In the realm of mind : nine chapters on the applications and implications of psychology / by Charles S. Myers.

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IN THE REALM OF MIND

Nine Chapters on the Applications and Implications of Psychology

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Chapter I

The Help of Psychology in the Choice of a Career[1]

Before I attempt to assess the help which psychology can render in the choice of a career, it seems desirable to consider briefly whether *any* help is necessary for the young person choosing his career. For, strange though it may appear, there are people who, on various grounds of general principles, feel opposed to *any* kind of vocational guidance. Some of them maintain that it is really beneficial to let young persons discover for themselves their most suitable occupation by the 'rough-and-tumble' process of repeated trial and failure. Others urge that most young persons show no special 'bent' for any particular career but are endowed with the ability to adapt themselves equally well to a wide variety of occupations. Others, again, question the value of vocational advice in these days of difficult employment when so often the young person must

[1] Modified from a Public Discourse, delivered at the Norwich Meeting of the British Association for the Advancement of Science, on 10 September 1935.

accept the very first vacancy which he is offered —whatever be the nature of the occupation.

To these various objections the following replies may be made. Experience shows beyond question that the majority of young people suffer, instead of benefit, when they are left to discover their most suitable occupation by a series of unsuccessful efforts. They lose self-confidence owing to their successive failures. Too often they only change their occupation when their misfit is so glaring that they are discharged by their employer. And when they remain in an unsuitable post, either it may bore them almost insufferably, or it may strain them to such a degree that they become 'nervy', unhappy and restless, perhaps rebellious against society: indeed, an important cause of social unrest and even of crime, especially among young people, has with good reason been ascribed to an unsuitable occupation.

It is quite true that only rarely can an *ideally* suitable occupation be found. For very few of us are 'pegs' which will fit to perfection the 'hole' of any one occupation: we can do equally and fairly well, and we can be equally and fairly happy, in the work of several different occupations. But it is not less true that there is a far larger number of other occupations in which we shall do

far worse and be far from happy. In point of fact, the expert vocational adviser hardly ever limits his recommendations to one particular career. He believes rightly enough in some limited power of human adaptation; but he insists that while there are certain careers which are to be recommended to a particular applicant, there are other careers which, owing to their unsuitability, should on no account be attempted.

He insists, too, that in times like these of much unemployment it becomes all the more important to make the best possible initial choice, when the difficulty of finding another post will make the maladjusted young person hesitate before relinquishing one that proves unsuitable, despite the mental or physical strain, boredom, irritation, and dissatisfaction which it evokes.

But vocational guidance is important not only for the benefit of the person who receives it and of those with whom he is brought daily into social contact. The adoption of an unsuitable occupation and its subsequent abandonment mean inevitably a huge national loss—a loss in productive efficiency, a waste of human effort and material, and a waste of time—in needlessly interviewing, training and employing successive unfit applicants until a suitable worker is found.

Moreover, in actual practice, if left to himself, the young person frequently fails to make a wise choice of a career. It is found, more often than not, that he drifts by mere chance into an occupation; and a special inquiry among those who have been educated at secondary and public schools has shown that about one-half of them intend to take up occupations which, on grounds either of ability or of temperament and character, are judged unsuitable by the psychologically trained vocational adviser whose guidance has proved correct in the vast majority of his cases. Sometimes the decision of young people is determined by parental wishes. And too often the influence which a parent may be able to exercise in finding for his child a position either in his own occupation or in the business of a relative or friend blinds him to the utter unsuitability of such a career for his boy or girl. Or the father may be so ambitious for his son, or the mother may play so exclusively for a 'safe' occupation, that again a hopelessly unsuitable career is selected for a naturally unadventurous or adventurous youth, as the case may be.

It is therefore not surprising that, when left to himself, the young person appears usually to exercise a rather better choice than when subject

merely to parental influence. But his own choice is so often wrong because, as a rule, he knows nothing, or virtually nothing, of the different requirements of occupations for success in them, and because he neither recognizes nor takes into account sufficiently his own abilities or disabilities. He is guided principally by his interests and ideals, and these are apt only too often to lead him astray. Thus, in a spirit of devotion to humanity, a girl may decide to take up hospital nursing or school teaching, quite unmindful of her lack of physique, accuracy or patience so necessary for successful nursing, or of her inability to preserve discipline which will make her future life in a school one of almost intolerable strain and torture. Endowed with some literary talent, a boy may embark on journalism with similar failure, because he has disregarded his lack of pushfulness and ability to write speedily, which are so essential for success in this occupation. Or again, a weakling may compensate for his physical disabilities by day-dreams or phantasies of flying: he aims therefore at being an aviator. Other choices may be dictated by fashion, or through imitation consequent on hero-worship.

