

grade alone has been considered in the figures and percentages, since the former is merely its complement.

The above data indicate that high-grade aments, *as a group*, when they develop dementia, pass more frequently to the moderate grade than do " normal " individuals.

This conclusion is especially evident in the " senile " or compound class, and it is not supported by the " premature " cases, in which the neurones of both " normal " and degenerate patients have apparently suffered equally commonly from a moderate degree of dissolution.

The table further illustrates the relative rarity of degeneracy in the " presenile " and the " mature " classes, which observation renders it probable that such degenerates as have not succumbed to cerebral dissolution at the " premature " period of life have continued relatively unaffected until the " senile " period of life has been reached.

It is therefore probable that the *cause* of the main conclusion deduced from the data contained in the table is to be found in a greater tendency to " senile " or " worn-out " dissolution of the cortical neurones on the part of the degenerates than exists in the case of the " normal " individuals. This explanation is rendered the more likely by the common observation that low-grade aments, as a rule, attain to senility at a comparatively early age, *e.g.* even at forty years ; in other words, that the cortical neurones of well-marked degenerates are especially prone to undergo early senile involution or " wearing out," even in the absence in many cases of an appreciable degree of " wear and tear."

It may, therefore, with a reasonable probability that the deduction made from the data contained in the table is correct, *be stated that the presence of physical or mental degeneracy* (high-grade amentia) *does not, until the " senile " period of life is reached, influence in any way the grade of dementia which follows an over-stepping of the limit of neuronic durability.*

When, however, the " senile " period has been attained, the presence of high-grade amentia, in cases which have over-stepped the limit of neuronic durability, results in the more frequent development of a moderate grade of dementia than occurs in patients with " normal " cerebral development ; and this result is due to the greater tendency to " senile " or " worn-out " involution of the cortical neurones on the part of high-grade aments than exists in the case of " normal " individuals.

Sub-class (1).—Premature Dementia—approximately " Hebephrenic "

This sub-class contains 64 cases, of which 32 are males and 32 are females. It includes the cases of premature dementia in which " loss of mind " is the essential clinical feature, and which exhibit neither

pronounced motor phenomena nor definite semi-systematised delusions. Further, in such examples as show a tendency to perform, or to repeat, certain acts, these (*cf.* No. 595, p. 340) are usually " skilled " in nature, and are presumably mechanical remainders of what has formerly been learned and practised, rather than the results of imperfect learning or deficient practice, which are such obvious features of certain of the motor phenomena exhibited by cases of " catatonia."

The average duration of residence, in the case of either sex, is 10 years ; and the individual duration varies from 1 to 34 years in the males, and from 1 to 29 years in the females.

Owing to the duration of residence and to the existence of dementia, the cases fall into the category of " chronic " ; and therefore, apart from the reasons adduced in the early part of the present chapter for the mode of treatment of the subject which is being adopted, no detailed description of precursory or " acute " symptomatology will be attempted. It suffices, with reference to this, to remark that, in my experience, all such cases, during the earlier stages of the attack of insanity which resulted in their " chronic " mental condition, exhibited a greater or a lesser degree of mental confusion, and that the severity of this, in uncomplicated cases, bears a direct relationship to the degree of dementia which ensues (Chap. XIII).

The symptomatology exhibited by the cases contained in this sub-class is that of stationary dementia, namely, " general dullness and apathy, a loss of initiative, and an indifference to their surroundings ; a marked degree of stereotypism of all the mental processes, and an inability to learn new acquirements ; a mechanical method of performance of known acquirements, a general stupidity and inability to understand when an attempt is made at correction of any kind, and a tendency to revert to accustomed modes of speech and action ; finally, a tendency to the repetition of accustomed actions, which often shows that these have been performed in the entire absence of intelligent volition " (pp. 274–5).

This symptomatology is due, in my opinion, to a more or less extensive dissolution of the region of higher association and co-ordination in the prefrontal part of the cortex, which is the latest developed and most important portion of the grey mantle of the cerebrum, and the first part to undergo dissolution under " stress " or normal involution ; and the cases in the present sub-class, as a whole, exhibit, in probably a purer form than is seen in any of the varieties of primarily neuronic dementia, the results of this dissolution.

As will be seen from the illustrative cases inserted at the end of this description, the contents of the present sub-class include examples both of amentia, chiefly of the high-grade type, and of what were originally

presumably "normal" individuals. Of the 32 males, no less than 20 or 62·5 per cent. are degenerates; and of the 32 females, no less than 13 or 40·6 per cent. Hence, 33 of the 64 cases, or 51·6 per cent., are examples of low- or high-grade amentia—a larger proportion than occurs in the "catatonic" and "paranoid" sub-classes of premature dementia.

Whilst this observation points to the desirability of suitable State provision for the care and control of the feeble-minded, many of whom, under the ordinary environment of the "sane" members of the race, are liable to suffer from cerebral dissolution with resulting dementia, the corollary that 48·4 per cent. of the cases were presumably of "normal" cerebral development shows that exceptional "stress" is equally harmful to these, and produces its quota of cerebral dissolutions. The latter point is probably the more important of the two, as such (non-demented) "normal" individuals would be of more use to the race than would such (non-demented) degenerates; and hence is suggested the desirability that greater attention should be attracted to the often disastrous results of over-training, even in subjects who are apparently of "normal" cerebral development.

The amount of dementia existing in the cases included in this sub-class is very high, as many as 55 per cent. exhibiting a moderate grade. This, though considerable, is rather less than the percentage of 60 in the entire class of premature dementia.

Of the 64 cases in this sub-class, 44 were workers (25 good, 8 ordinary, and 11 poor), 6 refused to work, and 14 were incapable of useful employment.

The following 10 cases of various types are inserted for illustrative purposes:—

Congenital Feeble-mindedness; Mild Premature Dementia; certified six years

Case 539.—A—— A——, male, single, æt. 35. Of no occupation. "Feeble-minded from birth." Certified since the age of 29. Notes taken three days after admission.

A dull-looking man, of sleepy appearance. Forehead prominent, head large, ears small and without lobules, mouth small and lips thin. He gives his name, and states that his age was 27 on April 3rd last. He knows where he is, where he has come from, when he came, the present day, and the approximate date. He is very slow in giving replies to questions. He does not know the present year. He tells me, in reply to leading questions, that he went to school, and that he was in the eighth standard at the age of 15. When asked to multiply 12 by 9 he tries to work it out by counting on his fingers and eventually says "10." To a question of 4×3 he replies "8," after counting by the same method. He, however, again in the same way, gets 2×3 correctly, but says that $3 \times 3 =$ "26." When asked to say the alphabet he inserts two "l's," and misses out "u" and "v." He spells "horse" and "cow" correctly, but "elephant" is "eofin," and he does

not attempt "asylum." He reads like a very young child, and, even after spelling them, entirely fails to make anything of such words as "attendant" and "commencing." He is dull and slow in all his movements, and exhibits none of the wayward intelligence and erratic or rapid movements and actions of the non-demented imbecile.

Whilst under observation he was a useful mechanical worker, and was able entirely to attend to such personal matters as washing, dressing, the calls of nature, &c.

Note.—The patient differs from the imbecile and approximates to the dement in his general dullness, his sleepy appearance, and the slowness of his movements, and in the general absence of initiative, either with or without the stimulus of sensorial excitation.

High-grade Amentia; Mild Premature Dementia; certified five years

Case 542.—T—— W—— C——, male, single, æt. 23, errand boy. Certified since the age of 18. Father insane. Notes taken two days after admission.

A dull, sleepy-looking boy, who is biting his finger nails. Palate very high and chink-like. He gives his name with a slight lisp, and states that his age is 18. When asked to do so, he slowly and carefully writes his name. Many of the letters, and even parts of letters, are written singly and laboriously. All the dots are inserted, weak parts of certain letters are touched up, and a full stop is inserted after his Christian name. He seems to be then unable to put down the pencil, and after a long pause adds, in similar writing, "18 years old." During the writing he frequently pauses to lick the pencil. He reads well. He knows where he is and when he came. He states that the day is Friday (Saturday), and that the time is 2.30 P.M., after which he seems to remember the clock, as he turns round to look at it (1 P.M.). He knows neither the month nor the year, and states that he was seven years (really five) in his previous asylum. He states that $4 \times 5 =$ "20"; $9 \times 6 =$ "42"; $7 \times 2 =$ "14"; $4 \times 5 =$ "20"; $4 \times 7 =$ "28"; $7 \times 5 =$ "35"; $9 \times 6 = ?$; $6 \times 9 =$ "78." His memory frequently fails during these and similar replies, and he then adds up, at times incorrectly, to aid himself to the result. He spells fairly well, such words as "elephant" and "house" being correctly rendered. He states that previous to going to an asylum he earned fourpence a week as an errand boy. During his residence he has "tried to do bed-making, and house-cleaning, and sweeping, and cleaning chambers."

Whilst under observation this patient was quiet and well-behaved, and, though dull, a useful worker.

Note.—This case is a good example of mild premature dementia in a high-grade ament. The method of writing his name is sufficient in itself to enable a diagnosis to be made, and the evidence produced of his present attainments and previous education, though brief, for reasons of space, is more than enough for the same purpose. The present case thus differs from the previous one, in which, for a clinical diagnosis, a general knowledge of the behaviour and habits of imbeciles and of dements, rather than a special study of symptomatology, is needed.

Moderate Premature Dementia ; certified six years

Case 547.—W—— H—— B——, male, single, æt. 32, labourer, and in army reserve. Certified since the age of 26. Notes taken two days after admission.

A fatuous-looking man, who laughs in a silly manner when addressed. He takes little notice of his surroundings. When asked to frown, he looks up and says, "That's all right." He notices that I am taking notes. When asked his name he replies, "Nothing, same as yours." Where have you come from ? "You shouldn't make fools of people like you do." How old are you ? "About 40." Married ? "Yes." Children ? "You needn't make a fool of us, you know," and he then laughs in a foolish manner. He takes his food well, goes to the lavatory with the other patients, and dresses himself. He sits in the same place all day long, and is quiet. He at times looks slowly around, and at others grins fatuously to himself.

Whilst under observation he was dull and listless, paid little attention to his surroundings, and was entirely unoccupied.

High-grade Amentia ; Mild Premature Dementia ; certified eight years

Case 550.—W—— H——, male, single, æt. 29, boatman. Certified since the age of 21. Maternal aunt insane. Notes taken three days after admission.

A dull, sleepy-looking man. The cranium is low, the base of the skull is broad, the ears project, the mouth is large, the lips project, and the palate is high and narrow. He gives his name, and when asked his age replies, "Asked yesterday I said 25, and he said I was more than 25." He knows where he is, but pronounces the name of the place incorrectly, and in a shortened and incomplete manner. He knows the day on which he came, and the present day and date. He knows where he has come from, and states that he was there seven or eight years. When asked why he was incarcerated, he replies, "Was sent there I suppose." When the question is repeated he says, "I don't know." When asked to write his name, he does so in a slow and laborious manner. He corrects the imperfect letters and dots the "i's." Nearly every letter is written separately and in copy-book style. When I ask him to add his age, he slowly and carefully writes "25," the "curls" at the beginning of the "2," and the end of the "5" being elaborately made, and the "dash" at the top of the latter being long and well-curved. I then ask him about the work which he did in his previous asylum, and he replies that he wheeled coal and got "pretty fair" of tobacco for doing so. He does not know why he has been incarcerated for such a long time, and "it don't trouble me much."

Whilst under observation patient continued dull and apathetic, and showed a marked lack of initiative, but he was a useful mechanical worker.

Mild Premature Dementia ; certified six years

Case 564.—D——D——, female, single, æt. 25, general servant. Certified since the age of 19. Maternal aunt insane. Notes taken two days after admission.

A pale, anæmic girl. Teeth irregular and badly enamelled. Palate narrow and deep. Some degree of red œdema on extremities, elbows, &c. Faint skin-cracks on abdomen.

Patient lies quietly in bed, and bites her right hand and sucks her fingers. She rarely stirs, but speaks rationally, though childishly, in reply to questions.

She knows where she is, and, roughly, how long she was in her previous asylum; and in reply to a question she informs me that she did washing there. She has, at times, suffered from auditory hallucinations—voices "asking me to be good and that." She used, at first, to think that she had done wrong, and "did not do my work properly sometimes." She would have liked to go home, and used to *try* to work, &c. She often makes use of the word "try." She knows that she had a child some time ago, or thinks she had, but cannot give any information about it. She does not know whether it is alive, and "I do feel sometimes as if I would like to know if it is alive." At times, when lying quietly, she moves her lips as if whispering to herself.

A few days after admission she began to do a little ward work. She was willing, but extremely dull and slow.

Whilst under observation she became stout, but continued anæmic. She was dull, heavy, and phlegmatic, and had absolutely no capacity of initiation, though she answered questions readily enough. She was a willing worker, but was better able to understand what was wanted of her than to perform it. She was slow and clumsy, and when, *e.g.*, she washed a floor, she often slopped the water about, wet her dress, and wiped very little of the water up again. She was, therefore, of little use except for unimportant and purely mechanical employment, and even then she required constant supervision.

High-grade Amentia; Moderate Premature Dementia; certified thirteen years, and previously at the age of 24. *Sister of Case* 576

Case 575.—E—— J——, female, married, æt. 41, of no occupation. Certified since the age of 28, and previously at the age of 24. Sister of Case 576. Great-grandfather insane. Notes taken on the day after admission.

Patient is a dull, apathetic woman, who shows fewer and less marked stigmata of degeneracy than occur in the case of her sister (Case 576). Forehead free from lines of any kind, hair light grey, palate high and narrow in front, teeth poor, skin-cracks on abdomen.

She at times laughs in a silly manner, and on these occasions her forehead remains unaffected. She states that her age is six. When asked her name she says that she does not know, and then adds, "an invalid." When asked if she is married she shows me a button on her nightdress and mutters something inaudible. She then asks "Would you like me to put my name on that little bit of biscuit?" She later makes such remarks as "The publisher wants his money, the Prince of Wales," "Glad you got home," "Sixteen years since," and "Don't you feel all right like that," and tries to cover herself in bed.

Whilst under observation patient remained dull, apathetic, and uninterested in her surroundings. She occasionally talked a little to herself. She was unable to perform work of any kind, and was only imperfectly able to attend to herself.

High-grade Amentia; Echolalia; Moderate Premature Dementia; certified three years, and previously at the age of 27. *Sister of Case* 575

Case 576.—E—— A—— B——, female, single, æt. 34, of no occupation. Certified since the age of 31, and previously at the age of 27. Sister of Case 575. Great-grandfather insane. Notes taken on the day after admission.

Patient is of similar type to Case 575, but is of much more markedly degenerate appearance. Forehead receding, hair very grey, palate very high and square at the canines, teeth fair, mouth large and open, lower lip very pendulous, ears lobuleless. She is extremely narrow between the anterior superior iliac spines.

A dull, stupid-looking woman, who appears to be much older than her stated age. She calls herself "E. A. W." She is not married, but wants to be. She scratches her face and smiles, or at times sighs. To questions she replies, "Yes, yes," "What's matter," "I don't think it's my fault," &c. She says that her age is 60, and that she is "at Hampstead in John Street." To a further question she replies that she was at Hampstead yesterday, and therefore does not seem to remember anything about her journey here. To a later question she says that she does not know where she is now. She names the day correctly, and says that "it looks like winter" (August) when asked the month. The year is "1888, 1860, 1880" (1903). She is "five years old yesterday" (*cf.* her sister's remark that her age is six). She differs from her sister in exhibiting well-marked echolalia, repeating, with alteration of pronoun, practically every question put to her.

Whilst under observation patient was dull, listless, and apathetic, and took absolutely no interest in her surroundings. She thus exhibited a somewhat greater degree of dementia than her sister.

Chronic Melancholia; Mild Premature Dementia; certified five years

Case 578.—A—— M—— M——, female, single, æt. 28, cook. Certified since the age of 23. Notes taken on the day after admission.

Upper lip prominent. Nostrils thick and round. Palate shelves forward markedly. Well-marked spinal curvature. Breasts virginal. No skin-cracks on abdomen.

A very depressed and apathetic woman, who, when asked if she is a cook, states that she was a nurse at G—— hospital for ten months in the surgical wards. She broke down with the work and returned home. She stayed at home for two years, and then went out again to nurse a lady who was suffering from influenza. She herself contracted the disease, fell into a low state of health, and attempted suicide by cutting her throat. She was then removed to the asylum. She was at that time about 24 years of age, and was 29 on her last birthday. When asked how she became a probationer at that particular hospital at such an early age, she states that she led the authorities to suppose that she was a good deal older than she was. Ever since she went to the asylum she has been "more sinned against than sinning." When asked as to immoral relations with men, she replies, "Yes, several." She feels that she will never recover from her dullness and depression. She does not suffer from hallucinations. Her knowledge of time and place is accurate, and her general memory is practically normal. She is, however, dull, slow, depressed, and apathetic, is very slow in her mental processes, and shows much lack of initiative.

Whilst under observation patient continued mentally unchanged. She showed much mental hebetude, but was a useful worker. Judging from her education and mode of speech, it is probable that she had developed at least a slight degree of dementia, and had been originally of more than average intelligence.

Chronic Mania; Moderate Premature Dementia; certified eight years, and twice previously since the age of 17

Case 585.—E—— L—— T——, female, single, æt. 30, of no occupation. Certified since the age of 22, and previously on two occasions, the first of which was at the age of 17. Paternal uncle and maternal great-aunt insane. Notes taken two days after admission.

A frowning untidy girl, who rapidly settles down to complete apathy with her head bent on her chest. Her palate is high and deep in front, and her extremities are cold and blue. She gives her name, and states that her age is 27. She speaks very childishly, and looks about 20 years old at the most. When asked to write her name and age, she does so in exactly the manner characteristic of cases of premature dementia which has already on more than one occasion been referred to—in the description of Case 550, for example. She says that she has come from the West Indies, and that she came "a long time now" ago. She has heard of the name of her last asylum, but does not know how long she was there. She has an extremely dull appearance, but she frequently frowns. She takes little or no voluntary notice of her surroundings, and she is wet in her habits.

Four months later there was little or no change in the patient. This is evident from the following description: Her face is screwed into an almost perpetual frown. She gives her name, and states that her age is 22. She knows neither the day nor the date, but thinks that it is winter (February). She replies "I don't know" to practically every question put to her. She usually sits all day long with her arms folded and her eyes shut, and with her head bent forwards and her chin touching her sternum. Her extremities are blue and toneless. She is occasionally wet in her habits. She dresses herself, and at times makes her bed. She never reads, but she has written two letters to her friends. Sometimes she is very excited, spiteful, and impulsive, and she has smashed more than once. She also, on these occasions, uses foul language. At times she has worked very well for about a week, and she can make beds very nicely, although she very rarely does so.

Verbigeration; Moderate Premature Dementia; certified eleven years

Case 595.—J—— C——, female, single, æt. 36, housewife. Certified since the age of 25. Cause stated to be "confinement." Sister insane. Notes taken two days after admission.

A dull, sullen woman, who sits quietly and takes no notice of her surroundings. She is stout, and is phlegmatic in appearance and behaviour. No skin-cracks on abdomen. Marked corns on knees. She gives her name, and, when asked her age, replies, "10 years old, 10 years old. I'm 10 years old, 10 years old . . . 10 years old . . . 1899." Where are you? "I know what you want to know, nothing, all right." Who is that? (a patient). "That's Jane Potter . . . nothing" (untrue). Who is this? (a nurse). "That's Ethel, Alice, Alice, Alice" (untrue). What is the day to-day? "Saturday. To-day is Saturday, Saturday, Saturday" (correct). She rocks to and fro as she talks. Where do you live? "Where's Peter, poor old Peter? Yes, all right, Peter, poor old Peter." Where have you come from? "H——s, H——s, seaside, H——s. . . H——s. H——s. . . .

H——s. . . . Came from H——Hh. asylum. That's right. H——Hh. asylum, you devil, H——Hh. asylum. . . . H——Hh. asylum." When not asked questions, she laughs and whispers to herself.

The following notes were made some months later: She is dull and phlegmatic, and she sits and plays with her fingers or a bit of thread. She replies in a similar manner to questions, *e.g.* Do you sleep? "Me, I don't sleep. I never sleep. I never do nothing. Oh! dear, dear, I never do nothing." In playing with the string one notices that she does it in a mechanical but "skilled" manner. The action is, in fact, a mechanical remainder of what she has formerly learned and practised.

As regards her general behaviour, she is at times inclined to be spiteful. She often makes grimaces, and laughs to herself, She has a habit of throwing out of the window everything she can lay her hands on, on the ground that it is dirty. She, in fact, thinks that everything is dirty and should be thrown away. She often repeats one or two words, *e.g.* "Beautiful," "Pretty Eliza"; and when irritated she repeats one or two phrases, *e.g.* "Dirty-looking thing, I'll make you run," and "I'll cut your ear-holes off." She is clean in her habits and fairly tidy, and she attends to herself. She is a bad bed-maker, but is moderately useful at sweeping and dusting. If asked to do anything, she invariably replies, "Yes, all right." She sews if everything is got ready for her, and she is very fond of unpicking.

Note.—This case approximates somewhat to "catatonia" in symptomatology, especially in the verbigeration and the tendency to mechanical repetition of certain actions. As, however, the "Frankenstein" or "mechanical model" is not suggested by these actions, the case has been included under the present sub-class. The detail that the attack of insanity was apparently precipitated by confinement is, in my opinion, as has already been stated, merely an unimportant etiological episode, for such a factor, even if followed by a general toxæmia, has no necessary bearing on general symptomatology.

Sub-class (2).—Premature Dementia—approximately "Catatonic"

This sub-class contains 41 cases, of which 23 are males and 18 are females. It includes those cases of premature dementia which, in addition to "loss of mind," are further characterised by the exhibition of pronounced motor phenomena.

The age on certification varies from 15 to 29 years in the case of the males, and from 19 to 27 years in the case of the females. The earliest age of onset, on such information as is available, is 15 years in the case of the males, and 17 years in the case of the females.

The average duration of residence is 8 years in the males and 9 years in the females, and is thus only slightly less than that in the preceding sub-class. The individual duration varies in the males from 1 to 21 years, and in the females from 1 to 30 years. There is, therefore, no evidence

that the average duration of life in the cases belonging to the present sub-class is appreciably affected by the clinical type of the symptomatology.

All the cases exhibit, to a greater or a lesser extent, the symptomatology of stationary dementia, which was briefly summarised in the description just completed ; and, in addition, show certain motor phenomena. I do not propose to give here a complete list of these motor phenomena, as my purpose will be sufficiently served by an enumeration of such as are exhibited by certain of the illustrative cases which are cited at the conclusion of this description.

They are as follows :—

Anergic stupor, where the limbs are absolutely flaccid, and from which the patient may, however, awaken to perform such lower voluntary functions as attending to the calls of nature, taking food, &c.

Simple cataleptoid states, in which the limbs may purposively, accidentally, or by outside influence, assume all kinds of unnatural positions, and maintain them for lengthened periods of time.

Semi-voluntary cataleptoid states, in which the positions are partly under voluntary control and are largely maintained by an effort of attention. As an example of the simpler type, if one arm is raised by the observer, it remains where it is placed, but gradually falls under the influence of gravity ; if the second arm is then raised the first at once falls. As an example of the more complex type, one arm may be raised and remain so ; when the second is raised both remain as placed ; when the mouth is then opened by suggestion to the patient by one of the several methods in vogue, it remains open, and the arms continue immobile ; when, finally, a particular leg is raised, either by the observer or at his suggestion, the mouth completely relaxes, and the arms partially relax. (In many such cases persistent prompting enables much useful mechanical work to be performed.)

Resistive stupor and *stubbornness*, in the former of which the patient forcibly resists every extraneously attempted movement, and in the latter almost invariably does the reverse of what is suggested or required.

The sudden striking of attitudes and the performance of forced movements and actions, which in chronic cases are stereotyped and habitual ; also the perpetual exhibition of such muscular acts as *frowning or pursing the lips*.

Repetition of such movements and actions as are performed, and an apparent *inability to cease*.

Impulsiveness and *aggressiveness*.

Hebetude and *delayed replies to questions ;* also *echolalia*, with or without change of pronoun, this last being apparently a similar phenomenon to what is in some persons a normal mode of assisting them-

selves to the understanding of a question, by the aid of further regions of lower association.

A tendency to *reply to questions and then to spell out the reply*, and even to repeat the reply ; also *verbigeration*.

Extraordinarily rapid cerebration, with instantaneous replies to questions, or with no reply at all if the question is not abruptly and rapidly put.

A peculiar method of writing, which includes one or more of the following characteristics : Delay in commencing to write, and hesitation as to where exactly to start ; great care both in writing and in correcting, completing, and " touching-up " what has been written ; a tendency to write without performing the normal movement from left to right ; inability to leave off writing and put down the pencil ; and, finally, a tendency to repeat the writing, or certain letters or words, over and over again.

A general absence of smoothness and refinement in all the movements and actions which are performed.

The above symptoms indicate, in my opinion, a functional disturbance of, and, in most of the cases, a partial dissolution of, the neurones of the psychomotor area of the cortex cerebri, and also demonstrate that the different associated groups of neurones, by insufficient exercise, owing to the age of the patient, are imperfectly organised into stable complexes, and, for the same reason, are under incomplete or imperfect voluntary control. The pathological condition is thus, on the one hand, one of sub-evolution of function, and, on the other, one of dissolution or involution ; and a more extensive tract of cortex cerebri is therefore involved in the pathological process than occurs in the " hebephrenic " type of premature dementia.

The motor phenomena resemble, in brief, those which would occur in a " Frankenstein-man " or " mechanical model," in which certain parts were imperfectly fashioned ; in which certain groupings of parts were imperfectly tested and not in proper running order ; in which the higher mechanical complexes were imperfectly controlled and co-ordinated into series, and therefore tended to stop, to repeat action, or to go by fits and starts ; and in which, owing largely to the existence of several sources of motive power (*i.e.* from the different organs of sensation), certain mechanical complexes tended to run independently in consequence of an imperfect general co-ordination of, and control over, the whole mechanism. The motor phenomena are thus varied, and are, on the whole, of a distinctly positive or a definitely negative nature ; and repetition, wayward and grotesque action, &c., are common.

In chronic cases the phenomena are often further complicated as regards an immediate explanation, but simplified as regards their actual

exhibition, by a more or less extensive dissolution of neurones, which results in stereotyped motor remainders of former " skilled " accomplishments. These, occurring on the dissolutional side of the scale, differ in character from the erratic, grotesque, repeated, mechanical-model-like, and often " unskilled " movements which occur on the sub-evolutional side, and are due to imperfect control and insufficient practice.

The above remarks on the general pathology of the " catatonic " sub-class of premature dementia point, in my opinion, to a more extensive process of neuronic dissolution than occurs in the " hebephrenic " sub-class ; and this view is supported by the amount of dementia which is found in the cases belonging to the former. Whilst in the " hebephrenic " sub-class the percentage of cases which exhibit at least a moderate grade of dementia is 55, this percentage amounts in the " catatonic " sub-class to no less than 73, which is at the same time much higher than the percentage of 60 in the complete class of premature dementia.

I thus feel justified in regarding the " catatonic " form of premature dementia as merely a more extensive grade of cerebral dissolution than the " hebephrenic " ; and in holding that it exhibits such distinctive motor phenomena on the one hand through immaturity or sub-evolution of—and consequent deficient stability of, and incomplete higher control over—the neuronic complexes of the psychomotor area, and on the other through the existence of stereotyped motor remainders of a " skilled " nature consequent on the survival, during the process of cerebral dissolution, of local and relatively stable neuronic complexes.

From the latter (dissolutive) aspect in mental disease generally, and from the former (developmental) aspect in many of the types of high-grade amentia, but especially in the class of " cranks and asylum curiosities," the homology, between these motor phenomena of catatonia and the psychic phenomena which are due to affections of the various regions of lower association (including hallucination), is obvious. These motor phenomena also afford a useful illustration of the view I expressed as early as 1903, and proved some years later (see Part I, Chap. VII), that the psychomotor area is a region of lower association and not a projection sphere.

As might be expected from the above remarks on the general pathology of " catatonic " motor phenomena, the histological evidence hitherto obtained has been positive and negative in the hands of different observers. The purely developmental or sub-evolutional phenomena of the " Frankenstein-man " or " mechanical model " nature, being due to a deficient stability of neuronic groupings owing to insufficient practice in the co-ordination and control of the complex physical bases of the " skilled " movements evolved, have necessarily no morbid histological

features capable of detection by the methods at the disposal of the neuro-histologist; and hence the entire absence of gross morbid appearances in the psychomotor area of cases which exhibited during life marked cataleptoid phenomena is only to be expected. On the other hand, well-marked morbid appearances in the cortex cerebri—especially obvious in the Betz-cells—of cases possessing considerable dementia, and, at the same time, exhibiting special stereotyped motor remainders of former "skilled" movements, are naturally found in association with general prefrontal and frontal dissolution of the cortical neurones; but, with our present knowledge, at any rate, it is impossible to isolate relatively normal physical cell-groupings for such motor remainders amongst the complex galaxy of normal, and partially or completely disorganised, cell-elements in the psychomotor area. It is, however, likely that the histological study of cases, selected according to the general type of the motor phenomena exhibited by them, may, even by the employment of the neuro-histological methods at present at our disposal, lead to fruitful results in the future.

The present sub-class, like the last, includes both presumably "normal" individuals and degenerates. In the male sex the percentage of high-grade aments is 30·4, in the female 39·0, and in the whole sub-class 34·1. This last is much lower than the corresponding percentage of 51·6 in the "hebephrenic" sub-class, and considerably lower than the percentage of 44·6 in the total class of premature dementia. Such a result is *a priori* to be expected, as more extensive dissolution naturally occurs when the breaking-strain of the relatively normal cerebrum is reached by over-training, than follows the attainment of the less severe breaking-strain of the cerebrum of the high-grade ament. A considerable proportion of high-grade aments, in fact, break down so readily, under the "stress" which is the normal environment of the sane, that they sustain no appreciable neuronic damage, and convalesce, only again to relapse, until they finally become permanent and non-demented asylum inmates.

Of the 41 cases in the present sub-class 16 were workers (8 good, 2 ordinary, and 6 poor), 8 refused to work, and 17 were incapable of useful employment.

The following 10 cases are inserted for illustrative purposes:—

Attitudes and Forced Movements; Stubbornness; Impulsiveness; Rapid Cerebration; Mild Premature Dementia; certified four years, and previously at the age of 15

Case 596.—W—— E—— W——, male, single, æt. 25, clerk. Certified since the age of 21, and previously at the age of 15. Notes taken three days after admission.

A dull, heavy-looking man. Palate high, and narrow in front. He takes little or no notice of me, but replies to short, sudden, and rapidly-spoken questions. He knows where he is and where he has come from. He cannot say when he came, but asks me if I have forgotten. He then guesses several days in succession and all wrongly, and afterwards talks on to himself in short sentences: "Why shouldn't it be? . . . Is it absurd that . . ." &c. He has been in his previous asylum four years and three months. He knows the present month and year, but is four days wrong in the date. He gives his age correctly. He did gardening at his previous asylum, and got cigarettes from home and tobacco from "one of the officials, a young fellow there." It is impossible to get replies to questions unless he is asked sharply and rapidly, in which case he answers in kind, as otherwise he mutters to himself and takes little or no notice. Occasionally after a question he talks on apparently quite incoherently: the sentences are, however, short and grammatical, and it is probable that several intermediate ones are missed out in such a way as to render it impossible to follow the association of his ideas. He informs me that he passed all the standards at school. He was then a clerk for several years, during which he lived in three different towns. He was only in his last situation for three months. When he begins to reply to questions the answers come so rapidly, and his attention so quickly fails, that it is difficult to cerebrate rapidly enough to understand the replies and state another question in time to retain his fleeting attention and render the conversation consecutive.

At the time the above notes were taken the patient had exhibited no definite motor phenomena beyond partial stupor, and a general tendency to stubbornness when anything was required of him. In a few days, however, he was noticed to stand for long periods in forced attitudes, and to be aggressive and at times impulsive. Whilst under observation such phenomena were of common occurrence, and were especially noticeable at entertainments, &c. He would suddenly kneel on the floor with upraised hands, or stand in cataleptoid attitudes, and keep up these positions for long periods. Similar phenomena were also at times exhibited whilst at exercise. He was a worker of ordinary type, but was at times untrustworthy, very stubborn, and aggressive. Mentally he was quite unchanged, either cerebrating with extraordinary rapidity, or taking absolutely no notice of any questions put to him.

Partial Stupor; Attitudes; Mild Premature Dementia; certified five years; and showed symptoms for at least six years previously

Case 599.—A—— S——, male, single, æt. 39, gardener. Certified since the age of 34, but showed symptoms for at least six years previously. A paternal relative insane. Notes taken two days after admission.

Patient sits staring forwards and upwards, with the head thrown back, and the muscles of the front of the neck prominent. His lips are compressed, and at times he nods and slowly closes and opens his eyes. He is very slow in replying to questions, but gives his surname and his Christian name. He says that his age is 20. He knows where he is, and where he has come from, and he states that he was in that asylum for four or five years. When again asked his age he repeats that he is 20. His limbs can be fixed in cataleptoid positions by stroking the necessary muscles, but these positions are not now (voluntarily) assumed.

Whilst under observation, the patient, as a rule, stood for practically the whole day long in the same attitude, and, as far as possible, in the same

places. By judicious and persistent prompting he would at times perform such simple mechanical acts as carrying coals, &c., and could similarly be got, and at times more readily, to attend to himself. Such actions as he performed resembled, in their absence of smoothness and refinement, those that might be carried out by a mechanical model. Whilst under observation the patient remained in exactly the same condition.

High-grade Amentia; Repetition of Movements; Simple Habit Tricks; Moderate Premature Dementia; certified eleven years

Case 600.—C—— F——, male, single, æt. 39, labourer. Certified since the age of 28. Mother insane. Notes taken three days after admission.

A vacuous-looking man, with a badly-developed lower face, teeth separated by gaps, and a large, partially-bald cranium. He constantly talks to himself and carries out habit-tricks, such as holding a piece of paper in one hand, and alternately turning it over, and moving the other hand up and down, to and fro, or round and round the piece of paper at some distance away from it. When asked to write his name he does so, but it is almost impossible to read what he has written, as he so exaggerates, and repeats over itself so many times, the beginning and end of each letter he writes. He also duplicates the "e" in "Charles." He writes his age as "35." Whilst writing "age" he seems quite unable to leave the "g" alone, and after writing the "5" he proceeds to cover it over with fine curled lines until the letter is practically invisible. This is probably owing to his not being prompted to write anything further, and to his being quite unable to take the pencil off the paper without being told to do so. As soon as the pencil has been taken from him he develops a vacuous grin of satisfaction. He is extremely garrulous. He is "not a married person, but I have a brother and sister married." He speaks inconsequently about asylums, convalescent homes, and sanatoria; and he asks me if this place is C—— or M—— (names of asylums). He thinks he has been away from town (H——) for about five years. Have you done any work? "With a piece of iron on a stock" (probably a farm or garden implement). He tends in his replies to questions to say the reply and then to spell it out, and he even at times repeats the spelling. Whatever he says or performs, he cannot leave alone, but tends to repeat the words or actions over and over again. During conversation he hardly ever stops twirling his right hand about or moving it around at different angles. When asked about hallucinations, he replies, "People come close to me and give me stones, and I wet them in my mouth and spit them out."

Whilst under observation the patient was mentally unchanged, and he was practically useless as a worker.

Note.—The tendency to repetition of movements, the simple habit-tricks, and especially the method of writing, which are exhibited by this patient, are worthy of attention.

Resistive Stupor; Impulsiveness; Mild Premature Dementia; certified five years

Case 603.—A—— V——, male, married, æt. 34, brick-maker. Certified since the age of 29. Notes taken three days after admission.

A blank-faced man who sits with his head bent forwards, or tries to turn

away from me, or to get up and go away. As soon as he settles on his chair he looks downwards with wide-open eyes and dilated pupils, and exhibits an intent expression which resembles that produced by fear. His attention can only be momentarily attracted, and when he is intently gazed at he gradually begins to exhibit tremor of the head and neck as a result of the great rigidity of his muscles. He is extremely resistive. There is no tendency to a cataleptoid state, but if the limbs are raised they remain in this position owing to their extreme rigidity. He either takes no notice of questions or replies quite suddenly, *e.g.* "I sleep very well, sir." He, therefore, at any rate, at times, hears and understands, and can reply to what is asked of him. When I tell him that I have done with him, he gets up and goes at once.

Whilst under observation the patient continued unchanged mentally. He was at times violent and impulsive, and he was totally unemployed.

Note.—This case, in many respects, presents a great resemblance to Case 596, p. 345.

Partial Stupor; Moderate Premature Dementia; certified two years, and previously at the ages of 25 and 23 years

Case 604.—P—— T—— M——, male, single, æt. 28, private in the army. Certified since the age of 26 years, and previously at the ages of 25 and 23 years. Notes taken four days after admission.

A sleepy man, who looks up when told to do so, and who makes grimaces when asked to put out his tongue. He gives his name, and states that his age is 24. He speaks in a whisper. At times he smiles in a vacuous manner, moving the left side of the face more than the right. He is very slow in replying to the simplest questions, and nearly all the information he supplies is either inaccurate or inapposite. When, for example, he is asked if he knows anyone here, he remarks, "Plenty to do." He sits all day in one position, and does not voluntarily move, even for meals. He does nothing for himself, frequently masturbates, and is wet and dirty in his habits. His bodily health is satisfactory.

Whilst under observation he gradually recovered from his stupor, and, though very dull, phlegmatic, and uninterested in his surroundings, became a useful worker.

Verbigeration; Echolalia; Moderate Premature Dementia; certified six years, and previously at the age of 21

Case 605.—G—— P—— P——, male, single, æt. 30, grocer's assistant. Certified since the age of 24, and suffered from a previous attack at the age of 21. Aunt insane. Notes taken two days after admission.

A vacant-looking man who stares about him, occasionally smiles in an insipid manner, and fidgets with his hands. When asked his name, he replies "P——, P——." Christian name? "Christian G—— P——." Where are you? "Where am I?" He reads the name of the asylum when shown it. He came here "3—4—5 years ago," and still seems to think that he is in his previous asylum, though he points to and speaks the name of the present one. How old are you? "How old am I? 27—28, yes." He says that he can work, in reply to a question. At his previous asylum he worked in the garden. Did you get tobacco? "Tobacco. Yes, little

pieces." Often ? "Why, three times a week, yes." Do you hear people talking to you ? "Yes, talk at night. Yes, they talk you know. Yes." He owns that he has been a troublesome patient, and uses such expressions as "Giving way," "Breaking out," "Smash," "Windows and such things," "Yes, yes." During examination he has a piece of bread in his left hand, and he persists in holding it whilst he dresses.

Whilst under observation the patient showed no signs of mental change, and was dull, listless, apathetic, and quite unemployed.

Semi-voluntary Cataleptoid State ; Some Premature Dementia ; certified nineteen years, and previously in an asylum

Case 623.—C—— R——, female, single, æt. 44, of no occupation. Certified since the age of 25, and had previously been in an asylum. Notes taken on the day after admission.

A woman with a dry skin, a mask-like face, and many fine, horizontal wrinkles on her forehead. She holds her hands, which are cold and blue, in more or less constrained positions. She grins in a silly manner at times. She sits up, puts out her tongue, and does generally as she is told. She otherwise sits quite still except for a more or less constant slow movement of the eyes, and an occasional smile. There is partial cataleptoid rigidity of the limbs. This is by no means marked, as occasionally, whilst I am moving her limbs about, a few (involuntary) movements of the extremities occur. Further, the limbs gradually fall to the bed under the influence of gravity, though if so placed as to be least subject to this force, *e.g.* in the vertical position, or curved as to be best supported by the resistance of tendons and ligaments, they remain for a considerable time practically immobile. Again, when one limb has been fixed, it tends to undergo relaxation when that on the other side is placed in a similar position. It is, therefore, probable that in at least many instances the cataleptoid condition is semi-voluntary. The patient takes no notice of questions, and except for an occasional smile, which at times appears to exhibit a certain degree of slyness, takes no interest in her surroundings.

Whilst under observation the patient continued unchanged. She was totally unemployed, but would feed and dress herself.

High-grade Amentia ; Stupor ; Salivation ; Moderate Premature Dementia ; certified four years

Case 632.—G—— K——, female, single, æt. 26, domestic servant. Certified at the age of 22. Notes taken two days after admission.

A dull-looking woman of vacuous appearance. Some asymmetry of the face, the right eyebrow being higher than the left. Forehead very peaked, *i.e.* each side falling rapidly away from the metopic suture. She sits with her hands doubled up, the thumb lying inside the flexed fingers ; and she takes no notice of her surroundings. She states her name in a childish whisper, and, when asked to write it, does so slowly and laboriously and in copy-book style, the details resembling those already referred to and described in previous cases as characteristic of patients who have learned to write properly and have afterwards developed premature dementia. She rarely says more than one or two words in reply to questions, and usually merely whispers a "Yes." She is very slow in replying to questions, and

the responses are, as a rule, quite incorrect. She salivates a good deal. She feeds herself with a spoon, and partially dresses herself. She is clean in her habits, and she follows the other patients to the lavatory.

Whilst under observation the patient remained unchanged; she was dull, apathetic, and semi-stuporose, and entirely unemployed.

High-grade Amentia; Attitudes; Explanatory Delusion; Some Premature Dementia; certified six years

Case 635.—A—— L—— M——, female, single, æt. 33, servant. Certified since the age of 27. Notes taken on the day after admission.

A morose-looking woman with a small moustache and beard, ears without lobules, and the general appearance, except for complexion, of a Red Indian. She states her name, speaking with a lisp, and gives her age as 36. She knows that she came here yesterday, where she has come from, and that she was in that asylum for six years and seven months. She informs me, in reply to a question, that she cleaned the bath-room whilst there, but she adds that *it was not she herself who worked but a machine which walks about as her, because* she *would not do "county work." "This machine goes and walks about and does things I don't want to do."* She has had the machine in her all her life. When asked about hallucinations she denies them, but she states that "men come about and pretend I am a person I am not." She knows the day correctly, and states that the month is "September or October" (October). She does not know the date or the year. She is spiteful, and has already several times spit and scratched. She is untidy as regards her hair. She is clean in her habits.

Four months later the patient continued unchanged. She usually sat still all day, or stood looking out of the window, and always in more or less forced attitudes, which she was constantly striking. She spit about a good deal, and often rubbed it on her dress. She did no work, and, though she dressed herself, she neither did her hair nor made her bed. She was clean in her habits.

Note.—The simple explanatory delusion exhibited by this patient is worthy of attention.

Habit-tricks; Attitudes; Forced Movements; Moderate Premature Dementia; certified nine years, and previously at the age of 20

Case 636.—J—— S——, female, single, aged 40, housekeeper. Certified since the age of 31, and previously at the age of 20. Paternal grandfather insane. Eldest brother, and also paternal uncle, committed suicide. Notes taken two days after admission.

