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FACTORS OF INSANITIES.

BY

J. HUGHLINGS JACKSON, M.D.,

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PHYSICIAN TO THE HOSPITAL FOR EPILEPSY AND PARALYSIS; CONSULTING PHYSICIAN TO THE LONDON HOSPITAL.

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I HAVE often urged that for the scientific study of maladies of the Nervous System we should investigate them as Dissolutions (reversals of Evolution) of this or that part of the nervous system ; we must also take into account the undamaged remainder—the evolution still going on in what is left intact of a nervous system mutilated by disease. The supposition is that the principle indicated will ultimately be found to apply to all nervous maladies—from those produced by lesions at the periphery of the nervous system, to these produced by lesions of the highest cerebral centres – from, for example, those produced by lesions of nerve trunks to ocular muscles, to cases of insanity. I have never put forward the opinion that nervous maladies should be classified on the principle of dissolution for clinical purposes, but, on the contrary, have urged that for those purposes we should continue our empirical arrangements of cases by types. In particular I have urged the necessity of arrangements by type of cases of Insanity for clinical purposes, as well as the study of

them, as they exemplify Dissolution of the highest cerebral centres. It would be as absurd to attempt to arrange patients in an Asylum on the principle of Dissolution as it would be to arrange plants in a kitchen garden on the "natural system" of botanists.

In every insanity there is morbid affection of more or less of the highest cerebral centres or, synonymously, of the highest level of evolution of the cerebral subsystem, or, again synonymously, of the anatomical substrata, or physical basis, of consciousness. There may be discoverable disease destructive of nervous elements, or there may be loss of function from some undiscovered pathological process inferred from symptoms. In every insanity more or less of the highest cerebral centres is out of function, temporarily or permanently, from some pathological process; for my present limited purpose it matters little what that process may be. It only matters as the pathological processes produce loss of function, that is Dissolution, of more or less of the highest centres, *at different rates* (Factor 3).

I do not use the term "function" in the sense often given to it in clinical accounts of nervous maladies, as, for example, when it is said of a patient that his "case is entirely functional." I do not believe that there is such a thing as loss or defect of function of any nervous elements without a proportionate material alteration of their structure and nutrition. Of course the separation into structure, nutrition and function of the nervous system is artificial; it is merely a convenient device, just as the separation into the surface, weight and mass of a body is.

I think a better term for my present purpose than "loss of function" would be "negative lesion"; the

latter term would include not only destruction of nervous elements, but also all other conditions of nervous elements from which they function no longer, for example cases where, as after an epileptic fit, certain cells and fibres, or the endings of fibres, are, for a time, of no use. If a man be so soundly asleep that he cannot be awakened, there is for the time being no help to be had from him any more than there would be if he were dead. There is a difference between destruction of nervous elements symbolised by the dead man and the temporary condition of them after an epileptic fit symbolised by the man deeply asleep, but *for the time being*, during the existence of the insanity, the cases are alike in that more or less of the highest cerebral centres is functionally absent, although in the former they are structurally absent too. Recovery (re-evolution) may occur in the latter, but does not occur in the former.

Whilst studying insanities as dissolutions we consider them so far as we can as they are *departures from* mentation concomitant with normal states of the highest cerebral centres, and not as we do for clinical purposes as they *approach* certain clinical types, melancholia, general paralysis, &c. Hence we take heed of delirium in non-nervous maladies, in pneumonia for one example, of cases of poisoning by belladonna and cannabis indica and of degrees of drunkenness from alcohol, as well as of cases of insanity ordinarily so-called (*a*).