The school teacher is hardly a better guide to a career than the parents or the young person

himself. He may or he may not know his pupil well: if he knows him well, he may know him only from one particular standpoint—the relation of pupil to master or mistress. Moreover, the teacher cannot be expected to know the various requirements of different occupations, of the abilities and qualities of temperament needed for success in each, and of the kind, length and cost of training and of the future prospects of each. It is therefore not surprising to receive (as I received) from one head master the following observation: 'Realizing that my knowledge of the boy is imperfect and one-sided, and my knowledge of occupational requirements grossly inadequate, I always feel more or less of a charlatan when called upon to advise. My only consolation is that my advice is so rarely followed that there is no real cause for my distress!'

Of late years, in certain secondary and in most public schools, a single teacher has been appointed to give special attention during part of his time to vocational guidance. He has received the name of 'careers master'—but no training whatever in this part of his duties. He may even apply tests and other psychological methods, although he may be unqualified to do so, thus bringing into popular contempt methods which are unquestion-

ably helpful when properly used. Many secondary and a few public schools have recourse to the voluntary Committees formed under the auspices of the Ministry of Labour by the Headmasters and Headmistresses Associations. But, efficient as is their placement work, they would be the first to admit the imperfection of their present efforts and methods in the direction of vocational advice. The juvenile employment officers, for whose work the Ministry of Labour is responsible, are mainly, but by no means wholly, concerned, together with the voluntary Local Juvenile Advisory Committees appointed for the purpose, in the guidance and placement of elementary school children. But these officers too receive no systematic training in their duties; and at present there are no adequate official prospects, nor, in consequence, is there permanence, in their work. Very often in elementary schools a Conference is held terminally, at which the school-leaver is advised as to his future occupation. But the interview of each child and parent is necessarily restricted to an inadequately brief interval of time; and too often the child's own wishes, so frequently erratic or irrational, tend to receive undue consideration.

We may conclude, then, not only that help in

the choice of a career is necessary but also that the methods now generally employed are capable of great improvement. And for such help and improvement we may naturally look to psychology—the science which is concerned with the mind and resulting behaviour. The directions in which psychology is actually helping—both by research and by practice—lie (i) in improved occupational analysis, (ii) in the more reliable and more accurate assessment of mental abilities and qualities, (iii) in insistence on a very broad attitude and a carefully balanced judgment in guidance, and (iv) in the establishment of systematic methods of training vocational advisers.

In occupational analysis much has already been done to determine the requirements for success in different occupations. But a vast field still awaits investigation, while a great deal of what has been done is sadly defective from the psychological standpoint. Such matters as appropriate courses of vocational training, prospects, seasonal fluctuations, hours of work and wages have been satisfactorily enough treated by those who have been engaged in occupational analysis. But information is still sadly lacking as to the precise mental and bodily abilities and qualities of temperament and character which are likely to favour

success in the many different industrial, commercial and professional occupations. Where they have been described, they are usually couched in such vague or identical terms that, as has been justly said, they 'are scarcely more illuminating than the remarks commonly made by centenarians when invited to explain the secret of longevity'.[1] Consequently, we are far from being able to classify occupations and processes in such a way that a person who possesses the abilities and qualities required for success in one member of a group of occupations may reasonably be expected to succeed in any other member of the same group, and to fail in other groups of occupations. It is obvious that the analysis and classification of occupations require the skill of the trained psychologist; he has already started on this work.