Hair very thin (from a habit of pulling it out). Teeth very irregular. Palate high, narrow, especially in front, and shelves forwards. Lobules of ears deficient. No skin-cracks on abdomen. Breasts very atrophous. Marked corns on right knee (from a habit of kneeling).

A dull, childish-looking woman, who sits quietly and pays little attention to questions. She sniffs almost continuously, and plays with and picks her fingers. What is your name? "Sally, Polly, Tommy, Jip," and laughs. She then, when the question is repeated, replies "Jane" (incorrect). "That's cherry tree they put in, your name, and turpentine and beeswax" (possibly

objects she has recently noticed, as the gardens are being planted and the floors are being polished). She then mutters away to herself about "Polly Paine," "Lucy Mercer," &c. (names unknown). She cannot dress herself. She stays wherever she is placed. When she walks she keeps stopping and kneeling down on the right knee.

Some three or four months later her condition was substantially unchanged, being as follows:—She picks away at her finger nails and takes no notice of me. If I try to attract her attention, she says, "Don't do that," and goes on picking away as if absorbed in her occupation. At times she looks up and smiles in a shy manner.

She is very quiet, but mutters to herself at times. She kneels down before she does anything—*e.g.* on getting up in the morning she kneels down, and then stands naked for about half an hour. She does nothing for herself except partial dressing, not even attempting to wash herself or to do her hair. She is at times wet and dirty in her habits. If put in a certain place she, as a rule, stays there until she is moved, but at rare intervals she darts suddenly to the opposite side of the room. She often performs such actions as carrying out rolling movements with her fingers, or lying flat on her back on the floor for a minute and then getting up and kneeling on her right knee. She is stubborn over her food, which has to be more or less forced into her mouth.

Sub-class (3).—Premature Dementia—approximately "Paranoid"

This sub-class contains 7 cases, of which 2 are males and 5 are females. In spite of the small number of included cases, I am of the opinion, for reasons which are given below, that a "paranoid" sub-class of premature dementia is desirable for descriptive purposes, as I am convinced that the delusional cases now under consideration should not be included either under the "hebephrenic" sub-class, or under the class of "paranoia or insanity with systematised delusions," which are described under "Amentia" in Chapter XII (p. 207).

With reference to the former, the differences between the types are obvious; and as I am here dealing, not with the precursory symptomatology of, but with developed examples of, premature dementia, a few words on this point will suffice. Cases belonging to the present sub-class exhibit relatively little mental confusion, and resemble ordinary examples of delusional insanity in the existence at their onset of a distinct and, at any rate, semi-systematised, persecutory stage in which hallucinations occupy a prominent place, and in their relatively slow progress. On the other hand, in the "hebephrenic" type of premature dementia, mental confusion, with hallucination as one of its symptoms, is the prominent feature, and more or less rapidly ends in a mild or a moderate grade of dementia. In the case of hebephrenia also, if persecutory ideas arise in consequence of persistent hallucinations, they are multiple and unsystematised, and the patient, at the most, develops an explanatory delusion (see Case 635, p. 350).

With regard to paranoia, on the other hand, the differences are less obvious, and the psychiatric description of these is somewhat difficult to give with clearness. The ordinary statement that paranoid cases are primarily dementias with a less systematised set of delusions is inadequate, as it is possible to reply that the earlier age of onset, and the consequent existence of a less stable and experienced cerebrum, result in the development of an abbreviated and less systematised set of delusions and in a more rapid course to dementia, and that, therefore, such cases are really examples of true premature paranoia.

The latter was at one time my opinion, but further experience convinced me that it was necessary to limit the term "paranoia" to a special type of case with systematised delusions, which possesses its sane prototype, as does amongst others another and simpler, but correlated, type of high-grade amentia, the insane "crank." Such cases exhibit anomalous psychic processes which are presumably of developmental origin, and mild dementia ensues only with the onset of cerebral involution. The remainder of the cases commonly classed under "paranoia" exhibit complex phenomena of association which arise under the influence of local disorders of lower association. These phenomena are probably indicative of neuronic dissolution in the particular regions of lower association which serve as their physical basis; and such cases frequently develop considerable dementia. Two such cases are described and discussed in an earlier chapter (pp. 269–273). In paranoia, in my opinion, the region of higher association is the primary cortical area at fault, in that it is unable to exercise its normal functions of co-ordination of, and of corrective and selective control over, the regions of lower association. In the delusional cases, which I exclude from the group of true paranoia, various local disabilities exist in one or more of the regions of lower association; and these lead either to unharmonious action of these regions in relation to one another, or to more generally aberrant psychic processes, involving also the region of higher association. The former condition is developmental, and the latter is evidence of local cerebral dissolution which slowly becomes widespread; and these types, for the sake of clearness, may be usefully spoken of as *developmental* and *dissolutive paranoia* respectively.

The cases contained in the present sub-class are of a similar type to the latter, and may be termed, for the moment, examples of *premature dissolutive paranoia*. Such cases occur at all ages, and might conveniently be classed as examples of "paranoid dementia." I prefer, however, owing to the fact that all grades of delusion exist in cases of dementia, from the unsystematised to the semi-systematised, or even the systematised, not to make use of any such general symptomatological division, although during the description of premature dementia

I have found a sub-class of the kind convenient. My excuse for making an exception in the present instance lies in the fact that, of all the classes of primarily neuronic dementia, the amount of dementia is the greatest in the premature variety, in which, therefore, such a symptomatological division is both possible and convenient for descriptive purposes, although, from the general psychiatric aspect, it is undesirable. In other words—to render my position quite clear—whilst in premature dementia the few "paranoid" cases stand out sharply from the (usually more demented) "hebephrenic" and "catatonic" types, in the other varieties of primarily neuronic dementia no such "paranoid" group is evident unless *all* cases exhibiting unsystematised, semi-systematised, or even systematised delusions were included in this, to the exclusion of every other symptomatological characteristic. Under such circumstances, as so many further possible sources of delusion exist, owing to the more extensive mental content of the adult individual, a *reductio ad absurdum* would necessarily result.

I therefore limit the term "paranoia" to cases possessing anomalies of the higher psychic processes which are of developmental origin, and include dissolutive delusional cases, with the above restriction of convenience, under the more general division of primarily neuronic dementia.

That this reservation is one of convenience only is clearly shown by the following case, which exhibits a symptomatology comprising motor phenomena—*e.g.* the striking of attitudes, semi-voluntary cataleptoid states, verbigeration, and characteristic handwriting; stereotyped "paranoid" phenomena—*e.g.* hallucinations and delusions of persecution and grandeur; and with these a moderate grade of dementia. The interest attached to this case is still further increased by the fact that a brother of the patient, now dead, had exhibited a similar complex symptomatology.

J—— J—— M—— (Rainhill Asylum), male, married, æt. 41, iron-moulder, certified since the age of 32. Brother died in this asylum (see notes below); father and also other brothers intemperate.

Six months before admission patient suffered from influenza; and three weeks before admission he developed mental symptoms, which consisted chiefly of hallucinations of hearing.

On admission he was quiet, coherent, and rational; and his memory was fairly good. He was able to give a good account of himself. He stated that his wife had committed adultery, and that people could easily read his thoughts by means of some machine.

For some months he continued quiet and unobtrusive, and was somewhat depressed. He was much occupied with his hallucinations, but worked fairly well. He then became grandiose, stating that he owned

millions of pounds, and that the Prince of Wales and others were trying to kill him by means of machines in order to obtain this money.

A few months later he became restless, excited, dangerous, and threatening; and he was noisy and talkative, and much troubled by hallucinations of hearing and delusions concerning electricity.

Four years after admission he was still in a similar condition, and he suffered severely from hallucinations of hearing, the voices appearing to come from the ceiling and from under the floor. He stated that he was in the asylum as "J—— J—— M——," but that this man was tortured and killed two years ago, and that he had assumed his form and name. He therefore gave his age as two years.

He then for some time showed little mental change, but gradually came to speak of the voices as "crack-pots."

He continued in this condition for some three or four years, and then gradually developed characteristic motor phenomena, and a fixed delusion of grandeur.

He had then been in the asylum nearly ten years; and his mental condition, in brief, was as follows:—

He is a dull, listless man with a broad nose and a high and shelving palate. He is clean in his habits and is a ward worker. He is at times noisy; and he is occasionally annoyed by what he calls the "crack-pots." He often stands motionless for long periods with his eyes closed, his mouth open, and his hands outstretched. He exhibits semi-voluntary cataleptoid phenomena. If, *e.g.*, one of his arms is raised, it remains where placed; if, then, the second arm is also raised, both arms remain for a long time rigid and motionless; if, during this period, the patient is suddenly told to open his mouth, he does so, and his arms at once fall down to the sides.

He replies readily to questions. He rejects his proper name, and states that his name is "King George," and when asked to write his name he slowly and laboriously indites "king George," carefully finishing off the letters and then returning to dot the "i" after he has finished. The style of handwriting is in every way characteristic of that frequently referred to as occurring in premature dementia. When asked which "King George" he professes to be, he replies, "*Not* King George *III*; my name is King George only to you, sir." Age? "Unknown Zetland years of age I been dead" (*cf.* a delusion referred to already). "I came with a man named M——" (his own name). "I'm turned five years in this building, sir. Altogether here going for ten years. He came from W—— on 7th or 8th October, ten years ago" (correct duration within two months). He knows the day and the exact date within a day, *i.e.* "26th or 27th February, 1907, 1907 year to you, sir" (really 25th). When again asked his age he replies, "Unknown Zetland,

Unknown Zetland, Unknown Zetland, if you know what 'Z' means. Unknown Zetland. I have to go by 'Z' to you, sir. I have no father and no mother to you, sir." It will be noted that he ends many of his phrases with "to you, sir," and also verbigerates.

The brother of this patient exhibited a very similar symptomatology, which is, briefly, as follows :—

He was nine years older than his brother, and was admitted at the age of twenty-nine years. He was married, and was a file-cutter. When admitted to Rainhill Asylum, he was excited; and he suffered from hallucinations of hearing concerning women and spirits, and from hypochondriacal delusions concerning his heart and stomach. He then became noisy, abusive, threatening, and violent; and suffered from marked auditory hallucinations and visceral delusions.

Two years later he often conversed with himself in an excited manner: he suffered from hallucinations: he had numerous delusions regarding his present position: and he considered himself a supernatural being.

Shortly afterwards he began to develop cataleptoid phenomena, often remaining on his knees for hours in a partially dressed condition.

Five years after admission he stated that he had been in the asylum 20,000 years, that he was sixteen years of age, and that "spinks" were around him (*cf.* the "crack-pots" of his brother).

Seven years after admission he became dull and slovenly; and he ceased to speak, work, or amuse himself. He also became dirty in his habits. Concurrently with this change in his mental condition, and probably as the cause of it, he developed tuberculous pleurisy; and he died from phthisis six months afterwards.

The remarkable resemblance between these two cases is too obvious to need further reference. As, however, I made no personal observations on the latter, I shall confine my attention to the former in the following remarks.

Such a case, though certified at the age of 32 years, would fall equally under the "catatonic" and "paranoid" sub-classes of premature dementia, in that it exhibits, on the one hand, developmental and dissolutive motor phenomena, and, on the other, complex dissolutive psychic products of paranoid type. The former of these have a physical psychomotor basis, which justifies a symptomatological "catatonic" sub-class; the latter, except perhaps as regards the hallucinatory phenomena of lower association, have no such relatively simple physical basis, and therefore the formation of a "paranoid" sub-class, except as regards convenience, possesses no present pathological justification. Such a paranoid symptom-complex, in fact, occurring in a case which exhibits the typical characteristics of the "catatonic" sub-class of premature dementia, is, in my opinion, ample evidence that the "paranoid" state,

in contradistinction to "developmental paranoia," is simply indicative of a cerebral dissolution which involves both the individual neurones of the higher region of association, and of several regions of lower association, and also, as a consequence, in a most intricate manner, the various intracentric neuronic complexes.

I therefore hold that the "paranoid" state is a variable symptom-complex indicative of widespread, though not necessarily advanced, cortical dissolution, and that it is consequently undesirable to employ the term generally, either for gross symptomatological purposes, or to denote a psychiatric subdivision possessing a histo-pathological basis.

The small number of cases in the sub-class at present under consideration renders it impossible to draw conclusions of value with regard to degeneracy and dementia respectively. It may, however, be stated that 3 of the 7 cases are high-grade aments, which is about the average occurring in the total class of premature dementia; and that 2 of the 7 cases exhibit a moderate grade of dementia, which is much below the average occurring in the whole class.

Of the 7 cases, 4 were workers (2 good and 2 ordinary), 1 refused to work, and 2 were incapable of useful work.

Owing to the psychiatric importance of the cases contained in this sub-class, as many as four are appended for the purposes of illustration.

High-grade Amentia; Grandeur; Suspicion; Systematised Persecutory Delusions; Hallucinations of Hearing; Mild Premature Dementia; certified eleven years

Case 637.—A—— A—— S——, male, single, æt. 31, painter. Certified since the age of 20. Father insane. Notes taken on the day after admission.

Palate very high, very narrow, and shelves markedly forwards. Incisor teeth very prominent. Mouth open. Chronic disseminated tuberculosis of both lungs.

A thin, bright-eyed young man with a bad cough, who speaks with a slight lisp. He gives his name, and the year in which he was born (presumably correct). He knows where he is, and says that he has never been in this neighbourhood before. He gives the correct day and date. He states the exact date on which he was first taken to an asylum, and states that he was there "just under 21 years." He presumably here refers approximately to his age when admitted. He gives the exact date on which he was transferred to the asylum from which he was admitted here. He was an "artist decorator," and served the whole of his apprenticeship, afterwards 'jobbing about." "I pleased myself and suited the exuberance of my own verbosity in going to C——" (his first asylum)—this remark being given in reply to a question as to the cause of his detention. He replies that he hears voices, but "I was all right, I was all right. I was keeping my eye open." He thinks it was a male voice, and he very seldom hears women's voices. He then states that "Electricity is life. As Dr. —— passed through the ward, he said, 'Is that the line?' and I said 'Not yet,'

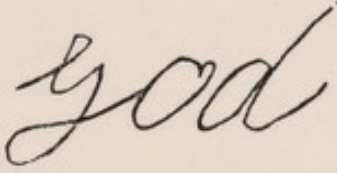
and then he came parallel, and we seemed to go by train, didn't we ? . . . But it's such a lot, it's no use talking, except giving an idea of what we are talking about." He thinks the voices "are all to my good," also "my brain is touched and played on by electricity." Who does it ? "That's a matter of the combination, one thing or another. Doctors must get well, and so a patient must get worse." . . . "I was much afflicted the first two months at C——. I had the battery put on."

Whilst under observation the patient improved in health, and became a moderately useful worker. Further conversations resembled that given above, and merely confirmed the conclusion, which had already been acquired, that the patient had previously elaborated a systematised group of delusions of a persecutory nature, but that his abbreviated modes of thought and expression, consequent on the development of stereotypism and mild dementia, rendered it impossible to obtain a complete account of their exact nature and mode of development. He was suspicious, conceited, and grandiose, and had a habit of showing very obviously that it was not worth while troubling, and might even be risky, to give detailed descriptions of his experiences, which could not be comprehended and might readily be misunderstood by his interlocutor.

High-grade Amentic ; Delusion of Grandeur ; Moderate Premature Dementia ; certified seven years

Case 638.—G—— P—— T——, male, single, æt. 29, of no occupation. Certified since the age of 22. Notes taken two days after admission.

A fatuous-looking young man with a small upper lip. He gives his correct surname ; and, when asked his Christian name, he remarks, "Whatever you like to call me." He does not know where he is or what is his age, but, hearing a piano, he remarks, "It's a good-toned piano, that is." Can you play ? "Oh, yes." He states that he was born in P—— workhouse, and used to scrub floors there. He tells me that his father and mother were Mr. and Mrs. M——. He is extremely dull, silly, and fatuous ; and the information he supplies is quite untrustworthy. For example, he previously did not know his age, but when asked later he replies "22." He says that he went to school, so I ask him to write his name, which he had previously stated correctly. He takes the pencil in his hand readily, but slowly, and, after licking it, he painfully and tediously writes as follows :—



He informs me that this is really his name, that it is a "Christian name," and that he has to keep writing it so as not to forget it.

Whilst under observation he remained dull, fatuous, and listless ; and could not be persuaded to do any work, though he would attend to his own wants. When requested, he would write his name as above.

Note.—The case is an unusual one, and owing to the amount of dementia present it was not possible to determine the method by which the patient had arrived at his fixed idea, which, curiously enough, he

could only be got to express in writing. The writing is similar to that already several times mentioned as characteristic of premature dementia. The general behaviour of the patient, as already stated, was that of a moderate dement, and not that of an imbecile, though the patient was obviously a degenerate. The case, after consideration, has therefore been placed in its present position, as an example of the delusional type of premature dementia in a patient of originally defective intelligence. I have been influenced to adopt this view owing to having seen more than one case of similar type, and, notably, a patient of originally defective intelligence who thought that he was heir to the throne and son of the late Queen Victoria. This patient was firmly convinced of the truth of his delusion, although he could give the names of his father and mother, and was able to inform me that they had both been dead some years. (The late Queen Victoria was then alive.) When confronted with this discrepancy he was not in the least disconcerted, but talked fluently and inconsequently about his "family likeness to the Georges," &c.

Delusions of Grandeur; Mild Premature Dementia; certified five years

Case 639.—A—— E—— R——, female, married, æt. 30, charwoman. Certified since the age of 25, and showed symptoms since the age of 24. Notes taken on the day after admission.

The teeth are very irregular. The palate is very high, narrows remarkably anteriorly, and then rapidly shelves forwards. The ears have no lobules. The finger nails are bitten into the quicks. There are no skin-cracks on the abdomen, and the breasts are nulliparous.

A lively-looking woman with a very smooth forehead and bright eyes. She informs me that her name is Mrs. L——, and that she became Mrs. L—— whilst at G—— (the asylum from which she has been transferred). Mr. L—— is a lawyer at H—— (her native town), and she used to know him when she was a girl at school. She thinks that he died six months ago. She was married by telephone in his hospital at H—— two and a half years ago. Mr. R—— (her present husband) died ten or twelve years ago, and two days after his death she was married to the Czar of Russia because she was an adulteress. She was then the Czarina of St. Petersburg. When asked about the asylums in which she has resided, she informs me that she lived "three and a half years next November at G——, might be longer." She went there from C——, in which she had lived three and a half years. (She has only been certified five years.) When leaving home "I was to go to Windsor Castle to go to the palace at Constantinople, and if not there to St. Petersburg or Germany, but they sent me to C—— instead." She knows the present day and the day on which she came here, but she guesses the month as "June or July" (August), and she does not know the present year. She then becomes garrulous, and amongst her remarks a question as to whether she has had any children elicits the following:—"I have three living children as I know of, but they are in Zululand doing well. Two

little boys with golden hair and one little girl. I had a boy and a girl before, but they had fits. One was a sailor and one was a soldier," &c. No clear persecutory stage prior to her present condition of grandeur could be elicited.

Whilst under observation the patient remained mentally unchanged, and she was a willing and useful worker.

Delusions of Persecution; Hallucinations of Hearing; Premature Dementia; certified seven years

Case 641.—M—— E—— G——, female, single, æt. 31, servant. Certified since the age of 24. Notes taken three days after admission.

A somewhat depressed woman, who says she is rather unsettled owing to coming here, but has nothing to complain about. She gives her name and her age correctly. She says that to-day is Wednesday (Thursday), and that she has been here a few days and came on Monday (correct). She knows the month, but not the date. She complains that she received no wages except an occasional penny, and money from her friends, whilst at C—— (the asylum from which she has been transferred). She states that she was there for seven years. She acknowledges that she suffers from auditory hallucinations, but "I refuse to attend to them." They are "in my head, but I will not attend, or they would run away with me. It is very hard to have this trouble, but I try to bear it." "They repeat my thoughts and seem to know them. They connect with me in some way, and are not to be seen—only heard. They would paralyse me if I would allow them the power. There are two or three of them, and it sounds like a man or woman. *If I think of a thing I hear the words back.*" As an example, she tells me that *if she thinks of my name she hears it repeated by them in her head.* She left her home at H——, as she was ill owing to this persecution. "I suppose it is someone I have done harm to, but *it is anyway a very unnatural sound.* I have been well brought up, and I feel that it is hard on me." She finally, when asked about work, informs me that she can wash up, cook meals or do anything, and she says that she is willing to do so.

Six months later her general condition was substantially unchanged, being as follows:—She is dull and phlegmatic, and smiles in a fatuous manner when addressed. She knows the day, the date, and the date on which she came here. Voices? "I hear them, but I don't listen to them." When? "Any time." "*I answer myself . . . thoughts.*" She is more secretive regarding her experiences than she was six months ago. She works in the ward kitchen, and works well at times, but as a rule she is very slow. She would like to attend to the kitchen by herself, but she is too slow. She is also slow over eating her food. It is always necessary to look after her in order to see that her work is properly performed. She talks to herself, and if she thinks she is alone she speaks quite loudly. She, as a rule, ceases when she is observed. She is very fond of hoarding rubbish. She reads newspapers and books, and she writes letters. She talks fairly sensibly on ordinary subjects, and she would be a useful worker if she had more initiative.

Note.—This patient resembles in every essential respect certain cases which exhibit complex psychic products, due, probably, to local disorders of the regions concerned with lower association, and allied to, and usually considered one of the types of, paranoia. I have described

two such cases in an earlier chapter (pp. 269–273). The present case commenced at an earlier age, namely, twenty-four, whereas the others had well passed the third and fourth decades respectively. This patient has developed considerable dementia; and this disability, her sex, and her lesser intelligence and education, are probably conjointly responsible for the absence in her case of a grandiose stage, for this stage in such slowly-developing cases occurs late, and is arrived at by a process of more or less elaborate reasoning. The case thus rightly falls, in my opinion, into the "delusional" or "paranoid" sub-class of premature dementia.

CHAPTER XV

CLASSIFICATION OF CASES OF DEMENTIA
(CONTINUED)

II. PROGRESSIVE AND SECONDARY DEMENTIA

The present and following chapters deal with the subject of progressive and secondary dementia. This includes the consideration of those cases of mental disease which, owing to the existence of certain extra-neuronic encephalic morbid states, do not develop a practically stationary condition of mental enfeeblement consequent on the loss of a proportion of the higher cortical neurones, but undergo a more or less rapidly progressive process of neuronic dissolution, which, if the patient survives to such a stage, finally ends in gross dementia.

As has already frequently been stated, the necessary precursor to dementia is, in my opinion, the symptom-complex which I have already exhaustively considered under the term " Mental Confusion " (Chap. XIII, p. 221).

When referring to the causes of mental confusion, I have expressed the view that the necessary precedent to this psychic state is, in at least all severe cases, a *deficient durability of the higher cortical neurones*, which ranks, therefore, as the essential physical basis.

Further, I have dealt with the non-pathological and secondary or exciting causes of this symptom-complex, namely, the *various forms of physical and mental stress*, which, especially at the " critical " periods of life, often excite morbid changes in cortical neurones of deficient durability, although they would be relatively or absolutely without prejudicial influence on normal cortical neurones. This factor merely causes temporary mental disturbances (unassociated with any considerable degree of mental confusion) in such individuals as possess cortical neurones of average durability but of subnormal or abnormal development and of imperfect functional stability.

Lastly, I have referred to the chief exciting or secondary causes of mental confusion which are pathological in nature, and have classed these into two groups. In the first of these groups has been considered the *direct action of toxines*, especially alcoholic excess and the toxæmia which frequently follows child-birth, but also, though more rarely, the different toxæmias (including drug-poisoning) and infections.

Whether the cases of mental confusion which arise in consequence of the action of one or more of these causative agents recover, or develop a mild or moderate grade of dementia, depends on the resistance of the affected neurones and on the extent and severity of the pathological changes which are produced. In the latter case, the result is an example of the " primarily neuronic dementia " which has been considered in the preceding chapter; and the patient may remain in a stationary condition of mild or moderate mental enfeeblement for many years, or even for life.

In the case of the second group of pathological and secondary causes of mental confusion the results are different, and it is to the consideration of these that the present and following chapters are devoted. These causes are, in essence, consequences of the *indirect action of toxines*, which results in imperfect nutrition of the cortical neurones and therefore tends to interfere with their vitality and functional stability.

This indirect action of toxines will be considered under two main headings, the contents of which present much similarity as regards pathology but differ considerably in details of procedure and in symptomatological consequences. They are responsible respectively for the types of case described under the terms " Progressive Senile Dementia " and " Dementia Paralytica." In both groups pathological changes exist in the cerebral vessels. These changes in the first group are chiefly of a degenerative or " wearing-out " nature, and in the second are partly degenerative and partly of the nature of a reparative reaction. In the first the vascular changes are chiefly the result of natural decay, and in the second they are largely the consequences of an enhanced capacity of reparative reaction which is due to the occurrence of a severe and prolonged systemic toxæmia. In the first group general non-neuronic reparative reaction is feeble; and in the second it is variable, and in many cases very marked. In both groups the effect on the neurones is partly caused by imperfect nutrition and partly by secondary toxæmia. In both groups there is a tendency to the formation of a " vicious circle," but in the second this is much the more marked owing to the greater capacity for reparative reaction which exists. In the first group the patients are senile or presenile: in the second they are usually adult, but may be of any age from puberty to advanced senility.

GROUP A.—Degeneration of the Cerebral Vessels accompanying Senility or Premature Senility

As has been shown in Part II, Chap. X, p. 152, and also in greater detail in former publications (*Archives of Neurology*, vol. ii., 1903; *Journ. Ment. Sci.*, April, 1905), there is a direct relationship

between the presence of degeneration of the cerebral vessels and the development of severe dementia.

The chief points bearing on this relationship are as follows :—

(1) Simple senility (*i.e.* old age) is not necessarily associated with gross degeneration of the cerebral vessels.

(2) In the insane, gross degeneration of the cerebral vessels may exist without dementia.

(3) Dementia, except in rare cases of slowly progressive presenile involution of the cortical neurones, does not progress beyond a moderate stage, if gross degeneration of the cerebral vessels does not coexist.

(4) In the 200 cases of Series A, and in the 233 cases of Series B, the percentage amount and also the severity of naked-eye degeneration of the cerebral vessels vary directly with the degree of dementia present.

(5) Severe degeneration of the cerebral vessels occurs before the development of gross dementia. In recent senile cases, with the mildest grade of dementia but with considerable mental confusion, who, had they lived, would on clinical grounds have been expected to develop gross dementia, the percentage of naked-eye degeneration of the cerebral vessels is as great as it is in Groups IV and V (severe and gross dementia). On the other hand, in chronic and recurrent senile cases, with a mild degree only of dementia, naked-eye degeneration of the cerebral vessels is rarely present and is then relatively slight.

Hence the relationship between the presence of degeneration of the cerebral vessels and the development of dementia may be thus summed up : *In a cerebrum which has begun to break down, or where degeneration has progressed to the " moderate " stage* (Group III, the chronic lunatic with moderate stationary dementia), *the presence or incidence of gross degeneration of the cerebral vessels will cause more or less rapid progress of the neuronic dissolution, with, from the clinical aspect, gross dementia.*

In such cases the pathological process in the neurones is caused on the one hand by imperfect nutrition and on the other by secondary intoxication from incomplete removal of the waste products of metabolism and dissolution ; and relatively little encephalic but extra-neuronic reparative reaction occurs, owing to the degenerative or " wearing-out " nature of the whole process.

The dementia which supervenes progresses rapidly or slowly until death occurs.

It may be added that, whilst " wearing out " of the cerebral arteries ensues at different ages in different individuals, and as a rule only occurs when old age is reached, the premature induction of this by such devitalising agents as prolonged alcoholic excess and by organic affections, particularly of the heart and kidneys, is fairly common. I am of the opinion that usually rather more extra-neuronic reparative reaction

occurs in these latter cases than in those in which the "wearing out" is due to simple senile decay. This detail is, I believe, related to the clinical truth that such cases not rarely exhibit symptoms which so much resemble those of general paralysis, and especially of its chronic form, as at times to render diagnosis difficult or impossible. It is in just such cases as these that the Wassermann reaction is likely not to be of service, since the lesion is in essence a slowly progressive cerebral dissolution associated with sclerosis of the cerebral arteries, and the course is therefore, or has become, independent of the presence or absence of spirochætes in the brain or body.

GROUP B.—Certain Vascular and Neuroglial (and chiefly secondarily Neuronic) Changes which follow the prolonged action of Poisons, Toxines, Protozooic and Microbic Infections, &c.

These appear to be largely of the nature of secondary proliferation after, or of reaction to, the injury produced by the poison, toxine, or pathogenic micro-organism: and their onset, in my opinion, is not necessarily coincident in time with its exhibition, but may ensue, or at any rate become greatly aggravated, as the result of adverse influences occurring at a subsequent period of life.

That this statement is in accord with general pathology can readily be illustrated. Prolonged immunity is common after many of the severe specific infections, which induce profound and more or less permanent protective modifications of general metabolism. Excessive local reparative reaction often occurs after diphtheria, scarlet fever, and syphilis; and results in intractable strictures of orifices. On the other hand, a similar local reparative reaction in the arteries during an attack of syphilis is later on followed by dilatation and the formation of aneurysms. Further, injuries in the subjects of syphilis frequently result in the occurrence of excessive local reparative reaction; and dense fibrous scars often follow abscesses, vaccination, &c., in the case of such persons.

This fact is explicable on the ground that the tissues, in consequence of a former attack of syphilis, possess a permanently enhanced capacity for reparative reaction to injury. The thesis, however, that the *Spirochæta pallida* still exists in the body, after perhaps as long a period as twenty-five years, at the present time holds the field; and, with regard to many of the rapidly progressive cases of general paralysis which occur within a reasonable number of years of the commencement of the attack of syphilis, this view may be regarded as proved. As I hope, however, to indicate later, "general paralysis" or "dementia paralytica" is a

general term which by no means necessarily denotes a disease due to the actual existence *throughout* its course of the *spirochæta pallida*.

The chief variety of mental disease which falls into the group of cases under consideration is the dementia paralytica (general paralysis) which is a frequent sequela of systemic syphilis in degenerates, and which rapidly or slowly passes on to a fatal issue.

As various authors give the percentage of ascertained (previous) syphilis in cases of dementia paralytica as anything from 50 or less to 100, and as several writers have denied any direct causal relationship between syphilis and dementia paralytica, it would be futile to introduce such diverse and extraneous conclusions. I therefore purpose to confine myself to a summary of my own previously published statistics on the subject, and especially so as prolonged experience has convinced me of their substantial accuracy. Such a course may at first sight appear unnecessary, in view of the discovery of the Wassermann reaction, and of the presence of spirochætes in the brain of many cases; but at present it is by no means either proved or shown to be probable that this reaction or a search for spirochætes is a safer and more certain method of diagnosis than are the methods of clinical observation and of post-mortem verification which have up to the present time served our purpose. In fact, if the term "general paralysis" should in the future become synonymous with "cortical syphilis," it will probably be necessary for another synonym of the former, say "dementia paralytica," to be employed in a wider sense to include, (1) cases with present active syphilis, (2) cases who have recovered from syphilis after or possibly even before the onset of dementia paralytica, and (3) cases of the second group who, in addition, are suffering from other toxic or microbiotic affections, or even from gross senile vascular degeneration alone.

Statistics relating to the ascertained frequency of previous or present syphilis in cases of dementia paralytica being still admissible, I will refer without further prelude to those indicated above. These statistics deal with 19 private and 83 rate-paid patients, in the case of whom, in the course of a systematic inquiry into their histories, I was able to obtain trustworthy personal details.

In 15 of the 19 private cases there was a history or clear clinical evidence of past or present syphilis; and the date of infection, where it could be ascertained, was from four to twenty-five years before the onset of mental symptoms. The following details were obtained concerning the remaining four cases:—

Case 3.—Tabetic general paralysis. Was twelve years in the army, and was then in the police force. Had been married for twelve years without children.

Case 4.—Tabetic general paralysis. Was an Indian Government

official for over thirty years, and at the age of thirty-seven married a half-breed, with whom he lived a jealous and unhappy life.

Case 8.—Patient stated that he had had several gonorrhœas and orchitis in each testicle on separate occasions.

Case 15.—Patient stated that he had had several gonorrhœas, and gleets, and had also suffered from orchitis.

Hence, of the 19 cases, syphilis was certain in 15 (79 per cent.), and probable in the remaining 4 (21 per cent.).

Of the 83 rate-paid cases, syphilis was proved to have existed in 59. The information was obtained from the histories, or from clinical or post-mortem evidence, and in some instances from all these sources. Syphilis had also probably existed in another 11 cases; there was no evidence for or against in 11; and it was definitely denied by the relatives in 2 cases. In the latter cases the only evidences against the disease were the direct negatives of the friends and the absence of clinical signs. In other cases where syphilis was proved to have existed, an equally definite denial was given by the friends. Of the 59 cases in which it had certainly existed, it was probably "congenital" in 4, and was probably acquired after puberty in the remainder. Where the information was available, the date of syphilisation varied from nine to twenty-five years before the onset of the dementia paralytica.

Hence, of the 72 cases which it is possible to employ, syphilis had existed in 59 (82 per cent.), and had probably existed in 11 (15 per cent.).

I therefore, many years ago, considered myself justified in concluding that syphilis is a necessary antecedent to, and is causally related to, the development of dementia paralytica.

This view is now almost universally accepted owing to the discovery of the Wassermann reaction, and to the frequency with which a positive result is obtained with the cerebro-spinal fluid of cases of dementia paralytica. My personal observations, based on the reports of the performance of this reaction by the pathologists of the Wakefield Asylum, lead me to conclude that a positive result is more common in rapid and fulminating cases with typical lower face physical signs than in chronic and stationary cases: and the reactions performed by Nabarro led to the interesting and allied result that a positive reaction is more common in males than in females. At the present time it is not possible to go further; and, needless to say, to employ the Wassermann reaction for diagnostic purposes, as is often done, is to beg the question.

On the basis of the conclusion that syphilis is causally related to the development of dementia paralytica, it is possible to demonstrate that the course taken by cases of dementia paralytica depends largely on their respective degrees of cerebral degeneracy, and also, as will be shown later in this chapter, that dementia paralytica is not a special organic

disease of the cerebrum (*i.e.* merely tertiary syphilis of the cortex), but is a branch of ordinary mental disease.

In the under-developed and poorly-constructed neurones of the imbecile variety of juvenile general paralysis, the process of dissolution is slow, and the neuronic changes, as was first shown by Watson and is now common knowledge and readily demonstrated, are proportionally more extensive than are the vascular and neuroglial.

On the other hand, in the better-developed cerebra of the ordinary juvenile general paralytic, who is infected with syphilis at birth or thereabouts, the process of dissolution is more rapid, and vascular and neuroglial proliferation is more pronounced.

Further, in adult cases of general paralysis, the course is usually chronic in degenerates, who readily break down under the influence of external "stress," and who, therefore, require early segregation, with the consequent relative absence of this factor; and it is commonly more rapid in the less degenerate subjects, who, before breakdown occurs, are frequently subjected to the severest forms of mental and physical "stress," and whose neurones are therefore strained to the utmost before asylum *régime* becomes necessary. In both these types, as the syphilitic infection at the time of its onset had acted on already fully developed neurones, and therefore had not induced still further developmental disabilities in these, vascular and neuroglial proliferation is the pronounced feature.

Finally, in senile cases of general paralysis, in which reparative reaction is naturally more feeble, the course of the process of dissolution is variable, and the general type of the symptomatology and of the morbid anatomy and histology approximates towards that which exists in progressive senile dementia.

Though an attack of syphilis, as has been stated, is usually the important extraneous factor in the production of progressive (secondary) non-senile dissolution of the higher neurones of the cerebrum, and is responsible for the development of the clinical entity termed "dementia paralytica," other influences, particularly certain of the slowly-acting metallic poisons—*e.g.* lead—produce a progressive cerebral dissolution of similar character.

Further, of the insane who are the subjects of epilepsy, about 25 per cent. suffer from a similar progressive disintegration of the higher neurones of the cortex, which, in well-marked cases, presents a clinical symptomatology and a morbid anatomy that in many important details resemble those existing in dementia paralytica.

It may be added that such devitalising factors as prolonged alcoholic excess, &c., play an important secondary part in the development of many of the cases referred to under this heading, by producing morbid

changes, not only in the higher neurones of the cortex, but also in the cerebral blood-vessels.

As dementia paralytica consists in essence, as will be seen later, of a dissolution of the (human) region of higher association, it is necessarily impossible to reproduce this clinico-pathological entity by experiment on the lower animals.

Watson, however, many years ago showed that the prolonged exhibition of certain virulent neurone toxines—*e.g.* abrin and ricin—produces, in the cerebrum of the guinea-pig or rabbit, dissolution of cortical neurones and proliferation of the neuroglia and blood-vessels ; and I had the opportunity of personally observing both his experiments and his histological specimens. There is no doubt that the former is the direct result of neurone intoxication, and that the latter is a reparative reaction to the injury produced. Though such experimental results present no true homology to human dementia paralytica and progressive dementia, they nevertheless indicate that the non-neuronic elements of the encephalon react to neurone destruction, as do the local mesoblastic elements of other parts of the body to destruction of glandular epithelium.

Similar experimental results, with definite plasma-cell formation, have since been obtained, by infection of rats by Ford Robertson and Shennan and of a goat by Lewis C. Bruce, with the *bacillus paralyticans* obtained by Ford Robertson from cases of general paralysis. Further, Ford Robertson and M'Rae have found that rats may be infected by the two allied bacilli—called by them *bacillus paralyticans longus* and *bacillus paralyticans brevis*—and after death exhibit similar pathological appearances. Later, Ford Robertson in 1912 showed that rabbits infected with *bacillus paralyticans* in the genito-urinary tract suffer from ataxy and paresis, and develop lesions in the spinal cord like those in the brain in general paralysis. He states that the bacillus does not grow in nervous tissue, and that therefore either its toxines produce changes which in their nature are progressive, or, as he thinks more probable, that the bacillus under anaerobic conditions becomes something else, probably a protozoon, owing to the occurrence of minute bodies in the lymphatic spaces round the vessels and nerve cells in the cerebral cortex.

Quite recently, Noguchi has demonstrated the existence of the *spirochæta pallida* in the brains of about 25 per cent. of the cases of general paralysis which he has examined ; and he has shown that rabbits, previously sensitised by repeated intravenous injections of *spirochæta pallida*, may thus be made susceptible to intracerebral inoculation, with the resulting production of the lesion of dementia paralytica. McIntosh and Fildes hence, plausibly but I think quite unwarrantably, argue that dementia paralytica is merely the expression of tertiary syphilis of the brain. They consider that such extensive lesions as those of dementia

paralytica can result from a minimal number of spirochætes, owing to the fact that such a patient is in a tertiary condition, and thus has his tissues hyper-immune to the virus. As I understand their argument, a case of general paralysis *must* give a positive reaction in the cerebro-spinal fluid, and the brain of such a case *must* contain spirochætes: hence, as a corollary, I suppose that, since on their thesis the brains of general paralytics necessarily contain spirochætes, such spirochætes in cases with very prolonged remissions must be able to exist for very long periods in the brain without causing symptoms. Such an argument is capable, as I hope to show, of the interpretation that existing spirochætes may be necessary to general paralysis, but that this is the case solely because they cannot by any means be removed without the death of the patient resulting, and not because they are the actual present cause of the condition. Spirochætes have recently been found by McIntosh and others in a high percentage of brains of cases of dementia paralytica supplied by the pathologist of Wakefield Asylum; and it seems probable that they are extremely common in such cases. If this be so, such spirochætes must be of greatly modified virulence and relatively or entirely innocuous from the aspect of infection at any rate.

In my opinion, all the experiments I have mentioned are of great importance in that they indicate the real nature of the characteristic histological lesion of general paralysis, namely, that this consists in a reparative reaction to injury, and is thus the pathological ally of that occurring in the different types of progressive dementia. It is thus, in essence, in no way dissimilar (differences in structure and function being allowed for) from the morbid process which occurs in, for example, certain forms of renal cirrhosis.

Such experiments, I think, indicate (as do the results of the Wassermann reaction), that the *spirochæta pallida* may be the actual infective agent present in acute and fulminating cases of text-book type, and that, in chronic and advanced cases, and particularly in those with remissions in activity, the morbid process may be re-incited and much aggravated by systemic infection with various microbic agents. To employ a coarse simile, certain acute general paralytics may be compared with cases of miliary pulmonary tuberculosis; certain chronic and remittent general paralytics may similarly be compared with examples of "chronic phthisis" suffering largely or entirely from fibrosis and cavitation of the lung with secondary infections of all kinds; and certain examples of the rarer types of progressive dementia may be compared with one or other of the forms of inhalation-fibrosis of the lungs. The first and second of these types would be coarsely comparable to cases of progressive dementia with spirochætes in the brain.

I would finally impress on the reader that dementia paralytica,

being in essence a dissolution of the (human) region of higher association assisted and aggravated by protozoic and microbic infections, is not to be explained, either as a clinical entity or as a disease, by the statements that the pathological process consists in various dissolutive, inflammatory, and reparative changes in the brain, that in cases of text-book type it is usual to obtain a positive Wassermann reaction in the cerebro-spinal fluid, and that in a certain number of cases (and probably in all giving a positive Wassermann reaction) it is possible to discover spirochætes in the brain.

The cases belonging to the present group of " progressive and secondary dementia " amount to 47 only, thus forming 10·6 per cent. of the total of 445 cases of dementia, and 6·5 per cent. of the total of 728 cases of amentia and dementia.

They will be divided, in accordance with the pathological considerations just adduced, into the following classes :—

	M.	F.	T.
Class (*a*).—Progressive senile dementia . . .	9	15	24
Dementia paralytica	14	9	23
Total . .	23	23	47

I would remark that these cases are employed not as a basis for the present description, but merely to indicate the proportion of cases of progressive and secondary dementia in the particular group of lunatics employed in this volume for general descriptive purposes. The relatively small number of male general paralytics is probably very largely due to the fact that such cases, if feeble and bedridden, would be unlikely to be transferred from another asylum, but would be kept there to die.

CLASS (A).—Progressive Senile Dementia

The cases to be referred to under the term " Progressive Senile Dementia " differ from the contents of the group of " Primarily Neuronic Dementia " in the fact, as has already been indicated, that the dementia is not stationary, but progresses rapidly or slowly until death occurs.