(*a*) There are in a scientific regard many degrees of insanity caused by alcohol, from that slight degree in which a man "begins to think too curiously," to deep coma (acute temporary dementia). The taking such cases as being in a scientific regard insanities, they not being what would ordinarily, or I may say clinically, be called insanities,

Enough attention is not given in certain cases to degrees of insanity. Whilst epileptic (post-epileptic I think) mania is thought of as an insanity, coma after a severe epileptic fit is not regarded as an insanity. Yet post-epileptic coma is acute temporary dementia, and is psychically a greater degree of the negative mental element which co-exists with a super-position element in post-epileptic mania. There are many degrees of post-epileptic states from slightest confusion of mind to deepest coma ; in a scientific regard all these degrees of insanity should be taken into account (*b*).

induces "mental diplopia." Although it is said that the term insanity is used in scientific exposition for the state of a person who has taken a very small quantity of alcohol and yet a little too much for him, only to signify a departure, a very slight one, from his normal mental state, there inevitably arises also the ordinary connotation of the term, and the notion that the case of a man slightly drunk is averred to be one suitable for a lunatic asylum ; thus there is mental confusion. I can only repeat that in a scientific study of insanities we have to take into account, so far as is practicable, all degrees of departure, however produced, from normal mental states, from the slightest to the most extreme, regardless whether or not they are clinically insanities, insanities ordinarily so-called. Some very slight degrees of insanity, such as those after slight and transient epileptic fits, may be looked on as being re-evolutions : a patient as he is coming round from a slight epileptic fit may ask "Where am I?" "What day is it?" and the like ; he is endeavouring to re-orient himself. But his need of such re-evolution implies slight dissolution. (I know of but a single study of re-evolution, a very valuable one by Professor Pick, of Prague.)

(*b*) In the Bowman Lecture, delivered November 13th, 1885 ("Trans. Ophth. Soc." vol. 6), I said "Deep post-epileptic coma is psychically dementia, but is, on the physical side nothing else than some universal, almost total, paralysis—paralysis not only of animal, but of organic parts also, proportionate to the degree of the prior epileptic discharge upon them. This contention of mine is, however, denied : let us say what cannot be denied, that the patient is nearly dead. I daresay my calling the psychical side of the condition insanity (dementia or amentia) will be objected to. Let us say that the patient is, or is nearly, mentally dead ; this cannot be denied."

Dreaming has long been likened to insanity. I suggest several degrees of the normal dissolution of sleep. (1) Sleepiness, (2) Sleep with dreaming, (3) Sleep with actions (somnambulism), and (4) Deep, so-called dreamless, slumber. At least 2, 3 and 4 ought to be considered as different depths of dissolution of the highest cerebral centres, with, in 2 and 3, and possibly in 4, lower ranges of evolution remaining in those centres.

There are four Factors (*a*) in Insanities. (1) There are different Depths of Dissolution of the highest cerebral centres. (2) There are different Persons who have undergone that Dissolution. (3) There are different Rates with which the Dissolution is effected. (4) There is the Influence of different Local Bodily States and of different External Circumstances on the persons who have undergone that Dissolution.

Although I speak of Dissolution of the highest cerebral centres as if it were uniform—as if all the divisions of these centres were "evenly" affected—it is clear enough that there are local Dissolutions of those centres. That there are different *kinds* as well as different *degrees* of insanity is evident—melancholia and general paralysis for two examples. Different regions of the highest cerebral centres undergo dissolution in different *kinds* of insanity. I shall nevertheless in this brief sketch (except incidentally for purposes of illustration) ignore *local* dissolutions of the highest

(*a*) I have several times stated what I suppose to be the factors of insanities; for the first time, I believe, in THE MEDICAL PRESS AND CIRCULAR, Dec. 9th, 1874, when I wrote, "The varieties of insanity would be explained (1) by the depths of the reduction or dissolution; (2) by the rapidity of the reduction; (3) by the kind of brain in which the reduction occurs; and (4) by the influence of external circumstances and internal bodily states on the patient who is reduced."

cerebral centres and speak of different degrees of insanity as if the Dissolutions of those centres producing them were uniform. If we did consider local dissolutions of the highest cerebral centres we should have to say that there are five factors in insanities (*b*).