He began it by assessing the general intelligence required for success in different levels of occupational life. He chose general intelligence both because of its importance and because he possesses already a sufficiently reliable means of estimating it. Essential as it is that a young person does not enter an occupation which needs higher intelli-

[1] A. Macrae, *Talents and Temperaments*, London: Nisbet, 1932, p. 148.

gence than he may possess, it is equally essential that he does not enter an occupation of so routine a nature that it makes insufficient demand on the intelligence which he may possess. Excessive boredom must be avoided as much as excessive strain. The result of long psychological, combined with statistical, research has been to establish the working hypothesis that a certain single factor of general ability runs through all mental and manual occupational work—the ability to discern relevant relations and to make appropriate use of them. This innate ability to discern relevant relations and to make appropriate use of them may be usefully called 'general intelligence'. Mathematically we may isolate it, but psychologically and in practice it can never be separated from the material on which it works. For this reason tests have had to be devised for assessing abstract or linguistic intelligence and other tests for assessing practical or concrete intelligence. In the former we employ 'verbal' tests, tests involving symbols—the use of words, numbers and abstract ideas; in the latter we employ 'performance' tests, involving the manipulation of concrete objects.

These tests have been devised to estimate, so far as possible, innate intelligence as distinguished

from acquired or examination knowledge which, owing to ill health, lack of interest, etc., on the one hand, or owing to 'cramming' on the other, may not yield a true index of intelligence. Repeated researches have definitely proved the greater reliability of intelligence tests than of school examination marks in the assessment of intelligence. As I have stated, no intelligence test evokes general intelligence and nothing more: indeed, no psychological test can be devised which involves the play of only one mental factor; there is besides intelligence a 'verbal factor' involved in carrying out a verbal intelligence test; and there is similarly a 'practical factor' involved in carrying out a practical intelligence test.

It is possible on mathematical grounds to regard these various factors as single or unitary, but the psychologist may not always accept the psychological truth of the mathematician's more convenient interpretation. As a working hypothesis, however, it has proved valuable to regard the intelligence factor as unitary and to assess it either in terms of the score made at the test or in terms of what is called the 'intelligence quotient'. The following table, now eleven years old, shows approximately the average intelligence quotients

Distribution of Intelligence among Children and Adults

(1) Level of intelligence (in mental ratio)	(2) Educational category or school	(3) Number of children (in percentages)	(4) Vocational category	(5) No. of male adults (in percentages)
1. Over 150	Scholarships (University honours)	0·2	Highest professional and administrative work	0·1
2. 130–150	Scholarships (secondary)	2	Lower professional and technical work	3
3. 115–130	Central or higher elementary	10	Clerical and highly skilled work	12
4. 100–115	Ordinary elementary	38	Skilled work. Minor commercial positions	26
5. 85–100	Ordinary elementary	38	Semi-skilled work. Poorest commercial positions	33
6. 70–85	Dull and backward classes	10	Unskilled labour and coarse manual work	19
7. 50–70	Special schools for the mentally defective	1·5	Casual labour	7
8. Under 50	Occupation centres for the ineducable	0·2	Institutional cases (imbeciles and idiots)	0·2

From *A Study of Vocational Guidance*, Report No. 33 of the Industrial Health Research Board. London: H.M. Stationery Office, 1926, p. 13.

of persons pursuing different kinds of vocation. The intelligence quotient is obtained by dividing the 'intelligence (or mental) age' of a young person by his actual (or chronological) age and multiplying the result by 100. The intelligence age of a person is commonly assessed by giving intelligence tests of varying difficulty which have been already standardized for different ages and by determining the tests which a given person can pass that would be performed by the average person at a certain age. For example, if a child of 10 years succeeds in passing tests performed by the average child of 11 years, he would be given an intelligence age of 11 years. The intelligence quotient, formed as I have just stated, by dividing the intelligence age by the actual age and multiplying by 100, is nearly constant throughout life, and therefore we may with interest examine in the above table the distribution of intelligence quotients among children generally. We see how this distribution compares with the proportion of adults engaged in the different levels of occupations that require different degrees of intelligence.

Besides this 'general' factor of intelligence which enters, in various degrees, into all occupations, there are 'group' factors of other abilities

common to a number of different occupations or operations, and there are also 'specific' factors peculiar to each of them. But in vocational guidance there is no time to apply psychological tests of these numerous specific factors or the numerous specific tests devised for many possible occupations: we can only apply tests of general and group factors, and supplement these, when occasion warrants, by tests devised for the selection of applicants for the commoner occupations, such as clerical, engineering and dressmaking work.