In cases of primarily neuronic dementia, as the result of morbid changes in the higher neurones of the cerebral cortex in association with (acute) symptoms of mental alienation and such a degree of mental confusion as is the necessary concomitant of these morbid changes, a certain amount of neuronic dissolution results. This finds its symptomatological expression in a grade of dementia which varies in degree from " mild " to " moderate," and it exhibits from the physical aspect

certain intracranial morbid changes which have been described in Part II, Chapter X (p. 136), under Groups II and III, namely, " cases with slight morbid changes and where the pia-arachnoid strips rather more readily than natural," and " cases with moderate morbid changes, with subdural excess to the level of the tentorium, and where the pia-arachnoid strips readily." Such cases, as the acute morbid changes—which constitute the physical basis of the " acute " symptoms presented—result in the maiming or death of numbers of the affected higher cortical neurones, pass into, and then for long periods remain in, a stationary condition of mild or moderate dementia.

In the case, however, of the class at present under consideration, that of progressive senile dementia, no such stationary condition of dementia ensues; but dissolution of the higher neurones of the cortex progresses more or less rapidly until the region of higher association is practically non-existent, and extensive dissolution of many of the regions of lower association has resulted, the patient being consequently in a condition of gross dementia.

This result is due, as has already been shown in summary at the commencement of this chapter, and has been demonstrated at length in previous publications (*Arch. Neurol.*, vol. ii., 1903, p. 479; and *Journ. Ment. Sci.*, April, 1905, p. 333), to the existence of gross degeneration of the cerebral arteries. In some cases this morbid condition is present at the time of onset of the attack of insanity, and in others gross degeneration of the cerebral vessels gradually develops in stationary cases of moderate dementia. In all such cases, however, whether the cerebrum is beginning to break down or dissolution has already progressed to the " moderate " stage (Group III), the determining cause of a more or less rapidly progressive dissolution of the region of higher association is the presence or incidence of gross degeneration of the cerebral arteries.

Whilst, as a rule, at any rate in comparison with dementia paralytica, relatively little reparative reaction occurs in the extra-neuronic elements of the encephalon owing to the degenerative or " wearing-out " nature of the whole process, in many cases a vicious circle, similar to that commonly occurring in dementia paralytica, undoubtedly develops—neuronic dissolution being followed by reparative reaction and this by further and secondary neuronic dissolution—and increases the rapidity with which the final result is attained. The progress of the dissolution is also in many cases assisted by temporary (or sometimes permanent) and local thromboses, which frequently find symptomatological expression in " seizures " accompanied by temporary paresis and homologous, in my opinion, with the " seizures " which so commonly occur in dementia paralytica.

Progressive senile dementia thus differs markedly, both in its patho-

logy and in its termination, from the types of dementia which have so far been considered. As, however, the essential feature of progressive senile dementia is a senile dissolution of the neurones of the region of higher association and of many of the neurones of the regions of lower association of the cortex cerebri, the correctness of the inclusion of this type of dementia under the terms "mental disease," or "insanity," may be taken for granted without discussion.

It is, however, necessary, as will be seen later, to adopt a different course in the section dealing with dementia paralytica. It will consequently be found that the greater portion of the section referred to deals with evidence which, in my view, conclusively shows that dementia paralytica is also a branch of insanity or mental disease, and is not merely a specific organic disease (*i.e.* simple parenchymatous syphilis) of the cerebrum. In other words, whilst progressive senile dementia requires no justification for its inclusion in the present group of "Progressive and Secondary Dementia," such justification is needed—and will be produced—in the case of dementia paralytica.

Certain of the more important features of the morbid anatomy, pathology, morbid histology, and symptomatology of progressive senile dementia will now be detailed. As, however, the morbid anatomy of mental disease has already been considered at some length in Part II, Chapter X, p. 135, and as the symptomatology of mental confusion and its relationship to that of dementia have been fully discussed in Part II, Chapter XIII, p. 228, only those details of morbid anatomy and symptomatology in which progressive senile dementia differs from primarily neuronic dementia will be introduced.

Morbid Anatomy and Pathology of Progressive Senile Dementia

Though naked-eye *degeneration of the cerebral arteries* is not one of the morbid changes which necessarily occurs in primarily neuronic dementia, it is, as has already been stated, a necessary factor to the development of progressive senile dementia. Cerebral vascular degeneration may exist in the absence of dementia. Though evidence of senility or prematurely produced senility of the cerebral arteries, it is not a necessary consequent of old age. On the other hand, the grosser forms of dementia never exist in the absence of macroscopic, or, at the least, of microscopic, signs of severe degeneration of the cerebral arteries, even in cases which have not attained to the senile period of life. Finally, in recent senile cases, with the mildest dementia but considerable mental confusion, who, had they lived, would on clinical grounds have been expected to develop gross dementia, the percentage of naked-eye degeneration of the cerebral vessels is so high as to justify the assumption

that, were it possible invariably to make a certain diagnosis, this morbid change would be found to be a constant feature of such cases.

Such, in brief, are the chief facts on which is based the conclusion that a causal relationship exists between degeneration of the cerebral arteries and the development of the grosser forms of dementia. I therefore place degeneration of the cerebral arteries first on the list of the morbid appearances which are found in senile progressive dementia.

As has been pointed out in an earlier chapter of this work, the intracranial morbid appearances, which are found in such cases of mental disease as during life exhibited a greater or a lesser amount of dementia, namely, chronic degeneration and fibrosis of the dura mater, excess of intracranial fluid, subdural deposits, chronic thickening of the pia-arachnoid, &c., are the macroscopic equivalents of, and vary in degree with, the grade of dementia which is present, and are otherwise independent of the duration of the insanity.

In the several types of "primarily neuronic dementia," such morbid appearances, in agreement with the amount of dementia, are not as a rule present in more than a moderate grade of severity (Group III). On the other hand, in the two classes of "progressive and secondary dementia," namely, "progressive senile dementia" and "dementia paralytica," these morbid appearances in advanced cases attain their maximum intensity (Groups IV and V), in association with the existence of gross dementia and of more or less complete dissolution of the cortical neurones of higher association and of many of those of lower association.

These morbid appearances are the physiological results of the loss of cerebral substance, caused by the degeneration of the cortical neurones which is the physical expression of dementia, reacting on the mechanical conditions existing within the cranial cavity. The skull is a closed bony chamber, and, were the neuronic dissolution ever so slow in its progress, replacement of the lost cerebral tissue could not well be fully performed by a chronic hypertrophy of the inner wall of the skull-cap and of the cerebral membranes. The progress of neuronic dissolution is, as a rule, however, by no means slow, and in cases of progressive dementia it is relatively rapid, and often very rapid. In consequence of this, the cerebral membranes, especially the pia-arachnoid, make a hopeless attempt at the formation of replacement- or scar-tissue, and what space cannot be filled up in this way is replaced by cerebro-spinal fluid.

I feel that I cannot too strongly or too frequently insist on the importance of *excess of intracranial fluid* in the pathology of dementia. This excess is so commonly neglected in descriptions of intracranial morbid changes in favour of gross or fine changes in the dura mater, the pia-arachnoid, or the cerebrum, that it might almost be supposed

to be valueless as a criterion of the degree of cerebral wasting which is present.

Under normal conditions, as has been shown by Leonard Hill, the intracranial fluid is minimal in amount; and this is also the case in all types of uncomplicated amentia or cerebral sub-evolution.

In cases, however, in which but a moderate grade of dementia exists, there is in the majority of cases such an excess of intracranial fluid as extends up to, or even above, the level of the tentorium, as well as considerable cerebro-spinal fluid in the pia-arachnoid and the ventricles: and a much greater excess exists in cases of progressive dementia, even when these are only reasonably advanced.

In the case of subdural excess alone in senile progressive dementia, for example, in the 92 cases contained in Group IV and the 79 cases contained in Group V, which have already been referred to (p. 140), excess of subdural fluid exists in all. In Group IV it is "slight" in 5·4 per cent., "moderate" (*i.e.* to the level of the tentorium) in 27·2 per cent., and "great" in 67·4 per cent.; and in Group V it is "moderate" in 17·7 per cent. and "great" in 82·3 per cent.

This excess of intracranial fluid, which primarily occurs to replace loss of cerebral substance in the closed bony chamber, interferes with the normal relationship of the pia-arachnoid to the dura mater, and converts a potential space into an actual one full of cerebro-spinal fluid. This fluid, which is often abnormal in composition, necessarily predisposes to the development of a chronic degenerative process in both the dura mater and the pia-arachnoid, as does also the hopeless attempt at the formation of replacement- or scar-tissue which is made by these membranes. Hence, any more or less sudden alteration of intracranial tension, due, *e.g.*, to a convulsion, a trauma, &c., or even to the change in blood-content from the arterial to the venous side, which occurs at or shortly after death, tends to cause an effusion of blood from the degenerate and often dilated vessels (arteries or veins) of the dura mater, the pia-arachnoid, or both. This effusion, whether recent or partially organised, single or multiple, constitutes the "*subdural deposit*," which is so relatively common in cases of well-marked dementia, and particularly so in cases of advanced progressive dementia.

In the 433 cases referred to in Part II, Chapter X, p. 140, for example, in Group I (no dementia), subdural deposits existed in 3·1 per cent., and in Group II (slight dementia) they existed in 5·2 per cent. All these deposits were of an accidental nature, or were recent and sufficiently explicable on general pathological grounds by the cause and mode of death.

In Group III (moderate dementia) these deposits existed in 17·8 per cent. of the cases: in Group IV (severe dementia) they existed in 17·4

per cent.; and in Group V (gross dementia) they existed in no less than 22·8 per cent. of the cases.

Extensive morbid changes in the pia-arachnoid are a constant feature in progressive senile dementia, and the relative severity of these is well illustrated by the following data.

In cases without dementia (Group I) the pia-arachnoid, except in cases of cerebral œdema due to systemic causes, strips naturally. In cases with mild dementia (Group II) this membrane is slightly thickened, and strips rather more readily than natural in 74 per cent. of the cases and readily in another 20 per cent. In cases of moderate dementia (Group III) it is thickened and at times slightly opaque, and it strips readily in 82 per cent. of the cases and very readily in another 16 per cent. In cases of severe dementia (Group IV) it is opaque and much thickened, and it strips readily in 13 per cent. of the cases, very readily in 83 per cent. and like a glove in 4 per cent. Finally, in cases of gross dementia (Group V), it is very opaque and markedly thickened, and it strips readily in 1 per cent., very readily in 41 per cent., and like a glove in 58 per cent.

As a rule, when death occurs, cases of progressive senile dementia have reached as far as Group IV or Group V.

The final important morbid appearance in senile progressive dementia, namely *cerebral wasting*, will now be considered.

At times, in recent cases, the wasting is only moderate in degree, and even naked-eye examination of the cut cerebral cortex discovers numerous areas of softening smaller than the head of a pin and situated in the grey matter itself or immediately below this. In some such cases the clinical symptoms rather resemble those of dementia paralytica, and the areas of softening may then be very numerous and may at times occupy relatively large areas of the "flat" surfaces of the convolutions.

It is more usual, however, even in relatively recent cases in which incomplete removal of the products of neuronic dissolution has occurred, to find the cerebral wasting quite pronounced, and this is still more evident in cases of chronic type. In many of the latter, however, before the hemispheres have been stripped, the wasting is by no means evident, in consequence of the opacity of, and still more the fibrotic contraction of, the pia-arachnoid. The difference in the appearance of a hemisphere before and after stripping is, in fact, in many cases quite remarkable.

Whilst individual variations in the relative degrees of wasting exist, which may by future study be associated with differences in symptomatology, the regions of wasting are on the whole very definite, and by practice can be determined with considerable accuracy.

In uncomplicated cases there is a clear relationship between the

grade of dementia and the degree of wasting present, and, therefore, cases of progressive senile dementia, as a rule, present the most clearly-marked examples of the cortical wasting which has developed *pari passu* with dissolution of the higher neurones of the cerebrum.

These regions of wasting are as follows :—

(1) The greatest amount occurs in the prefrontal region (the anterior two-thirds or so of the first and second frontal convolutions, including the neighbouring mesial surface, and the anterior third or so of the third frontal convolution), see also Fig. 37, p. 66.

(2) The wasting is next most marked in the remainder of the first and second frontal convolutions. [In dementia paralytica Broca's convolution should, as a rule, be included here, and (2) and (3) should follow (4).]

(3) It is, perhaps, next most marked in the ascending frontal and Broca's convolutions, though this grade should, in many cases at least, follow (4).

(4) It is next most marked in the first temporal convolution and the insula, and in the superior and inferior parietal lobules. In practically all cases it is more marked in the two former than in the two latter.

(5) It is least marked in the remainder of the cerebrum (including the orbital surface of the frontal lobe), particularly the inferio-internal aspect of the temporo-sphenoidal lobe and the posterior pole of the hemisphere.

In my experience, exceptions to this general order are invariably due to vascular or traumatic causes, and should, therefore, be excluded from the ordinary and normal wastings of dementia.

Such exceptions, however, occur not uncommonly in progressive senile dementia, owing to the extensive degeneration of the cortical arteries, which is a constant feature of these cases. I here refer, not to definite old or recent softenings, but to more or less extensive atrophies of convolutions, which commonly exhibit vermiform or cross-striated markings, and are obviously due to local ischæmias in the distribution of (chiefly) the anterior and middle cerebral arteries. Such exceptional regions of wasting are, however, quite readily separable from the normal wasting caused by dissolution or retrogression of the prefrontal region of higher association.

They are chiefly found in cases in which acute exacerbations of symptoms, in the form of severe mental confusion with or without convulsions followed by temporary paresis, have occurred: and they are usually absent from cases which have undergone a steady progress to gross dementia. Further, these local wastings are, in my experience, absent from cases which have for years exhibited stereotyped and repeated motor phenomena, and from the occasional cases of Hunting-

ton's chorea which have come under my observation. It is probable that such motor exhibitions are homologous with such normal phenomena of senility as lower jaw and manual movements.

Cases presenting these local atrophies form, in fact, a half-way house between cases of ordinary gross dementia and cases of gross dementia which also exhibit gross lesions of the cerebrum of vascular origin.

The regions of wasting, which have been described above, have

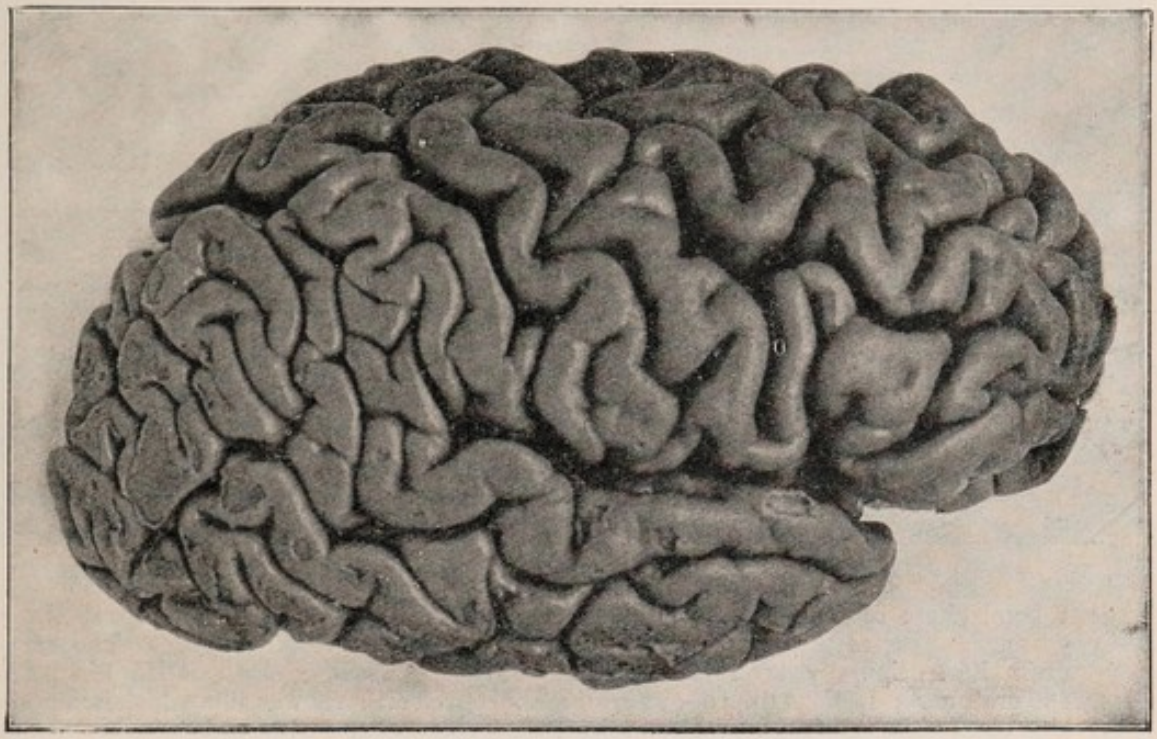


FIG. 73.—RIGHT HEMISPHERE OF A MALE, AGED 91, SUFFERING FROM SENILE DECAY, WITH RELATIVELY LITTLE DEMENTIA.

Convolutional pattern somewhat above the average in complexity. R.H., 485 grammes. Very gross degeneration of the cerebral arteries. The pia-arachnoid was grossly thickened over the fronto-parietal region, and adherent over the temporo-occipital, in which region decortication is seen. There is relatively little cerebral wasting. A section of an artery in this case is shown in Fig. 75.

already been fully demonstrated by means of illustrative cases in Part II, Chapter X.

I propose, however, in view of the contents of the following section, to insert here photographs of two hemispheres which respectively illustrate :

(1) Extreme senility with gross degeneration of the cerebral vessels and relatively little cortical wasting, and

(2) Progressive senile dementia with gross degeneration of the cerebral arteries and gross cerebral wasting.

The first hemisphere (Fig. 73), from a man of 91, is a very good example of extreme senility ; and it markedly contrasts with the grossly

wasted second hemisphere (Fig. 74) which is from a case of progressive senile dementia aged 78 years.

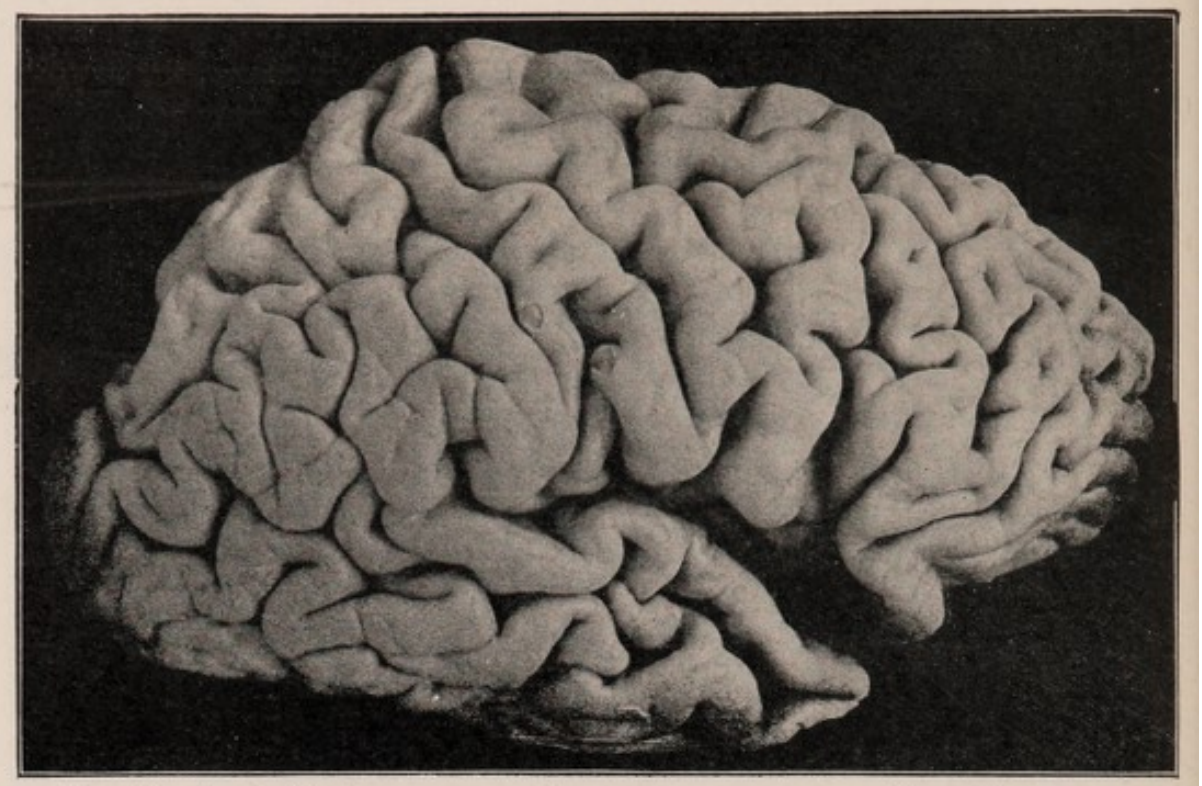


FIG. 74.—RIGHT HEMISPHERE OF A FEMALE SUFFERING FROM GROSS DEMENTIA.

Right hemisphere of female, aged 78. Widow. Housekeeper. Duration about three years. A case of marked senile confusion resulting in gross dementia. The cerebrum had originally been probably of above the average size. R.H., stripped, 485 grammes; L.H., stripped, 480 grammes. Gross cerebral wasting, which is especially marked in the frontal region. Some degree of asymmetry of hemispheres, the pattern of the right being the simpler (*cf.* Fig. 71, p. 159). Gross degeneration of the cerebral arteries. Group V.

Histo-pathology of Progressive Senile Dementia

In *senility* with gross degeneration of the cerebral vessels, it is usual to find a varying degree of fibrosis—at times even a gross amount—of the pia-arachnoid of the prefrontal and central regions.

If this fibrosis is marked, a well-developed layer of proliferated neuroglia of considerable standing lies on the surface of the outer fibre lamina of the cortex, and this is separated from the thickened pia-arachnoid by a lymph space. On the other hand, if the fibrosis of the pia-arachnoid is less marked, a considerable amount of proliferated and slowly proliferating neuroglia may lie beneath it, and the pia-arachnoid and the surface of the cortex adhere. This condition is found more usually on the " flat " surfaces of the gyri between the fissure lips, and in the occipito-temporal regions of the hemispheres. In other words, at death it is common to find that the prefrontal and central regions exhibit a more marked degree of surface fibrosis than does the occipito-temporal.

Throughout the hemispheres the larger arteries are calcareous, thickened, and very tortuous. The cortical arteries, large and small, are in such cases grossly fibrous, and differ little in this respect from

FIG. 75.—FIBROUS VESSEL OF BRAIN FROM A CASE OF SENILE DECAY, AGED 91.

One hundred and forty-four diameters. Male, aged 91 years. Senile decay with relatively little dementia. Gross degeneration of the cerebral arteries. Section through the precentral gyrus. The specimen shows a large and very fibrous vessel in the white matter. The surrounding tissue is normal. This figure is introduced for comparison with those following, and as an example of extreme senility.

those of progressive senile dementia. The larger arteries are readily visible in both the grey and the white matter, and the smaller arteries and arterioles, *e.g.* the small surface perforating arteries, are strong and bristly. Around the arteries there is, however, little or no excess of neuroglia, the neuroglial proliferation, as has already been stated, being

largely or entirely limited to the outer part of the outer fibre or superficial lamina.

There is commonly a considerable amount of pigmentary degeneration of the larger nerve cells of the cortex, but on the whole these cells,

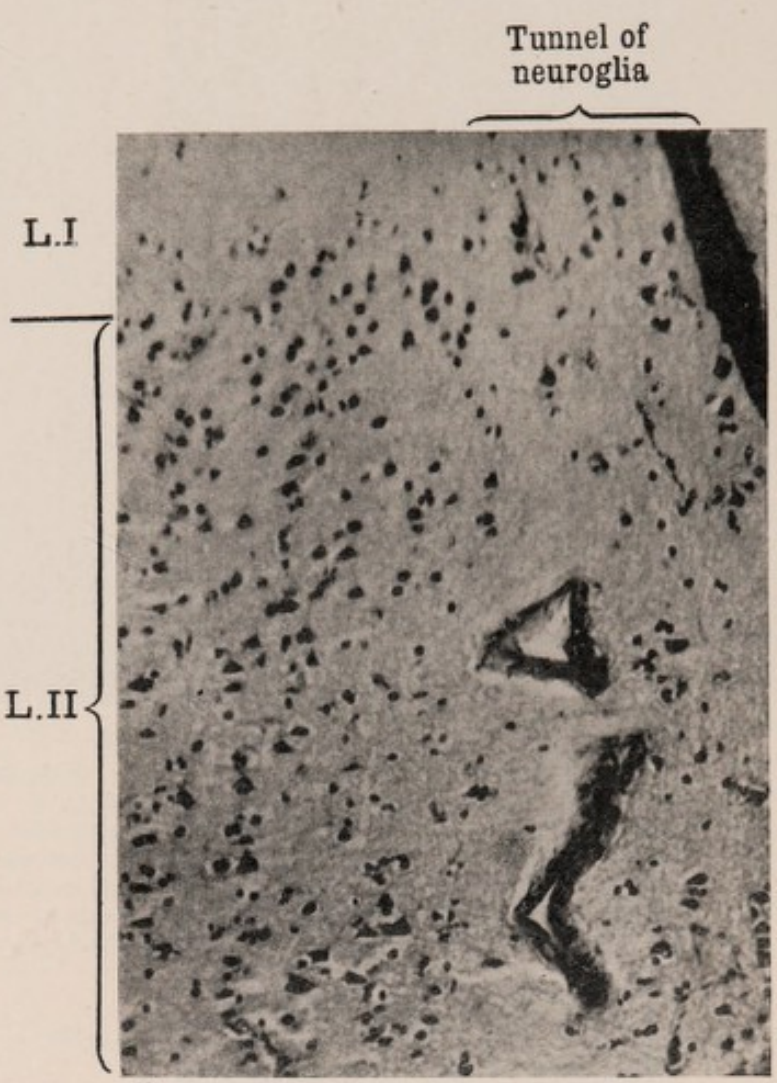


FIG. 76.—GROSS PRESENILE PROGRESSIVE DEMENTIA. FIBROSED PERFORATING ARTERY WITH SHEATH OF NEUROGLIA AND GROSSLY DEGENERATED NERVE CELLS.

One hundred and forty-four diameters. Female, aged 55 years. Huntington's chorea. Section of the prefrontal cortex. The specimen shows two pieces of an obliquely cut (tortuous) perforating artery, which exhibits marked fibrosis of its wall, and is surrounded by a sheath or tunnel of unstained neuroglia. On the left half of the photograph may be seen the grossly degenerate nerve cells of the upper part of the pyramidal lamina (L. II).

large and small, are remarkably well preserved, and the cortex is almost of the normal adult depth.

In *progressive senile dementia*, the pia-arachnoid may or may not show much fibrosis, although it is commonly thickened, especially in the frontal and central regions, and subdural deposits of varying age and type are frequent. It is, in fact, probable that in many cases of

simple senility a more definite effort at the formation of replacement-tissue is made than occurs in progressive senile dementia.

The neuroglia is usually markedly proliferated both at the surface of the outer fibre lamina and throughout this and the outer cell- or pyra-

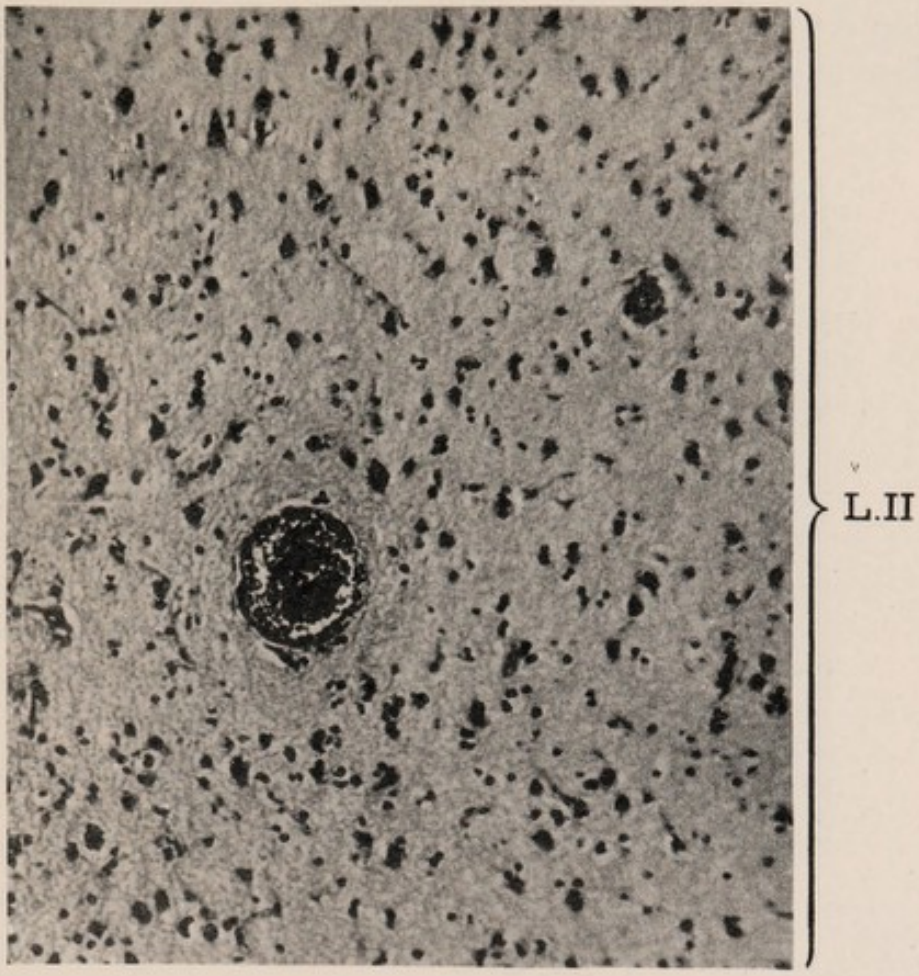


FIG. 77.—GROSS PRESENILE PROGRESSIVE DEMENTIA. MEDIUM AND SMALL FIBROUS CORTICAL VESSELS IN CROSS SECTIONS, SHOWING SHEATHS OF NEUROGLIA. NERVE CELLS GROSSLY DEGENERATED.

One hundred and forty-four diameters. Female, aged 55 years. Huntington's chorea. Section of the prefrontal cortex. Lower part of the pyramidal lamina (L. II). The specimen shows a medium and a small fibrous cortical artery in cross section, each with a well-marked sheath or tunnel of unstained neuroglia. The nerve cells are grossly degenerate and largely disintegrated, and have quite lost their normal columnar arrangement.

midal lamina. The fibrous and bristly cortical arteries are surrounded by a thick sheath of proliferated neuroglia (see Figs. 76–8).

Apart from this feature, the arteries much resemble those of simple senility with arterial degeneration which have just been described.

The nerve cells exhibit all stages and often all types of chronic degeneration, and in local areas all stages and types of acute degeneration also. In advanced cases, in fact, it is difficult to find a healthy nerve cell. The depth of the cortex is much decreased in spite of an

actual increase in the depths of the outer fibre-lamina and of the outer part of the outer cell-lamina owing to the markedly proliferated, and even proliferating, neuroglia.

In many cases numerous miliary areas of softening exist. These show all stages of repair, and are, when at all recent, surrounded by large and actively proliferating neuroglia cells with obviously phagocytic as well as reparative properties. Such areas may be in the outer part

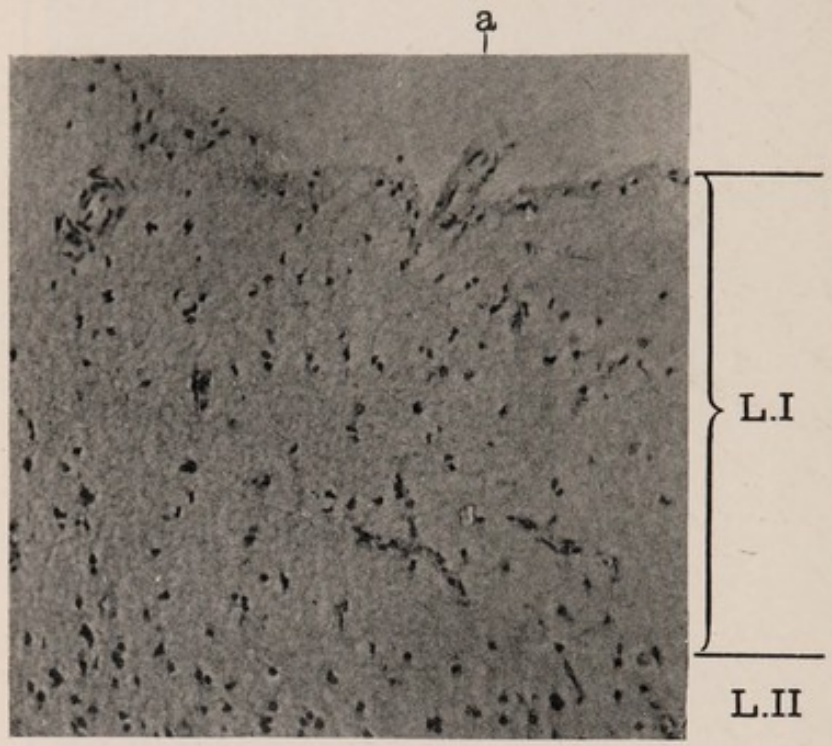


FIG. 78.—GROSS PRESENILE PROGRESSIVE DEMENTIA. OUTER FIBRE-LAMINA OF PREFRONTAL CORTEX, SHOWING SMALL AND VERY WIRY SURFACE ARTERIES AND PERFORATING ARTERIES.

One hundred and forty-four diameters. Female, aged 55 years. Huntington's chorea. Section of the outer fibre-lamina (L. I) of the prefrontal cortex, showing small and very wiry surface arterioles and also a cross section of a perforating artery, and another perforating artery which stands out from the surface like a bristle (*a*). Throughout the outer fibre-lamina (L. I) is to be seen a large amount of proliferated and proliferating neuroglia.

of the grey matter at the flat surface, and may be then of relatively considerable extent, or they may lie beneath the middle cell-lamina or in the white matter just below the inner cell-lamina.

It may be remarked that it is in cases of this kind, as in many of dementia paralytica, that the difficulties presented by the attempted staining of the cortical nerve fibrils are almost insuperable.

Some such cases exhibit a more diffuse affection with less definite lesions and, particularly in the prefrontal region, are only distinguishable from some cases of well-marked chronic dementia paralytica by the existence in such of occasional vessels surrounded by a few plasma

cells, or of larger isolated vessels with more numerous plasma cells around them. It may, in fact, happen, owing to the absence from the section of any vessels possessing definite plasma cells around them, that cases of progressive senile dementia with a decent amount of reparative reaction in the neuroglia may be quite indistinguishable from similar cases of chronic dementia paralytica. This type of case is more common in prematurely senile persons in whom the vascular affection and resulting slowly progressive dementia have been incited by prolonged alcoholism or lead encephalopathy, &c.

Symptomatology of Progressive Senile Dementia

It is unnecessary to introduce here a detailed description of the symptomatology of progressive senile dementia, as the subjects of mental confusion and dementia have already been considered at length in Chapter XIII (pp. 221–277). On reference to these it will be seen that both the symptomatological differences between simple and presumably recoverable mental confusion and the mental confusion of progressive senile dementia, and also the more complex phenomena of lower association which are frequently presented by the latter type of mental disease, have been fully referred to.

My present purpose will therefore be served by the repetition of a case which illustrates with exceptional clearness the chief characteristics of the mental confusion of progressive senile dementia. The interest of this case is increased by the fact that the exciting cause is stated to be intemperance, for this factor has not in any way obscured the details of symptomatology to which it is necessary to draw the attention of the reader.

Case 21.—*Admitted September* 22, 1904. (Hellingly Asylum.) Exciting cause, intemperance. Duration prior to admission said to be fourteen days.

Female, married, nurse, æt. 75. Admitted four days ago.

A wrinkled old woman, who says that her name is "Sarah C——x, a large family we are." This is her married name, and her maiden name was H——s. She then states that she married again, and that her present name is W——m. (Isn't your name Mrs. B——d ?) "I am, sir, because I was a widow and married Mr. R. B——d." She recognises the nurse as "Mrs. W——m's daughter. Mrs. P——r it was once I know. Weren't your grandmother's name P——r ?" She then tells me that the nurse is "Mrs. P——r's granddaughter, isn't it ? I know the old lady, and I know your mother." She states that she has seen me before at Bishopstoke. She does not know whether my name is P——r or not. "I know Mr. P——r and Mrs. P——r, and thought you were Mr. P——r." She calls a patient named Mrs. B——d "Mrs. T——r," and another named S—— P——x "Mrs. P——r," and a nurse "Mrs. P——r's daughter." She thinks to-day is Sunday (Monday), and that the date is the 25th or 26th (26th). She replies that the month is "not February, is it ?" (September), and that the year is "I

don't know whether it is 101 or 102" (1904). Age? "I'm getting on for forty. It's a nice little age, isn't it? I suppose you're beginning to shave it, aren't you?" Out to-day? "Yes, I've been out to see the cricket match to-day." She states that she saw her husband at Bishopstoke this morning. She brought her husband's breakfast home with her—bread, butter, and oysters. I tell her that I don't know a *soul* in Bishopstoke, and she remarks, "A *soldier* there, are you?" She replies that she has children at home. The youngest is five or six, and she has twenty-five living, and thinks it likely that she will have another to make twenty-six. When asked where she is, she replies that it is "about one mile from Bishopstoke Station here." When again asked the same question, she remarks, "Very nice place, I like it very well. I should think it was a bonny place myself." I then ask her if she is a countrywoman, and she replies, "Southampton woman." She answers questions quickly and apparently rationally, but as a whole does not volunteer much information about herself. She laughs, and looks about slyly from face to face as if she thinks that she is amusing. She has evidently lived a rather dissolute life, as she says, "I went to Bishopstoke this morning. I enjoyed myself I can tell you. I always do when I go on the spree. I was along with your nephew last time I saw you, and with his father this morning." She is very erotic. When I touch her chin to get her to open her mouth, she tells me I am a rascal, and that "he thought he'd tickle me under the chin." She is wet and dirty in her habits, but she is quiet and no trouble, and she takes her food well.

This patient died two and a half months after admission in a condition of advanced dementia.

The chief details of importance which are exhibited by this case are the following:—

(1) The patient does not know the time of year.

(2) She gives her first married name instead of her present one.

(3) She states that she is "getting on for forty," whereas she is seventy-five years of age.

(4) She confabulates readily, *but the psychic phenomena which are evolved are, on the whole, impossible as statements of fact, and are largely based on groups of memorial units dealing with her early life.*

(5) She has well-marked illusions of identity, *but she continually employs the same name, "P——r," in her identifications.*

In all these points the case differs from one of presumably recoverable mental confusion, and shows evidence of the mental confusion of progressive dementia. Other similar examples have been cited and discussed in the Chapter referred to—*e.g.* Case 3, p. 231, and Case 12, pp. 244–246.

As the various phenomena of lower association which frequently occur in cases of progressive senile dementia are, in reality, closely connected with, and, in fact, part of, the existing mental confusion, and as they are thus the symptomatological expression of active neuronic dissolution, I have not employed them as a basis for the elaboration of clinical types.

The cases falling into the group of progressive senile dementia have, therefore, been grouped as follows :—

	M.	F.	T.
Sub-class (1) : Melancholia with dementia . . .	3	2	5
Sub-class (2) : Mania with dementia	—	5	5
Sub-class (3) : Simple dementia	6	8	14
Total	9	15	24

The cases of progressive senile dementia thus form the small proportions of 5·4 per cent. of the 445 cases of dementia under consideration, and 3·3 per cent. of the total of 728 cases of amentia and dementia.

This point is interesting in view of the fact that the cases are derived from the largely agricultural population of East Sussex. Though I have no statistics at my disposal, I am nevertheless quite certain that progressive senile dementia is much more common amongst the insane derived from the great centres of population ; and I am also inclined, after considerable experience in all, to think it more common in Lancashire and the West Riding of Yorkshire than in the County of London.

As would be expected, very few cases of progressive senile dementia are capable of useful work. Of the 9 males, 7 were unemployed and 2 did a little work : and of the 15 females, 13 were unemployed and 2 did a little work.

CLASS (B).—Dementia Paralytica (General Paralysis)

Though earlier in this part of the volume I have indicated the existence of certain types of progressive dementia, which are, from the aspect of general pathology, homologous with dementia paralytica, these types are so unimportant from the clinical aspect owing to their rarity, and they are consequently at present so undefined, that I propose to confine my attention in the following description to dementia paralytica alone.

It is not my intention to discuss, or even to enumerate, the various views which have been enunciated with regard to the causation and general pathology of this clinical entity.

The question as to whether dementia paralytica is primarily a meningo-encephalitis or a primary degeneration of the cortical neurones is now chiefly of historical interest, as it is very generally accepted that the essential histological features present consist on the one hand of a proliferation of the extra-neuronic elements, which is of different ages and of different degrees of severity according to the stage and type of the case, and on the other of a mixture of acute and chronic nerve-cell changes, which also vary in type and extent in accordance with the clinical symptomatology manifested by the patient. It is probably

quite unimportant seriously to discuss whether the former or the latter occurs the first, for, in the established morbid state, a " vicious circle " exists in which each factor in turn causes the other ; and, as I hope to make clear, there is every reason to believe that, under the influence of different exciting causes, either may originally form the starting point of the morbid process.

I have already, earlier in this chapter (pp. 362–370), indicated my views as to the relationship, from the aspect of general pathology, which exists between dementia paralytica and progressive senile dementia, and as to the part played by syphilis in the development of the former of these types of progressive and secondary dementia.

That actual invasion of the cerebrum by the *spirochaeta pallida* is a necessary precedent to the development of dementia paralytica is certain. That such invasion is not necessarily followed by the development of dementia paralytica is equally certain ; and on this point I would draw the attention of the reader, in particular, to the section of the histopathology of dementia paralytica (pp. 415–434).

That living spirochætes exist in the cerebrum of all cases of dementia paralytica during their entire course is not proved, but may be the case if the thesis be accepted that, once they are actually within the substance of the encephalon, their removal is impossible by any method of treatment which would not at the same time be fatal to the patient. I am, however, satisfied, and I hope also to convince the reader, that, although invasion of the brain by the *spirochaeta pallida* is in all cases the primary cause of the progressive dementia of general paralysis, the progressive cerebral dissolution responsible for this ensues only in persons who might from other exciting causes have developed stationary dementia. I would further add that dementia paralytica, in my opinion, is, during its course, in most cases relatively independent, after its actual onset, of the presence of living spirochætes in the brains of the subjects of this form of progressive dementia.

In the following description, therefore, the etiology of dementia paralytica will be considered mainly from the point of view of *whether this clinical entity is a subdivision of mental disease, or is an organic disease (parenchymatous syphilis) of the cerebrum which merely in its symptomatology resembles insanity.* If the latter were true, the frequently expressed opinion that no anxiety need be felt regarding the future of the offspring of general paralytics would be justified ; and dementia paralytica would bear no closer a relationship to mental disease than does cerebral tumour or cerebral abscess.