It is obvious that when studying insanities as Dissolutions—as reversals of evolution—of the highest cerebral centres we are making, by help of what may figuratively be called the experiments of disease, a study in psychology as well as one in the anatomy and physiology of a certain part (highest cerebral centres) of the nervous system. For, as I have said and I shall speak at more length on the matter later, we have in these cases to take into account not only the depths of dissolution of these centres, but also the evolution going on in the undamaged remainder of them—the mentation remaining possible when these centres have been mutilated in different degrees.

(1.) FIRST FACTOR IN INSANITIES. DIFFERENT DEPTHS OF DISSOLUTION.

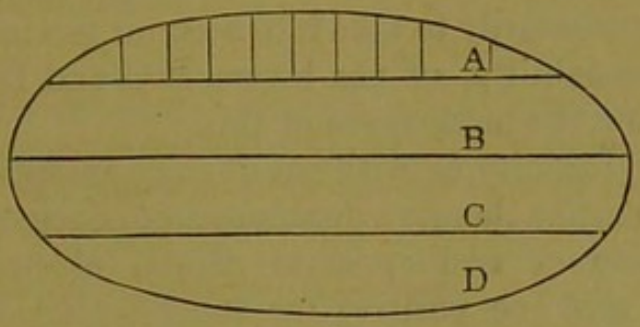
No centres are in layers, but for simplicity of illustrations I shall imagine that the highest cerebral centres

(*b*) We rarely, if ever, meet with a dissolution from disease which is the exact reversal of evolution. Probably healthy senescence is the dissolution most nearly the exact reversal of evolution. In local dissolutions of the highest cerebral centres there plainly cannot be the exact antithesis of evolution. To take another example from the lowest level of evolution of the central nervous system. Wasting of cells of anterior horns (as in progressive muscular atrophy) being a morbid affection of motor elements only, cannot be the antithesis of evolution which is sensori-motor. Evolution may be rudely symbolised as raising an expression to a higher power (called involution in

are in four layers, A.B.C.D. (*c*) In accord with this I make, still arbitrarily of course, four depths of Dissolution of these centres, and, correspondingly, four degrees of insanity.

(A) *First Depth. First degree of Insanity.*

In this depth the first, we may say topmost, layer of the highest cerebral centres is rendered functionless by some pathological process. The situation may be represented thus:—



I am obliged to stay here to consider a matter to which I attach extreme importance. I submit that, with obvious exceptions, the symptomatology of nervous maladies in which there are negative lesions is made up of two opposite elements, one negative, alone produced by disease, and one positive, or superpositive, the outcome of activities of healthy nervous arrangements. The simplest illustration of this dictum

Algebra), and dissolution as reducing an expression to a lower power (called evolution in Algebra). But the quasi-random doings of disease must mostly, if not always, be symbolised as taking out some terms of an expression, and not as a reduction of the whole of it to a lower power.

(*c*) Of course I am not speaking of what are morphologically called layers of cells of the cortex, but of imaginary anatomico-physiological layers.

is given by the symptomatology of paralyses of ocular muscles from disease of the motor nerve trunks supplying them. In this paper I illustrate the dictum by the first depth of dissolution of the highest cerebral centres, first degree of insanity.

Whilst noting that in this, the first, degree of insanity, the layer A. is out of function, possibly permanently, we have to keep vividly in mind that the three other layers are intact. The only thing *disease*, in the proper sense of pathological process or result of one, has done, is to render functionless or to destroy the layer A., and we have necessarily to take into account the intactness, the functionability, of the layers, B.C. and D. I now try to show the importance of this.

In every insanity, (*a*) with one obvious exception, (complete dementia), there is a double symptomatic condition, a condition of two opposite mental elements, one negative and one positive (or super-positive). (*b*) Repeating what has just been said, there is in every insanity (1) negatively, defect of consciousness (loss of some (*c*) consciousness) and there is (2) the conscious-

(*a*) As I have several times pointed out the late Dr. Monro first stated the doctrine that the mental condition in cases of insanity, is a double one—one of two opposite elements, negative and positive. Dr. Anstie and Dr. Thompson Dickson formulated the principle of "loss of control."