One factor of considerable importance in engineering, architecture, surveying, designing and the like, which has been designated a group factor, is that of appreciating the relations of shapes and geometric forms. The National Institute of Industrial Psychology has devised a widely used test of this ability to discern form relations, which has proved of practical service. This factor of appreciating form relations is no doubt closely associated with another factor which has been mathematically regarded as a single group factor —the factor of mechanical ability, i.e., the ability to understand moving mechanisms and to solve problems involving them. The mechanical models, devised by Dr J. W. Cox, which have recently

been introduced as tests of mechanical ability, promise to be of great value to the psychologist in vocational guidance. They are unquestionably superior to another (the Stenquist) test, hitherto much used, which was believed to measure the same group factor of mechanical ability, but which is undoubtedly complicated by other factors, e.g., the factor of manual deftness. The vocational psychologist applies these and other tests, for purposes of standardization, to large numbers of persons, differing in age, sex, educational and social level, so as to ascertain the normal score according to age, sex, educational and social level. He is thus able, in the case of each applicant for guidance, to assess his position in the age group or other group to which he belongs.

Special psychological tests of manual deftness or dexterity are now employed in vocational guidance, particularly in advising elementary school children. Recent psychological research indicates that the more *complex* the manual operation, the more fully is it saturated by a single group manual factor, common to other complex manual operations; whereas in the *simpler* manual operations numerous specific manual factors predominate, each of which is peculiar to each such simple manual operation. At the National

Institute of Industrial Psychology, a test has recently been devised by Dr Cox, which, on mathematical grounds, is believed from the data of careful experiment to afford a reliable measure of the group factor of manual dexterity: it should therefore prove useful in vocational guidance, but its exact practical value has yet to be determined.

Even more important, however, for vocational guidance, in the opinion of many, than the assessment of mental abilities—or at all events fully as important—is the assessment of qualities of temperament and traits of character. If a young person is emotionally unstable, it is hopeless to recommend him to a post which demands an unusually equable temperament. Indeed in a case of grave emotional instability the psychologically trained vocational adviser will advisedly recommend expert medical treatment before attempting to offer guidance. If a young person shows strong social proclivities, it would be disastrous for him to embark on work which has to be performed in relative loneliness. If he is fond of change or seeks adventure, he cannot without serious risk of failure be advised to take up work of a highly routine nature.

Unfortunately, there are no sufficiently reliable

tests of temperament and character available for the vocational psychologist, although promising progress is being made in certain directions. He is compelled at present to collect as systematically as possible—and far more systematically than heretofore—all the information available from those who have been in the closest touch with the applicant and also directly from the applicant himself by his own questioning and observation. How this is done can be best described by the account which I will presently give of the vocational examination of a secondary or public school boy or girl who at the age say of sixteen, after obtaining the school-leaving certificate, is seeking advice as to a future career.

But before passing to this, I would stress the importance of a medical history concerning many applicants for vocational guidance. It is obvious that on medical grounds not only of a bodily but also of a mental character, certain occupations may in certain cases be very definitely contra-indicated. I would also stress the importance of ascertaining the family history, not only medical but occupational. Further, the psychologically trained adviser must take into consideration not only the possible hereditary factors but also the present social environment, home conditions, and

the character and influence of the parents of applicants who seek from him vocational guidance. Even the terminal school reports have for him a certain value, although they are necessarily couched so often in non-committal language which gives little or no psychological insight into the real mental make-up of the pupil. He must be guided, too, by the applicant's interests and ambitions, when sufficiently genuine and potent, by his opportunities and his financial circumstances, by the prospects of different occupations and by a vast number of other general considerations.

Thus, in the exercise of his art, the applied psychologist cannot expect success merely by giving a few psychological tests, computing the scores made at them and translating these scores mechanically into the particular occupation or occupations which seem to demand the special abilities indicated by the test scores. This is what I had in mind when, earlier in this chapter, I stressed one of the directions in which psychology is helping vocational guidance—namely its insistence on a very broad attitude and on a carefully balanced judgment. This end is undoubtedly attained most easily and effectively by an adequate training of the adviser in psychology.

The time has now come to describe how the psychologically trained adviser proceeds to deal with a young applicant for vocational guidance. Different forms in which various questions are asked are sent to his (or her) parents, to his (or her) head master or house master (or mistress) and to several of his (or her) form masters (or mistresses) before the applicant is interviewed and examined. By the time the young person comes up for an interview the adviser has thus at his disposal a considerable body of information—of various degrees of reliability. Before he examines the applicant, he interviews one or both parents and learns still more about the applicant and about his parents, their temperament and character, their desires and their circumstances. Meanwhile the applicant starts to perform one of the easier tests in a neighbouring room, and later he is asked, on a prescribed form, to assess his own qualities of temperament and character. This assessment, which he is found to give in a surprisingly honest fashion, affords a useful starting point for detailed discussion about his personality in the course of subsequent conversations with him when his hobbies, interests and ambitions are considered. Much information as to his temperament and character is also obtained by observing the appli-

cant in his actual performance of the various tests, especially in regard to his emotional stability, accuracy, persistence, systematic procedure and the like.