In my opinion, however, *dementia paralytica is an integral part of mental disease, and, were syphilis non-existent, the majority of the existing cases of dementia paralytica would merely be replaced by cases of the primarily*

neuronic dementia which has already been considered. Of these cases the majority would remain in asylums as permanent inmates, and the rest would possess a sufficient remainder of intelligence to be discharged as "recoveries" or to the care of their friends.

I thus hope to demonstrate that the paralytic dement (*i.e.* case of dementia paralytica) is a lunatic who differs from the ordinary case of primarily neuronic dementia solely in the fact that his cerebrum has been invaded by the *spirochaeta pallida*, and that what would have been a stationary dementia has thereby become a more or less rapidly progressive one.

I believe that the ordinary sane individual, and the ordinary psychopath or potential lunatic who possesses cortical neurones of average durability, may suffer from syphilis with impunity as regards the onset of dementia paralytica: and I would express the same opinion with regard to the syphilised lunatics with little or no dementia, who are fairly common in asylums.

On the other hand, I think that a psychopath, who possesses cortical neurones of subnormal durability, and who, apart from an attack of syphilis, would develop a moderate grade of dementia as the result of one or more attacks of mental alienation, would, on acquiring this disease, be liable sooner or later to suffer from one or other of the types of dementia paralytica.

Further, since I consider, as I have already remarked, that the extra-neuronic reaction, which constitutes the essential feature of cases of dementia paralytica, is allied to, and only differs in type and degree from, that occurring in cases of progressive senile dementia, I am of the opinion that, whilst in ordinary life many psychopaths with deficiently durable cortical neurones manage to survive without the onset of an attack of insanity, all or nearly all such psychopaths would, if infected with syphilis, sooner or later develop (chronic) dementia paralytica.

This latter suggestion is founded on a basis of general pathology, but it is not contradicted by the estimate that some 1 or 2 per cent. of general paralytics occur amongst the subjects of syphilis, as this probably roughly represents the percentage of dementable psychopaths in the general population, such certainly being much greater than the existing proportion of certified lunatics in England and Wales (1 in 267 in January 1913).

Such an estimate is naturally not to be considered as other than suggestive, for even an approximate determination of the incidence of syphilis in England is impossible; and it is quite likely that the percentage of psychopaths amongst the subjects of syphilis may differ somewhat from that in the general population.

The only available evidence on this point is derived from the figures

of Mattauschek and Pilcz, who, by following the further history of officers infected with syphilis during the period 1880–1900, have found that, of 4134 cases, by January 1912, 198 (or 4·8 per cent.) had developed progressive paralysis, 113 (or 2·7 per cent.) tabes, 132 (or 3·2 per cent.) cerebro-spinal syphilis, and 80 (or 1·9 per cent.) various psychoses. The first and last figures, namely, 198 and 80, strongly tempt me to regard my point as proved, since they are proportionate to the respective numbers of dementable and non-dementable psychopaths (5 : 2) when low-grade aments are excluded (see p. 166).

In the following description an attempt will be made to record in compact but intelligible form such data as I am able to produce with reference to the relationship of dementia paralytica to mental disease.

The subject will be considered under the following headings :—

(1) Evidence as to the existence of heredity of insanity and of parental and family degeneracy in the subjects of dementia paralytica.

(2) Evidence as to the relationship between dementia paralytica and mental disease, derived from the study of the death rates in mental disease (including and excluding dementia paralytica) at different ages, and from the comparison of these death rates with the homologous death rates in the corresponding general population.

(3) Pathological evidence as to—

(*a*) The relationship between the morbid anatomy and the regional cortical wasting of dementia paralytica and of progressive senile dementia.

(*b*) The existence of cerebral under-development in certain types of dementia paralytica.

(*c*) The histo-pathology of dementia paralytica and its relationship to that of progressive senile dementia.

(4) Evidence as to the relationship between dementia paralytica and mental disease, derived from a study of the clinical types of dementia paralytica.

(1) Evidence as to the Existence of Heredity of Insanity and of Parental and Family Degeneracy in the Subjects of Dementia Paralytica

As has already been stated, I am of the opinion that the presence or absence of *heredity of insanity* in any case or series of cases possesses merely a relative value, as family and social conditions so largely decide whether any particular individual should be sent to an asylum or not. The equally and often more important evidence of *family or parental degeneracy* is frequently not available, and is usually not easy to obtain.

I think it more probable that isolated cases of insanity arise from the intermarriage of ill-assorted couples and mild degenerates—and that

the severer grades of family degeneracy follow the intermarriage of definite degenerates—than that isolated examples of insanity in either parental stock will be followed by insanity in the offspring of such parents.

I would, in other words, place the percentage of heredity at 100 with regard to the offspring of either degenerate or "normal" individuals, and, without going so far as to assert that non-traumatic cerebral underdevelopment or dissolution *cannot* occur in the absence of hereditary causes, would emphatically express my doubts with regard to its occurrence with any degree of frequency.

On the thesis that dementia paralytica were an integral part of mental disease, it would be expected therefore that a high percentage of heredity of insanity and of parental or family degeneracy would be obtained in a series of carefully taken cases, although this percentage, for reasons to be stated, would necessarily fall far short of 100.

In a series of 85 cases of dementia paralytica which I published some years ago (*Arch. of Neurol.*, vol. ii.), satisfactory family histories were obtained. These histories were the outcome of several hundreds of personal interviews with all the available relatives or friends of the patients, and were supplemented by information collected by other means.

Much labour was expended on the subject, for the difficulties in the way of obtaining information concerning the family histories of cases of dementia paralytica are often very great, and particularly so in the case of patients of the male sex. The wife is frequently the only visitor, and it is quite common for the family of the patient to be unknown to her. This is more often the case with patients suffering from dementia paralytica than in other forms of insanity, for the former patients, owing to their previously dissipated and often wandering life, are frequently entirely out of touch with their relatives. The usual age of the subjects of dementia paralytica is again a serious drawback, as the older the patient is, the fewer are the available relatives who can give trustworthy information regarding the family history. Lastly, it is common for relatives to be informed that the disease is not insanity, but is due to the formerly dissipated life of the patient, in order that their natural apprehensions concerning the future of the offspring may be relieved. They therefore tend to hide many facts of family history which they would otherwise have mentioned. I have in fact met with several instances in which the relatives, until definitely taxed regarding the correctness of some specific fact of history which had been accidentally acquired from other sources, stoutly denied the existence of any insanity in the family, and deliberately suppressed the name of the subject of this when first giving the history. Whilst such deliberate misstatements are at

times met with during ordinary history-taking, I am convinced that they are more frequently found in the case of the histories of general paralytics, the friends of whom are often only too anxious to accept syphilis as the cause of the disease.

Of the 85 cases which will now be referred to, 13 were private and 72 were rate-paid patients.

In 8 of the 13 private cases there was direct or collateral insanity: in 3 there were allied disorders, including epilepsy: in the twelfth the father died of cerebral hæmorrhage, and the mother of paralysis, and the patient was the youngest of a family of eight: and in the thirteenth the mother and sister died of phthisis, a brother was delicate, and 11 out of 14 in the family were dead.

In one instance the parents were first cousins, and a paternal uncle and two female cousins were insane: and in 3 families there was a very high death rate. In 4 cases there was phthisis in the family (mothers and sisters), in 2 diabetes, and in 1 asthma.

Of the 72 rate-paid cases, *actual insanity* existed in 45 families (62·5 per cent.), and in 4 of these true epilepsy also existed, apart from the cases of insanity. *True epilepsy* existed in 5 other families without insanity (6·9 per cent.), though in one case it was probably associated with melancholia of pregnancy. Histories of insanity and epilepsy consequently existed in 50 of the 72 families (69·4 per cent.). In these 50 families, as further evidence of family degeneracy, there were disorders allied to insanity in at least 16 instances (nervous diseases not being included).

In the 45 histories containing actual insanity there existed 65 insane relatives. These included 10 brothers, 10 sisters, 11 mothers, 7 fathers, 3 maternal grandfathers, 1 maternal grandmother, 2 paternal grandfathers, 1 maternal great-grandfather, 2 maternal uncles, 5 maternal aunts, 4 paternal uncles, 1 paternal aunt, and 8 collaterals (1 half-sister, 1 half-brother, 4 cousins, 1 father's maternal cousin, and 1 sister's son). Several of these insane relatives suffered from fits, and a few may have been cases of general paralysis, but no stress can be laid on this point, as the details available are insufficient.

Of the remaining 22 of the 72 cases, *psychopathy* (*i.e.* "borderland cases," not including examples of nervous disease) existed in 9 (12·5 per cent.), 2 brothers, 2 sisters, 3 mothers, and 3 sons being affected.

Of the remaining 13, there was *an abnormally high death rate* amongst relatives in no less than 7 cases (9·7 per cent.).

Finally, of the remaining 6, in 3 there was a history of *paralysis*; in 1 the patient was the *delicate child of the family*, and did not walk until he was four years of age; and in the remaining 2 there was merely a history of alcoholic excess in the parents.

Hence, of the 72 histories of rate-paid patients, there was *psychopathic heredity* in no less than 81·9 per cent., and an abnormally high family death rate in another 9·7 per cent. In the remaining 8·4 per cent. less important etiological factors existed.

Phthisis existed in 19 of the 72 families (26·4 per cent.), in 8 affecting brothers and sisters, and in 6 the father's, in 4 the mother's, and in 1 both families.

Intemperance in alcohol existed in 26 of the 72 families (36·1 per cent.), both sides of the family suffering from the disorder in 7 cases, the paternal side in 12, and the maternal in 5: the remaining 2 cases occurred in sisters of the patients.

General or nervous diseases were ascertained to have existed in 19 cases (26·4 per cent.).

In 13 families (18 per cent.) there was an *abnormally high death rate*, it being so high in 7 of these, that very few family details could be obtained.

The figures given above illustrate the high percentage of heredity of insanity and of parental and family degeneracy which occurs in dementia paralytica, and form the first part of the evidence which I am able to produce in support of the thesis under consideration.

I am, of course, aware that comparative observations on normal individuals and on ordinary cases of mental disease would be necessary in order that exact conclusions might be drawn regarding the respective degrees of degeneracy in these two classes and in dementia paralytica. Such observations would, however, necessarily have had to be made on exactly similar samples of population, and for these I had neither the time nor the opportunity. It is also extremely doubtful whether the results would have been of sufficient value to justify the expenditure of the necessary time and labour, even had it been possible to obtain them, as, for practical purposes, the only question it was necessary to settle was whether or not a high percentage of heredity of insanity and of parental and family degeneracy were obtainable in dementia paralytica.

I considered it desirable personally to carry out this investigation, as there are few subjects on which greater differences of opinion exist than with regard to the question of the percentage of heredity of insanity in dementia paralytica, and many writers of eminence consider such percentage to be very low. Mott, for example, regards dementia paralytica as a disease which affects the best brains of town populations.

That the figures I have given are higher than those published by most observers, I admit, but I judge this to be due to the fact that in, at any rate, the majority of cases, the histories employed are such as are provided by ordinary case-book entries, and are not obtained as the result of laborious individual investigation.

In Table XV of the Sixty-seventh Report of the Commissioners in Lunacy are given the proportions (per cent.) of the yearly average number of the total direct admissions to the asylums of England and Wales during the five years 1907–1911, in which certain assigned causes of insanity were found to exist. Those data which bear on the question under consideration are as follows :—

Causes and Associated Factors in Insanity.	Percentage of Instances in which each Cause or Associated Factor was assigned either as Principal or Contributory.	
	Male.	Female.
HEREDITY (excluding cousins, nephews, nieces, and offspring)—		
Insane Heredity	20·6	26·1
Epileptic	1·4	1·7
Neurotic (including only hysteria, neurasthenia, spasmodic asthma (idiopathic), and chorea) . . .	1·0	1·6
Eccentricity (in marked degree) . .	0·4	0·6
Alcoholism	4·8	5·1

As at least a large proportion of the histories of admissions to asylums are not taken at all, these figures are naturally very much lower than such as would be obtained from the data provided by asylum case-books.

In his presidential address (*Journal of Mental Science*, October 1902), Dr. Wiglesworth provides statistics of great interest in this connection. "My statistics deal with a series of 3445 insane patients who have been admitted into Rainhill Asylum under my care during a period of twelve years, 1693 of these patients being males and 1752 females. It has not been practicable to include all cases that have passed through the asylum in the course of that period, as many patients come in of whose antecedents it is impossible to obtain any trace, but every patient has been included of whose family history any details whatever were obtainable."

These are shown in the opposite table (p. 393).

It will be noted that the *percentage of hereditary cases amongst the female general paralytics is slightly higher than that amongst the examples of ordinary insanity, whereas amongst the male general paralytics it is much lower.* From the considerations already adduced it seems to me to be at the least probable that this sex difference is largely or entirely due to the less satisfactory nature of the information which is usually obtainable regarding the personal and family history of male general paralytics. This explanation is supported by the fact that no such sex difference existed in the case of the 85 histories referred to above. The private patients, for example, were all of the male sex.

It is true that in the above table a similar sex difference exists in the case of the epileptics, the hereditary cases forming an extremely high percentage in the case of the females and a low one in the case of the males, in comparison with the respective percentages in the case of ordinary insanity. Epileptic insanity, however, is so frequently the result of organic and traumatic causes that it falls into a different category from other cases of mental disease ; and the number of cases (120), even when recruited from the cases of congenital insanity, forms an unusually low proportion of the total of 3445 cases. Dr. Wiglesworth expressed this opinion as follows :—" One cannot but think that this great difference must in part be due to accidental causes, and that if larger numbers were taken, the real disparity would be found not so great. Still, the

Form of Insanity.	Number of Cases.			Number of these showing Heredity.			Percentage of Hereditary Cases on Total Numbers.		
	M.	F.	T.	M.	F.	T.	M.	F.	T.
Congenital insanity (idiocy and imbecility) with or without epilepsy .	35	33	68	13	17	30	37·14	51·51	44·11
Epileptic insanity .	77	43	120	15	23	38	19·48	53·48	31·66
General paralysis .	363	70	433	60	22	82	16·52	31·42	18·93
Ordinary insanity (non-congenital)—mania, melancholia, dementia, &c.	1218	1606	2824	331	484	815	27·17	30·13	28·85
All cases together .	1693	1752	3445	419	546	965	24·74	31·16	28·01

figures certainly lead one to suppose that epilepsy in the male is far more of an acquired affection than it is in the female."

The percentages given in the case of congenital insanity are also of relatively slight value, for " the number of cases of congenital insanity admitted into Rainhill Asylum is a small one, due in part to the fact that, the asylum having been overcrowded for many years past, a restriction has been put upon the admission of this class of cases " ; and Dr. Wiglesworth adds : " These cases have, however, been taken indiscriminately, and no endeavour has been made to exclude ' accidental ' idiots from the list, whose idiocy may have been occasioned by accidents occurring during the process of birth. On account of the superior size of the male head, it is probable that there are more cases amongst males than amongst females, and if all these cases (in which one might expect an absence of hereditary taint) were excluded, it would

tend to make the difference between the two sexes somewhat less pronounced."

The important sex difference in the table, therefore, concerns the general paralytics ; and this is, in my opinion, susceptible of the explanation I have given.

Hence Dr. Wiglesworth's statistics, though intended by their author to serve a different purpose, may be considered not to contradict the conclusions drawn from the personally obtained data which I have provided with reference to the existence in dementia paralytica of a high percentage of heredity of insanity and of parental and family degeneracy. Further, they are susceptible of the interpretation that the percentage in dementia paralytica does not differ substantially from that in ordinary mental disease.

(2) Evidence as to the Relationship between Dementia Paralytica and Mental Disease, derived from the Study of the Death Rates in Mental Disease (including and excluding Dementia Paralytica) at Different Ages, and from the Comparison of these Death Rates with the Homologous Death Rates in the corresponding General Population

I have calculated the death rates at different ages amongst the insane of a certain asylum population. These death rates on the one hand refer to the whole of the asylum population, and on the other to the subjects of mental disease apart from dementia paralytica.

My object is twofold. I propose in the first place to compare the death rates of the insane with those of the corresponding general population, and in the second to determine what modifications of the former rates result from the exclusion of the cases of dementia paralytica.

In the case of the statistics which follow no attempt at entire accuracy is made, since such is impossible. The errors, however, which run throughout the tables, are quite unimportant as regards any influence they can exert on the gross modifications in death rate to which I propose to draw the attention of the reader. To put it crudely, a few inches here and there are unimportant when one is comparing certain very differently-sized rooms by means of a number of approximately accurate yard measures. I have, however, thought it wise to make this explanation, since it is quite common for persons inexperienced in the employment of figures to imagine that errors, which are slight in comparison with the marked results which it is desired to obtain, must necessarily invalidate the latter.

The data employed with reference to the general population are the corrected death rates per 1000 living in the County of London for the

year 1905 (Sixty-eighth Report of the Registrar-General, Tables XVI and XVII). The margin of error owing to the use of these data is inconsiderable, as the rates for neighbouring years are practically constant. It is necessary to assume that the death rates for the whole County of London and for its several larger sub-districts are the same, and this assumption may appear likely to cause a serious error. Such an error, however, if it exists, cannot be considerable, as the death rates in the County of London do not, as regards my present purpose, differ greatly from those of the total general population of England and Wales.

The data regarding the insane refer to the inmates of the London County Asylum, Claybury. The deaths employed are those included in Series B (*Journal of Mental Science*, April 1905), together with the cases of dementia paralytica dying during the same period of twenty months, from October 1901 to May 1903, inclusive.

The number of deaths during the period under consideration was 311. Of these, 16 special cases (8 male and 8 female) suffered from gross lesions, &c., and were unclassified. These deaths are excluded, and an error of about 5 per cent. is thereby introduced throughout the death rates, as it is impossible to correct these by also excluding the living portion of the asylum population from which such "accidental" cases arise. This general lowering of the death rates, however, applies to all the tables, and is fairly evenly distributed through the decades, the 8 male cases dying at ages varying from 21 to 77 years, and the 8 female cases dying at ages varying from 27 to 67 years. This error therefore, as will be seen, does not prejudicially affect the conclusions which will be drawn from the death rates.

The cases employed thus include 127 males, of whom 83 are ordinary cases and 44 are general paralytics; and 168 females, of whom 150 are ordinary cases and 18 are general paralytics.

The annual death rates per 1000 living at the eight age-periods which are dealt with are worked out from the estimated average population of the London County Asylum, Claybury, at these age-periods during the twenty months referred to.

In the first instance the rates are prepared from the total numbers of male and female deaths respectively, and from the estimated total average male and female populations respectively, at the eight age-periods under consideration.

Further death rates are then prepared from the numbers of non-general-paralytic male and female deaths respectively, and from the estimated non-general-paralytic average male and female populations respectively, at these age-periods.

The estimated average population of the London County Asylum, Claybury, at the eight age-periods during the twenty months under

consideration, is based on the returns of patients resident on December 31, 1902.

The average general paralytic population during these twenty months is estimated by me, from personal data at my disposal, to be 121, of which 90 (or 9 per cent. of estimated average total male population) are males, and 31 (or 2·2 per cent. of estimated average total female population) are females.

Of the 90 males, 12, 29, 37, 8, 3, and 1 are estimated to belong to the second to the seventh age-periods respectively; and of the 31 females, 7, 15, 7, and 2 are estimated to belong to the second to the fifth age-periods respectively.

The estimated average general paralytic male and female populations are subtracted from the estimated average total male and female populations, in order to obtain the average non-general-paralytic male and female populations, which are employed for the preparation of the series of death rates on the fourth lines of Tables I and II respectively.

These death rates are shown on the opposite tables (p. 397).

It will be noticed that the death rate in the normal population nearly doubles itself at each decade, the rise being slightly more rapid throughout in the case of the males than in that of the females.

In the case of the total male insane population, as is shown both by the death rates (Table I, B) and by their ratios to the normal death rates, which are shown on the next line of the table, a rise also occurs throughout the age-periods, but this rise after the second decade becomes progressively less in comparison with the normal.

In the case of the total female insane population (Table II, B), a similar rise in the death rates occurs throughout the decades, but it is somewhat less than in the males in the earlier decades, and somewhat greater than in the males in the later.

The average total insane male death rate (not shown in the table) is 76·5, and the average female is 72·2. These thus differ slightly only, but this difference is in the same direction as that of the normal population, though it is less marked.

The death rates of the total insane of both sexes thus resemble those of the general population in forming an ascending series, the increments to which are, however, much greater than in the latter at first, but become proportionately less marked as the ages increase, this being especially evident in the case of the male sex.

In line C of the tables the death rates of the non-general-paralytic male and female insane population are given.

In the case of the females (to whom in the total number the general paralytics form a relatively small proportion), the ascending series of death rates (Table II, C, and also the ratios on the following line) is not

markedly affected, though the death rates in the second and third, and to a less extent in the fourth, of the given decades are decidedly low.

In the case of the males, however (to whom in the total number the general paralytics form a relatively large proportion), the ascending

TABLE I.—*Death Rates per* 1000 *Living Males.*

Age-Periods.	15–	20–	25–	35–	45–	55–	65–	75–	85 and upwards.
A. London County, 1905	2·8	3·7	5·8	10·6	19·4	35·8	70·3	135·9	313·7
B. Series B + G.Ps. on estimated total average population at the several age-periods . . .	26		58	55	64	121	129	280	600
Ratio of B to A . .	About 8		10	5·2	3·3	3·4	1·8	2·1	1·9
C. Series B, on estimated total average population less estimated G.P. population at the several age-periods . . .	26		44	26	25	110	126	257	600
Ratio of C to A . .	About 8		7·6	2·45	1·3	3·1	1·8	1·9	1·9

TABLE II.—*Death Rates per* 1000 *Living Females.*

Age-Periods.	15–	20–	25–	35–	45–	55–	65–	75–	85 and upwards.
A. London County, 1905	2·3	2·8	4·2	7·8	14·0	25·9	55·1	117·1	288·0
B. Series B + GPs. on estimated total average population at the several age-periods . . .	27		41	48	48	59	199	315	600
Ratio of B to A . .	About 10·6		9·8	6·2	3·4	2·3	3·6	2·7	2·0
C. Series B, on estimated total average population less estimated G.P. population at the several age-periods . . .	27		31	35	40	57	199	315	600
Ratio of C to A . .	About 10·6		7·4	4·5	2·9	2·2	3·6	2·7	2·0

series is entirely broken up at the third and fourth of the given decades, and the unexpected and curious result appears that *male lunatics have an extraordinarily low death rate between the ages of* 35 *and* 54. (Table I, C, and also the ratios on the following line.)

This result is so grossly marked that the only possible inference from the figures is that exclusion of the general paralytic members of the

lunatic population is unjustifiable, and that therefore *cases of general paralysis form an integral part of mental disease.*

In other words, it is impossible to avoid the conclusion that, *whatever be the cause of the particular symptom-complex known as dementia paralytica, the cases which exhibit this are nevertheless lunatics, and not merely the subjects of a disease of the brain of protozoic origin.*

(3) Pathological Evidence as to

(*a*) the Relationship between the Morbid Anatomy and the Regional Cortical Wasting of Dementia Paralytica and of Progressive Senile Dementia ;

(*b*) the Existence of Cerebral Under-development in Certain Types of Dementia Paralytica ; and

(*c*) The Histo-pathology of Dementia Paralytica, and its Relationship to that of Progressive Senile Dementia.

In its essentials the morbid anatomy of dementia paralytica is that of ordinary (senile) progressive dementia. Certain important differences, however, exist ; and these I consider to be largely or entirely due to the higher degree of reparative proliferation on the part of the non-neuronic elements of the encephalon which is present in dementia paralytica.

As in progressive senile dementia, so here, the grossly obvious features are cerebral wasting, and replacement of the lost cerebral tissue to some extent by reparative proliferation of the non-neuronic elements, but chiefly by a large quantity of intracranial fluid.

The following description will largely be confined to those appearances in which the morbid anatomy of dementia paralytica differs from that of progressive senile dementia, with the view of illustrating how these are due to differences in the immediate etiology and in the course of these different types of dementia.

The cerebra of certain selected cases will then be illustrated and described, with the object of demonstrating (*a*) that the wasting in dementia paralytica bears a close resemblance in distribution and degree to that occurring in progressive senile dementia, such a resemblance, in fact, as renders it impossible to avoid the conclusion that in both cases this wasting is the result of dissolution of the last evolved and functionally highest regions of the cortex, and (*b*) that cerebral under-development occurs in dementia paralytica just as it exists in ordinary mental disease, and that the naked-eye anatomy of the cerebrum gives evidence regarding the unity of dementia paralytica and ordinary mental disease which is as important as that which will shortly be produced with regard to the clinical types of dementia paralytica, and as that which has already been detailed from other aspects in the preceding portion of this chapter.

I shall lastly describe in some detail the histo-pathology of dementia paralytica with the object of indicating that the encephalon may show widespread plasma-cell (syphilitic) affection of the intracerebral vessels in the absence of dementia paralytica. I also hope to justify on histo-pathological grounds my inclusion of dementia paralytica and progressive senile dementia under the one class of progressive dementia.

(*a*) Morbid Anatomy of Dementia Paralytica

In early and moderately developed, but less often in very advanced cases, the venules, &c., of the intracranial membranes and encephalon are intensely congested, a morbid appearance usual in *status epilepticus*, but not often seen in progressive senile dementia.

Even in relatively early cases of dementia paralytica, the excess of *subdural fluid* is large, and in advanced cases it is as great as, or greater than, occurs in ordinary gross dementia.

In the 44 male cases already referred to, great or very great excess existed in 37, excess just over the tentorium in 2, moderate excess in 2, slight excess in 1 early case, and no excess in 2. Of the 2 without subdural excess, 1 was very recent and acute, and in the case of the other the subdural space contained 205 grammes of recent blood-clot.

Of the 18 female cases already referred to, a very great excess of subdural fluid existed in all.

This sex difference is in all probability associated with the greater chronicity of the female cases.

A similar sex difference exists with regard to the frequency of the *subdural deposits*, which are somewhat more common in dementia paralytica than in progressive senile dementia, except in the case of the severer grades.

Thus, of the 44 male cases, subdural deposits occurred in 12, or 27 per cent.; and of the 18 female cases, in 2 or 11 per cent.; the percentage in the case of the total of 62 cases being 22·6.

Of 85 male cases published by me many years ago, these deposits occurred in 25, or 29·4 per cent.; and of 38 female cases in 4, or 10·5 per cent., the percentage in the case of the total of 123 being 23·6.

The percentages in these two series of cases are thus substantially the same, and it may therefore be stated that subdural deposits are found in the male sex more than twice as frequently as in the female sex. In both series also, in each sex, half of the deposits were of recent date, and the remaining half were more or less organised, and in several instances multiple.

In progressive senile dementia subdural deposits are rather less common, except in very advanced cases.

In the case of the combined series A and B referred to in Chap. X, p. 140, and including in all 433 cases of ordinary mental disease, these deposits existed in 17·4 per cent. of the 92 cases in Group IV (severe dementia) and in 22·8 per cent. of the 79 cases in Group V (gross dementia), the latter percentage being about the same as that indicated above as occurring in dementia paralytica.

In early cases of dementia paralytica there is little or no excess of *sub-arachnoid fluid;* in slow chronic cases there is often considerable excess, frequently in the form of scattered "arachnoid cysts"; and in advanced cases there is great excess, the prefrontal pia-arachnoid being in many instances ballooned out by the subjacent fluid.

In early cases the *pia-arachnoid* may superficially present few abnormal characters beyond a larger or smaller amount of congestion; in later cases it is, as a rule, immensely thickened and opaque, and stretches as a continuous sheet over and often entirely hides the subjacent sulci. The thickening and opacity are, usually, most marked over the fronto-parietal regions and the neighbouring median parts of the hemispheres, and also over the first temporal gyri. They are often not so marked in the prefrontal region, where the pia-arachnoid is raised up by subjacent fluid. The opacity may, however, be more widespread, and may even occupy the whole cerebrum except, apart from rare cases, the orbital surfaces of the frontal lobes, the lower and inner occipito-temporal regions, and the posterior poles of the hemispheres.

In progressive senile dementia the distribution of the opacity and thickening is similar to that described, but the fibrosis (and also the contraction) of the pia-arachnoid is commonly much less marked than in dementia paralytica.

Even in early cases of dementia paralytica *the pia-arachnoid is granular in the mid-line prefrontal region below the falx cerebri*, and pia adheres more or less firmly to pia in this position, the actual area of adhesion depending on the size and shape of the falx cerebri. In more advanced cases the adhesions in this region are dense, and the hemispheres cannot be separated without tearing the subjacent cortex. It is worthy of note in this connection that the region under consideration is, with one exception, the only part of the encephalon where pia meets pia, as elsewhere the pia is in contact with the dura, to which, however, it only rarely forms adhesions. This exception is the point behind the corpus callosum and in front of the tentorium where the pia of the anterior tip of the upper surface of the cerebellum extends upwards and adheres to the pia between the two cerebral hemispheres at this point.

The amount of fibrosis of the membranes at the base of the brain varies greatly in different cases and is probably largely a remainder of a former syphilitic meningitis.

Particularly in early cases, but also in later ones in the regions into which the morbid process is extending, the pia is adherent to the subjacent cortex. Later on, when the pia-arachnoid has become much thickened and the cortical wasting is pronounced, the membrane strips like a glove from the underlying cortex. Decortication on stripping is usually laid much stress on in descriptions of the morbid appearances seen in dementia paralytica, but it is an uncertain sign. The more chronic or the more advanced the case happens to be, the less is the decortication, and *vice versâ*. Decortication, on the other hand, is much increased by œdema of the brain, and especially by post-mortem decomposition. It is largely obviated by the absence of these latter factors, but in early cases it very often occurs in the mid-line prefrontal region below the falx cerebri.

The peculiarly localised areas of adhesion between the pia and the cortex, which are usually situated on the flat external surfaces of the convolutions and do not reach to the fissure lips, strongly suggest a vascular causation. This is almost conclusively proved by the occasional occurrence, particularly in acute cases, of fairly extensive areas of adhesion which approximate very closely to known areas of arterial distribution.

This is finally proved by the fact that exactly similar areas of pial adhesion occasionally occur in cases of gross senile vascular degeneration (with or without dementia) and also in cases of progressive senile dementia. (*Archives of Neurology*, vol. ii. pp. 483–4, Case 201 : also last section of this work, Fig. 73, p. 377.)

The *lateral ventricles* in dementia paralytica are dilated, and often extremely so, and, with the *third*, are much more frequently granular than are those regions in progressive senile dementia. The *fourth ventricle*, however, exhibits, as a rule, the most characteristic naked-eye sign of dementia paralytica. Granularity of the lateral sacs of the fourth ventricle is common in all varieties of insanity, and in progressive senile dementia granules also at times exist on each side of the mid-line in the upper half of the diamond-shaped floor of the ventricle. They, however, rarely or never occur in the lower half or calamus except in dementia paralytica, in which, even if the granularity is general, it is usually most marked in this situation.

The smaller *cortical arteries*, even in very early cases of dementia paralytica, are invariably fibrous, and in toughness resemble strands of thread or fine wire.

The *basal vessels* sometimes show no obvious naked-eye abnormality, but in many cases, and especially in such as have acquired syphilis at or after maturity, they are dilated and irregularly thickened owing to patches of pearly-white fibrosis. They are occasionally small and fibrous. They are less frequently calcareous.

Of the 44 male cases of dementia paralytica referred to above, the basal arteries were affected to a greater or a lesser degree in 28, or 64 per cent., and were apparently normal in 16, or 36 per cent. In the 28 cases the affection was slight in 11, moderate in 10, and severe in 7. The average age of the 28 cases showing affection of the basal arteries was 49 years, whereas in the case of the remaining 16 with apparently normal basal arteries the average age was 38 years.

Of the 18 female cases, the basal arteries were more or less affected in 9, or 50 per cent. In these the affection was slight in 4, moderate in 2, and severe in 3. The average age of the cases with affected basal vessels was 47 years, whereas in the case of the 9 with apparently normal basal vessels the average age was 38 years.

The basal vessels on naked-eye examination were therefore more frequently affected in the case of the male sex. In the case of both sexes the average age of the patients with affected basal vessels was about ten years higher than that of the patients with apparently normal vessels.

These morbid appearances in the cerebral arteries resemble in their characters the dense, almost cartilaginous, pearly-white fibrosis of the often-dilated aorta which frequently occurs in dementia paralytica, and particularly so in cases over the age of 40 years. These vascular changes, and particularly that in the aorta, are, in my experience, practically diagnostic of a (former) attack of syphilis, in that they represent an intense reparative reaction to previous severe injury, and at the same time are found in syphilised but not in non-syphilised subjects. Early atheroma of the aorta is of course a practically constant feature in dementia paralytica, and also is a valuable sign of syphilis in very young persons. I have seen atheroma of the aorta and of one coronary artery in a male case of juvenile dementia paralytica at the remarkably early age of 8 years.

The vascular degeneration and nodular atheroma of the cerebral arteries, which occur in senility and prematurely induced senility, show, on the other hand, no such fibrotic appearances. In these cases, in association with, and probably owing to, the exceedingly feeble reaction of repair which they possess, a deposition of lime-salts occurs, and results in the better known calcareous degeneration.

As has already been stated, this condition of the cerebral arteries is practically constant in progressive senile dementia. On the other hand, in dementia paralytica, though naked-eye pearly fibrosis is not a constant feature, it is, when present, a highly characteristic morbid appearance.

The *cerebral wasting in dementia paralytica* often differs in degree from that found in progressive senile dementia. In fulminating cases of dementia paralytica, death frequently occurs so rapidly that no time

is allowed for the removal of the products of neuronic dissolution. On the other hand, in more chronic cases of dementia paralytica, the relative finality of the dissolution of the region of higher association and the organisation of the results of extra-neuronic reparative reaction more often result in very marked grades of cerebral wasting than is the case in progressive senile dementia.

As a preliminary to the description of certain selected cases of dementia paralytica which illustrate the more important appearances found in its different types and stages, I propose to refer briefly to four cases which exhibit in the different sexes the essential features presented by the ordinary rapid and slow types of dementia paralytica.

These cases were published in full in the second volume of the *Archives of Neurology* as Nos. 212–215, and their morbid anatomy, in summary, is as follows :—

The encephala of the females (Nos. 213 and 215) weighed respectively 985 and 782 grammes (average normal 1275 grammes), and both, in their remarkably low weights and in the simplicity of their convolutional patterns, were markedly the brains of degenerates (high-grade aments). Those of the males (Nos. 212 and 214) were much below the average normal weight of 1400 grammes., scaling respectively 1205 and 1225 grammes, but they differed from the brains of the females in being convoluted in a fairly average manner.

Nos. 214 *and* 215—*Rapid spastic cases with very small and alternating pupils.*—In both cases there existed relatively little opacity and thickening of the pia-arachnoid, this occupying the fronto-parietal region ; and there was only a moderate amount of wasting, which was chiefly visible in the prefrontal region.

Nos. 212 *and* 213—*More chronic cases without knee-jerks.*

No. 212—*Male.*—There was considerable fronto-parietal opacity and generally marked thickening of the pia-arachnoid, except at the occipital pole and on the under and inner part of the temporo-sphenoidal region and the orbital surface of the frontal lobe. In the region of the marked thickening, the pia-arachnoid stripped like a glove from the brain. The wasting was extreme in the *prefrontal region*, marked in the *first temporal gyrus and the inferior and superior parietal lobules*, rather less marked in *Broca's gyrus, and the posterior thirds of the first and second frontal gyri*, moderate in the *ascending frontal gyrus*, slight only in the *outer part of the temporo-sphenoidal and pre-occipital regions*, and almost absent in the *occipital lobe, the lower and inner part of the temporo-sphenoidal region and the orbital surface of the frontal lobe.*

No. 213—*Female.*—The pia-arachnoid showed considerable opacity and marked thickening, which was most obvious in the frontal lobe, the first temporal gyrus, and the superior and inferior parietal lobules. The

wasting was extreme in the *prefrontal region*, marked in the *first temporal gyrus and the superior and inferior parietal lobules*, moderate in *Broca's gyrus and the posterior thirds of the first and second frontal gyri*, much less in the *ascending frontal gyrus*, and slight or absent elsewhere.[1]

The above-mentioned morbid appearances agree closely with the clinical course of the dementia paralytica in the several cases. In the two which rapidly broke down, the total amount of intracranial fluid, the morbid state of the pia-arachnoid, and the grade of cerebral wasting were all much less marked than in the two cases of chronic type, in which it may be presumed had occurred a more complete removal of the results of neuronic dissolution, and a greater degree of finality, as regards cell-death, in the degenerative process.

Though such morbid appearances as those just referred to are in average cases very definite and quite readily visible, the determination of regional grades of wasting, and also of the type of convolutional pattern as regards relative simplicity or complexity, is at times attended with much difficulty. This is especially the case when sub-development and wasting occur together, though experience and practice enable error largely to be eliminated.

I have, therefore, illustrated on Figs. 79–84 certain hemispheres of cases of dementia paralytica, which demonstrate the chief types of wasting and under-development which have come under my notice. In order that they may be the more readily compared with one another and also with the hemispheres of under-developed cerebra and of cases of progressive senile dementia which have already been illustrated, all the photographs are of exactly the same relative size.

As has already been more than once insisted on, the most useful preliminary criterion both of the existence and of the approximate amount of wasting is the quantity of intracranial fluid which is present, as this is practically non-existent in the normal cranium, and as it can only occur in quantity in association with loss of cerebral tissue. I here exclude certain grossly obvious pathological conditions unassociated with mental disease in which the blood normally contained in the cerebral vessels and sinuses is largely replaced by *intracerebral* fluid, and also ordinary local gross lesions of the cerebrum in which loss of brain tissue is replaced by intracranial fluid, as none of these morbid states forms part of the subject which is under consideration.

Before I pass on to the comparison of the illustrative cases, it is necessary that I should refer to certain details concerning the examination of hemispheres which are of importance, and to certain pitfalls from which experience enables the observer to escape.

[1] The terms employed for the cortical regions in the above summary overlap somewhat, but are convenient for brevity of description.

The first two of the important points to which I wish to draw attention are that:

Gross wasting markedly increases the APPARENT *complexity of the convolutional pattern;* and LARGER *actual size of a hemisphere decreases the* APPARENT *complexity of the convolutional pattern.*

Hemispheres, when studied one by one as they occur at post-mortem examinations, are unconsciously inferred to be of about the same size, unless they should happen to be grossly large or very small. Even if certain selected hemispheres are later on compared side by side, the smaller and more wasted examples often *appear* to be the more complex, although actual detailed examination may demonstrate the reverse to be the case. I have, therefore, been in the habit of systematically supplementing my examination of cerebral hemispheres by the study of a series of photographs, all taken exactly to scale and of such a size as enabled several to be examined at the same time.

As might be expected, the converse of the last point to which the attention of the reader has been drawn is also true:

SMALLER *actual size of a hemisphere increases the* APPARENT *complexity of the convolutional pattern.*

I would finally draw attention to the point that whilst in many hemispheres wasting is associated with an unfolding of the affected convolutions, which results in relatively little apparent increase of complexity:

In other cases which exhibit gross wasting the convolutions may lie so closely together that great APPARENT *increase of complexity results.*

This detail is especially evident in the hemispheres illustrated on Fig. 84. These, though very simply convoluted, appear, through the gross wasting and close packing of the convolutions, to be, on first inspection, little inferior to the average hemisphere in complexity of pattern.

After these preliminary remarks, the necessity of which will be seen when the different illustrations are compared with one another, I will now proceed to describe the hemispheres of the cases of dementia paralytica which are shown in Figs. 79–84.

In Figs. 79 and 80 are respectively figured the right hemisphere of a chronic case, and the left hemisphere of a more acute case of dementia paralytica. In the former of these (Fig. 79) the pia-arachnoid stripped readily from the hemisphere illustrated, whereas in the case of the left hemisphere of the same brain, which was the less severely affected of the two, this membrane stripped with considerable difficulty on the postero-inferior aspect. In the hemisphere illustrated in Fig. 79 both the regional distribution and the degree of the cortical wasting are well shown.

In the latter (Fig. 80) the pia-arachnoid was very adherent to the subjacent cortex, and decortication occurred on the second temporal

gyrus and the pre-occipital region. The distribution and the degree of the wasting, which are stated fully in the description, are readily visible in the illustration.

A cursory examination of these hemispheres by no means suggests

FIG. 79.—RIGHT HEMISPHERE OF A MAN SUFFERING FROM CHRONIC DEMENTIA PARALYTICA.

Photograph of the right hemisphere of a case of chronic dementia paralytica, who died after a series of 198 epileptiform convulsions. The figure shows wasting, which is very marked in the prefrontal region; marked in the first temporal gyrus, the inferior parietal lobule, Broca's gyrus, and the lower part of the ascending frontal gyrus; fairly marked in the remainder of the psychomotor area, the post-central gyrus, and the superior parietal lobule; and relatively slight in the remainder of the hemisphere, including the orbital surface of the frontal lobe.

History.—Male, æt. 53. Married eighteen years, no children. No family or personal history. In Claybury Asylum suffering from chronic dementia paralytica for nearly three years, during the greater part of which time he was lost to time and place, and wet and dirty in his habits. During the last two years of his illness he had several series of convulsions, and eventually died after a succession of 198 epileptiform fits. Knee-jerks absent. Left pupil greater than right, and both inactive to light. Tremor.

Post-mortem.—Dura: slightly thickened. S.D.: recent subdural hæmorrhage and excess of blood-stained fluid. Pia: fronto-parietal opacity and marked thickening and congestion; strips readily except on the postero-inferior aspect of the left hemisphere. S.A.: excess. Vents.: L, markedly dilated and granular; IV, granular throughout. Vessels: considerable thickening of basal arteries. Encephalon: 1225 grammes. Cerebellum, &c.: 145 grammes. R.H.: 500 grammes: stripped, 460 grammes. L.H.: 520 grammes; stripped, 480 grammes. The right hemisphere is more severely affected than the left. The aorta was exceedingly dilated and of cartilaginous density, and contained a large amount of pearly-white fibrosis and some calcareous deposit. Liver, spleen, and kidneys dense.

that the former (Fig. 79) possesses a greater complexity of convolutional pattern than the latter.