(*b*) Mind, Mentation and Consciousness are in the text used synonymously. I am ignoring Subject-consciousness and deal only with Object-consciousness. I may say that I consider ideation as certainly as perception to be a state of object-consciousness. (See MED. PRESS AND CIRC., Aug. 30th, 1893, p. 308) If a man in a dream "sees" a black cat that mental state is as certainly objective as is his seeing what we call a real black cat in the day is.

(*c*) Literally taken, the statements in the text imply that there is a sort of homogeneous consciousness, and that in the first depth of Dissolution, for example, there is a certain quantity lost, corresponding to abrogation of the layer A. and that there is retention of the rest

ness remaining. In the first depth of Dissolution the physical condition corresponding to the defect of, loss of some, consciousness is the abrogation of A; the physical condition corresponding to the consciousness remaining is the intactness of B.C. and D. In other words disease only causes the physical condition corresponding to the negative mental element, defect of consciousness; the positive symptoms signify, or rather they sample, the consciousness remaining, and are the outcome of activities of the layers B.C. and D. which are perfectly healthy. (*d*)

corresponding to intactness of B.C, and D. In writing on so complex a subject it is not possible to be always giving qualifications. I repudiate the implication mentioned, looking on it as an absurdity. For as evolution is a passage from the simple, &c., to the complex, &c., the reverse process of Dissolution is a passage from the complex, &c., towards the simple, &c. Thus in the first depth of Dissolution there is loss of the most complex, &c., and retention of the next most complex, &c. Or more generally and roughly, the deeper the Dissolution the less elaborate is the mentation remaining possible.

(*d*) Here a question arises. It may be said that in certain cases of insanity there is no consciousness remaining in any of the degrees. I refer especially to post-epileptic states. When, a man, after a slight epileptic fit, acts elaborately and yet quite irrelevantly to his present surroundings, he is said to be unconscious. If this be taken literally the patient is for time a mere automaton, a neuro-muscular machine. Others would infer from the elaborateness of his actions that the patient, commonly said to be unconscious, really retains some degree of consciousness. Each view has consequences. Those who take the first view cannot say that when the patient is comatose after a severe fit there is greater negative affection of consciousness than there was after his slight fits, because they hold that he has no consciousness after the slight ones. Those who take the second view may say that there is greater negative affection of consciousness after the severe fit than after the slight fit. All that we *know* is that the patient on full recovery *remembers* nothing (this is the rule at least) from the period of his post-epileptic elaborate action. In the text I speak as if in cases of dissolution consciousness did attend activities of the lower, intact, layers of the highest centres –activities of the lower range of evolution remaining.

Putting the matter differently we have not only to take into account the dissolution of the one layer A. caused by the disease, but the Evolution going on in the layers B., C. and D., which no pathological process has touched. In every case of insanity, short of dementia, there is a problem in evolution as well as one in dissolution. We may say that "to undergo dissolution," to lose A. for example, and "to be reduced to a lower range of evolution," to B., C. and D. in the example taken, are equivalent expressions.

Dissolution and Evolution in cases of insanity vary inversely—the shallower the Dissolution the higher the range of evolution remaining; conversely the deeper the Dissolution the lower the range of evolution remaining. Correspondingly the shallower the Dissolution the less consciousness is lost and the more of it remains. In other words the slighter the Dissolution the less the negative mental state and the more elaborate the mentation remaining possible. I will now try to illustrate the duplex mental state in insanities. Suppose a patient imagines, to take one delusion as a sample of his mental condition, that his nurse is his wife. It is not enough to dwell only on the positive element, that he supposes the person attending on him is his wife, for this delusion of necessity implies the co-existing negative element that he does *not* know her to be his nurse (or some woman not his wife). His "not-knowing" is a sample of the result of disease (Dissolution of A.); his "wrong-knowing" is a sample of the outcome of what is left intact of his highest cerebral centres (Evolution going on in B., C. and D.) (*a*)

(*a*) Of course there is in normal states a rhythm of evolution and dissolution—a going in and a going out of function. I ignore this in

I now take for further illustration a case of insanity from what I suppose to be a Local dissolution of the highest cerebral centres. When a general paralytic believes he is Emperor of Europe, I submit that this delusion (the patient's belief) arises during activity of perfectly healthy nervous arrangements, presumably those of the posterior lobes and those left intact of the anterior. The disease of the anterior lobes is reponsible for his not knowing that he is X.Y., a clerk in the City.