The whole examination, as conducted at the National Institute of Industrial Psychology, lasts about half a day and is followed by the psychologist's evaluation and consideration of all the information he has obtained from so many various sources in the light of his knowledge of occupational requirements, prospects and opportunities. He recommends finally, in a written report, as I have already said, not a single occupation but several, in the order of their preference when possible. He follows up the applicant in his after-career by corresponding with him periodically and asking him how successful and satisfied he is in his occupation. The following data indicate the surprising success of his advice, when comparisons are made between those applicants (mainly from secondary and public schools and Universities) who accepted and those who disregarded that advice. They relate to a group of 463 boys and girls who were advised by the Institute during the years 1927–31, who were followed up three or four years later, and who were classified as being in 'accordance' and 'non-accordance' posts

according as they took or rejected the vocational advice which they received.

	In accordance posts	In non-accordance posts
Satisfied with and successful in work	316	67
Dissatisfied with and/or unsuccessful in work	29	51
Total number of cases	345	118

That is to say, over 91 per cent. of those who took the advice of the vocational psychologist were satisfied with their work, whereas of those who rejected that advice less than 57 per cent. were so satisfied.

Evidence is also available indicating the like value of such advice when given (in Birmingham) to elementary school children. Here two groups were compared—an 'experimental group' of 162 children who received the advice resulting from the use of the Institute's psychological methods, and a 'control group' of 166 children who only received the usual vocational guidance given at the school conferences and by the juvenile employment officers. As before, the children were classified as holding 'accordance' or 'non-accordance' posts according as these posts

conformed to or differed from the advice given. The following data were obtained from 281 of these children:

	Percentage of first posts retained throughout the follow-up period of two years	
	In accordance posts	In non-accordance posts
Experimental group		
78 boys	21	1
72 girls	35	4
Control group		
67 boys	7	15
64 girls	20	15

We clearly see that the drift of children to other posts is far greater in the experimental group when the first post was *not* in accordance with the advice given than when it *was* in accordance; whereas in the control group the same drift was far less or even reversed in direction.

Realizing the superiority of psychological methods of vocational guidance, a few education authorities in this country are now taking steps to have their elementary and secondary school teachers effectively trained in these methods. It is clear that the vocational guidance of elementary

school children, at least, should be the joint concern of (*a*) the school careers master, on the one hand, who has, for several terms before the school-leaving time arrives, been observing and testing the child and accumulating all possible knowledge about him so as to arrive at a *broad* occupational recommendation, and (*b*) the juvenile employment officer, on the other hand, who has received sufficient psychological training to appreciate the careers master's data and knows far more fully than the careers master the *detailed* requirements, opportunities and prospects of particular occupations. For those who are likely to enter into the higher professions from secondary and public schools, an even more widely trained careers master is desirable.

The psychological aspects of all such vocational guidance work need to be supervised by a whole-time regional expert who would train those in his area in the psychological methods of guidance and assist them in their difficulties. Such is the future ideal for vocational guidance, if we are adequately to utilize the great help which the science of psychology unquestionably offers in the choice of a career. That help bids fair to render the vocational adviser's predictions at least as reliable as the predictions of the meteorologist. If we

could but bring ourselves to spend on applied psychological work in vocational guidance even what we now spend on forecasting the weather, or, still more, on testing factory materials and machines, what untold happiness and economies would result!

Chapter II

The Human Factor in Accidents[1]

It is of interest, at least to one of an antiquarian turn of mind, and moreover it is often illuminating, to trace the derivation of a word, when starting to consider the subject to which that word has come to be applied. The Latin word 'accidere' meant literally 'to fall upon': an 'accident' was therefore some unexpected occurrence that 'fell on', or struck, a person—and was hence employed to denote a *chance*, unforeseen, unpreventable, unfortunate occurrence. In Latin 'accident' was clearly distinguished from 'event'. 'Evenire' meant literally 'to come out of': that is to say, an 'event' denoted an occurrence (fortunate or unfortunate) of definitely *known* origin.