These cases indicate what is still more clearly demonstrated in the cases illustrated in Figs. 81 and 82, namely, that the degree and the

regional distribution of the wasting are the same as is found in progressive senile dementia, and shown on Fig. 74 (p. 378). They also show that, in the absence of post-mortem decomposition, the pia-arachnoid is especially adherent in those regions in which, at the time of death,

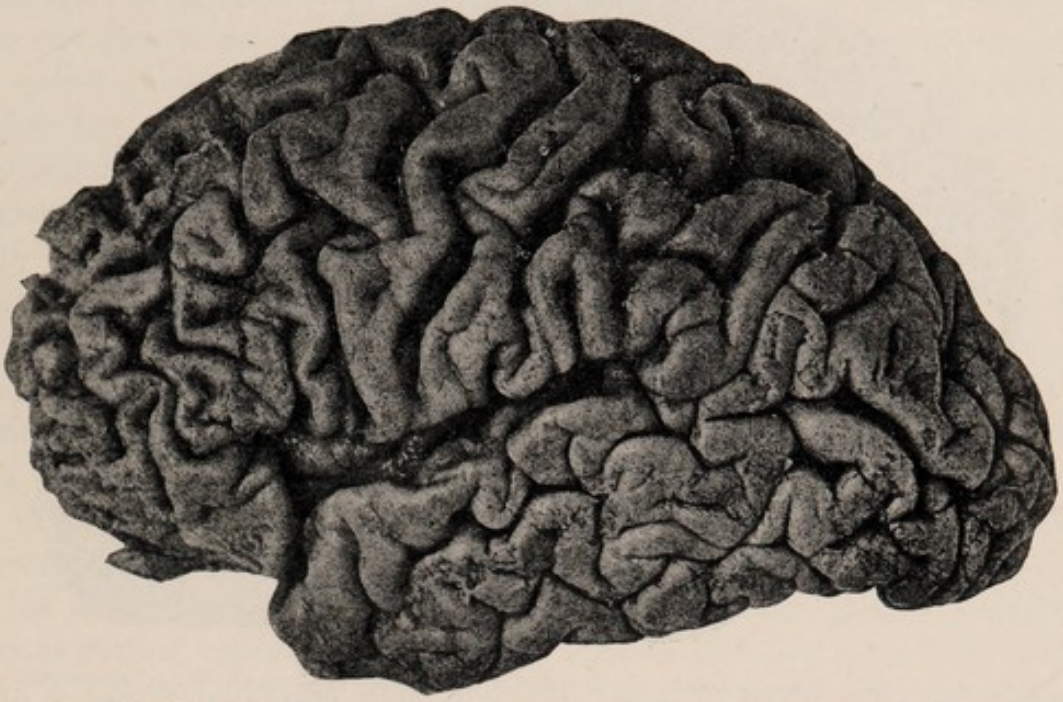


FIG. 80.—LEFT HEMISPHERE OF A FEMALE SUFFERING FROM SUB-ACUTE DEMENTIA PARALYTICA.

Photograph of the left hemisphere of a case of sub-acute dementia paralytica. The figure shows wasting, which is very extreme in the prefrontal region; extreme in Broca's and the first temporal gyri and the inferior parietal lobule; marked in the rest of the psychomotor area, the post-central gyrus, and the superior parietal lobule; and less marked elsewhere, including the orbital surface of the frontal lobe. Decortication exists in the second temporal gyrus and the pre-occipital region, into which parts the morbid process appears to be rapidly spreading.

History.—Female, aged 38. Married. No family or personal history. In Claybury Asylum suffering from dementia paralytica for thirteen months. On admission she was quiet and somewhat lost. She collected rubbish, and she was dirty in her habits. During her residence she had several (chiefly left-sided) convulsions. The pupils were unequal. The right-knee jerk was absent, and the left was exaggerated. Facial and lingual tremors. Speech slightly slurred. Died in the last stage of dementia paralytica.

Post-mortem.—Dura: natural. S.D.: great excess. Pia: fronto-parietal opacity; extremely thickened and gelatinous, and very adherent to the cortex. S.A.: excess. Vents.: L, immensely dilated, the left more than the right, and very granular; IV, dilated and granular, especially in the lower part. Vessels: natural. Encephalon: 1045 grammes. Cerebellum, &c.: 160 grammes. R.H.: 393 grammes; stripped, 360 grammes. L.H.: 355 grammes; stripped, 320 grammes. The left hemisphere was more severely affected than the right. Cause of death: Chronic tuberculous pneumonia. Aorta natural. Liver, spleen, and kidneys dense.

recent and active dissolution of the cortical neurones is occurring, whereas this membrane becomes less adherent to, or readily strips from, the convolutions which have already undergone considerable dissolution, and in which more or less complete organisation of the proliferated non-neuronic elements of the cerebrum has occurred.

In Figs. 81 and 82 are shown two cases, which are unique owing to the clearness with which they illustrate certain of the above details.

Fig. 81, in fact, depicts the different functional regions of the cerebrum

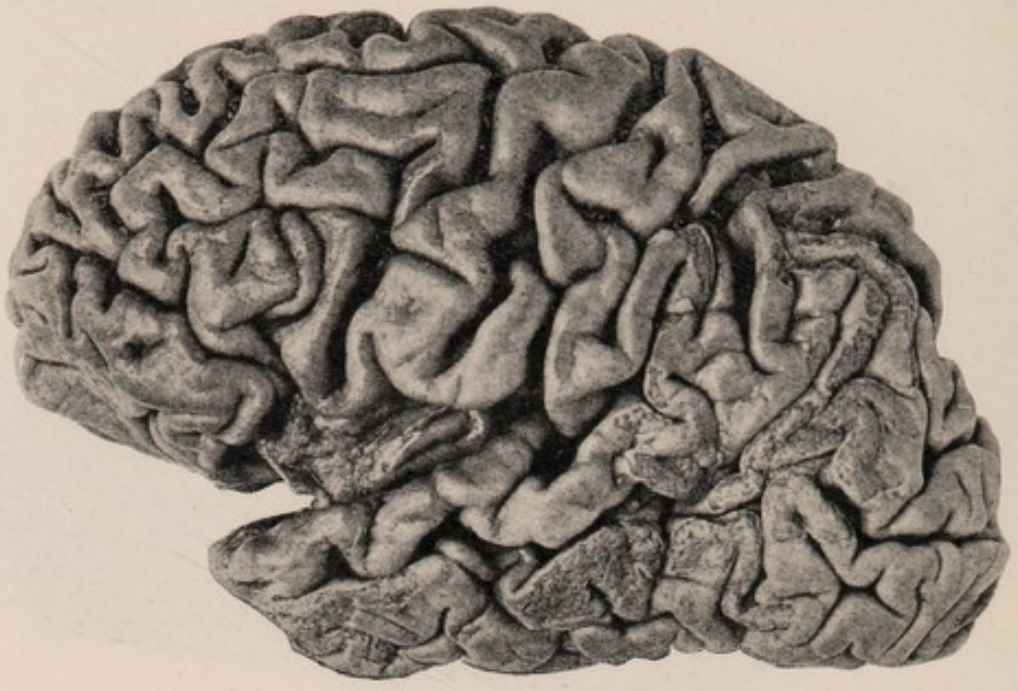


FIG. 81.—LEFT HEMISPHERE OF A CASE OF DEMENTIA PARALYTICA, SHOWING THE ORDER OF PROGRESS OF THE MORBID PROCESS.

Photograph of the left hemisphere of a case of dementia paralytica. The prefrontal area of higher association is grossly wasted. The psychomotor area shows some, but much less, wasting. The temporal and parietal and insular regions of associations are acutely changed (post-mortem four and a half hours after death). The upper part of the temporal region of association, and the anterior part of the parietal, show less acute change and more wasting. The visual projection area, and the visuo-psychic cortex around it, are intact.

History.—Male. Single. Private in Rifle Brigade. Stated to be aged 26. No satisfactory personal or family history, but heredity of insanity denied. Died in Claybury Asylum after a residence of four weeks. Was admitted in a feeble and helpless condition. Tongue tremulous. Right pupil greater than left, and both irregular. The pupils react neither to light nor to accommodation, undergo irregular rhythmic movements, and become eccentric at irregular intervals. Knee-jerks + +. All the limbs undergo clonic contractions, and at times enter into a pseudo-clonus. There are continual masticatory movements of the lower jaw. Patient is somewhat resistive, grossly demented, and wet and dirty.

Post-mortem.—Dura: natural. S.D.: remarkable excess. Deposit: non-hæmorrhagic film, the thickness of brown paper, on the right vault. Pia: extremely opaque and almost universally thickened; marked mid-line prefrontal adhesions below the falx cerebri; strips very readily over the frontal region. S.A.: great excess, especially in the prefrontal region. Vents.: L, immensely dilated, granular; III, granular; IV, very granular throughout, but especially so in calamus. Vessels: apparently natural. Encephalon: 975 grammes. Cerebellum, &c.: 157 grammes. R.H.: 395 grammes. L.H.: 395 grammes; stripped, 350 grammes. Density of liver, spleen, and kidneys increased. Cause of death: right lobar pneumonia, dementia paralytica.

with almost diagrammatic clearness. The prefrontal region of higher association is grossly wasted, and the pia-arachnoid over it stripped very readily. This is the region in which, in mental disease, dissolution first occurs, and in which in advanced cases of dementia, as has already been

abundantly illustrated, it is the most marked. Further, as has already been stated, it is the only region of the convex aspect of the cerebrum in which, in very early cases of dementia paralytica uncomplicated by post-mortem decomposition, adhesion of the pia-arachnoid to the cortex occurs. The psychomotor area shows some, but much less, wasting; and the pia-arachnoid over this area stripped readily. In the case of the parietal, temporal, and insular regions of lower association externally, and of the precuneus and the inner part of the temporo-occipital region internally, the pia-arachnoid was very adherent to the cortex, and extreme decortication resulted from stripping (post-mortem four and a half hours after death). There was also decortication scattered in irregular patches throughout the callosal convolution, but the visuo-sensory area (projection sphere) was practically intact. It was, unfortunately, impossible to obtain a clinical history of this case for a longer period than one month before death (see, for fuller description, *Brain*, cii., 1903, pp. 14–16).

On Fig. 82 the same distribution of the cortical wasting, and also a similar distribution of the decortication, are visible, but the differences in the appearance of the several regions are still more gross. The prefrontal region, especially, was to all intents and purposes little more than a firmly organised scar, and cut like soft wood. The case presented an unusual course in having started with a long series of epileptiform convulsions, after which the patient rapidly became grossly demented; and this history exactly agrees with the morbid appearances exhibited in the cerebrum. The unusually severe involvement of the psychomotor area has its clinical counterpart in the series of convulsions which ushered in the illness. In the majority of the cases of dementia paralytica which have come under my observation, the temporal and parietal regions of association are, however, more severely affected than is the psychomotor area, and this distribution agrees with the usual clinical course of the cases. Such a distribution has also been independently described by Schaffer and by Watson. On the other hand, in ordinary cases of dementia, in which the process of neuronic dissolution is neither so fulminating nor so severe, and in which the regions of lower association are frequently less severely affected than is the pre-Rolandic (psychomotor) portion of the cortex, it is less common to meet, during their clinical course, with the grossly aberrant psychic phenomena of lower association which are common in dementia paralytica, and which have already been fully considered (Chap. XIII, pp. 252–254).

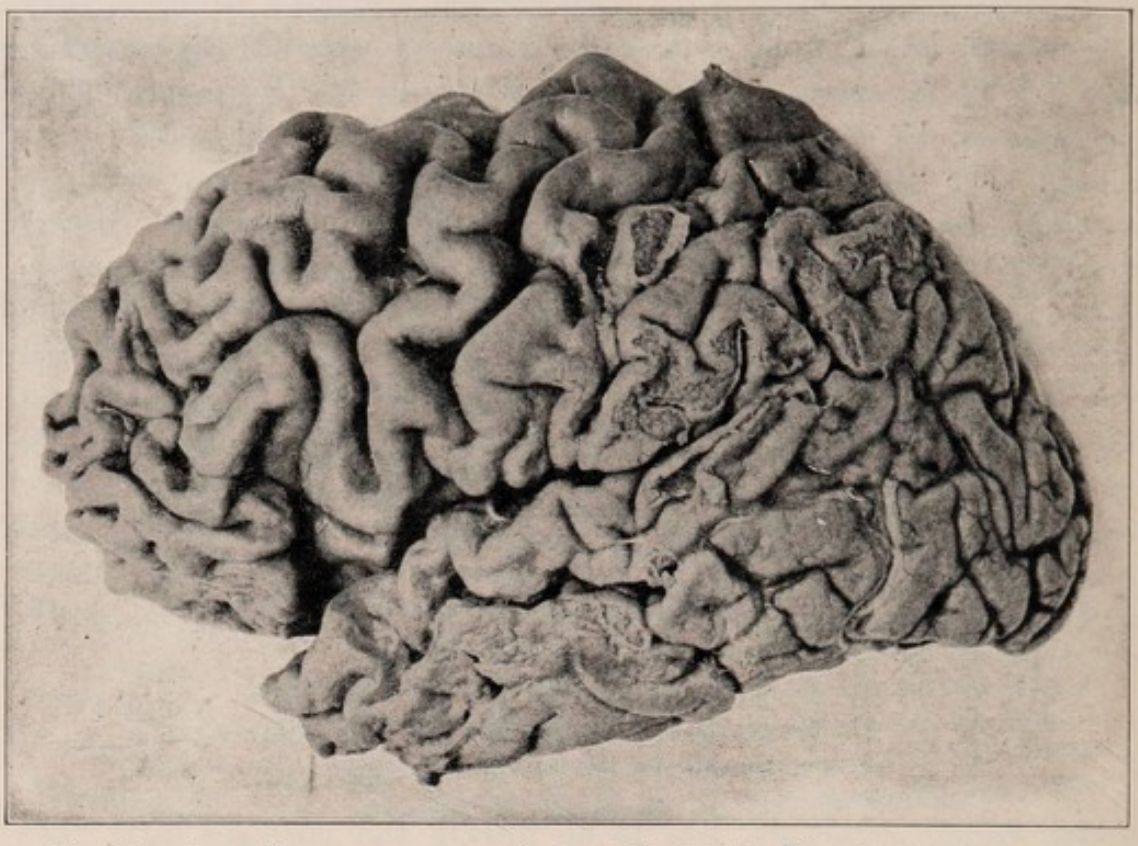


FIG. 82.—LEFT HEMISPHERE OF A CASE OF DEMENTIA PARALYTICA, SHOWING THE ORDER OF PROGRESS OF THE MORBID PROCESS.

Photograph of the left hemisphere of a case of dementia paralytica. The wasting is very extreme in the prefrontal region; and extreme in the whole psychomotor area and in the first temporal gyrus, the superior parietal lobule, and the post-central gyrus. The acute degeneration is most marked in the outer surface of the temporo-sphenoidal lobe, the inferior parietal lobule, and the pre-occipital region, but it is marked elsewhere. This distribution shows fairly well in the photograph, but it was much more clear in the actual hemisphere.

History.—Male, aged 41. Clerk. Uncle insane. Mother died of phthisis. Family intemperate. Married six years, no children. Suffered from syphilis in early life, and "took enough mercury to kill a horse." One year before admission to Clayburn Asylum patient had a series of convulsions, and was unconscious after the first for twenty-four hours. He had forty-two in four days; and he had fifty or more during the year. He has been in two asylums, with an interval of two weeks at home, during this time. Slight hypospadias. Old scar on glans penis. Resists examination as if afraid of being hurt. Is grossly demented. Does not speak. Is wet and at times dirty. During his residence he rarely spoke, and he suffered at times from auditory and visual hallucinations. He had several right-sided and mixed convulsions. He continued helpless and resistive, and wet and dirty, until his death, fourteen months after admission.

Post-mortem.—Dura: natural. S.D.: great excess; a little lymph between pons and occipital bone. Pia: marked fronto-parietal opacity and thickening; extreme mid-line prefrontal adhesions. Both on the median surface in the prefrontal region, to some extent in the prefrontal region externally, and also in the post-central region, and the whole of the temporo-sphenoidal lobe, there is marked decortication on stripping. In the remainder of the fronto-parietal region the pia-arachnoid is ballooned out with fluid and strips like a glove from the subjacent cortex. S.A.: great excess. Vents.: L, considerably dilated; many scattered granulations; IV, granular throughout. Vessels: apparently natural. The prefrontal region, after hardening in formalin, cuts like soft wood. Encephalon: 1280 grammes. Cerebellum, &c.: 198 grammes. R.H.: 535 grammes. L.H.: 527 grammes; partially stripped, 475 grammes. Cause of death: broncho-pneumonia, dementia paralytica.

(*b*) Cerebral Under-development in Dementia Paralytica

In the cases to which reference will now be made, and which are illustrated on Figs. 83 and 84, the question of cerebral under-development in relation to dementia paralytica will be considered. All the cases of dementia paralytica which so far have been described may, for practical purposes, be considered to have possessed cerebra of, at the least, average development.

For comparison with the clinical account of the varieties of dementia paralytica, in which it will be shown that not only " normal " individuals but also high-grade aments and even imbeciles exhibit this symptom-complex, it is now necessary to produce cases of dementia paralytica which possess the small and simply convoluted cerebra of mental degenerates.

In Fig. 83 are shown the right and left hemispheres of a woman possessing a markedly under-developed cerebrum. These hemispheres are very small and also very simply convoluted : and these details become especially obvious when the photographs are compared with the equal-sized illustrations in previous figures. The weights of the right and left hemispheres, after stripping, are respectively 385 and 373 grammes, whereas the weight of the average normal stripped hemisphere of the female (based on Huschke's ratio and on F. Marchand's statistics) is about 534 grammes.

The hemispheres of this case are so simply convoluted that the marked wasting which exists is not obvious, in spite of the fact that in any, but particularly in small, hemispheres the apparent complexity of convolutional pattern is increased by wasting. Were the hemispheres of this case in their original condition, it is not an exaggeration to remark that the simplicity of their convolutional pattern would appear extraordinary.

In Fig. 84 are shown the hemispheres of a similar (male) case of dementia paralytica with an under-developed cerebrum. The central photograph is that of a subdural deposit of long standing, which entirely covered the left hemisphere. Though the patient was of the male sex, the stripped hemispheres weighed respectively but 330 and 290 grammes, the pair thus totalling but 31 grammes more than the 589 grammes which is the average male normal weight of a single stripped hemisphere.

Here, again, the simplicity of convolutional pattern is so marked that the very gross wasting which exists is far from obvious. On the other hand, the close packing of the convolutions, in association with the gross wasting, tends to hide the remarkable simplicity of convolutional pattern, and makes it difficult to conceive that the hemispheres are of exactly the same relative size as are those of the hemispheres shown in previous figures.

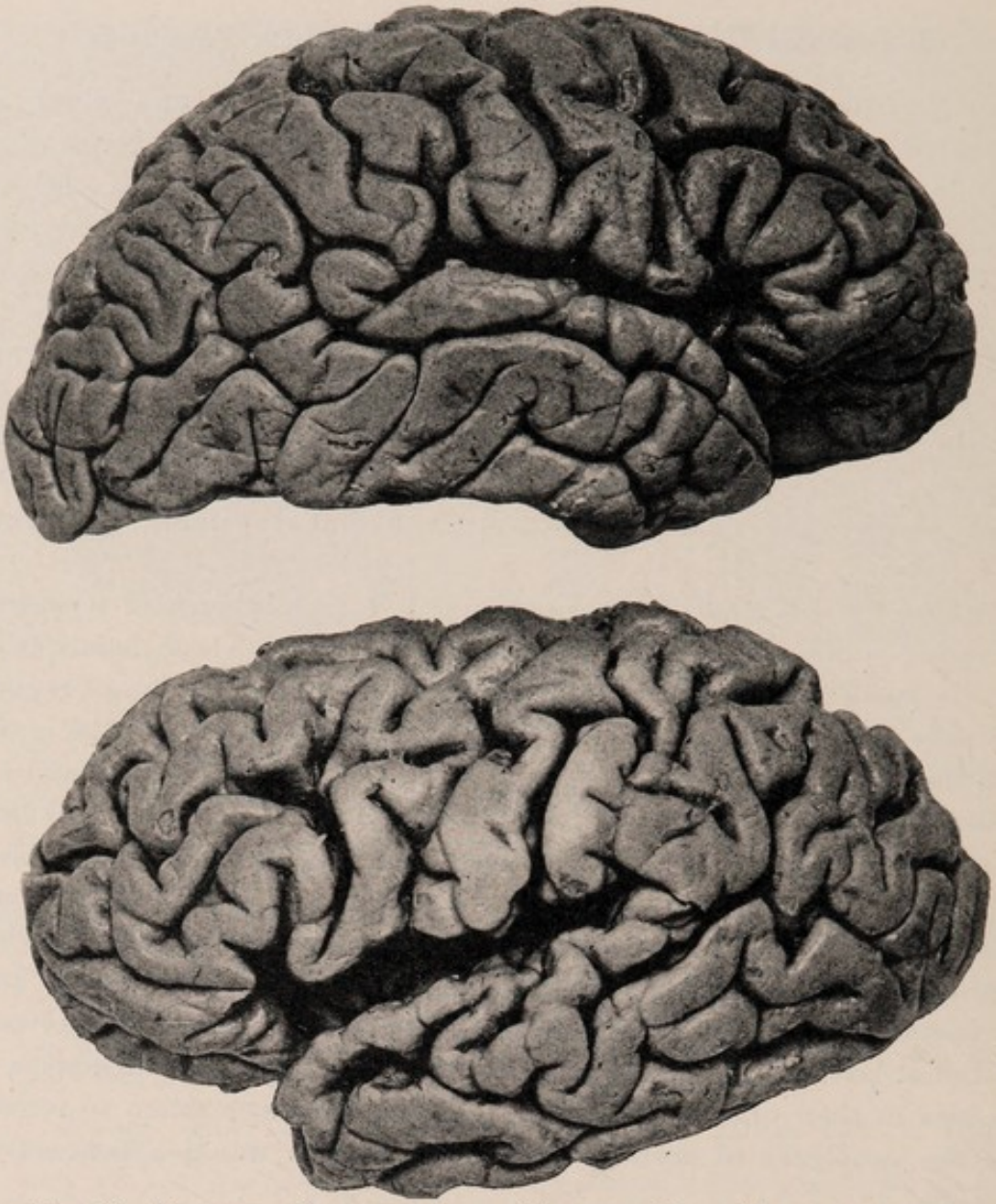


FIG. 83.—DEMENTIA PARALYTICA IN A FEMALE. VERY SMALL AND VERY SIMPLY CONVOLUTED CEREBRUM.

Photograph of the hemispheres of a case of dementia paralytica. Duration about two and a half years. There is much wasting of the fronto-parietal region and of the first temporal gyrus, but this is imperfectly shown in the figure. The hemispheres are very small and very simply convoluted.

History.—Female, æt. 37. Married. Father intemperate. Father and sister committed suicide. Patient suffered from tingling of the hands and feet for six months before her admission to Claybury Asylum, where she died of dementia paralytica after a residence of two years. On admission she exhibited marked physical signs of dementia paralytica, and was dull and lethargic and lost to her surroundings. She soon became defective in her habits. She had her first convulsion a year after her admission. She died helpless and grossly demented.

Post-mortem.—Dura: natural. S.D.: great excess. Pia: much fronto-parietal opacity and thickening; marked mid-line prefrontal adhesions. S.A.: moderate excess. Vents.: L, somewhat dilated, granular; III, granular; IV, markedly granular throughout. Vessels: natural. Encephalon: 985 grammes. Cerebellum, &c.: 138 grammes. R.H.: 415 grammes; stripped 385 grammes. L.H.: 400 grammes; stripped, 373 grammes. Wasting: chiefly marked in the prefrontal region, less severe and fairly general in the rest of the fronto-parietal region and in the first temporal gyrus; and slight or absent elsewhere. Cause of death: dementia paralytica, cystic kidneys, and secondary morbus cordis.

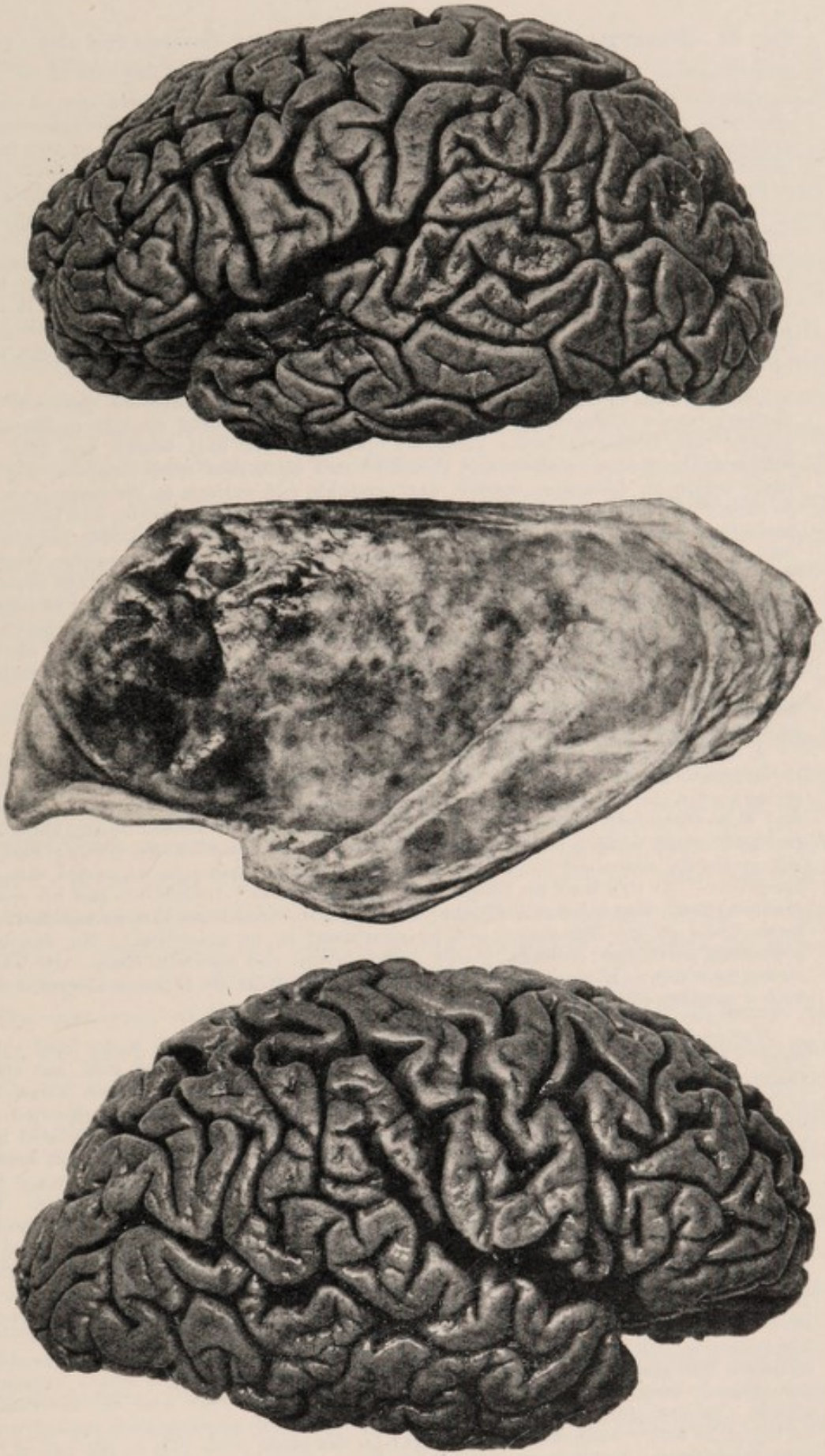


FIG. 84.

FIG. 84.—DEMENTIA PARALYTICA IN A MALE. SIMPLY CONVOLUTED AND VERY SMALL CEREBRUM. SUBDURAL DEPOSIT.

Photographs of the cerebral hemispheres and of a subdural deposit from a case of chronic dementia paralytica. The illustrations exhibit the essentials of the following description. The right hemisphere shows extremely marked wasting in the fronto-parietal region and in the first temporal gyrus. Of these parts the prefrontal region is the most wasted, and the psychomotor area, with the exception of Broca's gyrus, is the least. The left hemisphere, which was compressed by the deposit photographed below it, exhibits scattered bronzing and very extreme wasting in the prefrontal region. The anterior part of the first temporal gyrus shows much bronzing and marked wasting. The wasting is otherwise as in the right hemisphere. The hemispheres, apart from the wasting, are very small and simply convoluted (R.H.=330 grammes, L.H.=290 grammes, average normal male=589 grammes); and the small size, in association with the wasting and the close packing of the convolutions, tends in the photographs to obscure the simplicity of the convolutional pattern.

History.—Male, aged 41. Insurance agent. Intemperance on paternal side. Father's cousin is at present in an asylum. Patient acquired syphilis at the age of twenty years. Married seven years, six children. The first, fourth, and fifth were stillborn, the second is alive, and the third and sixth died when infants. For two years before his admission patient was excitable and curious in his behaviour, and he talked and raved about his business. He had been intemperate, but latterly he had often been queer and erratic although he had had no drink. He slept badly during the last four months, and he was eventually certified owing to sudden violence. He resided in Claybury Asylum for three and a half years, and then died of dementia paralytica. On admission he was excited and grandiose and confused, and he thought that he was Emperor of the World. Knee-jerks absent. Speech characteristic. Pupils irregular, and left greater than right. A year afterwards he was cheerful and industrious, but was beginning to go downhill. A year later he still exhibited delusions of wealth and strength, but he was demented and wet and dirty. He gradually became lost, untidy, destructive, shaky, and feeble; and he died in an advanced stage of dementia paralytica.

A monthly record of reflexes and pupillary changes was taken from the sixth to the fifteenth month of his residence. The knee-jerks were absent. Hypotonus (85°) developed in the fourteenth month, and continued. Both pupils were very irregular and were absolutely fixed to light. The right gradually decreased during the above period from 3½ to 2½ mm., accommodating to 3 and 2 mm. respectively; and the left gradually decreased from 5 to 4½ mm., accommodating to 4½ and 3 mm. respectively. At this time his tongue was only moderately tremulous, and his speech was not grossly characteristic. By the twelfth month of residence patient was distinctly more stolid in his behaviour, but he continued to be grandiose. He devoured pheasants, partridges, bullocks' brains, jellies, honey, and port wine daily. He was as strong as a lion. His mother was a beautiful lady, and his father a lawyer's clerk with a carriage and pair.

Post-mortem.—Dura: natural. S.D.: enormous excess of clear fluid. Deposit: when the dura is reflected it tends to adhere over the left side, but strips readily; the whole left hemisphere, except for the median half inch about the posterior half, is covered with an old greyish-green deposit, which is ballooned out anteriorly by fluid; the right hemisphere possesses a large amount of loculated S.A. fluid, but there is less on the left side. On removing the brain the deposit readily separates from the dura at the base. It is very loosely attached to the pia. The deposit contains fluid in its anterior part, and is here in places hæmorrhagic. The weight of the deposit and contained fluid is 45 grammes; it is dense and pale and fibrous, and behind the cystic cavity it varies from one-eighth to one-sixteenth of an inch in thickness. Pia: almost generalised opacity and extremely marked mid-line prefrontal adhesions. Vents.: L, enormously dilated, granular throughout; III, granular throughout; IV, extremely granular, especially in calamus. Vessels: slightly fibrous and very small. Encephalon: 812 grammes. Cerebellum, &c., 108 grammes. R.H.: 362 grammes; stripped, 330 grammes. L.H.: 310 grammes; stripped, 290 grammes. Cause of death, &c.: gangrene of right lung; dementia paralytica; very chronic tuberculosis of the small intestine and the mesenteric glands. Severe pigmented scars on the left shin, and unpigmented papery scars on the right shin; extremely marked scar on the glans penis just to the left of the urethral orifice. Glands in groins very shotty.

(*c*) The Histo-pathology of Dementia Paralytica and its relationship to that of Progressive Senile Dementia

It is not my purpose in the following histo-pathological description of the cortex cerebri in dementia paralytica to describe in minute detail the morbid appearances presented respectively by the vessels, the neurones, and the neuroglia. I presume that the reader is in a general way familiar both with these histo-pathological changes and with the several researches which have drawn attention in turn to the neuroglia, the neurones, and the vessels, as more or less the especial seat of the morbid appearances peculiar to dementia paralytica. These appearances have thus in turn been regarded as due to a meningo-encephalitis, to a primary degeneration of the cortical neurones, and to a plasma-cell periarteritis. Following on, if not directly owing to, these varying theses, the histo-pathology of the cortex cerebri has been for some years under a cloud; and the subject has now fallen on still more evil times owing to the discovery by Noguchi of the *spirochaeta pallida* in the cortex of a number of cases of dementia paralytica. Levaditi, Marie, and Bankowski state that the spirochæte is only found in the cortex proper, and in more or less circumscribed foci. Mott has gone even further, and described *living* spirochætes in film preparations of the second frontal convolution four days after death. "The spirochætes of this case four days after death were also observed moving, it is true only sluggishly, by means of the ultramicroscope. Spirochætes were not found in films from the second frontal when the brain was received; but twenty-four hours later, when the substance was soft and a certain amount of decomposition had occurred owing to invasion of other organisms, they were found in abundance in this one region."

The discovery of Noguchi is of course proved, but it is necessary to repeat, as I have already pointed out (pp. 226 and 369), that this does not justify the opinion that the spirochæte is the cause of dementia paralytica. I hope, in fact, to demonstrate that the spirochæte, even if it be present somewhere in the brain of every case of dementia paralytica, can have little direct action on the morbid process. I may even go further and remark that, if the above-mentioned observations are correct, the living spirochæte in the brain is a necessary accident to dementia paralytica owing to its being so difficult to get rid of it, rather than the cause of this particular form of progressive dementia.

The view that a hyper-reaction of repair in the subjects of syphilis is the cause why what would otherwise be a stationary case of primarily neuronic dementia becomes one of progressive dementia paralytica is not likely to find favour with syphilologists, who tend more and more

to regard the spirochæte as the actual existing cause of every tissue change in the subjects of syphilis. It is, however, in my opinion the only one which fits the facts, and I am thus unfortunately in the position of having to pit my experience as alienist and neuro-histologist against the present opinion of modern bacteriology. I would add that I have introduced this short discussion here for the purpose of enabling the reader to study the description which follows with the idea of the spirochæte before him.

Does this organism cause the plasma-cell periarteritis, the neuronic dissolution, or the neuroglial proliferation? Does it originate one or all of these; or does it, owing to its accidental and unavoidable presence in the brain, play its part (as a form of irritative agent) in assisting in the progress of neuronic dissolution and non-neuronic reparative reaction when such has for other reasons occurred? Lastly, has the organism the power of harming the cortical neurones of otherwise non-dementable individuals? I hope that the particulars which follow will supply probable answers to all these questions.

It is difficult for one unfamiliar with the histo-pathology of dementia paralytica to appreciate the remarkably different morbid appearances which are presented by individual cases. Some cases show extreme degrees of plasma-cell periarteritis, others gross dissolution of neurones, and others extensive proliferation of neuroglia, and in any given case the one of these three changes which preponderates may be greatly in excess of the degree of the others which is presented. Further, acute and chronic changes of any one or all kinds may exist side by side in the same case, or the histo-pathological changes may on the whole be mainly of the acute or the chronic type.

It is, however, possible to state certain truths with a fair degree of definiteness.

In cases of whatever type it is almost the rule to find the changes more extensive and aged in the prefrontal region than in the central, and in the central than in the visual. In early cases, dying of course from something else, it may be possible to diagnose dementia paralytica by examination of the prefrontal region alone; in later cases, also dying from something else, and particularly in those which soon show psychomotor symptoms, dementia paralytica can be diagnosed by examination of the central region also; in still later and in all advanced cases, histological examination of practically any part of the cerebrum enables dementia paralytica to be diagnosed. The prefrontal, central, and visual regions are in my experience the best parts to examine in a routine way, but I do not wish it to be thereby inferred that many other regions of well-defined lamination would not also exhibit varying degrees of affection.

Periarteritis.—To now take the three chief morbid changes in order, the round-cell and plasma-cell periarteritis varies remarkably in type and degree in different cases, and, as I shall show, may even be widespread in a case which is not one of dementia paralytica. I have personally for many years regarded this feature merely as the expression of syphilis of the cerebral arteries; and when the *spirochaeta pallida* was first discovered I thought it probable that this organism was the direct cause of the morbid appearance. Even the statement that spirochætes can be found in the cortex of cases of dementia paralytica, and not in the subjacent white matter, has not yet caused me to alter this opinion.

In early and very acute cases, round-cell periarteritis may be a prominent feature, but it may be a very minor one indeed. In cases of sub-acute and chronic type, plasma-cell periarteritis may be very marked indeed, or it may be a very minor feature; and as a rule the ordinary plasma-cell is grading into more organised cells in many vessels, and particularly so in the prefrontal region. In very chronic cases, fibrosis of the arteries is the chief feature, but varying degrees, from marked to slight, of all stages of plasma-cell periarteritis may be presented. On the whole, it may be said that the older the patient is the greater may be the amount of vessel change. In the young, vessel changes are slight, and constitute the least pronounced morbid appearance: in the adult they are as a rule marked or extensive, and round- or plasma-cell change preponderates, except in the prefrontal region: in the senile, fibrosis preponderates over plasma-cell change.

Dissolution of neurones.—All kinds of morbid change are often presented by the same case. Acute necrosis, acute change, and œdema on the one hand, and various types of chronic wasting on the other, constitute the main morbid appearances. Acute necrosis, which is the only change calling for special reference, is usually limited to small areas, and is due to blockage of small vessels; and the former existence of this condition may be at times indicated by more or less organised cortical scars. This change may, however, be widespread in very acute and severe cases.

This mixed nerve-cell change is more marked in the prefrontal region than in the central, and in the central than in the visual region. It is the most pronounced morbid appearance presented by juvenile cases of dementia paralytica, and, in my experience at any rate, acute changes preponderate over chronic, though this is, I believe, due on the one hand to the tremendous loss of neurones which has occurred, and on the other to the readiness with which the still immature cerebral tissue develops œdema.

In the case of the adult, even in acute cases, some degree of chronic

cell change is present, and even in very chronic cases a good amount of acute change is to be seen. As a rule both are well marked. It, however, depends largely on the *stage* of the case whether the cell change is essentially a prefrontal change or whether it exists in the central, or, also, in the visual region. In the grosser examples—and I have seen such even in a girl of twelve years of age—the nerve cells are practically absent from the prefrontal region, which at first sight, owing to its relatively prominent vessels, much resembles a section of kidney from a case of renal cirrhosis.

In the senile case the cell change is relatively very marked indeed, and is largely of the chronic type, though there is always a considerable amount of acute change intermingled.

The proliferation of neuroglia runs roughly *pari passu* with the amount and type of neuronic dissolution. In very acute cases the proliferation of neuroglia is marked and recent. In sub-acute and chronic cases there is a marked increase of stationary neuroglia, largely below the pia and in the form of unstained sheaths around the vessels. These sheaths of neuroglia have already been referred to under progressive senile dementia (Figs. 76 and 77, pp. 380–1).

Proliferation of neuroglia is active in juvenile cases ; it is more active in acute than in sub-acute and chronic adult cases ; and the senile case resembles the chronic adult in character.

I regard the proliferation of neuroglia as a hyper-reaction of repair, around the vessels in consequence of the plasma-cell periarteritis, and elsewhere in consequence of dissolution of neurones. The former is perhaps a fairly pure reaction to the irritation of spirochætes actually present, and actually the cause of the round- and plasma-cell periarteritis. The latter is, I believe, a hyper-reaction of repair due to the prolonged presence of spirochætes in the body. I think that it is incited by dissolution of neurones, however caused, and that, as a hyper-reaction, it may produce a vicious circle by inciting or producing dissolution of neurones during its growth and organisation. Such is naturally largely assisted by local ischæmias and even more permanent occlusions of the cortical vessels.

This general description will now be supplemented by the insertion of microphotographs of four important illustrative cases.

Case A.—*Gross Plasma-cell Periarteritis in a man aged 76 years. Senility. Recurrent Melancholia without Dementia*

J—— S—— T——. *First admitted* 31/5/'90, at the age of 55. Formerly an army bandsman, and educated for three years at the army school of music. Cause stated to be sunstroke in India. Now an ironmoulder. Duration on admission about five weeks. Was depressed, and had tried

suicide by hanging and poisoning. The woman with whom he cohabited had left him 5–6 weeks before his admission with a child of 15 months on his hands. His memory and intelligence were good.

He soon recovered, but on June 20, '90, *he developed headache and suddenly relapsed.* Seven grains of quinine at once relieved the headache, and then the depression disappeared. He was discharged recovered on 18/9/'90.

FIG. 85.—RECURRENT MELANCHOLIA WITHOUT DEMENTIA. MALE, AGED 76. VESSEL SHOWING VERY GROSS PLASMA-CELL PERIARTERITIS.

Three hundred and forty-two diameters. White matter of the visuo-psychic region. Figs. 85–88 illustrate widespread plasma-cell periarteritis identical with that found in well-marked dementia paralytica, but without either dissolution of neurones or proliferation of neuroglia, and occurring in a typical case of hereditary recurrent insanity without dementia.

Readmitted suffering again from melancholia in June, '01, *at age of* 66, and discharged recovered in July, '01, after a residence of a few weeks. The history given was a duration of some months, and the symptoms were depression without mental confusion, with rapid recovery.

Finally admitted 9/10/01, *aged* 67. Married. Two sisters were insane, and both died in M—— Asylum. Has a severe self-inflicted wound of throat. Marked arcus senilis. Has been very depressed. Moaned about having lost

his soul and been cast out. Says tried to end himself. Memory good. Accuses himself of misdeeds. Says he ravished his daughter twenty years ago.