Illusions, delusions, extravagant conduct and abnormal emotional states in an insane person signify evolution, not Dissolution; they signify evolution going on in what remains intact of the mutilated highest centres—in what disease, effecting so much dissolution, has spared. The positive mental states mentioned *imply* the co-existing negative mental states, defective perception, less reasoning power, less adaptation to present surroundings and absence of the "finest" emotions (in comparison with the former, sane, person). To take examples, Any illusion implies that a thing is *not* recognised as it would have been before the insanity, and this means that there is a co-existing negative mental element; any delusion implies that the patient does *not* believe as he would have done before he underwent Dissolution, and this means that there is a co-existing negative mental element. (*b*)

the text. There is a big rhythm of evolution and dissolution in healthy people, being awake in the day and asleep at night. Some of the "uses" of sleep are that the highest ranges of the highest centres may be "swept clean" of trivial acquirements made during the day, and that "internal evolution" (evolution going on without interference by or reaction upon the environment) of the lower ranges may be facilitated.

(*b*) It may be said of some cases of insanity that there is no defect

To resume :—In the first depth of Dissolution the negative mental state is slight, the dissolution being very shallow ; the positive mental state is very elaborate, the range of evolution remaining being very high. This depth (first degree of insanity) may be symbolised as —A+B+C+D. In fact the whole person is now B+C+D. The term—A is only given to indicate how the new person, the man insane, B+C+D differs from the former person, the sane man, A+B+C+D. Suppose the sane man is X. then the insane man, the new person Y, is X—A, that is Y is B+C+D.

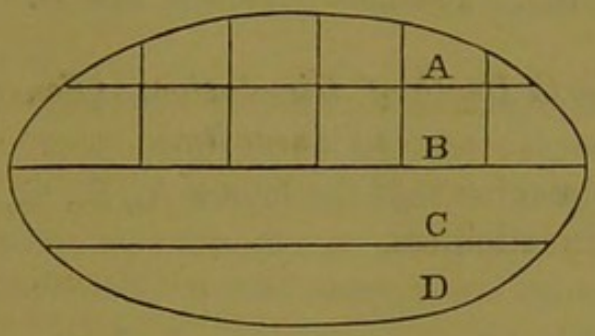
And here when using the term "new person" for

of consciousness. But I think we do not always take into account slight degrees of negative affection of consciousness; it almost seems to be assumed that above loss, or what is called loss, of consciousness, there are not slighter degrees of negative affection of consciousness. A patient in a lunatic asylum may write letters and occupy himself in other ways, may argue with his doctor about his own case with considerable pertinence. One does not say of such a patient that he has loss of consciousness, but that he has defect, slight defect, of consciousness, Moreover I think of some insane patients defect of consciousness is admitted in popular language, when denied in technical terms. A patient may be said to be perfectly conscious, and yet be declared to be irresolute, forgetful, not clear in his observations, and apathetic. But this detailed statement grants that he is defective in Will, Memory, Reason and Emotion, and since these are the (artificially distinguished) elements of consciousness, the statement amounts to saying that the patient has some degree of negative affection of consciousness (of object-consciousness). All this is consistent with his doing commonplace things definitely, with memory of all ordinary matters and of many long past circumstances, with his talking to the point on simple things, and with his having some interest in striking occurrences ; or, in other words, that with some defect of Will, Memory, Reason, and Emotion, there should be persistence of the rest of these so-called faculties—that with loss of " some" mind or consciousness (with some defect of consciousness) there should be retention of the rest of mind or consciousness. For a man to be absolutely unconscious, or synonymously demented, is for him to have no Will, no Memory, no Reason, and no Emotion.