May, '03.—Still depressed. Thinks that he killed his wife. March, '04.—Very quiet and somewhat dull. No attack of depression for three months. Sept., '05.—Appendicitis since July last. Still in bed. Jan., '07.—Feeble and old. June, '07.—Rarely speaks, but not from inability to do so. Is very depressed, and talks in a low even voice, or not at all if questions are not repeated and insisted on. Oct., '07.—Very depressed. Would like to remain in bed all day. Often pretends to be sick so as to be left in bed. Oct., '08.—Very depressed and confined to bed. Seldom speaks. Blood-

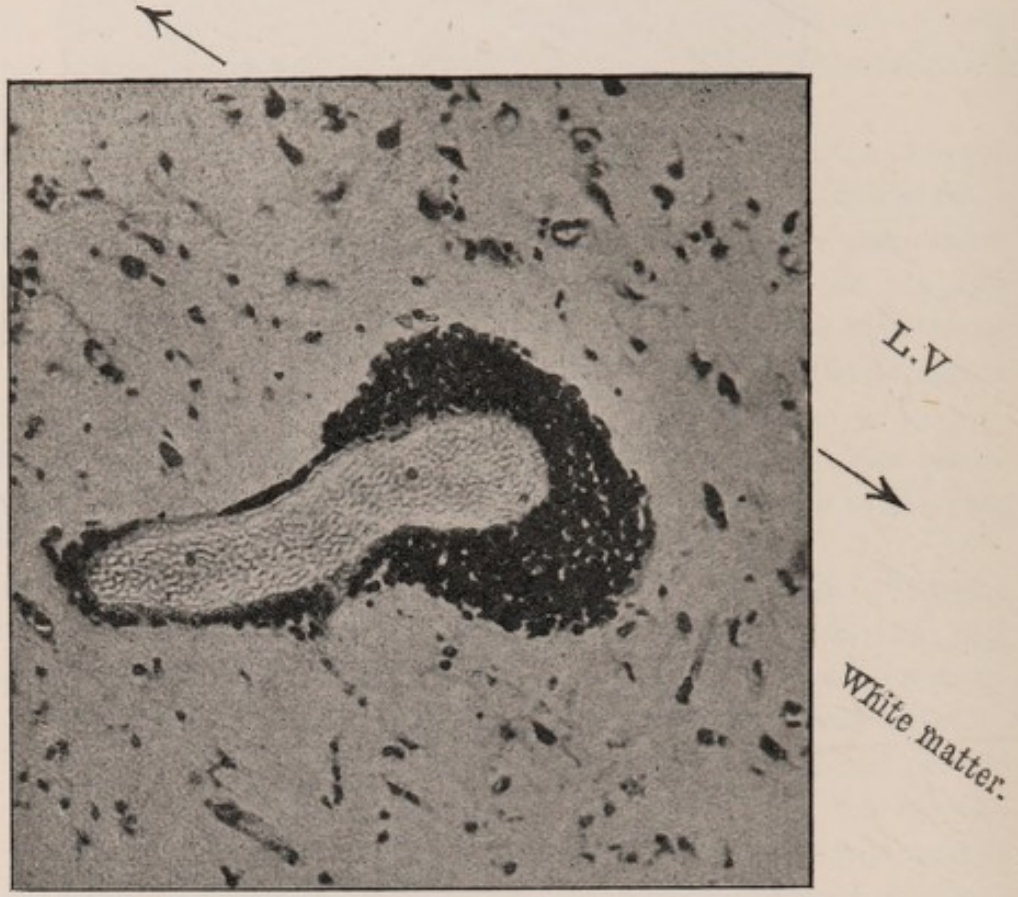


FIG. 86.—RECURRENT MELANCHOLIA WITHOUT DEMENTIA. MALE, AGED 76. OBLIQUELY-CUT VESSEL WITH GROSS PLASMA-CELL PERIARTERITIS.

One hundred and forty-eight diameters. White matter of visuo-psychic region just below the inner cell lamina (L.V.). The specimen shows an obliquely cut artery with gross plasma-cell periarteritis.

vessels very hard and atheromatous. Jan. to April, '10.—Depressed and in bed. Irritable if one talks to him. At times converses sensibly on music, &c. Died 13/11/10, at the age of 76 years.

Post-mortem, 14/11/10.—Dura thick, fibrous and adherent. Vessels congested and fibrous. Pia strips easily. Brain good. Little or no wasting. Encephalon: 1480 grammes. R.H.: 650 grammes. L.H.: 640 grammes. Cerebellum, &c.: 170 grammes. Floor of fourth ventricle somewhat rough. Liver adherent to diaphragm, and gall bladder contains one large stone. Aortic valves atheromatous. Coronaries very calcareous, as also is ascending aorta. Left kidney cystic. Right kidney fatty and fibrotic. Spleen fibrous. Cause of death: Cardio-vascular degeneration.

This case is of course one about which no doubt can arise with regard to diagnosis. The patient showed no signs of dementia paralytica, or even of general paralysis. He was in fact a typical example of the hereditary recurrent insanity which rarely or never results in dementia. The characters of the first two attacks for which he was treated in the asylum are, however, consistent with the presence of syphilitic cepha-

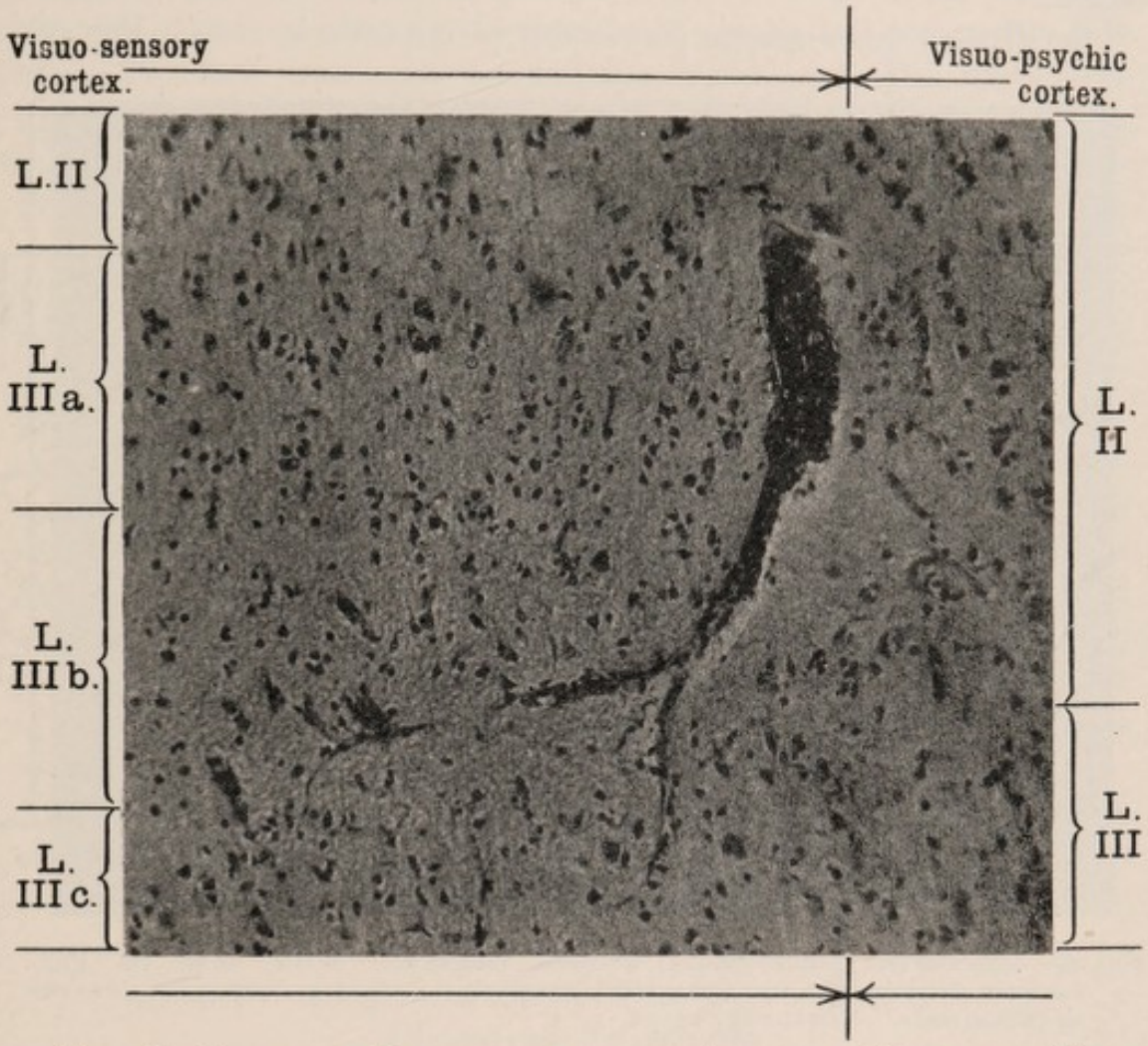


FIG. 87.—RECURRENT MELANCHOLIA WITHOUT DEMENTIA. MALE, AGED 76. PERFORATING ARTERY SHOWING WIDESPREAD PLASMA-CELL PERIARTERITIS.

One hundred and forty-eight diameters. A vessel lying at the junction of the visuo-sensory and visuo-psychic cortices, at the site shown by the lettering. The specimen shows a perforating artery with widespread plasma-cell periarteritis. The neurones are intact.

lalgia ; and the post-mortem characters, namely, fibrosis of organs, &c., are such as one is accustomed to find in persons who suffer, or have suffered, from syphilis. Further, the facts of past history which are available are such as render an attack of syphilis likely, to say the least.

Of the illustrative photographs, Figs. 85 to 88, taken together, indicate the widespread plasma-cell periarteritis which existed. Fig. 85 shows the white matter of the visuo-psychic region ; and Fig. 86 the

white matter just below the inner cell-lamina in the same region. Fig. 87 shows, on the left side, the middle part of the grey matter of the visuo-sensory area separated by a perforating artery from the pyramidal lamina of the visuo-psychic region, on the right. Fig. 88 shows the cortex of the lower part of the pyramidal, the granule, and the upper part of the inner fibre-lamina (inner line of Baillarger), in the prefrontal region.

In all these photographs plasma-cell periarteritis is gross. Fig. 88

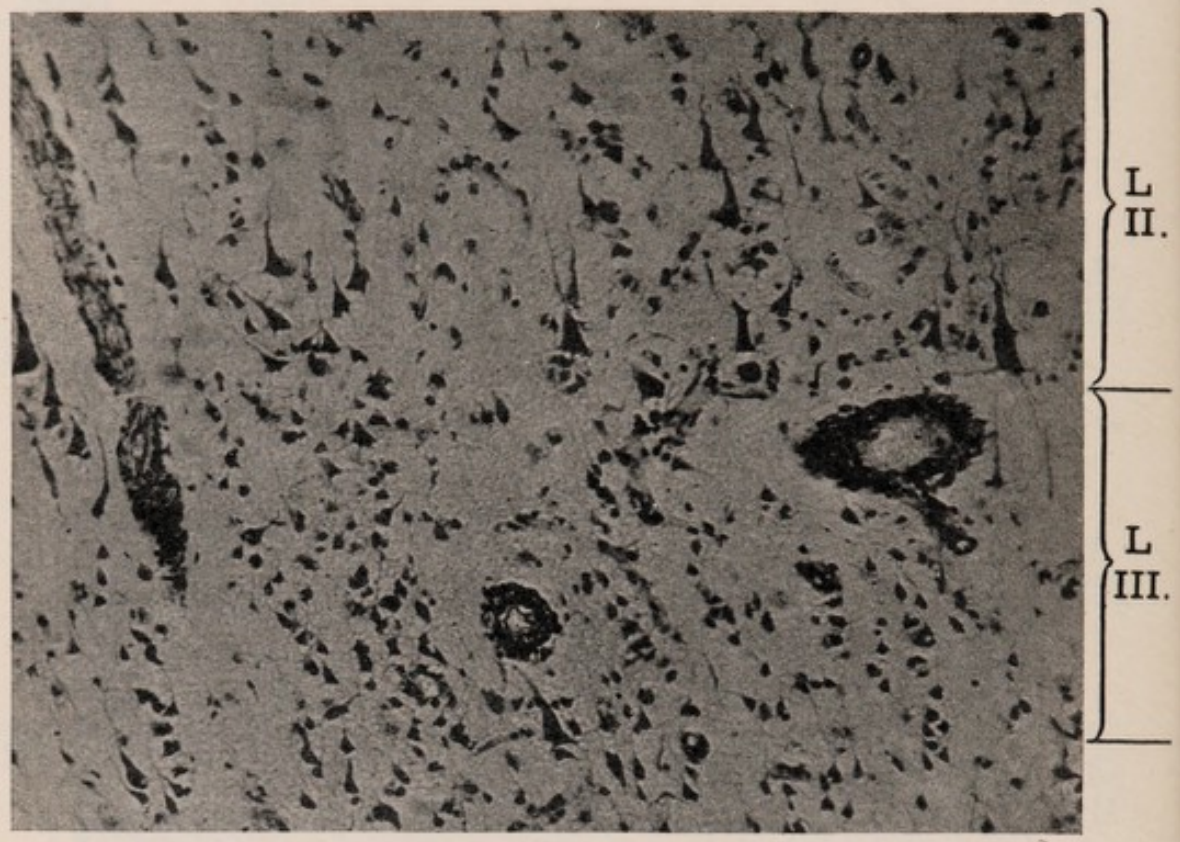


FIG. 88.—RECURRENT MELANCHOLIA WITHOUT DEMENTIA. MALE, AGED 76. PREFRONTAL CORTEX. PLASMA-CELL PERIARTERITIS UNDERGOING FIBROSIS. SHEATHS OF NEUROGLIA. NEURONES INTACT.

One hundred and forty-eight diameters. Prefrontal cortex showing the lower part of L. II, and the whole of L. III. The neurones are intact. There is no active proliferation of neuroglia, but tunnels or sheaths of unstained neuroglia surround the vessels. The plasma-cell periarteritis is undergoing fibrosis. These features indicate the greater age of the process in the prefrontal region.

shows that in the prefrontal region the condition is older, and that the plasma-cell periarteritis is undergoing fibrosis. Further, a definite sheath of unstained neuroglia surrounds each vessel, and thus indicates the greater age of the process in this region. At the same time, the large pyramidal cells are normal, and beautifully displayed, thus indicating the absence of neuronic dissolution.

This case shows quite definitely that the plasma-cell periarteritis, which is so often regarded as peculiar to and characteristic of dementia

paralytica, may occur in grossly typical form in the brain in the absence, clinically, of dementia paralytica, and, histologically, of neuronic dissolution and active proliferation of neuroglia.

It is clear, therefore, since sleeping-sickness can be definitely excluded by the history and course of the case, that the plasma-cell periarteritis must be regarded as evidence simply of syphilis of the cerebral vessels. I think it would be difficult to find a bacteriologist who would deny that invasion of the cerebrum by the *spirochaeta pallida* had occurred in this case. To allow that such an invasion could cause the widespread vascular affection of this case without at the same time causing dementia paralytica is tantamount to acknowledging that this condition is due to other causes than simple spirochæte invasion. The only possible argument would be the apparently plausible one that the parenchyma of the brain had escaped: and such would cause a smile in any pathologist familiar with the truth that the cerebral cortex is one of the most vascular parts of the body. Though I have not been able to make any actual measurements, I have nevertheless prepared silver-chrome specimens which prove that the larger neurones lying in the capillary interspaces of the cortex resemble halfpennies lying in a 2-inch wire-mesh more than anything else. *It must therefore be accepted that the most characteristic, and the obviously syphilitic, member of the trinity of cortical changes in dementia paralytica can exist in gross form in the absence of dementia paralytica.* This is important positive histological evidence in favour of my argument that dementia paralytica is mental disease + syphilis of the encephalon, and not the latter alone.

The three following examples of dementia paralytica are intended chiefly to illustrate my remarks on the morbid histology of this branch of mental disease.

Case B.—*Advanced Dementia Paralytica with very gross Plasma-cell Periarteritis*

Admitted 17/8/'10. Aged 48, married, Jew. Duration three months. It was stated that he did not understand questions. He was inarticulate. He laughed immoderately without apparent cause. He was very childish, and very noisy and destructive.

On admission he was in a very late stage of dementia paralytica. He was lost to time and place, and quite happy. He needed spoon-feeding, and was wet and dirty in his habits. The physical signs of dementia paralytica were marked. The reflexes were +. There was a large scar on the penis.

During the following eight months patient was at times very restless, and occasionally noisy. He gradually became weaker and bedridden and much quieter, and died 5/5/'11 grossly demented.

Post-mortem.—The brain showed unusually gross naked-eye signs of dementia paralytica, with extreme wasting of the prefrontal region and the usual grading. R.H.: 500 grammes; stripped, 450 grammes. L.H.: 490

grammes; stripped 440 grammes. Cerebellum, &c.: 165 grammes. The arteries showed much atheroma. The naked-eye evidence of dementia paralytica shown by this case was, I think, as gross as I have ever seen.

The Figures 89 and 90, with regard to the plasma-cell periarteritis, may be usefully compared with the Figures 85 and 86 of the preceding case.

Fig. 89 is from the upper part of the cortex of the pre-central region,

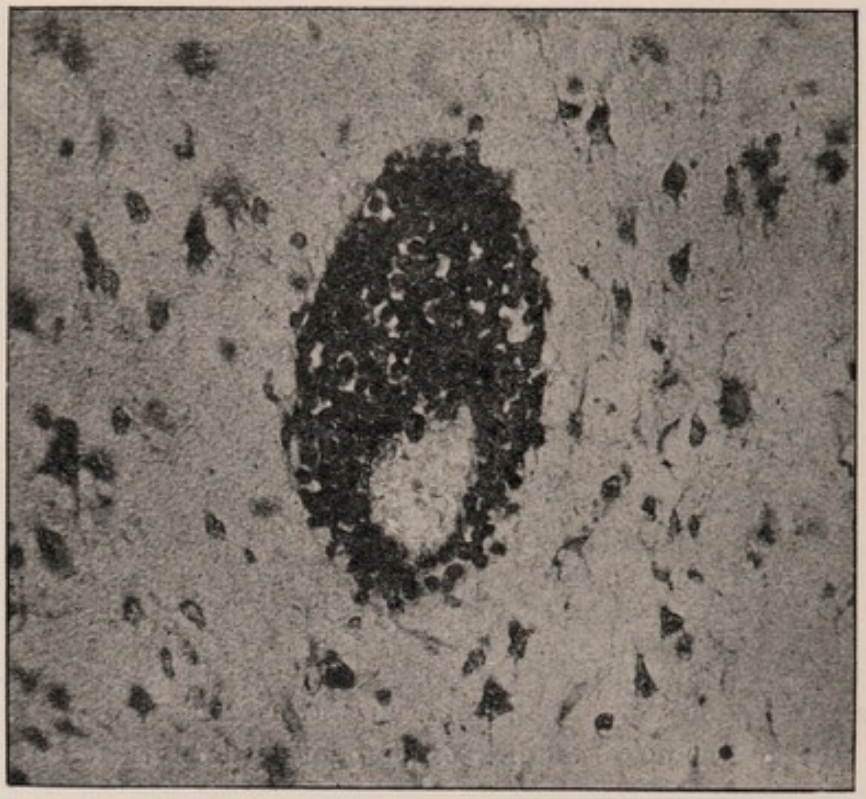


FIG. 89.—ADVANCED DEMENTIA PARALYTICA. CORTEX OF PRE-CENTRAL GYRUS. GROSS PLASMA-CELL PERIARTERITIS AND MUCH ACTIVE PROLIFERATION OF NEUROGLIA.

Three hundred and twenty diameters. *Cortex* of the pre-central gyrus near the surface of the pyramidal lamina. The specimen shows gross plasma-cell periarteritis with much active proliferation of neuroglia.

On comparing this figure with the following Figures 90–92, it will be seen that in the pre-central *grey matter* gross plasma-cell periarteritis exists with much active proliferation of neuroglia; in the prefrontal *white matter* the former exists without the latter; and in the prefrontal *grey matter* very marked proliferation of neuroglia exists in association with moderately aged *fibrosis* of the vessels.

and exhibits gross plasma-cell periarteritis with, at the same time, much active proliferation of neuroglia in the neighbourhood of the vessel. On the other hand, Fig. 90, from the white matter of the prefrontal region, shows very little proliferation of neuroglia. In other words, in these two regions the plasma-cell periarteritis is equally grossly marked, but *the active proliferation of neuroglia is taking place at the site of dissolution of neurones*, namely in the grey matter, not the white, although the former is pre-central and the latter prefrontal.

Fig. 91, when compared with Fig. 90, also a polychrome specimen from the prefrontal region, shows that at the site of the morbid process in the cortex in this region the plasma-cells are largely organised into fibrous tissue, in association with neuronic dissolution and neuroglial proliferation, whereas in the underlying white matter pure plasma-cell periarteritis alone is present.

Lastly, Fig. 92, a Heidenhain counterpart of Fig. 91, beautifully exhibits the relative age of the morbid process in the prefrontal cortex, by showing on the one hand relatively recent neuroglia cells, and also

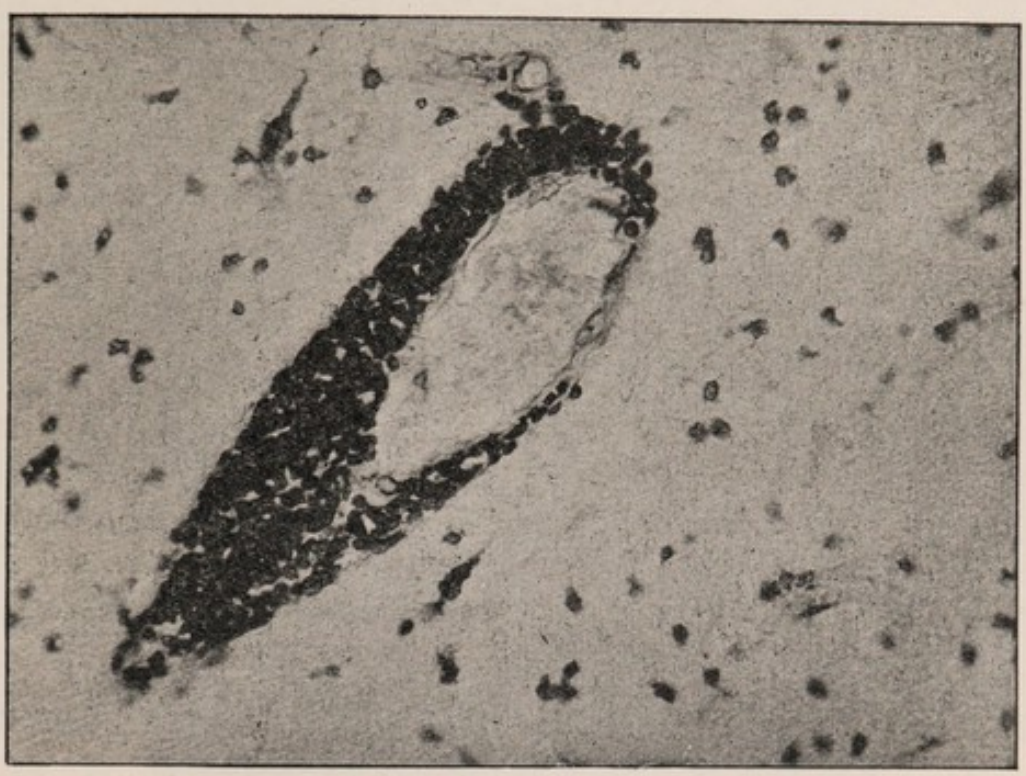


Fig. 90.—Advanced Dementia Paralytica. White Matter of Prefrontal Region. Gross Plasma-cell Periarteritis with very little Proliferation of Neuroglia.

Three hundred and twenty diameters. Polychrome stain. *White matter* of the prefrontal region. The specimen shows gross plasma-cell periarteritis, but very little proliferation of neuroglia. It should be compared with the preceding and following figures.

the wiry attachments of the neuroglia cells to the vessel wall, and on the other the well-marked but moderately-aged fibrosis of the latter.

This case thus illustrates many of the statements made in the general description.

Case C.—*Early and Recent Dementia Paralytica with much Proliferation of Neuroglia and relatively little Plasma-cell Periarteritis*

Admitted 28/11/'10. Aged 41 years, married, glass-works' founder. Is stated to have been very steady for eight years. Was previously a drunkard. Five days before admission he was promoted. On the following day he

tried to commit suicide by cutting his throat. His wife is stated to be very loose morally. He had seven healthy children. His certificate stated that he was restless, noisy and confused, and thought he was rich.

On admission he was suffering from mania. He was excited, restless, and very noisy. He shouted and gesticulated and made remarks with regard to his supposed wealth and possessions. He was destructive, and wet and dirty in his habits. His general health was fair.

The pupils doubtfully reacted to light, but were difficult to examine

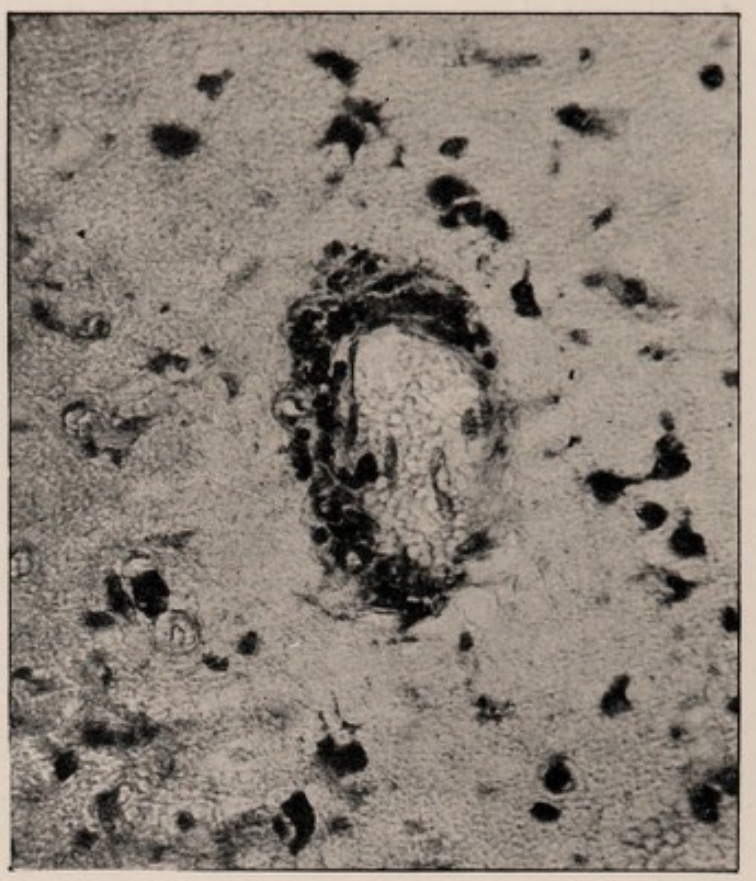


FIG. 91.—ADVANCED DEMENTIA PARALYTICA. PREFRONTAL CORTEX. FIBROSIS OF PLASMA-CELL PERIARTERITIS. DISSOLUTION OF NEURONES. PROLIFERATION OF NEUROGLIA. POLYCHROME.

Three hundred and twenty diameters. Polychrome stain. *Cortex* of the prefrontal region. The specimen shows that the plasma-cells in this region are largely organised into fibrous tissue in association with dissolution of neurones and proliferation of neuroglia.

Fig. 92 is a Heidenhain counterpart. Fig. 90, on the other hand, shows that in the prefrontal *white* matter pure plasma-cell periarteritis alone is present.

owing to the state of the patient. They were equal in size. The knee-jerks were brisk. Speech at times very slurred. Slight facial tremors. The tongue showed jerks on protrusion. There was a purulent urethral discharge, and also a penile scar.

8/12/'10.—Patient has exhibited occasional slight general convulsions. He has rapidly gone down hill. Speech and deglutition much impaired.

11/12/'10.—Comatose, and died at 7.45 P.M.

Post-mortem, 12/12/'10.—Dura thickened and densely adherent to skull; congested. Pia-arachnoid thickened, and very œdematous. Strips

more readily than natural. Tends to adhere to cortex, which is granular on surface. Marked mid-line prefrontal adhesions. Much opaque fibrous tissue around base of brain and on dorsal surface of cerebellum posteriorly, and also along Sylvian fissures and even below tentorium all along the mid-line dorsally. Basal vessels thickened and fibrous. Intracranial fluid *not above tentorium*. Encephalon: 1390 grammes. R.H.: 590 grammes; stripped, 550 grammes. L.H.: 590 grammes. Cerebellum, &c.: 190 grammes. Brain above average complexity. Much œdema. Very little evidence of wasting, and this limited to the prefrontal region. Vents.: Lat., slightly dilated; III and Lat.,

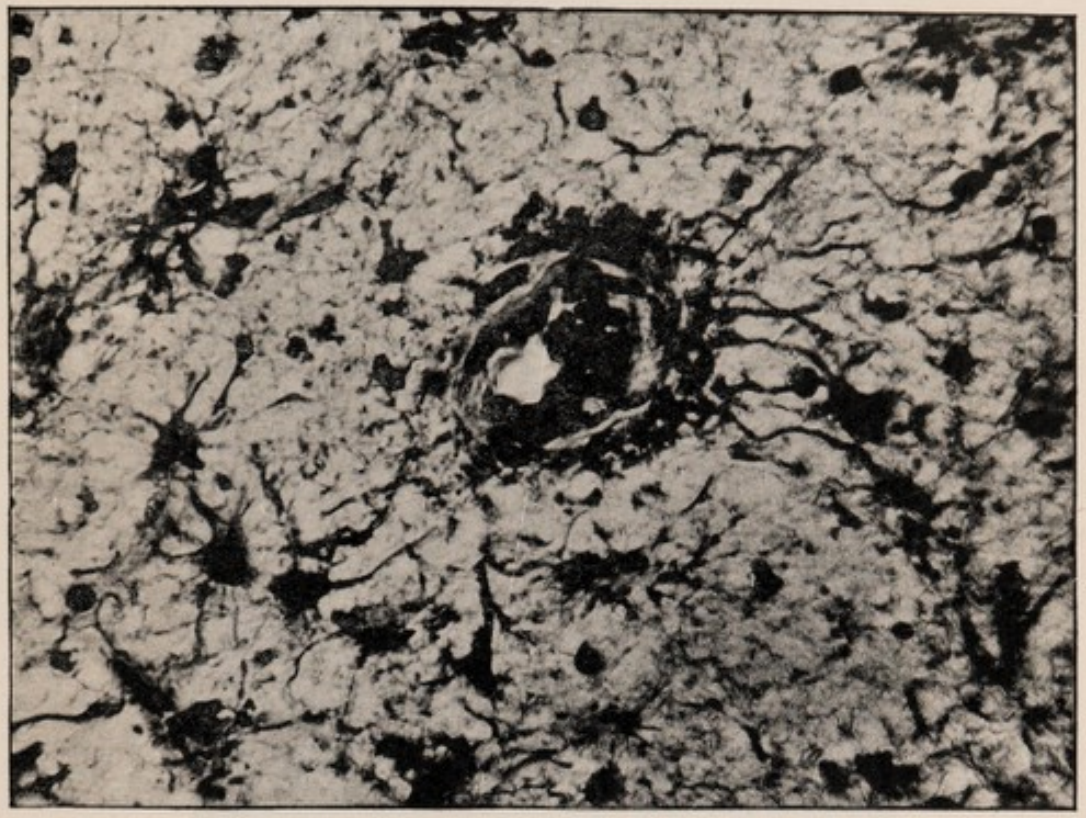


FIG. 92.—ADVANCED DEMENTIA PARALYTICA. HEIDENHAIN COUNTERPART OF FIG. 91, SHOWING FIBROSIS OF VESSEL, AND NEUROGLIA CELLS AND PROCESSES.

Five hundred and two diameters. Cortex of the prefrontal region. A Heidenhain counterpart of Figure 91. The specimen shows a vessel in the lower part of the pyramidal lamina with moderately advanced fibrosis of its wall. Surrounding this vessel, and affixed to it by wiry processes, are large and relatively recent neuroglia cells.

generally finely granular; IV, coarsely granular in calamus. Liver dense. Old pleuritis adhesions in chest. Aorta shows early atheroma and also pearly patches. Kidneys dense. Left testicle denser than right. Spleen contracted and fibrous. Cause of death: Dementia paralytica.

Fig. 93 exhibits a small fibrous perforating cortical artery anchored in place by neuroglia. The artery resembles a hair in a hair follicle, and thus reminds one of the similar artery of progressive senile dementia shown in Fig. 78 (p. 382). It will be noted that there are very few plasma-cells—two or three only being visible in the figure—along the course of the vessel shown in Fig. 93.

Fig. 94 shows a little plasma-cell periarteritis, but its striking feature is the entire obliteration of the Canal of His by the anchoring processes of the neuroglia cells. Around the periphery of the illustration are seen relatively recent and large neuroglia cells. This specimen (and also Fig. 93) shows the mode of evolution of the tunnel of neuroglia described

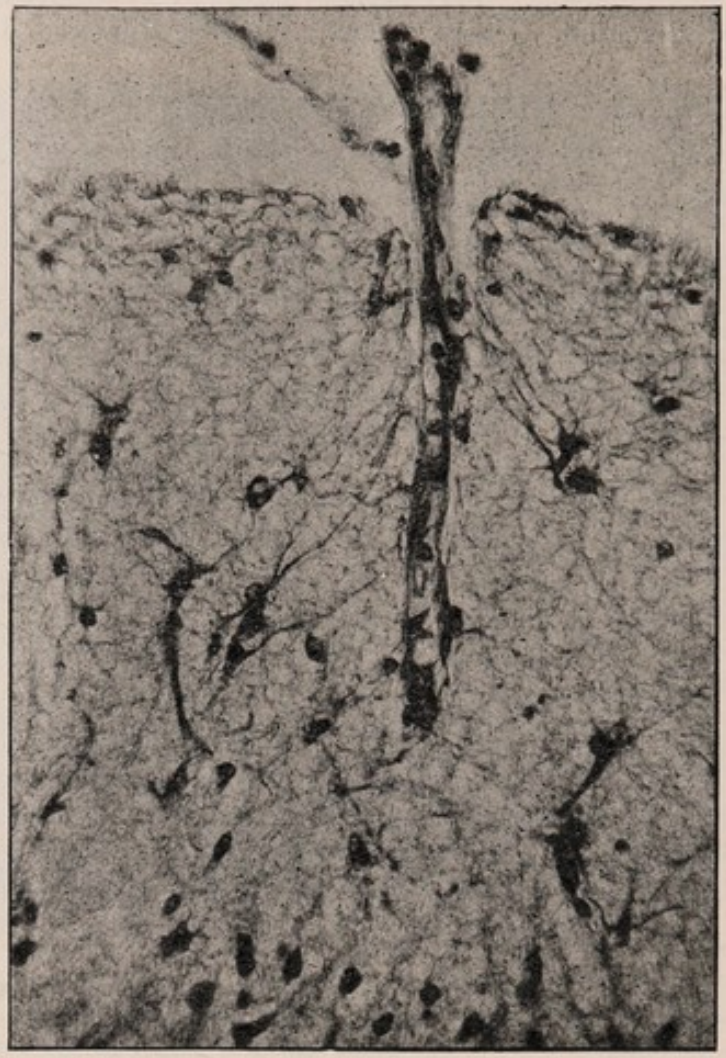


Fig. 93.—Recent Dementia Paralytica. Prefrontal Cortex. Small Wiry Perforating Artery anchored by Neuroglial Processes.

Three hundred and twenty-eight diameters. Early and recent dementia paralytica. Prefrontal region at apex of a convolution. Small and somewhat wiry perforating cortical artery anchored in its place by recently developed processes of neuroglia cells. Two or three plasma-cells lie along the vessel. This and the following two figures illustrate an early and recent case with much proliferation of neuroglia and relatively little plasma-cell periarteritis.

and illustrated in previous figures (*e.g.* Fig. 79, of progressive senile dementia, and Fig. 88, of vascular syphilis), and indicates why such a clear space is visible just around the vessel wall.

Lastly, Fig. 95 illustrates a small artery in the middle of the lower part of the pyramidal lamina of the prefrontal region. It shows a number of round- and plasma-cells, but not very many. The fact that the morbid

process is of recent date is indicated by the large number of well-developed pyramidal cells which is visible, and by the presence of young neuroglia cells. Some of the nerve cells are undergoing dissolution, and several are presumably dead. It is worth noting that there is no indication of the acute necrosis and œdema of nerve cells which are so often found

Fig. 94.—Recent Dementia Paralytica. Prefrontal Cortex. Oblique section of Large Perforating Artery showing Obliteration of Canal of His by Anchoring Processes of Neuroglia Cells.

Three hundred and twenty-eight diameters. Early and recent dementia paralytica. Prefrontal region. Oblique section of a perforating artery near the surface of the cortex and at the bottom of a fissure. The specimen shows entire obliteration of the Canal of His by the anchoring processes of the numerous and large neuroglia cells, and indicates the early evolution of what later on becomes a sheath or tunnel of neuroglia.

in the neighbourhood of local lesions of vessels, and are presumably due to failure of blood supply.

Cases A, B, and C, taken together, clearly show that plasma-cell periarteritis does not possess the importance in dementia paralytica which has been attributed to it. Case A possesses this feature in marked degree, and is not one of dementia paralytica at all. Case B similarly possesses it in marked form, and is a well-marked and advanced case ot dementia paralytica. Case C, a very acute and early case of demenfia

paralytica dying after convulsions, exhibited very little plasma-cell periarteritis, in spite of very careful search even for single vessels showing this morbid appearance. This last remark is made because I have several times in aberrant cases only found evidence, and then purely local, of plasma-cell periarteritis, after prolonged examination.

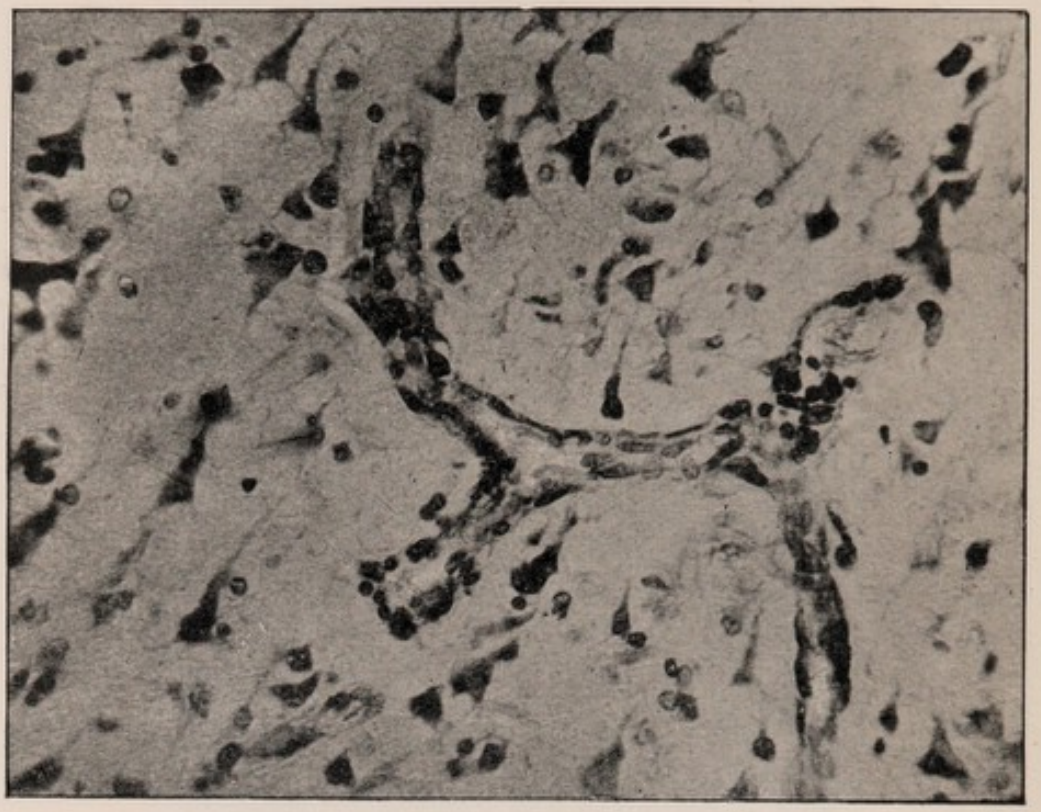


FIG. 95.—RECENT DEMENTIA PARALYTICA. SMALL MID-CORTICAL ARTERY, SHOWING A NUMBER OF ROUND- AND PLASMA-CELLS.

Three hundred and twenty-eight diameters. Early and recent dementia paralytica. Small artery in the middle of the lower part of the pyramidal lamina of the prefrontal region. On the vessel lie a number of round- and plasma-cells. The morbid process is of recent date because many well-developed, and also some dying and dead, pyramidal cells are present, together with young neuroglia cells.

CASE D.—*A gross example of Dementia Paralytica of over two years' duration, illustrated in Fig.* 82, *and showing the order of progress of the morbid process*

The description of this case is attached to Fig. 82 (p. 410).

All these illustrations are from the prefrontal region, and they are intended to indicate—though this is not necessarily the case—that the earlier stages of the morbid process may still be present even in a region so sclerosed as to cut like soft wood.

Fig. 96 shows a moderate degree of partially organised plasma-cell periarteritis in a vessel in the lower part of the grey matter (polymorphic lamina).

Fig. 99 gives the similar appearances, under a higher power, and beautifully shows the neuroglial tunnel around the vessel.

Fig. 97, a tangential section near the surface of the cortex, shows a number of fibrosed perforating arteries, and at the same time indicates their great number, as their average distance from one another is about $\frac{1}{10}$ mm. The three vessels to the left of the figure are in fact only

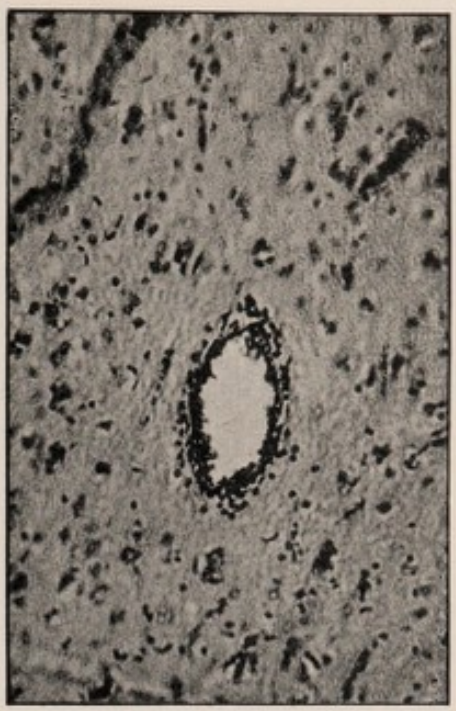


Fig. 96.—Gross Dementia Paralytica. Marked Prefrontal Sclerosis. Cross Section of Vessel, showing Partially Organised Plasma-cell Periarteritis and a Sheath of Neuroglia.

One hundred and forty-four diameters. Cross section of a vessel in the lower part of the grey matter of the prefrontal region. The specimen shows a moderate amount of partially organised plasma-cell periarteritis, and also a surrounding sheath or tunnel of neuroglia.

This and the following three figures are intended to illustrate that all stages of plasma-cell periarteritis and its results may exist even in a region which is grossly sclerosed.

$\frac{1}{320}$ inch from one another. The numerous neuroglia cells are also well shown.

Fig. 98 illustrates a vessel cut obliquely, and indicates, in its upper part, a moderate amount of plasma-cell periarteritis and, in its lower, the older and more organised appearance, which is also seen well in Fig. 99.

I have, for these illustrations, chosen as typical examples as possible, but I nevertheless wish it to be quite clearly understood that, whilst the general description stands as a general statement, much experience is needed in order that different cortices may be successfully compared either with one another or with their respective clinical histories.