Y, we must urge that what we call his delusions are his beliefs, and most generally his positive mental "symptoms" are samples of a mentation which is only abnormal in contrast with the mentation of the prior self X. (or with that of some arbitrary standard of sanity.)

(B) *Second Depth of Dissolution.* (*Second Degree of Insanity.*)

Let us imagine that disease (any pathological process productive of loss of function whether there be destruction also or not) has affected not only A. but B. also.

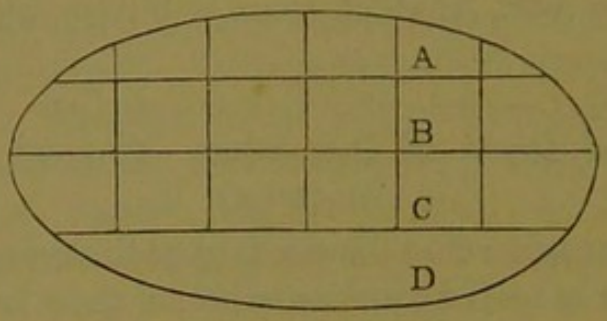


Now the negative mental element, defect of consciousness, is greater and the positive less ; less consciousness is retained. Correspondingly since the dissolution is deeper, A. and B., the range of evolution is shallower, C. and D. This depth may be symbolised as—A—B+C+D. The new person is C+D.

(C) *Third Depth of Dissolution.* (*Third Degree of Insanity.*)

Let us imagine that the layers A., B. and C. have been put out of function.

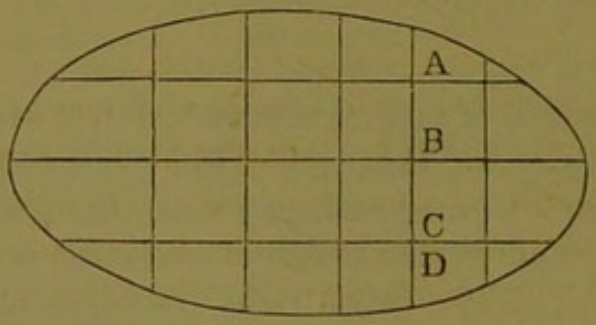
Now the negative mental element is very great and the positive very little. Correspondingly the Dissolution is very deep ; the range of evolution remaining,



only D., is very shallow. This depth may be symbolised as A-B-C+D. The new person is now D.

(D) *Fourth Depth of Dissolution.* (*Fourth Degree of Insanity.*)

Let us imagine that the layers A., B., C., and D. are rendered functionless.



Here the negative mental affection is greatest, is indeed total ; there is dementia. There are no positive mental symptoms ; there is no mind or consciousness. There is complete Dissolution, and thus no lower range of evolution remains. Here is what I called

"the obvious exception" to the statement that the mental condition in insanities is a double condition, one of a negative and a positive element. In the fourth depth there is no *person*, but only a living creature.

Recapitulation as to Different Depths of Dissolution.

The deeper the Dissolution the lower the range of evolution remaining, and correspondingly the greater the negative affection of mind or consciousness and the less elaborate the mentation remaining possible, until the deepest (total) Dissolution when there is no range of evolution remaining and no mentation going on (dementia).

We must not speak crudely of disease "causing the symptoms of insanity." Popularly the expression may pass, but, properly speaking, disease of the highest cerebral centres no more causes positive mental states, however abnormal they may seem, than opening floodgates causes water to flow, or than cutting the vagi causes the heart to beat more frequently. Disease only causes the (physical condition for the) negative element of the mental condition ; the positive mental element, say a delusion, obviously an elaborate delusion, however absurd it may be, signifies activities of healthy nervous arrangements, signifies evolution going on in what remains intact of the highest cerebral centres.