As regards the general trend of the morbid process to end in the sclerosis of neuroglia and the fibrosis of vessels, which (Figs. 75, 76, 77, and 78) I have illustrated as characteristic of progressive senile dementia, I would draw the especial attention of the reader to Figs. 91 and 92, 93, 94, and 96–99. These illustrations are, I think, sufficient to show clearly that the difference between progressive senile dementia and

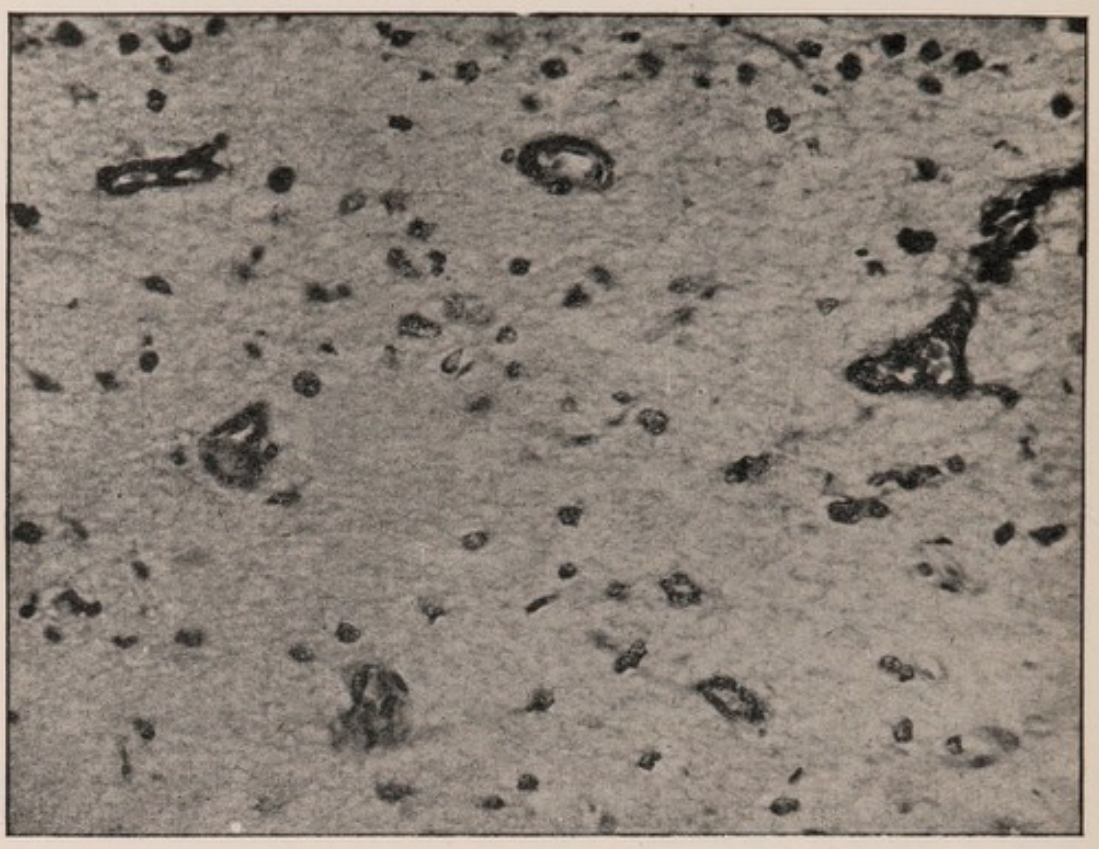


FIG. 97. — GROSS DEMENTIA PARALYTICA. TANGENTIAL SECTION OF PREFRONTAL CORTEX WITH NUMEROUS FIBROUS PERFORATING ARTERIES AND PROLIFERATION OF NEUROGLIA.

Three hundred and twenty diameters. Tangential section near the surface of the cortex of the prefrontal region. The specimen shows the numerous fibrosed perforating arteries which lie about one-tenth mm. apart. The very numerous neuroglia cells may also be seen.

dementia paralytica is one of degree and not one of kind, the plasma-cells arising in reparative response to syphilis and resulting in the formation of fibrous vessels, and the neuroglia reacting, and owing to syphilis over-reacting, to neuronic dissolution and replacing parenchymatous by stationary tissue cells.

In concluding this account of the histo-pathology of the cortex of dementia paralytica, I would draw attention to the following points :—

(1) Round- and plasma-cell periarteritis may exist in marked degree throughout the intracerebral arteries without the onset of dementia paralytica (see Figs. 85–88).

(2) The cerebrum is one of the most vascular of organs. Some 100 perforating surface arteries exist per square millimetre (see Fig. 97), and the vascular meshwork throughout the cortex is remarkably close, a good-sized nerve cell looking a large object when seen lying in one of the meshes, since it occupies about a quarter of the superficial area of the mesh.

(3) Generalised intracerebral plasma-cell periarteritis thus indicates

FIG. 98.—GROSS DEMENTIA PARALYTICA. VESSEL SHOWING PLASMA-CELL PERIARTERITIS OF VARYING AGE.

Three hundred and twenty diameters. Oblique section of a vessel in the grey matter of the prefrontal region. The specimen shows a moderate amount of plasma-cell periarteritis which appears older and more organised in the lower than the upper part.

the very closest of relationships between the cortical neurones and the cause of the periarteritis.

(4) It is hence impossible for dementia paralytica to be merely parenchymatous syphilis of the cerebrum.

(5) The general account of the histo-pathology of dementia paralytica conforms in every respect with the evidence produced in other sections

of this chapter in that it shows dementia paralytica to be a branch of mental disease, psychopaths who would otherwise be dementable but stationary becoming under the influence of syphilis examples of progressive dementia.

(6) It is probable that the round- and plasma-cell periarteritis is the

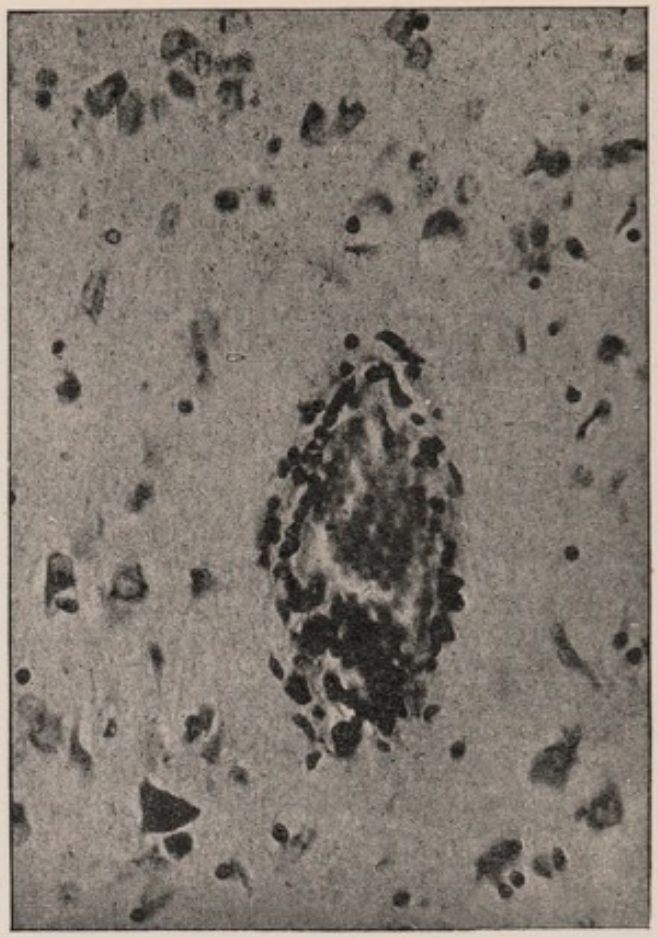


FIG. 99.—GROSS DEMENTIA PARALYTICA. VESSEL OF LOWER GREY MATTER SHOWING PARTIALLY ORGANISED PLASMA-CELL PERIARTERITIS, AND A NEUROGLIAL SHEATH.

Three hundred and twenty diameters. Cross section of a vessel in the lower part of the grey matter of the prefrontal region. The specimen shows a moderate degree of partially organised plasma-cell periarteritis and, around this, a well-marked neuroglial sheath or tunnel.

characteristic feature of infection of the cerebrum with syphilis; and indicates, when still unfibrosed, the presence of the organism of syphilis. It is probable that the active proliferation of neuroglia which follows—and even when overshooting the mark may cause—destruction of neurones, is a hyper-reaction of repair consequent on the prolonged subjection of the whole of the individual to the influence of syphilis, either as organism or as secondary toxine.

(4) Evidence as to the Relationship between Dementia Paralytica and Mental Disease, derived from a Study of the Clinical Types of Dementia Paralytica

In the preceding sections evidence has been adduced as to the frequency of heredity of insanity and of family and parental degeneracy in dementia paralytica, and as to the modification of the death rates of the insane at different ages which results from the exclusion of the cases of dementia paralytica. Further, I have indicated the relationship which exists between the morbid anatomy of dementia paralytica and that of progressive senile dementia, and I have drawn attention to the existence of cerebral under-development in certain types of dementia paralytica. Lastly, I have discussed the histo-pathology of insanity with evidence of syphilis of the cerebral vessels, and of dementia paralytica; and I have compared the histo-pathology of the latter, in its later stages, with that of progressive senile dementia.

The final evidence—final in position rather than in importance—which I purpose to produce in support of the thesis that dementia paralytica is an integral part of mental disease, and is not merely parenchymatous syphilis of the brain, is derived from a comparison of the clinical types of dementia paralytica with the homologous types of ordinary mental disease which have already been considered under the heading of "Primarily Neuronic Dementia."

Further experience has confirmed me in the opinion that the following classification of the varieties of dementia paralytica, which I suggested many years ago (*Archives of Neurology*, vol. ii., 1903), is on the whole satisfactory. It is based on the different grades of cerebral degeneracy which are presented by the several types, and thus follows on the lines already adopted in the description of primarily neuronic dementia, though for convenience the order is inverted.

The classification is as follows:—

(1) *Dementia Paralytica.*
  (*a*) Juvenile dementia paralytica.
    (1) In imbeciles (low-grade aments).
    (2) In high-grade aments, &c.
  (*b*) Ordinary chronic dementia paralytica in adult high-grade aments.
  (*c*) "Tabetic general paralysis," or dementia paralytica associated with extensive degeneration of (usually afferent) lower neurones.
  (*d*) Acute or sub-acute dementia paralytica in the highest grade degenerates (general paralysis of the text-books).
(2) *General Paralysis without Mental Symptoms.*

Between (1) and (2) might be placed a certain number of the syphilised lunatics without dementia who are found in asylums. I prefer, however, to omit these, because, on the one hand, such as show signs of general paralysis bear a small proportion to the total number of non-demented syphilised individuals, and on the other, my experience leads me to believe that these few cases are merely slowly developing examples of dementia paralytica.

Cases of dementia paralytica form a small proportion only of the series of 728 cases under consideration for the purposes of illustration, there being but 23, of whom 14 are males and 9 are females. They thus amount to 5·17 per cent. of the 445 cases of dementia, or 3·16 per cent. of the total of 728 cases of amentia and dementia. This would naturally be expected in view of the fact that the cases are derived from the (largely rural) population of East Sussex. On the other hand, dementia paralytica is much more common in the great centres of population. For example, the 892 direct admissions to the West Riding Asylum, Wakefield, during the years 1911 and 1912 contained amongst the males 23 per cent. and amongst the females nearly 6 per cent. of dementia paralytica.

The East Sussex cases fall into the following classes :—

Dementia Paralytica.

	M.	F.	T.
(*a*) Juvenile—			
(1) In imbeciles	1	0	1
(2) In high-grade aments, &c.	—	—	—
(*b*) Ordinary chronic in high-grade aments	9	8	17
(*c*) "Tabetic general paralysis"	—	—	—
(*d*) Acute or sub-acute in the highest degenerates	4	1	5
Total	14	9	23

In spite of the small number of cases it will be seen that in the acute or sub-acute type there is the usual preponderance of male cases, whereas the chronic cases show but a slight difference in sex-frequency.

The practically equal sex incidence in chronic dementia paralytica was reported by me many years ago. Whilst dementia paralytica is more common in the male than in the female sex owing to the greater frequency of syphilis in the former, "stress" is also a more important factor in the male sex, owing to the conditions of civilised life. In the case of prostitutes, of course, dementia paralytica has only rarely a chance of developing, since such persons commonly die within a few years of acquiring syphilis, in consequence of their extremely hard means of livelihood.

Acute cases of dementia paralytica therefore preponderate in the male sex, and chronic cases in the female sex, with the accidental result

that an approximately equal number of chronic cases exists in the two sexes.

On the other hand, the approximately equal sex incidence in juvenile general paralysis, which was first noted in 1893 by Wiglesworth, is the natural consequence of the equal sex incidence of "congenital" syphilis and of the more equal sex incidence of "stress" in such juvenile cases.

As the existence of the several varieties into which I have classified dementia paralytica is well known, my purpose will be served by an explanatory amplification of the classification, without the insertion of any cases beyond those already briefly summarised in the illustrations.

Juvenile Dementia Paralytica.—In the *imbecile type* the patient is a well-marked degenerate of congenitally deficient intelligence. At or before the age of puberty a slowly progressive dementia develops under the influence of the "stress" of normal environment. In spite of the deficient durability of the cortical neurones of these cases, the development of the dementia is usually slow, as the "stress" which has determined their incarceration in an asylum is so slight that a relatively small amount of immediate injury to the cortical neurones has been produced. It is probable that accident of environment or physical disease has a good deal to do with the exacerbation of symptoms which at times occurs. In one case, for example, I have little doubt that the exertion of acting as a golf caddie was the exciting cause of a more rapid progress of the disease, for the patient had for a long time previously remained in a practically stationary condition. In my experience, cases of this type frequently suffer from degeneration of the lower neurones and exhibit optic atrophy and tabetic symptoms. They are the probable juvenile homologues of the "ordinary chronic" and "tabetic" types of dementia paralytica.

In my opinion patients suffering from the imbecile type of juvenile dementia paralytica would, if they had not been infected with syphilis, have become ordinary examples of the (stationary) premature dementia of marked degenerates.

In the *high-grade ament form* of juvenile dementia paralytica, the patient has originally been of at least average intelligence, and at times appears to have been distinctly well-endowed mentally. It is, however, common to find that such patients become "backward" in their studies about the period of puberty. Under what at times seems to be the "stress" of normal environment, but is usually distinctly more severe, *e.g.* the strain of prolonged over-study, the patient, about the period of puberty or adolescence, develops acute and progressive dissolution of the higher cortical neurones, which, when the morbid process has once got under way, often runs a rapid course. The symptomatology pre-

sented by cases of this type is at times identical with that given in ordinary text-book descriptions of adult "general paralysis." I have formed the opinion, though I express it guardedly owing to the lack of statistical evidence, that degeneration of the afferent systems of neurones is less common in such cases than in the imbecile type of juvenile dementia paralytica.

I believe that the subjects of the form of dementia paralytica under consideration would, if they had not been infected with syphilis, have become ordinary examples of (stationary) premature dementia. In consequence, however, of infection with syphilis, these cases become the premature homologues of the rapidly progressive adult variety of dementia paralytica, in which, at the period of greatest mental and physical activity, fulminating dissolution of the higher neurones of the cortex is precipitated under the influence of excessive mental and physical "stress."

Ordinary Chronic Dementia Paralytica.—Whilst any of the well-known types of symptomatology, including epilepsy, may occur in the subjects of the chronic form of dementia paralytica, progressive dementia is the prominent clinical feature, and the course of the case is often so slow that, were it not for the existence of the ordinary physical signs, the condition would undoubtedly often be undiagnosed until the post-mortem examination. Many such cases, in fact, probably die unsuspected at home or in workhouses, for only the cases which cause trouble are likely to be sent to asylums. Ideas of grandeur often exist; and I have seen several cases which still exhibited this symptom after a residence in an asylum of ten or twelve years. Such cases, as a rule, neither exhibit the acute symptomatology nor provide the antecedent history which occurs in cases of the ordinary text-book description, and they are often admitted to asylums when already in an advanced stage of dementia. Two examples of this type of dementia paralytica are described and illustrated in Figures 83 and 84.

These cases are commonly, if not invariably, high-grade aments, who often exhibit marked stigmata of degeneracy. It is probable, therefore, that, especially in the examples who do not suffer from convulsions, the often prolonged course of the case is due to the same cause as has already been stated with reference to the imbecile variety of juvenile dementia paralytica, namely, the readiness with which the cortical neurones are affected by "stress." In such cases there is consequently less immediate dissolution of the higher cortical neurones than occurs in the more fulminating types, whose breaking-strain is not readily reached. Hence, when the slight "stress" which has precipitated their breakdown is removed by their being placed under asylum *régime*, the symptoms largely subside; and, unless they should be dis-

charged "recovered" and consequently relapse, these cases usually run a prolonged course.

In my opinion, such cases would, had they not been attacked by syphilis, have become examples of the ordinary chronic lunatic with moderate (stationary) dementia and a general symptomatology appropriate to their mental constitution.

"*Tabetic General Paralysis.*"—In this form of dementia paralytica dissolution of the higher cortical neurones is associated with a more or less extensive degeneration of (usually afferent) systems of lower neurones. Owing to the definite neurological symptomatology in well-marked cases, it is desirable that these examples should be considered a special type, as otherwise dementia paralytica would require to be artificially subdivided into (*a*) dementia paralytica, and (*b*) dementia paralytica with involvement of lower neurones. This is, however, undesirable, as many, if not the majority of, cases of dementia paralytica exhibit some slight affection of these neurones when they are submitted to systematic histological examination. As a rule, however, when the affection of lower neurones is well marked, the cases are either the rare examples of the imbecile variety of juvenile dementia paralytica or are fairly high-grade degenerates who, apart from involvement of lower neurones, would fall into the class of "ordinary chronic dementia paralytica."

I think it probable that, had they not been infected with syphilis, certain of these cases would have become examples of ordinary chronic insanity with moderate (stationary) dementia, and the remainder would have suffered from a chronic process of dissolution of certain systems of lower neurones, and would have thereby come under the purview of the neurologist rather than that of the alienist.

Acute or Sub-acute Dementia Paralytica in the highest-grade degenerates (general paralysis of the text-books).—It is unnecessary to refer here to the classical symptomatology of this form of dementia paralytica, and particularly so as it has already been critically discussed under the subject of "Mental Confusion and Dementia" in Chapter XIII (pp. 247–254).

It may, however, be pointed out that cases of this type are, by cerebral development, frequently so little prone to suffer from dementia, that only the severest forms of "stress" (mental and physical over-strain, business worries, alcoholic and other excesses, &c.) are able to precipitate the onset of dissolution of the higher neurones of the cortex. In such cases, where highly evolved cortical neurones have long been strained to breaking-point, fulminating dissolution occurs when this has been overstepped, and a rapid case of dementia paralytica ensues.

I believe that, if cases of this type had not been infected with syphilis, they would either have become temporarily insane, or would have developed a more or less marked grade of non-progressive dementia.

General Paralysis without Mental Symptoms may perhaps be considered the very highest (and non-certifiable) grade of the form of mental disease under consideration. Though well known to neurologists, this condition does not fall into the sphere of alienism, although certain rare cases of arrested or recovered general paralysis might be included under the term. Such latter cases are, however, more likely to be examples of what might be called a premature onset of dementia paralytica, in which the " stress " to which the cerebrum had been subjected had sufficed for the production of symptoms, but had not been severe enough to cause an appreciable degree of dissolution of the higher neurones of the cortex cerebri. In these cases definite dementia paralytica would be expected to ensue at some future time, provided that the patient were again subjected to " stress " beyond the resistance of his cerebrum.

If, however, it were taken for granted that *no* mental symptoms, rather than *no certifiable* mental symptoms, exist in such cases, it would be preferable to employ the term " general paralysis in the sane."

I have necessarily excluded *senile dementia paralytica* from my classification, as cases of this kind are usually complicated by the existence of senile or prematurely senile degeneration of the cortical arteries of a grade which might in itself result in the development of progressive senile dementia. Such cases, in other words, as a rule, combine both the morbid anatomy and the symptomatology of dementia paralytica and of progressive senile dementia.

In these cases, in my experience, the attack of syphilis has usually been acquired at or after maturity, and its influence has been chiefly in the direction of a gross exacerbation of normal senile vascular degeneration. This is shown by the presence of well-marked dilatation and pearly fibrosis of the aorta and of the larger and medium arteries, together with extensive fibrosis of the smaller arteries (particularly in those of the cerebrum), and a moderate amount of calcareous deposition in the arteries generally. Further, though the number of cases which have hitherto been examined is too few for trustworthy conclusions to be available, such seem likely to give a negative Wassermann reaction and to fail to show spirochætes.

The cerebral morbid anatomy of such cases, whilst suggesting dementia paralytica, is frequently that of progressive senile dementia, probably in consequence of the lesser capacity for reparative reaction on the part of the non-neuronic elements of the encephalon than exists in ordinary dementia paralytica. The clinical symptoms presented by such cases agree with the morbid anatomy in being chiefly those of progressive senile dementia, although dementia paralytica is suggested both by the physical signs which are present and by the type of mental confusion which is exhibited.

(5) *Summary*

It is beyond my expectation that the evidence which I have collated should finally settle the vexed question of the relationship of dementia paralytica to mental disease. I hope, however, that I have at any rate stated a case which will justify the attitude I have adopted; and the fact that my views have successfully survived the discoveries of Wassermann and of Noguchi must in itself be regarded as strong evidence of their truth.

In brief, I consider that dementia paralytica is a branch of mental disease, and that the subjects of this form of mental disease would, if they had not been syphilised, have suffered from one or other of the types of primarily neuronic dementia. I am further of the opinion that an attack of syphilis is a necessary antecedent to dementia paralytica.

With regard to the first question, I have shown, by a study of the death rates in mental disease at different ages, and by a comparison of these death rates with the homologous death rates in the corresponding general population, that the exclusion of the general paralytic population of an asylum leads to the result that lunatics (particularly those of the male sex) have an extraordinarily low death rate between the ages of thirty-five and fifty-four. If, on the other hand, the general paralytic population is included in the total lunatic population, this result is not apparent.

I have also pointed out that the morbid anatomy and the pathology of dementia paralytica do not differ in their essential features from those of progressive senile dementia. Further, I have suggested that the essentially syphilitic feature of the cortex in dementia paralytica is a round- or plasm-cell periarteritis which gradually becomes organised, and that the hyper-reaction of the neuroglia to dissolution of cortical neurones is probably an exaggerated reaction of repair in an individual who has for a long period suffered from the parasites or secondary toxines of systemic syphilis. I have finally shown, by a classification of the types of dementia paralytica and a comparison of these with the varieties of primarily neuronic dementia, that the two series are homologous.

On these various grounds I base my contention that dementia paralytica is a branch of mental disease. As confirmatory evidence, I have pointed out the high percentage of heredity of insanity and of parental and family degeneracy which can be obtained in cases of dementia paralytica; and I have shown that cerebral under-development occurs in certain types of this form of mental disease.

With regard to the second question, I have indicated my reasons for considering that an attack of syphilis is a necessary antecedent to dementia paralytica. I am of the opinion that the ordinary sane individual and the ordinary psychopath or potential lunatic, if possessed of cortical

neurones of average durability, may suffer from syphilis with impunity as regards the future onset of dementia paralytica ; and I consider that the same statement may be made with regard to the syphilised lunatics with little or no dementia, who are fairly common in asylums. On the other hand, I hold that a psychopath who possesses cortical neurones of subnormal durability, and who, apart from infection with syphilis, would develop a moderate grade of dementia, would, after acquiring that disease, sooner or later suffer from one or other of the types of dementia paralytica.

I think that the important feature in which dementia paralytica differs from progressive senile dementia consists in the possession, by the subjects of syphilis, of a more or less marked degree of round- and plasma-cell periarteritis of the cerebral vessels, and of a permanently enhanced capacity of reparative reaction on the part of the non-neuronic elements of the encephalon. The former of these is not peculiar to dementia paralytica, and is, I believe, evidence of present syphilis ; and the latter is, I think, the result of prolonged general syphilisation of the individual.

In both dementia paralytica and progressive senile dementia, dissolution of cortical neurones and non-neuronic reparative reaction occur *pari passu*. In the case of dementia paralytica non-neuronic reparative reaction is more or less intense, and vascular *degeneration* is relatively slight ; in the case of progressive senile dementia non-neuronic reparative reaction is relatively feeble, and vascular degeneration is relatively severe. I would illustrate this point by a coarse analogy, comparing dementia paralytica to certain types of progressive renal cirrhosis and progressive senile dementia to senile renal cirrhosis.

On these grounds I include dementia paralytica and progressive senile dementia under the common group of "progressive and secondary dementia."

CHAPTER XVI

CLASSIFICATION OF CASES OF DEMENTIA
(*CONTINUED*)

III. SPECIAL VARIETIES OF DEMENTIA

INTRODUCTION

In the case of the two great groups of "Primarily Neuronic Dementia" and "Progressive and Secondary Dementia," which have been described, dissolution or involution of the region of higher association results primarily in consequence of a more or less markedly deficient durability of the higher cortical neurones.

In the first of these groups, whilst the result may follow a mere inability to survive on the part of these neurones, the onset of dissolution is usually incited, or at any rate precipitated, by one or more of the numerous extra-encephalic causes which have already been discussed.

In the second, the result is achieved under the additional influence of certain intra-encephalic but extra-neuronic agencies, namely, affection of the cerebral arteries (as round- and plasma-cell periarteritis, arterial fibrosis and arterial degeneration), excessive reparative reaction on the part of the non-neuronic elements of the encephalon, or a combination of both these factors.

The group at present under consideration differs from both these in the fact that it includes, not a special pathological type, but the residue of the series of cases of dementia which is under description. This method of treatment has been adopted, not owing to any heterogeneity on the part of the cases included in the group, but as a matter of convenience in consequence of their relative rarity.

The group, which included thirty-eight cases only, contains three well-defined classes, which, were they considered solely from the aspect of scientific precision, might equally have been described as homologues of the groups of "Primarily Neuronic Dementia" and "Progressive and Secondary Dementia."

These classes are as follows :—

	M.	F.	T.
(*a*) Dementia following Sense-Deprivation . . .	6	4	10
(*b*) Dementia following Epilepsy	12	8	20
(*c*) Dementia following Cerebral Lesions . . .	3	5	8
Total	21	17	38

Whilst few preliminary remarks are required in the case of the second and third of these classes, a more lengthy introductory reference to that of "Dementia following Sense-Deprivation" is necessary.

Amentia following sense-deprivation, or idiocy of deprivation, is a commonly recognised type of mental disease, and is more or less fully described in the various works on psychiatry. It includes such cases of idiocy as have ensued in consequence of, or in association with, the congenital absence of one or more of the important avenues of sensation.

I have, however, met with but one author, namely Clouston, who specifically refers to the existence of what he terms "Insanity from Deprivation of the Senses." The description given by this author, being sufficiently brief for reproduction here, is as follows:—"I saw a gentleman, L—— M—— B——, some years ago, who became melancholic and suicidal coincidently with his loss of sight from cataract, and who improved greatly after the operation for removing it was partially successful, so that he could again see even in a dim way the outer world. It is very common indeed for those who are deaf to become quiet, depressed and irritable. It is also common for such persons to become subject to hallucinations of hearing, and so insane as to need to be sent to asylums. I have now at the Royal Asylum four or five such cases. It seems as if they were so cut off from social intercourse and the outer world by their deafness that their subjective experiences became objective realities to them. In the case of all men the senses correct many delusions, and the impressions from the senses, streaming in on the mental areas from the outer world, are the best preservatives of mental health." (*Mental Diseases*, 6th ed., pp. 666–7.)

It is, of course, usual to find sense-deprivation included amongst the numerous and heterogeneous "causes" of insanity. For example, the schedule of "causes and associated factors of insanity," authorised by the Medico-Psychological Association and adopted by the Commissioners of the Board of Control, contains a heading, "*Deprivation of Special Sense* —smell and taste (either or both), hearing, sight." It would, however, be difficult to decide under what heading of the authorised schedule of "Forms of Insanity" it would be possible to insert "Dementia following Sense-Deprivation"; and I have hitherto been unable to discover such a form of mental disease in any of the publications on the subject of psychiatry which have come under my notice. I am, however, convinced that the dementia which develops in certain cases of sense-deprivation is worthy of recognition as a distinct type of mental disease, and I purpose to produce my reasons for this opinion during the course of the present description.

Of the 728 cases of mental disease under description, I have classified ten under the heading of "Dementia following Sense-Deprivation." In

the majority of these cases the patient appears to have arrived at the adult period of life before deprivation of one or more of the special senses has occurred. In others, the disability (not the dementia) dates from an earlier period or from birth. In all the cases, however, mental symptoms have developed, and have been followed by a greater or lesser amount of dementia.

From the aspect of dementia alone, as more or less dissolution or involution of the region of higher association has occurred in the absence of intra-encephalic but extra-neuronic causative factors, the cases under consideration might be included under the group of " Primarily Neuronic Dementia." This course is, however, impossible, as the cerebra of these cases are *maimed* in the neuronic sense, since loss of one or more of the special senses has resulted in the development of extensive atrophic or involutive states of the respective projection spheres, and in gross functional (if not structural) modifications of the lower associational systems of the cerebrum. Further, the permanent, if non-progressive, cause, or the special type of permanent stress induced by this cerebral disability, differs altogether from the numerous and temporary, inciting or precipitating, causes which evolve the various types of " Primarily Neuronic Dementia," although, as in dementia of any kind, the primary cause, deficient durability of the higher neurones of the cortex, is common to both.

I therefore consider myself justified in describing " Dementia following Sense-Deprivation " under a special heading.

In the case of " Dementia following Epilepsy," whilst equally cogent reasons exist for the formation of a special class, these are of a very different nature.

In the section on epileptic insanity (Part II, pp. 197–206), I have produced evidence that epilepsy most frequently occurs in association with mental disease in those types of the latter in which cerebral degeneracy is most marked. I consider, therefore, that both epilepsy and amentia are degeneracies, and that the general effect of coexisting epilepsy is harmful in all types of the latter. The epileptic idiot or imbecile is more spiteful and degraded, the epileptic high-grade ament is more vicious and impulsive, the epileptic maniac is more treacherous and dangerous, and the epileptic dement becomes progressively more demented than occurs in the cases of the corresponding types of mental disease when this complicating factor is absent.

I am thus of the opinion that dementia is not a consequence of epilepsy *per se*, but that it occurs in such epileptics as possess higher cortical neurones of deficient durability. In cases, therefore, which are developing or have developed some grade of dementia, this is aggravated by epilepsy. Further, the amount of neuronic dissolution and dementia is

increased, as is often also the frequency of the fits, by the extra-neuronic reparative reaction, which is a frequent feature of cases of epileptic dementia. In such cases certain of the morbid appearances, especially the thickened and fibrous pia-arachnoid, the wiry cortical arteries, and the pial adhesions, often much resemble those present in dementia paralytica. Both the grade of the dementia and the frequency of the fits are probably also in many cases increased by the development of the small multiple thromboses which are described by Turner as common and often permanent.

Cases of "Dementia following Epilepsy" may, therefore, justifiably be provisionally considered to occupy a special group, which pathologically is midway in position between the groups of "Primarily Neuronic Dementia" and "Progressive and Secondary Dementia."

The third class of "special" dementia which is under consideration requires no justification for its position or existence, consisting, as it does, of cases which present various types of focal gross lesion of the cerebrum. In certain of the cases focal lesions occur in conjunction with dissolution of the region of higher association of any of the types which have been described. Other cases included in the class, though fairly common in asylums, do not necessarily fall into the domain of psychiatry. Focal maiming of the cerebrum, even when limited to the post-Rolandic and infra-Sylvian parts of the brain, may so affect the psychic content and so influence the processes of lower association as to make the patient, for practical clinical purposes, a gross dement, even although his region of higher association, from the neuronic aspect, is intact.

This truth is, in fact, so clearly recognised by neurologists that an influential school exists which discounts the importance of the prefrontal region of higher association, and holds that severer grades of mental impairment result from lesions of the posterior than of the anterior portions of the cerebral hemispheres. Such might be true if the notified insane persons under care in England and Wales, who amount to upwards of 138,000, were excluded from consideration!

CLASS (A).—Dementia following Sense-Deprivation

The present group contains ten cases of congenital or acquired deprivation of one or both of the senses of sight and hearing, in which a greater or lesser degree of cerebral dissolution and dementia has developed.

The cases are of various types, and, on the whole, in spite of their small number, form a fairly satisfactory series. The rarity of the type under description is indicated by the fact that the present group forms the small proportion of 2·2 per cent. of the total series of cases of dementia.

This figure is much higher than the 0·28 per cent. of such cases in the general population of East Sussex according to the Census of 1911, and it is still higher than the 0·18 per cent. for the country generally. The same detail is seen in the sub-group of "deaf and dumb," which contains three cases or 0·67 per cent., which number is much higher than the 0·05 per cent. for East Sussex, and the 0·04 per cent. for the country generally. These figures are much more significant than at first appears when it is remembered that sense-deprivation is not "mental disease," and that the onset of dementia in cases of sense-deprivation is by no means necessarily followed by certification and transfer to an asylum. Many cases, in fact, must become more quiet and tractable than they were before the development of dementia.

In spite of the rarity of this type, I hope to produce, during the following description, satisfactory reasons for classing the cases of dementia following sense-deprivation under a special heading, instead of including them amongst the cases of "Primarily Neuronic Dementia."

As will be briefly indicated, the senses of sight and hearing, especially the latter in ordinary uneducated individuals, are so necessary to, and play such an important part in, both the evolution and the conservation of the normal functions of the cerebrum, that deprivation of one or both of these senses in congenital or early cases grossly modifies, and in adult cases necessitates an entire readjustment of, the associational processes which constitute the physical basis of psychic function.

On the other hand, in modern civilised life at any rate, the senses of taste and smell play but a small part in the evolution and performance of the psychic functions. It is doubtful, therefore, if congenital or early deprivation of one or both of these senses would in any important measure influence the psychic functions; and it is probable that such deprivation, when occurring during adult life, would be unable, *per se*, to produce either insanity or dementia even in predisposed individuals, although it might take part in the determination of the special symptomatology exhibited by the sufferers when they became insane. There is no reason to suppose that partial or even total abolition of the tactile sense has any real influence on the psychic functions, except in so far as it may interfere with the proper execution of voluntary movements and thereby induce a certain amount of physical "stress."

The present group, therefore, both in fact and in intention, contains cases which exhibit deprivation of one or both of the senses of sight and hearing only.

I also exclude such cases as suffer from the various physical disabilities which interfere with the earning of a livelihood, *e.g.* the loss or maiming of limbs and the development of chronic diseases of the bones and joints. Such disabilities produce various grades of physical "stress"; and when

occurring in high-grade aments they may thereby induce mental symptoms, and when in patients who possess cortical neurones of deficient durability they may induce the onset of dementia. In the first case, a potential lunatic becomes an actual one ; and, in the second, an individual with a deficiently durable cerebrum becomes a case of " Primarily Neuronic Dementia," though naturally both conditions and results may occur in the same person.

Such disabilities do not, however, directly modify or reduce the performance of the psychic functions. Normal individuals often develop really surprising capabilities in the employment of maimed limbs, and at times the physical disability appears to act as a stimulus to the cerebrum, and to bring into activity mental powers which would otherwise remain latent. On the other hand, when these disabilities occur in high-grade aments, or in individuals with cerebra of deficient durability, they add such persons to the population of the workhouses or asylums.

In the class of cases now under consideration the conditions are different. On the one hand, the patient suffers a permanent loss of one or both of the important avenues of special sensation, and, on the other, all kinds and degrees of structural and functional impairment develop in the cerebrum in consequence of the deprivation. Not only does secondary atrophy of the particular afferent fibres to the cerebrum result, but the complex associational relations between the special projection area or areas and the rest of the cerebrum are seriously affected. The special sensori-memorial images dependent on the lost sense or senses pass more and more permanently into the sphere of the subconscious. The physical bases of even the most elementary existing (*i.e.* already experienced) percepts require readjustment to the altered conditions. Finally, the mechanism for the development of new and the correction and continuation of existing (*i.e.* already experienced) percepts, which normally involves the majority of, if not all, the projection or sensory areas of the cerebrum, together with their related memorial spheres, becomes imperfect or " maimed."

These results follow acquired blindness or deafness, but similar and more severe developmental defects exist when either of these disabilities is congenital or is acquired in early life. The psychic functions, in fact, either are very imperfectly evolved or are performed, as will be remarked later, in an entirely abnormal manner. In such cases deafness is a more serious deprivation than blindness, as for the evolution of the functional activity of the cerebrum an entirely new development of associational spheres to replace those normally employed for auditory and spoken language has to be acquired. In the case of congenital or early-acquired blindness, on the other hand, the complex sphere of language, with all its psychic components, can be employed in a perfectly normal manner

and almost exactly as it is brought into use in the case of persons who neither read nor write.

Hence cases of congenital or early-acquired deafness are more liable to imperfect mental development, with which is associated mutism, than are cases of congenital or early-acquired blindness.

Further, from the dissolutive aspect, both in the cases in which the sense-deprivation is congenital or acquired early in life, and in those in which it is acquired after adult life has been reached, cerebral involution is *a priori* more likely to occur in the case of the deaf than in that of the blind. This statement is supported by the cases which are cited later, for, of the ten, three are deaf and dumb, two are deaf, four are almost or totally deaf and blind, and only one, a well-marked high-grade ament, who had been certified for thirty-seven years, is blind.

I have laid much, and feel that I cannot lay too great, stress on the disablement or maiming of the complex processes of association which exists in the cerebra of the blind and especially of the deaf.

The whole of the higher intellectual processes depend on and develop *pari passu* with the evolution of language. Till of recent years the majority of, and even now many, individuals depend on the sense of hearing for the acquisition of the greater portion of their (human) psychic content, though persons who read and write perhaps gain an equal amount by means of the sense of sight, and the more intellectual members of the race probably acquire the greater part by means of the latter sense.

Early loss, therefore, of the fundamental (auditory) channel through which language is acquired is an almost fatal bar to cerebral evolution; and loss of the subsidiary (visual) channel constitutes a serious disability.

In an earlier chapter (Part I, pp. 113–128), I have endeavoured to indicate that language is in essence a symbolic mechanism for the integration of sensori-memorial images, and analogous, as an instrument, to the symbolic system employed by mathematicians.

The subject was dealt with at some length in order to make clear, on the one hand, how necessary for the proper performance of the cerebral functions is such a symbolic mechanism for the integration of sensori-memorial images; and, on the other, how the separate symbols of the mechanism are of psychic value solely in so far as their reproduction serves to evolve a series of processes of association, which arouse into the sphere of consciousness the varying and heterogeneous collection of sensori-memorial images, of which they may be described as the algebraic representations.

I therefore need not delay to consider the language mechanism and its relationship to the cerebral functions, but will proceed at once to the application of the principles there laid down to the subject under consideration, namely, the gross modifications of cerebral function which

are the necessary consequences of congenital or acquired deprivation of the senses of hearing and sight.

In cases of early or congenital deafness, the complex mechanism for the reception, storage, and reproduction of language—or the symbolic representation of the results of sensorial excitation and of psychic association—is incapable of evolution unless the patients are laboriously educated through other avenues of sensation. It is hardly necessary to add that mutism is a necessary consequence of early or congenital deafness, though a considerable development of lip language can often be induced by education. Such patients, in fact, unless brought up with their kind or educated by special methods, would necessarily possess mental functions relatively little removed from those of the lower primates.

I therefore feel justified in laying stress on the gross modifications of general cerebral association—with the markedly deficient mental content that is their consequence—which necessarily exist in the congenitally or early deaf, as a frequent cause of dissolution, or involution from disuse, of the region of higher association in such subjects. On the other hand, the congenitally or early blind can obtain a large and important part of their mental content by means of the sense of hearing, just as do ordinary uneducated (*i.e.* non-reading and non-writing) persons. That the former can supplement their methods for the acquisition and communication of information by means of descriptive mimicry, the deaf and dumb alphabet, etc., and the latter by means of the tactile-motor sense, do not affect the fundamental difference between them, which is based on the fact that a highly important part of the mental content is normally (in the uneducated) acquired by means of the sense of hearing and not by that of sight.

The special method of descriptive mimicry which is employed by the deaf and dumb for intercommunication with their kind is of great value as a *natural* method of education. Yearsley, however, who can speak with authority on the subject of the education of the deaf, regards this natural method as a bar to the acquisition of the *normal* method of communication, namely, automatic speech. He therefore advocates the training by experienced teachers of the congenitally or early deaf from the age of three years, in order that evolution on normal lines may not be interfered with by the prior development of replacement descriptive mimicry. Extremely good results are known to have followed systematic training, children showing when properly educated relatively little disability. Such instances of genius as Laura Bridgeman and Helen Keller will nevertheless remain isolated examples of the possible, not the probable.

Deprivation of sight or hearing, when occurring later in life, results in the educated in relatively less cerebral disability, and in probably an approximately equal amount in the case of either of these senses. In the

uneducated, however, loss of hearing produces greater cerebral disability than does loss of sight.

In all these types, however, both sensory, and also extensive and grave associational, deprivations exist: and the cerebrum, as a machine, is maimed not only in its most stable and earliest acquired regions, namely, in one or more regions of projection or sensory areas, but also throughout its intricate, later evolved, and more important (from the psychic aspect) systems of lower association.

The onset of dissolution or involution of the region of higher association in the prefrontal region therefore occurs, in such cases, under totally different causes and conditions from those which induce dementia of the "primarily neuronic" and "progressive and secondary" types; and I therefore feel justified in classing cases of dementia following sense-deprivation under a special heading.

In congenital cases the onset of involution of the region of higher association, with the resulting dementia, whilst due to a deficient durability of the neurones which it contains, is eventually incited by the stress of prolonged sense-deprivation and the consequent abnormal modes of cerebral association which result. In other words, the abnormally working psychic machine sooner or later breaks down.

In persons who acquire sense-deprivation later in life, the mental stress involved on the one hand in the sense-disability, and on the other in the more or less unsuccessful attempts to revive the related memories, which tend to pass more and more into the permanently subconscious, or to replace the absence of these memories by the integration of percepts and concepts on an unusual sensori-memorial basis, often, or perhaps invariably, results in the development of irritability, or depression, or general emotional instability. In cases like that cited by Clouston, partial removal of the sense-deprivation by operation may result in a return to normal psychic life. In the case, however, of individuals who possess higher cortical neurones of deficient durability, insanity followed by dementia ensues.

In such cases the symptomatology which is presented, and the period of life at which the morbid process makes its appearance, depend on different factors. The symptomatology exhibited depends on the one hand on the nature of the sense-deprivation, and on the other on the psychic configuration of the particular subject. The period of life at which insanity followed by dementia occurs depends on the duration and the severity of the mental stress produced by the sense-deprivation, and on the resistance presented by the higher cortical neurones. Examples of the dementia following sense-deprivation may, therefore, presumably occur which form the homologues of any of the four classes of "Primarily Neuronic Dementia," namely the premature, the mature,

the presenile and the senile. That this presumption is correct is suggested by the fact that the ages at which mental symptoms first appeared in the ten cases which are cited later, were respectively 16, 27, 28, 28, 30, 37, 42, 50, 53, and 74 years. Three of the ten cases were discharged and recertified one or more times. The ages of certification in the present, and in seven cases the only, attack are as follows :—Five cases were aged between 28 and 37 years, three were aged between 50 and 54, one was aged 62, and one was aged 74. I do not wish these figures to be regarded as other than suggestive, owing to the fact that several of the histories are imperfect.