Suppose we compare and contrast the first degree of insanity with the fourth degree. The dementia in 4, no mentation at all, is not a greater degree of the "mental condition" in 1, but only a greater degree of the negative mental element (defect of consciousness) of that duplex mental condition. In 4 there is no

(2) THE SECOND FACTOR IN INSANITIES. THE PERSON WHO HAS UNDERGONE DISSOLUTION.

This factor may seem to need little illustration. It is obvious that the insanity will vary according as the person who has undergone Dissolution of his highest cerebral centres is a child or an adult or an old man, clever or stupid, intelligent or unintelligent, educated (trade, &c., included) or non-educated. At any rate, it is obvious when the Dissolution is but of little depth.

Here has to be considered the question of heredity of insanity. I submit that no one inherits a tendency to insanity in the sense that he inherits a tendency to disease (pathological process) of any part of his brain. He inherits a healthy brain, but a smaller one than the average; I do not mean smaller morphologically, but smaller in the anatomico-physiological sense that he has fewer functional elements in the highest ranges of his highest cerebral centres. He inherits a brain which will "give out" more easily under unfavourable influences than the brain of the average man. (*a*)

(3) THE THIRD FACTOR IN INSANITIES—RATE WITH WHICH DISSOLUTION IS EFFECTED. (RATE OF REMOVAL OF CONTROL FROM RANGES OF EVOLUTION REMAINING.)

The more rapidly the Dissolution is effected the greater is the activity on the range of Evolution

(*a*) Griesinger wrote; "Sometimes we see individuals who, after partaking of a relatively small quantity of spirits and without being in a state of deep intoxication, but retaining fully their consciousness,

remaining. To take extreme cases. The senile dement undergoes Dissolution very slowly. The post-epileptic maniac has undergone dissolution with extreme rapidity. The former is quiet, the latter is very busy. In the former control is slowly, in the latter rapidly, removed from the lower ranges of evolution remaining.

Taking the first Depth of Dissolution for illustration we may symbolise the first factor and the third factor. In two patients the symbolisation as to factor 1 is —A+B+C+D. But in one of them Dissolution of A. is rapidly effected, in the other slowly; this means that control is rapidly removed from B+C+D in one and slowly in the other. So that in one the layers B., &c., are very over-active, in the others they are more nearly normally active. We may symbolise the two, one as $-A+B'''+C''+D'$ and the other as—A+B+C+D.

(4) FOURTH FACTOR IN INSANITIES.

There is the influence of local bodily states and of external circumstances. A healthy man has muscæ from intra-ocular specks; they seem like moving spots and films in front of him. But suppose he undergoes Dissolution (as in cases of Delirium Tremens) and that there is the first depth of dissolution; then he sees mice and rats. Speaking roughly the muscæ "turn into" those animals for him. The most striking illustrations of the fourth Factor are given by provoked dreams in the normal dissolutions of sleep; cramp in

present a great tendency to commit very extravagant, noisy and foolish acts; a circumstance which may be truly considered as a symptom of predisposition to mental disease." (*On Mental Diseases, New Syd. Soc. Trans.*, 1867.)

a sleeper's finger developes the dream that a cat is biting his finger.

What we call external circumstances are perhaps artificially separated from "local bodily states." If a man had been reading about kings he might, if he became insane soon afterwards, believe himself to be a king. What was doing just before an epileptic fit may influence the patient's actions in the temporary insanity after it.

COMPLICATION OF FACTORS.

Although it is necessary for clearness to speak of the factors *seriatim*, it is evident enough that each must not be thought of in isolation from the others.

As in different Insanities there are different depths of Dissolution of the highest cerebral centres, as the persons who undergo dissolution are different, as dissolution is effected at different rates and as the local bodily states and external circumstances of different patients are not the same, we may say that every case of Insanity is a "function of four variables." With regard to what we may call the Complications of the Factors, it is of no use speaking of the fourth depth of dissolution—dementia. In this depth there are no longer highest cerebral centres, there is no mind, there is no person, the rate with which dissolution is effected, when that dissolution is established, is of no consequence (*a*) and local bodily states and external circumstances have nothing to influence. In what follows I shall ignore the fourth depth of dissolution.