As will be evident during the description of the cases included in the group under consideration, the grade of dementia which is present is very different in the several individuals. Though the actual dementia depends primarily on a deficient durability of the higher cortical neurones, the probability that the sufferers would not necessarily have become insane in the absence of the sense-deprivation causes the type and degree of the sense-disability which is present to be important exciting factors as regards the grade of dementia which is induced.

On the whole, though each case requires consideration on its merits, deafness is a more important disability than blindness, for, of the ten cases, nine are partially or totally deaf, and only five are partially or totally blind.

Three of the cases are deaf and dumb. All these exhibit definite dementia ; and in two of them it is well marked.

Two of the cases are deaf. In the one, the deafness is total, there is considerable dementia, and the patient, who had been certified for twelve years and had shown symptoms for sixteen years, has gradually forgotten how to speak in an articulate manner. This symptom is worth noting, as it is so often misunderstood and misinterpreted. In the other of the deaf cases, the deafness is marked but not total, and the patient has developed a mild degree of dementia during her year of residence.

Four of the cases are partially or totally deaf and blind. In two of these the deafness and blindness are total, there is no hyper-activity of the tactile sense, and there is well-marked dementia. In one case the deafness is total and the blindness is almost total, the disability developed relatively early in life, there is marked hyper-activity of the tactile sense, and there is very little dementia. In one case the blindness is total and the deafness is almost total, the disability developed relatively late in life, there is no hyper-activity of the tactile sense, and there is definite dementia.

The final case is totally blind, and is a marked high-grade ament who has been certified for thirty-seven years (since the age of twenty-eight). She exhibits no hyper-activity of the tactile sense, she has gradually

forgotten how to speak in an articulate manner, and she shows much dementia.

It is evident, therefore, that, whilst deafness markedly overshadows blindness as a causative agent in dementia, the latter disability becomes of importance if it is not replaced by hyper-activity of the tactile sense.

There is no evidence that mere duration of the sense-disability has a direct influence on the grade of dementia.

The cases included in the group under consideration will now be summarised, with especial reference to the question of symptomatology. For convenience, they will be considered under four headings.

(1) *Deaf and Dumb*

Case 691.—Male, æt. 31, single, engraver. Previous attack. Father insane. High-grade ament and developing dementia.

Case 692.—Male, æt. 33, single, working jeweller. Showed symptoms for some years before admission. High-grade ament. Has developed more dementia than Case 691.

Case 693.—Male, æt. 64, single, cooper. Epileptic; previous attacks since the age of 42. Paralysis on paternal side. High-grade ament, and of less original intelligence and education than Cases 691 and 692. Is developing cerebral involution and dementia.

Remarks.—All the cases are high-grade aments. The mental symptoms exhibited are those of dementia. None of the cases show irritability, excitability or stubbornness. It is probably an environmental accident following inability to earn a livelihood that any one of these cases is an inmate of an asylum.

(2) *Deaf*

Case 694.—Male, æt. 46, married, plasterer. Certified twelve years, and showed symptoms for four years previously. Mother very deaf. Is poorly educated, and has largely ceased to speak in an articulate manner, under the influence of deafness and slowly progressing cerebral dissolution. Is garrulous, excitable, irritable, and quarrelsome, and exhibits a moderate grade of dementia.

Case 695.—Female, æt. 54, widow, laundress. Certified one year. Is practically deaf. Is irritable, unstable, bad-tempered and quarrelsome. Is solitary and moody. Suffers from severe hallucinations of hearing and delusions of persecution. Has developed some, but relatively little, dementia.

(3) *Deaf and Blind*

Case 696.—Male, æt. 65, single, milkman. Certified eleven years. Previous attacks at the ages of 54, 53, and 50. Showed symptoms at the age of 16. Scarlet fever at the age of 25. *Is quite deaf and practically blind.* Is irritable, excitable, and quarrelsome. Exhibits marked hyper-activity of the tactile sense. Shows remarkably little dementia, considering his age and his severe sense-deprivation. This is probably largely due to the adult onset and the long duration of the sense-deprivation, and to the employment of the tactile sense.

Case 697.—Male, æt. 45, single, farm labourer. Certified eight years.

Is stated to have had fits from birth. *Is quite blind and quite deaf.* Is irritable and stubborn. Is probably of originally low intelligence. Has developed a well-marked grade of dementia.

Case 698.—Female, æt. 81, married, housewife. Certified seven years, and was previously in a workhouse. *Quite blind and very deaf.* High-grade ament. Irritable, unstable, and excitable. Probably originally possessed more intelligence than Case 697 and less than Case 696. Has developed considerable dementia, but much less than Cases 697 and 699.

Case 699.—Female, æt. 57, single, of no occupation. Certified seven years. *Quite blind and quite deaf.* High-grade ament. Is irritable, excitable, resistive, and spiteful. Speech largely unintelligible. Is probably of decidedly deficient original intelligence. Has developed much dementia. Resembles Case 697, but is more maniacal.

Remarks.—All the four cases are irritable and excitable. Cases 697 and 699, who are quite blind and quite deaf, and who are probably both of originally defective intelligence, have developed a well-marked grade of dementia. Case 698 is quite blind and very deaf, is a high-grade ament, and has developed considerable dementia, but less than Cases 697 and 699. Case 696 is quite deaf and practically blind. He has developed remarkably little dementia, and exhibits marked hyper-activity of the tactile sense, in this resembling an ordinary blind man.

(4) *Blind*

Case 700.—Female, æt. 65, single, of no occupation. Certified thirty-seven years. Is quite blind. High-grade ament. Speech, except at times, quite unintelligible. This is probably due to the combined influence of blindness, mental degeneracy, prolonged residence in an asylum, a constant habit of talking to herself, and dementia. She is irritable, excitable, resistive, and quarrelsome, and she exhibits much dementia.

General remarks.—It may be pointed out that, with the exception of the three deaf and dumb cases, all the examples of sense-deprivation which have been referred to are irritable, excitable and unstable. It is therefore probable, as has already been indicated, that these symptoms arise in consequence of the stress involved in the loss of a sense or senses which have already been employed, and in the more or less unsuccessful attempts of the sufferers to revive the related memories, which tend to pass more and more into the permanently subconscious, or to replace the absence of these memories by the integration of percepts and concepts on an unusual sensori-memorial basis. On the other hand, in congenital or very early cases (deaf and dumb), either the mental content is extremely defective, or abnormal modes of psychic association have gradually been evolved, and consequently such symptoms of "stress" do not arise. It is in the younger congenital or early cases (deaf and dumb) that descriptive mimicry is a well-marked symptom. As such get older they become quieter, and when, as in the three cases cited, they have developed dementia, the symptom is practically gone. The close study of such congenital or early cases invariably discloses a very defective mental content, even in patients who develop dementia. In the

most marked examples, as has been stated, dementia is not to be expected, as the psychic functions are anthropoidal in grade.

Illustrative examples of the group of cases under consideration will now be inserted; and as I consider the subject to be of very great importance, I propose to insert the whole of the ten cases which are included in the group.

These are as follows:—

(1) Deaf and Dumb, Cases 691–3

Male, æt. 31; *Deaf and Dumb; High-grade Ament; certified ten months; Former attack of a Year's Duration, two and a half years ago; Definite Dementia*

Case 691.—T—— A—— J——, male, single, engraver, æt. 31. Certified ten months. Was previously sent to an asylum two and a half years ago, and remained there for twelve months. Father insane. Notes taken four days after his admission.

Patient is deaf and dumb. He exhibits considerable facial asymmetry, the right side of the face being the larger. He has a dull and despondent expression, and unless notice is taken of him he shows little interest in his surroundings. When his attention is drawn to written questions he at times understands them if they are written in a simple manner, and also at times writes replies. He, however, understands the questions much better if they are slowly written letter by letter, in which case he appears to spell them to himself (by translation into the deaf and dumb alphabet) as they appear on the paper. He is decidedly feeble-minded, and his vocabulary is very limited. He soon gets fatigued under examination, and his attention is difficult to retain. He appears to have no desire to reply to questions in the deaf and dumb alphabet, and pays little or no attention when it is performed in his presence. On the other hand, he can be stimulated to attend to the writing of questions, and in some instances to indite replies, which are written in a slow and halting manner. These replies are fairly grammatical, but very little attention is paid to such details as capitals and stops.

The following are some of the questions which were put to him together with his replies:—

What is your name? "T—— A—— J——."

What work have you done? "engraver is my trade"

How much a week? "I last earned £1 10 4½"

When did you leave work? "last October 14th, 1902." (He was admitted to an asylum on the day following this date.)

Why did you leave? "I did not feel well"

Were you miserable, and if so why? "I was rather dull."

Had you any strange fancies? "What is it"

When "*ideas*" and "*thoughts*" are written in place of "fancies," he does not reply, but shakes his head.

I saw something about Satan on the papers sent with you. What was it? "I have a trouble as I am deaf and dumb as I hardly understand"

Does the word "Satan" mean anything to you? "My deaf and dumb people called me Satan I could not understand what is Satan"

Did they call you "Satan" by the deaf and dumb alphabet on their hands?
"Yes"

During the eighteen months he was under observation he exhibited not the slightest mental change unless in the direction of increased dullness. He was, however, a useful worker.

Male, æt. 33; Deaf and Dumb; High-grade Ament; certified one year; Symptoms for four years previously; Well-marked Dementia

Case 692.—W——R——, male, single, working jeweller, æt. 32. Certified one year, and had shown symptoms since the age of 27. Notes taken two days after admission.

Patient is deaf and dumb. Hair greyish-black with several white patches. Palate high; tongue points to the right when protruded. Right naso-labial fold present, left absent. He has a wide-awake appearance as regards the eyes, but his face is expressionless when in repose. He is emotional, being at times rather depressed and at others mildly excited. He occasionally laughs in a foolish manner. He takes practically no interest in his surroundings, and it is difficult to attract his attention, and still more difficult to retain it even for a few moments. He is able to read, and seems to understand written questions, but he can rarely write a satisfactory reply even to the simplest. He has obviously possessed some considerable degree of intelligence and education, as when he is presented with the written question: "Where are you?" he writes in reply: "I am in an asylum." When asked where he has come from he writes, after an interval, the first letter of the name of his last asylum, and then stops. When asked when he came, he writes: "I come," and again stops. When asked the day (Monday), he puts down a "T," and half writes a second letter. He then makes several attempts at commencing a reply to a question as to why he is in an asylum, but does not get a single letter written. To the question put in a different form he attempts no reply. When asked if he has always been deaf and dumb, he writes, "No." When, however, he is asked how long he has been deaf and dumb, he does not write a reply to this question, but first crosses out the "No" he had answered to the previous question, and then re-writes it. To further questions he makes no response, but he continues to try to read the notes I am writing, apparently more because he has hitherto been reading my questions than from curiosity. He gives one the impression that he reads and understands what is placed before him, but he is either incapable of thinking of, or unable to initiate, a reply. He invariably smiles in response to a smile. He exhibits much mental hebetude, and during examination he in not a solitary instance initiates any motor phenomenon beyond an occasional foolish laugh.

Whilst under observation he continued dull, listless, uninterested in his surroundings, and quite unemployed.

Male, æt. 64; Deaf and Dumb; Epileptic; High-grade Ament; certified two years; Previous attacks at the ages of 60 and 42; Well-marked Dementia

Case 693.—S—— H——, male, single, cooper, æt. 64. Certified two years. Previous attacks at the ages of 60 and 42. Epileptic. Paralysis on paternal side. Notes taken two days after admission.

Patient is deaf and dumb, and is stated to suffer from epilepsy. He is an

old man of pleasant appearance, who smiles in a knowing way. He at once writes replies to written questions. The following are examples of these :—

What is your name ? " S—— H—— "

What age ? " born 1837 cooper at C——with my father when he dead but doctor take me up here "

How long have you had fits ? " but born 1837 october at C—— with my parents deaf and dumb asylum 10 years but holiday every summer at with my father."

FITS ? " forgot all away last 10 years time but any (? my) Sister can tell you about me all right "

What day to-day ? " September 23 " (correct), adding what appears to be " sheep farm 21 " or " sleep fair 21 " (he was admitted on September 21st).

What a week did you earn as a cooper ? " the same with my father about 10 years then he dead out away but doctor Turner Take me up to L—— . . . (?) . . . mary nimon "

The above replies indicate an originally defective intelligence, some degree of inattention to the questions asked, and a certain amount of mental decadence. The defective composition of the replies, and also the misplaced and missing capitals, and, except in a solitary instance, the absence of stops will be noted. The spelling, on the other hand, is correct.

Whilst under observation he was dull, apathetic, uninterested in his surroundings, and unemployed, though he was able and willing to attend to his own wants.

(2) Deaf, Cases 694–5

Male, æt. 46 ; Deaf ; certified twelve years ; Symptoms for four years previously ; Mania ; Forgetting how to Speak ; Moderate Dementia

Case 694.—D——H——, male, married, plasterer, æt. 46. Certified twelve years, and had shown symptoms since the age of 30. Mother very deaf. Notes taken four days after his admission.

Patient is a happy-looking and very garrulous man, who looks and speaks in a childish manner. He is almost completely deaf. He talks rapidly about himself and his work, but pronounces his words very badly. He states whence he has come and when he was admitted to that asylum. As far as can be understood, he speaks quite intelligently. He acknowledges that he is at times excited, but he speaks so quickly, and the words are so imperfectly articulated and so rapidly pronounced, that it is not always possible to understand him. As he cannot hear, or, at any rate, cannot be got to understand questions, these have to be written down. When asked his name in this manner he writes : " Mr. D—— H—— from the Parrash of C—— near E——" When then asked if he worked at his previous asylum, he insists on writing down this reply also, as follows : " at times at Cleaning han Bead Making han hother odde Jobs " His writing is halting and of an uneducated and self-acquired type. It is obvious that, owing to his inability to hear his own voice, his articulation has gradually degenerated until his speech has become almost unintelligible. At the same time he speaks unusually rapidly, and, frequently, his phrases become little more than gibberish. In other words, in consequence of his deafness, together with his chronic mania, he has gradually ceased to be able to speak properly.

Whilst under observation he remained garrulous, excitable, irritable, and quarrelsome. He was a useful ward helper.

Female, æt. 54 ; *almost totally Deaf ; certified one year ; Mania ; Hallucinations of Hearing ; Delusions of Persecution ; Mild Dementia*

Case 695.—S—— C—— D——, female, widow, laundress, æt. 54. Certified one year. Notes taken on the day after admission.

The patient shows no obvious stigmata of degeneracy. Her palate is high. There are skin-cracks on the abdomen. The breasts are normal, but the patient states that the right was " gathered " on two occasions.

The patient is totally deaf on the right side, and very deaf on the left. She uses an ear-trumpet in the left ear, and with this can, though with difficulty, hear what is said to her.

She is of intelligent appearance, and readily answers questions and volunteers information about herself. She knows where she is, and states that she long ago read in the papers about this (new) asylum. She knows the day, and gives the date correctly by reckoning forwards from last Sunday, the date of which she remembers. She informs me correctly when she went to her previous asylum. Before going there she began to think that people did things to try to get into her sister-in-law's house, in which she resided. She also thought that some of the things in the house were changed whilst she was out. She has heard curious noises in her ears for a considerable time. Some four or six weeks before leaving her sister-in-law's for the asylum, she had a quantity of wax removed from her ears. Since this operation was performed the noises have sounded more plainly, and she is therefore sorry now that it was done. The noises sound " like a lot of steam and water rushing." Whilst at her sister-in-law's house, which was near the police station, she asked whether there was a prison there, and if the noise was caused by the prisoners. Whilst in her previous asylum she slept badly. She " used to be awakened at night by people talking and ill-using other people—a young man or young girl calling out ' mother '." She heard this every night at G—— Asylum. Last night she heard a curious " noise " here. " I don't know what it sounded like." She thinks it probable that these noises and voices are produced " for annoyance, but I don't know who."

Whilst under observation the patient was a good and useful worker, particularly at sewing. She was irritable, unstable, bad-tempered and quarrelsome. She was solitary and moody, but tidy and careful of her appearance.

(3) Deaf and Blind, Cases 696–9

Male, æt. 65 ; *Deaf and practically Blind ; certified eleven years ; Previous Attacks at the ages of* 54, 53, *and* 50 ; *Symptoms at the age of* 16 ; *Hyper-activity of the Sense of Touch ; Mania ; very little Dementia*

Case 696.—J—— M——, male, single, milkman, æt. 65. Certified eleven years ; previous attacks at the ages of 54, 53, and 50 ; showed symptoms at the age of 16 ; had scarlet fever at the age of 25. Notes taken on the day after admission.

Patient is quite deaf and practically blind. The right pupil is occluded, and there is a marked corneal opacity on the inner portion of the left cornea. He appears to see slightly through the outer portion of the left eye. Palate narrow. Eyes close together.

Patient is a vacant-looking man, who appears to be some years younger than his stated age. He informs me that his name is G—— M——. He

indicates that he can see very slightly with the outer part of the left eye and not at all with the right. He tells me that his eyes have been operated on three times. He informs me, "I don't know what to say," as, owing to his deafness, he cannot hear questions. He squints and turns his head round, as I am sitting on his right side, in order to try to get a glimpse of me, and tries to get me to understand clearly that he cannot communicate with me owing to his deafness and blindness. He points out that he has no pain anywhere, and endeavours in every way in his power to supply me with information about himself. When I touch his mouth he opens it, puts out a tremulous tongue, and tells me that he possesses only eight teeth (correct). He responds to the slightest tactile suggestion. When I open one of his shirt buttons he takes off his shirt, lies down flat, keeps on breathing deeply during my examination of his chest, and then puts his shirt on again. He shows much more intelligence than is exhibited by most patients possessed of the ordinary faculties, and is both very anxious to do what he thinks I require, and very smart over its performance.

Whilst under observation he was unemployed owing to his sense-deprivation, but could find his way about and look after his own wants. At times he became excited and quarrelsome, and he was, as a rule, irritable and unstable, and liable to fall out with anyone in contact with him.

Male, aged 45 ; *Deaf and Blind ; said to have had fits since birth ; Probable High-grade Ament ; certified eight years ; Mania ; Much Dementia*

Case 697.—T—— G——, male, single, farm labourer, æt. 45. Certified eight years. Is stated to have suffered from fits since his birth. Notes taken four days after admission.

Patient is quite blind and quite deaf. External strabismus. The right side of the face exhibits more puckers than the left.

He is a dull-looking man of fatuous aspect. He breathes heavily. It is quite impossible to communicate with him except by tactile suggestion. He is very dull and slow in his movements. He reacts to stimuli in a dull and listless manner. If his coat is half taken off he will complete the process. If his coat is given to him and an arm is inserted into a sleeve, he will then put on the coat. He will completely, though very slowly, dress himself if his socks are given to him and the rest of his clothes are placed near him. He is clean in his habits and he feeds himself. He is at times irritable and stubborn. For example, he always endeavours to begin his meals as soon as the food is placed before him and before grace is said, and he resents being made to wait. This is obviously caused by his inability either to see or to hear what is going on around him.

Female, æt. 81 ; *Blind and very Deaf ; High-grade Ament ; certified seven years ; previously in a Workhouse ; Mania ; Considerable Dementia*

Case 698.—A—— D——, female, married, housewife, æt. 81. Certified seven years, and was previously in a workhouse. Notes taken three days after admission.

A pleasant-looking old woman. Her forehead is narrow and receding, and she is quite blind and very deaf. She gives her name, and states that she has been twice married. She says that she was 78 years of age on the 11th of May last. She states that she came here the day before yesterday (three days ago), and that the day was Thursday (correct). The present day

is Sunday (correct). She persists that she has only been here two days, and even alters the day of her admission to Friday (incorrect) from Thursday (correct) in order to make the latter agree with it. She has come from "H—— Hospital, and some said Asylum. I don't know which, for I can't see and can't tell you." She was there for more than six years and went in a February (correct). She thinks that she was put there, "as I had a fever and didn't know what I said . . . I never told a story the whole time, and behaved myself . . . I gave a penny to one, and twopence to another, and sweets to another." She acknowledges that when she was first taken to H—— Asylum she was excited.

Whilst on the way to this asylum, both in the train and elsewhere, she gave away everything she possessed.

During the period that she was under observation, she was usually a decent and well-behaved old woman, who gave away everything in her possession or that she could get hold of. She was, however, irritable and unstable, and she frequently lost her temper and became excited. She was unemployed owing to her age and sensory defects, but she was able to do a good deal for herself.

Female, æt. 57; Deaf and Blind; High-grade Ament; certified seven years; Speech largely unintelligible; Mania; Much Dementia

Case 699.—E—— S——, female, single, of no occupation, æt. 57. Certified seven years. Notes taken on the day after admission.

Corneæ occluded by thick leucomata. Right pupil pin-point and immobile, and left pupil invisible. Very little hair on the pubes. Abdomen covered with skin-cracks. Breasts very large. As the patient is a very stout woman, the skin-cracks do not necessarily indicate a former pregnancy, although they are suggestive of this.

The patient is quite blind and totally deaf. She is an excitable and spiteful old woman, who speaks quite unintelligibly and in an explosive manner. She is very sensitive too, and strongly resents any attempt to touch her. She shrieks and yells when an endeavour is made to examine her, and she strikes out blindly in all directions. She shouts out something which one interprets as "Can't you be quiet?" She several times loudly passes large quantities of wind *per rectum*.

When undressed last night she struggled violently with the nurses, and told them that a policeman was coming for them. She also remarked, "You must not terrify poor Lizzie."

Whilst under observation this patient continued excitable, spiteful, and resistive. She fed herself, but did nothing else.

(4) Blind, Case 700

Female, æt. 65; Blind; High-grade Ament; certified thirty-seven years; Speech, except at times, quite unintelligible; Mania; Much Dementia

Case 700.—E—— P——, female, single, of no occupation, æt. 65. Certified thirty-seven years. since the age of 28. Notes taken on the day after admission.

Pupils entirely occluded by leucomata. Palate high and broad. A beard and moustache of moderate dimensions. Red œdema of the feet.

The second toe of each foot is small, and lies on the dorsal surface of the adjoining toes. Skin-cracks on the abdomen.

The patient is an old woman of dull and fatuous aspect, who lies with her eyes closed and mutters to herself in an entirely unintelligible manner. Such words as, or words resembling, "Lord," "devil," "you know," "I know," can be made out. When asked her age, she remarks, relatively clearly, "Don't you be a fool." Every now and then she laughs to herself at something she says. She rarely or never takes notice of what is said to her, and her attention cannot be retained. She has obviously forgotten how to pronounce, or has ceased to be able to pronounce, words properly, except by accident—perhaps in consequence of her blindness, her habit of talking to herself, and her prolonged residence in an asylum.

She strongly resents any attempt at physical examination. She eats bread and butter, but feeds herself with her fingers. She is irritable and quarrelsome and resistive, and she is often excited. She is very dirty in her habits, and she is unable to attend to her own wants.

Whilst this patient remained under observation, her condition continued quite unaltered.

CLASS (B).—Dementia following Epilepsy.

Large numbers of epileptics exist amongst the general population, and are not specially prone to the development of dementia; and in my experience dementia following epilepsy is much less common in asylums than is generally supposed. It is probable that the very frequent use of sedatives is largely responsible for the idea that dementia and epilepsy commonly run together.

In accordance with this opinion, the present group contains but twenty cases of "Dementia following epilepsy." Of these, twelve are of the male, and eight are of the female sex.

As has already been indicated both in the introduction to this chapter and in the chapter on "Epileptic Insanity" (Part II, p. 198), epilepsy occurs most frequently in association with mental disease in those types of the latter in which cerebral degeneracy is most marked. This remark is illustrated by the following table, which shows the percentage of epilepsy in certain divisions of the 728 cases under consideration:—

	Number of Cases.	Percentage of Epilepsy.
Low-grade amentia (idiocy and imbecility)	94	37·2
High-grade amentia	189	12·7
Dementia	445	4·5
Total	728	10·9

I regard both epilepsy and amentia as degeneracies, and consider that the general effect of co-existing epilepsy is harmful in all types of the latter. The epileptic idiot or imbecile is more spiteful and degraded, the epileptic high-grade ament is more vicious and impulsive, the epileptic

maniac is more treacherous and dangerous, and the epileptic dement becomes progressively more demented than occurs in the cases of the corresponding types of mental disease when this complicating factor is absent.

I have produced evidence that epilepsy may occur in association with *any grade* and even with *any type* of amentia. Though, for convenience, cases of amentia associated with epilepsy have been grouped separately under low-grade amentia (Part II, p. 167), and as a special group of "Epileptic Insanity" (Part II, p. 200), it would have been possible to have scattered them throughout the various types of amentia which have been described. Certain cases of insanity and epilepsy might be included in the group of "excited and 'moral' cases," large numbers of cases of insanity with epilepsy are "recurrent," the alternation of typical hysterical attacks with true epileptic fits has been referred to under "high-grade amentia with epileptic mania," and, finally, certain cases which, in the absence of fits, would be classed under "paranoia," are illustrated by Case 237 under "higher-grade amentia with epileptic mania" (p. 203).

The coexistence of epilepsy and mental disease, however, so profoundly modifies the course of the latter, and so modifies its symptomatology in the case of the higher grades of amentia, as to necessitate the inclusion of "epileptic insanity" as one of the types of amentia, unless as an alternative "amentia with epilepsy" and "amentia without epilepsy" were considered quite separately. This, though a possible, is not a desirable, clinical classification, because the majority of the examples of the higher grades of amentia, when associated with epilepsy, exhibit a sufficiently characteristic symptomatology to enable them to be classed under the term "epileptic insanity."

The facts above cited may, in other words, be regarded rather as evidence of the unity of mental disease than as indicating the desirability of regarding amentia with epilepsy and amentia without epilepsy as separate divisions of a general group of amentia.

A similar line of argument may be applied to the subject of dementia. I am of the opinion that dementia following epilepsy is not a consequence of epilepsy *per se*, but that it occurs in such epileptics as possess higher cortical neurones of deficient durability. Owing to the existence of certain general and local extra-neuronic but intra-encephalic morbid states, which result in the development of a *progressive* dementia, in some cases closely resembling that of dementia paralytica, examples of dementia following epilepsy form a fairly definite clinico-pathological group. As in the case of "amentia with epilepsy," so in that of "dementia following epilepsy," the epilepsy, however, merely accentuates the mental state and does not evolve anything new. The majority of

the cases of " dementia following epilepsy " are examples of " primarily neuronic dementia " of the " senile," " presenile," " mature," or " premature " forms, in which epilepsy is a concurrent phenomenon. A few are examples of " progressive and secondary dementia " of either the " senile " or the " paralytic " form.

In the case of the latter (dementia paralytica) of these, owing to its syphilitic etiology and consequent individual course, the epileptic cases are included (in intention though not in fact, as the small number of cases of dementia paralytica does not happen to contain an example of the epileptic form), as are all the other (and non-epileptic) types from the imbecile to the " normal."

In the case of the former (progressive senile dementia) of these, on the other hand, this course has not been adopted, since there is nothing especially characteristic in progressive senile dementia beyond the inevitably progressive nature of this type, and the senility of the cerebra and of the cortical arteries of the sufferers. Cases of " Dementia following Epilepsy " are thus conveniently grouped together under a special heading.

Few remarks are needed with regard to the cases included in this group.

The twelve cases of the male sex commenced at the respective ages of **12**, 15, **16**, 17, **18**, **25**, 27, 28, 31, **32**–, 38, and 39–. The first of these was an imbecile (slight low-grade amentia), and the others in heavy type were high-grade aments. Of the twelve cases, nine were single and three were married, the latter being those commencing at the ages of 18, 27, and 28 respectively.

The 8 cases of the female sex commenced at the respective ages of **14**, **24**, **24**, **31**–, 31, **42**, 46, and 48. Those in heavy type were high-grade aments. Of the 8 cases, 6 were single and 2 were married, the latter being those commencing at the ages of 31 and 48 respectively.

With regard to the symptomatology of " Dementia following Epilepsy," I have again and again been impressed by the difficulty of distinguishing between cases of ordinary primarily neuronic dementia and cases of epileptic dementia, *in the absence of a history of epilepsy*. This remark especially applies to cases of premature dementia, as the majority of examples of epileptic dementia occur before maturity.

The chief distinguishing feature, when a series of cases is analysed, is the profound grade of the dementia which occurs in cases suffering from epilepsy. Such cases, in fact, had they not suffered from epilepsy, would probably have become ordinary examples of primarily neuronic dementia. Under the influence of epilepsy, however, the dementia, instead of remaining stationary when at the most it has advanced to the moderate grade, progresses until it becomes gross.

Whilst alcoholic cases frequently exhibit a well-marked degree of dementia with extreme mental hebetude and great loss of memory, they differ from cases of epileptic dementia in being, as a rule, useful mechanical workers, who suffer from a more or less general maiming of the cerebrum, instead of an extensive dissolution of the region of higher association with less marked affection of the regions concerned with the processes of lower association.

As a rough criterion of the severity of the grade of dementia which exists in epileptic cases which have developed dementia, it may be remarked that of the 12 males, 9 were unable to work, 2 were ordinary workers, and one could do a little work; and that the whole of the 8 female cases were incapable of employment.

The following table, which for convenience is inserted here, very roughly but graphically illustrates the relative severity of the grade of dementia in the several types of cerebral dissolution which I have included under the general heading of Dementia :—

Type.	Total.	Workers.	Refuse to Work.	Unable to Work.	Percentage Unable to Work.
Primarily neuronic dementia—					
Premature	112	64	15	33	29
Mature	60	42	11	7	12
Presenile	65	35	13	17	26
Senile	123	57	10	56	46
Progressive and secondary dementia—					
Dementia senilis . . .	24	4	—	20	83
Dementia paralytica . .	23	10	4	9	39
Dementia following sense-deprivation	10	3	—	7	70
Dementia following epilepsy .	20	3	—	17	85
Dementia following cerebral lesions	8	2	—	6	75

It will be noted that the proportion of non-workers is about the same in the groups of " progressive senile dementia " and of " dementia following epilepsy," and that it is little inferior in the groups of " dementia following sense-deprivation " and " dementia following cerebral lesions."

The following 7 cases of " Dementia following Epilepsy " are inserted as illustrative examples of the group under consideration :—

Imbecility with Epilepsy; Premature Dementia; Male, æt. 22; duration of retrogressive symptoms ten years

Case 701.—A—— T——, male, single, of no occupation, æt. 22. Certified two years. An illegitimate child. Epileptic since the age of two years, and showed mental symptoms at the age of twelve years. Notes taken four days after admission.

A very dull and phlegmatic man, who appears to be about 16 or 17 years of age. When the attendant is asked if the patient has had any fits, the latter replies: "I ain't got nothing in here," and smiles fatuously, adding, "No more fits, never take them things." He gives his name, and states that his age is 21. When asked to write his name, he does this in the slow and careful manner referred to in the chapter on "Premature Dementia," and also writes the surname first, and then the Christian name afterwards on the next line. When asked whether he had been to school, he replies, "Got put in H—— Asylum and had to do school along with 'em." He says that he has done nothing since he left school. When he is then asked about his fits he says, "I don't take 'em now," and adds, "I took fits for years; none for eight years; had 'em right on my life till then." He remarks that his mother wanted to kill him, but didn't dare to do it, and that his father also wanted to kill him with a poker. "I didn't want that thing; he ain't what I call a father; he's only a step-father to me." He does not know where he is. He came "when them men came; last week I think." He states that the day is "Thursday or else Friday" (Monday). He was at his previous asylum four or five months, "That's all I was down there" (nearly two years).

Whilst under observation the patient was unable to occupy himself, but was clean in his habits.

High-grade Amentia with Epilepsy; Premature Dementia; Male, æt. 27; duration ten years

Case 703.—C—— J——, male, single, of no occupation, æt. 27. Certified ten years, and showed symptoms for some months previously. Notes taken four days after admission.

A dull-looking man, with a narrow peaked forehead and a rough skin. Convergent strabismus. He has a habit of performing washing movements with his hands as he sits. He gives his name in a slow drawl, and when asked his age replies, "I ain't sure of the age." He writes his name in the slow and careful manner already referred to as characteristic of premature dementia. He knows neither where he is nor where he has come from. He apparently has no recollection of the name of the asylum from which he has been transferred: at any rate, he states that he has not heard the name before, when it is repeated to him. He knows neither the day nor the date. When asked about fits he replies, "I hev had 'em," and states that he does not know when.

He feeds himself, and can partly dress himself. He knows the way to the lavatory, and at times walks about the ward. He is entirely unemployed. He is occasionally shaky on his legs.

Whilst under observation this patient remained quite unchanged.

Epilepsy ; Premature Dementia ; Male, æt. 24 ; *duration seven years*

Case 704.—A—— E——, male, single, of no occupation, æt. 24. Certified some months. He first showed symptoms at the age of 17, about which age his fits began. Notes taken five days after admission.

A dull man of childish appearance. Several old scars on the forehead. Pupils large, and react normally. Left slightly larger than right. He gives his name, adding a second Christian name, and states that his age is 24 on his next birthday. When asked when he came here he replies, "We all came together between a week and a fortnight." He, however, knows the present day and the day on which he came. He calculates the interval between Thursday and Tuesday to be seven days. When asked about his fits he indicates that they are mild, as follows : "There's nothing to say of 'em, if I was to have one." He states that he was only a fortnight at his previous asylum. He says that before he went there he hawked fruit, but has no idea when that was. He says that he intends to continue this occupation when he leaves the asylum. He went to school when he was "a little nipper," and got into the "highest standard." He says (incorrectly) that he can read and write well. His attempts at arithmetic are as follows : $12 \times 11 = 24$; $7 \times 9 = 64$; $8 \times 5 = 40$; $7 \times 6 = 42$; $12 \times 11 = 64$; $5 \times 9 = 64$; $8 \times 11 = 56$; $4 \times 3 = 12$; $9 \times 2 = 24$; $4 \times 2 = 8$. It is, therefore, quite clear that he has at one time learned, but has forgotten, the multiplication table. He says that he did no work at his previous asylum, but he thinks that "If I were asked to do it I should hev to it, I dare say."

Whilst under observation this patient looked after himself. He never did, or attempted to do, any work. He occasionally used to pick up a newspaper, but did not seem to be at all interested in its contents.

Epilepsy ; Dementia ; Male, æt. 66 ; *certified twenty-seven years*

Case 707.—A—— G——, male, married, occupation unknown, æt. 66. Certified thirty-nine years ago for the first time. Notes taken four days after admission.

A dull, heavy, and depressed looking man. His forehead is covered with vertical and horizontal wrinkles. He appeared to take no interest in his surroundings, and sits down without looking at me. Whilst being examined he incessantly turns his hat round and round. He gives his name as, "J—— W——, from L——" (both these names are unknown). His age is "very near 60." Where are you ? "Three corners off Old Road" (name unknown). When the name of the asylum from which he has come is mentioned to him, he does not recognise it, and adds, "I heard some talk of such a party . . . and three more besides." What time of year is it ? "12 o'clock" (3 P.M.). He says that he has not yet had his dinner to-day. He recognises one of the attendants as the man who "keeps the stores." When he is asked who another is he replies "B——r if I do."

As a rule the patient looks stolidly forwards or downwards, but at times he looks up in a dull and sleepy way. Whilst he is apparently deeply absorbed, he at once looks up if he is gently touched on the hand. He replies fairly readily to questions, and, as has been indicated above, he has a habit, when he is doing such a thing as putting on his trousers, hat, &c., of passing the article from hand to hand, from the left to the right round the front, before he puts it on. He feeds himself. He never makes a move to the lavatory.

Whilst under observation he remained quite unchanged.

High-grade Amentia with Epilepsy; Premature Dementia; Female, æt. 27 years; duration three years

Case 715.—M—— W——, female, single, of no occupation, æt. 27. Was previously in an asylum at the age of 24 years, and the present is a continuation of that attack. Notes taken two days after admission.

Patient is a dull-looking girl, who at first resisted when she was brought forward for her case to be taken. She gives her name, but does not know her age. She knows that she has been here two days. She writes her name slowly, painfully, and carefully. Her attempts at arithmetic are as follows:—$2 \times 2 = 3$; $4 \times 2 = 8$; $5 \times 3 = 9$; $6 \times 2 = ?$. She spells cat "tac." She cannot spell "horse," and she says that she does not know what a horse is. She spells "cow" and "man" correctly. During this examination she stands up as if saying a lesson. Her articulation is normal, and the above replies, as does her hand-writing, present the various indications which have already been described as characteristic of ordinary premature dementia. She is dull and slow and appears to know nothing about anything when she is questioned. When I have done with her she walks off and imagines that she is going home.

After five months her condition was as follows:—She is on the whole quiet, and she is entirely unemployed. She dresses herself somehow, and washes herself, and then requires to have her hair done for her. For from ten to thirty minutes before a fit she is excited, violent, and impulsive, strikes the nurses, and throws the furniture about. After a fit she is for at least twenty-four hours very dull, drowsy, and confused. She thinks that people deprive her of her food. She sometimes stands or wanders about the whole day, but takes no notice of anyone. When asked to do anything, *e.g.* to play the piano, she says, "No, I'm not going to; I don't want to," but soon afterwards will get up and do it. She never either reads or writes. She is invariably clean in her habits.

Whilst under observation this patient remained unchanged.

High-grade Amentia with Epilepsy; Dementia; Female, æt. 32; certified one year, and previously in an asylum

Case 716.—E—— F——, female, single, of no occupation, æt. 32. Certified one year, and had previously been in an asylum. Notes taken on the day after admission.

A vacant-looking girl with a pale face and staring eyes; pupils mobile; palate narrow and very high; ear lobuleless. She gives her name "same as you've got written there," pointing to my book. Age? "I don't justly know how old I am, but I had a birthday on October 3rd." She knows the day, and has been living here "some time now." She went to H—— (her previous asylum) in a fly yesterday when the fly went there, and she was in a train yesterday. She thinks that she went to H—— (her previous asylum) yesterday, "same as the rest of 'em did." She thinks that the month is September (October), and repeats that her birthday will be on October 3rd. She came here because she had fits. She suffered from them for some time before coming here. "I never hardly knows when I have 'em. I'm taken so suddenly, and knocked down on the floor." After a fit "I'm all

right." After her examination was concluded and she was going away, she suddenly fell down on the floor exactly like a case of hysteria.

Whilst under observation this patient was dull, listless, and unoccupied. She did very little for herself and took little or no interest in her surroundings.

Epileptic Mania; Progressive Presenile Dementia; Female, æt. 54; certified six years

Case 720.—E—— V——, female, married, housewife, æt. 54. Certified six years. Mother suffered from fits. Notes taken two days after admission.

A garrulous woman with a very scarred face. She gives her name, and states that her age is 52 years. She has come from "Worth Rectory. That was my home, and I've always found it so." She points out one of the patients and says that she is her niece. She then informs me that Queen Alexandra has four or five daughters here, and that the nurse is her sister-in-law and Mr. J—— N——'s wife. She does not know me, but asks if I took lodgings at her place when she first came away. She knows the day, and says that she could soon tell me the date if she had an almanac. She owns "this whole place. My brothers have bought the ground in front of my house here and your brother took the butcher's shop on the schools." She then begins to tell me about her family. When asked about fits she tells me that she has had two in about twenty years. She has been married about sixteen or eighteen years, and has had twelve or fifteen children. "They came by anyhows. I once had three, and my sister that is Queen Alexandra now helped me through with 'em, but they all died as soon as they were born. Mr. B—— (name unknown) didn't like to see 'em lying about, and he used to make boxes and bury 'em. They were only tiny children, and lived only ten hours, and I had three alive working under the Queen at R—— Church, my own daughter, a nephew of mine, and my own son." Ten years ago she had her tongue taken out and cut off and splintered, and her husband, her brother, and herself have all been mutilated.

Five months after admission the following notes were taken:—She looks a dull, miserable object. She says that she has been murdered by inches and inches for 127 years and worse for 119 years. She has a clock to prove it, the clock of her grandmother, which stood for over 1000 years in a church. The ward clock is a church clock, and no one can claim it but herself. To-day is "Tuesday, hot-cross-bun day" (Monday February 1st). "I will give you a clean apron on Valentine's day; I am not saucy, and give no one sauce," etc. She is very abusive and at times uses foul language. She is violent and impulsive and a "terror." Nearly every day she swears about her food, and if she cannot at once get what she wants she throws the plates, chairs, &c., about. She is not destructive, but she is untidy in her appearance and cannot dress herself properly. She never does any work. She sometimes asks for a prayer-book and then swears at it. She has very severe fits, and for two or three hours after them she is confused and violent.

Whilst under observation this patient visibly deteriorated in her mental condition, though she remained as violent and impulsive as ever.

CLASS (C).—Dementia following Cerebral Lesions

Such cases as those to be dealt with in the following section are relatively rare in asylums, as, owing to their severe physical disability,

they commonly remain at home or in workhouses unless they become very troublesome. It may be remarked that a more or less wide borderline exists between the group of progressive senile dementia and the cases of the present group which are caused by gross vascular degeneration.

The cases included in this group are eight in number, and are as follows :—

	M.	F.	T.
(1) Cerebral syphilis	2	—	2
(2) Other lesions (gross)—			
(*a*) Old standing (embolism, thrombosis, etc.) .	1	2	3
(*b*) Gross vascular degeneration	—	3	3
Total	3	5	8

This group calls for no special remark beyond the reference contained in the introduction to this chapter.

Of the cases of cerebral syphilis, No. 721 is an example of organic dementia in a man of originally defective intelligence who was aged 42, had been certified nine years, had been previously under asylum treatment between the ages of 14 and 24, and showed evidence of congenital syphilis ; and No. 722 is an example of progressive dementia, who was aged 46, had been certified one year, and showed evidence of former syphilis, gross vascular degeneration, and paralysis of the face. The father of the latter case was insane. In the absence of a post-mortem examination, it was in either case impossible to state the nature of the cerebral lesion. Physical evidence of an attack of syphilis was in each case conclusive, or at any rate as conclusive as anything could be in the necessary absence of modern bio-chemical methods.

Of the cases of gross lesion, the male patient (No. 723) was aged 41, had been certified four years, and suffered from bilateral palsy secondary to trauma. Of the 5 females, No. 724 was aged 45, had been certified since the age of 28, and suffered from a right-sided palsy following childbirth ; No. 725 was aged 48, had been certified one year, and also suffered from a right-sided palsy ; and Nos. 726, 727, and 728 are examples of progressive dementia, with cerebral lesions following vascular degeneration, and were aged respectively 67 (certified three months), 75 (certified twenty-nine years), and 53 years (certified twenty-two years).

None of the cases contained in this group are appended, as, apart from dementia, their symptomatology is individual and accidental, and their inclusion would therefore serve no useful purpose.

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