Obviously the deeper the Dissolution the less we are concerned with the factors 2, 3, and 4. There is

(*a*) I mean so far as we are concerned with it in the present inquiry.

in deep dissolution reduction towards what we may rudely call a general personality, one in which individual peculiarities are more or less effaced—a reduction, still speaking rudely, towards what is common to the race. And in deep Dissolution the rate with which it is effected is of less consequence than in shallow Dissolution, the range of evolution remaining in the former case to be in over-activity from rapid removal of control being less. Further, in deep Dissolution there remains little range of evolution for local bodily states and external circumstances to act on.

We may say that the shallower the Dissolution the more elaborate is the mentation possible, the greater difference does the rate with which Dissolution is effected make in the activity of the lower range of evolution remaining, the more is there retention of "individual peculiarities" and the more do local bodily states and external circumstances influence the mentation still possible.

This must suffice, although many qualifications might be mentioned. The word "elaborate" may mislead. Although speaking generally, the shallower the Dissolution the more elaborate the actions possible, it is obvious that in comparatively deep Dissolution very elaborate actions may remain if the nervous arrangements for them have been (Factor 2) strongly organised, as, for example, manipulations of trade, &c.

I have in the foregoing spoken of insanities as if in all cases the disease producing dissolution were primarily of the brain. But I think that in many cases of insanity the brain suffers secondarily, for example, in acute non-cerebral maladies, such as pneumonia, when they are attended by delirium.

We have to bear well in mind that there are,

broadly speaking, two factors in the physical processes corresponding to the mentation of healthy people. I cannot here go fully into this question. A man may have a highly developed brain, but not the full use of it, if the subserving organs (of digestion, circulation, &c.) are not well developed, or have become inefficient. Such a man may have many fine thoughts, and yet no system of thinking; his brain soon falls out of gear when dealing with complex subjects. And I believe that some cases of insanity ordinarily so-called, are owing not to primary disease of the brain, but to failure of the brain, because it is ill-served by the circulatory and other "vital" systems.

I think it is a legitimate hypothesis that the mental disorder from poisoning by belladonna—to take for definite illustration that artificially produced temporary insanity—is mainly owing to failure of the subserving systems (digestion, circulation, respiration) and not entirely, possibly not at all, to direct action of the drug on the so-called "organ of mind" itself. Atropine is known to poison certain nervous elements of the lowest level for regulating the circulatory and other "vital" systems (*a*) and connections of those elements with the organs of these systems. The cerebral hemisphere will suffer according to the degree of ill-service by the organs of the four "vital" systems thus put in difficulties by the poison. (*b*) I hope to

(*a*) To take a slighter, but more chronic case, one we do not call insanity. I attribute the neurasthenia in Graves' malady (the so-called "emotional condition" and "mental instability" of the patient) to imperfect menial work of the "four systems" consequent on negative lesions of elements of the lowest level representing those systems. (So too for ordinary cases of neurasthenia.)

(*b*) It may, however, be asked how it is that there are *visual* illusions or hallucinations in cases of belladonna poisoning. In the first

consider this aspect of insanity on another occasion. (Here is given a qualification to the statements on heredity of insanity when speaking of the Second Factor.)

place most of the elements of normal mentation are visual ideas, and this will be so in the abnormal mentation of insane persons. But in the poisoning by belladonna, of young persons at least, the state of the intro-ocular musculature has to be considered. In two cases recorded ("Lond. Hosp. Reports," vol. iii), one by Dr. Gossett-Brown and one by Dr. Fraser, the pupils were widely dilated, and presumably the ciliary muscles were paralysed. Hence there was a peripheral, ocular, condition influencing the parts of the layers of the highest centres remaining in activity, one likely to affect visual ideation. In one of these cases objects appeared to the patient as a long way off—a very significant thing when it is remembered that uncomplicated paralysis of the ciliary muscle makes objects appear smaller. It is not necessary to suppose that in these two cases the poison acted especially on any "visual centres" of the cerebral hemispheres.