In our everyday language we still maintain this original notion of an accident as being a 'chance', unavoidable, adverse occurrence. Those, however, of us who are imbued with the scientific spirit of modern times may urge that, strictly

[1] A lecture delivered before the Insurance Institute of London on 5 March 1934. More recent statistical data are here substituted.

speaking, nothing ever takes place by 'chance'—that if only we could ascertain and foresee the conditions determining any so-called accident, we should no longer ascribe its happening to 'chance'. On the other hand, we must not forget that even if we knew all the conditions determining any event, our command of Nature could never be adequate for us always to control them. We recognize this limitation when in our insurance policies we still ascribe certain accidents to the 'act of God': the material damage, or the personal injuries, caused by lightning or by gales, for example, must usually be regarded as unavoidable; they remain 'accidents' in the original Latin sense of the word.

But this word is also applied to occurrences that might have been prevented by greater human care and foresight, e.g., to the damage wrought by a burst exposed water pipe, to the fire caused by defective electrical insulation, or to the injuries resulting from the sudden fracture of an improperly inspected railway carriage axle. Thus, not all of those *physical* occurrences to which we conveniently apply the term 'accident' are really due to chance.

There remains, however, a large group of 'accidents' attributable not so much to physical

as to *mental* occurrences; and it is to these that I wish particularly to direct your attention. They are 'accidents' in the sense that they do not arise deliberately or even intentionally; but they are not primarily attributable to external dangers. They arise more immediately from defects in the working of the higher human central nervous system, or in the working of the human sensory system by which it is largely controlled, or in the working of the human muscular system which it usually controls. Because such accidents, for which 'the human factor' is responsible, are unforeseen, unintentional and often immediately uncontrollable, they have hitherto been in great part attributed to 'chance'; and until modern times they have too commonly been regarded as unavoidable.

Before the importance and the complex nature of this 'human factor' were adequately recognized, factory accidents were attributed mainly to culpable 'carelessness', foolish recklessness, and to dangerous machinery. Accordingly, punishments were inflicted with little discrimination or effect, and excellent work—invaluable in its effects—was done in the direction of providing suitable fencing and other safeguards to machines. But more than half of the factory accidents even of

to-day, fatal or non-fatal, prove to be due not to dangerous *machines*, but to 'the use of hand tools, persons struck by a falling body, persons falling from a height, persons stepping on or striking against objects, and persons handling goods or articles'.[1] It is therefore not surprising that a little while ago H.M. Chief Inspector of Factories estimated that, however perfectly machinery be guarded, not more than about a further 10 per cent. reduction in the present appalling factory-accident rate could thus be effected. When, further, we bear in mind that, in the preparation of Home Office statistics, the term 'factory accident' is officially limited to one which is either fatal or disables the worker for *not less than four days* from earning full wages for the work at which he was employed—when we reflect that many cases (say, of slight concussion or of even severe electric shock), the effects of which may rapidly pass away, are consequently excluded from these official statistics—we begin to realize the extreme frequency of the entry of the human factor into

[1] Report of the Chief Inspector of Factories and Workshops for 1932. In that year 66,103 of the 106,164 factory accidents (including 323 of the 602 fatal accidents) were of this kind, in which the human factor clearly played the most conspicuous part.

the causation of industrial accidents, and the urgent need for its more precise study.

The same conclusion holds also for accidents on the roads. Despite regulated speeds of traffic, prescribed routes and crossings, better lay-out of roads and their surfaces, improved signals and brakes and the testing of new drivers—despite the undoubted reductions in road accidents which have resulted from these safeguards—the total present number of road accidents, as is well known, remains appallingly high. In the 52 weeks ending 26 December 1936, according to the data available, 225,689 persons were injured and 6489 were killed through road accidents in Great Britain. In the Metropolitan Police area of London alone, 3 persons were killed every day and 155 injured. According to the Ministry of Transport 46·5 per cent. of those thus killed were pedestrians. It is universally agreed that the human factor is mainly responsible for this holocaust: according to Lt.-Col. J. A. A. Pickard, General Secretary of the National Safety-First Association, over 80 per cent. of fatal road accidents are due to it, while others make their estimate 95 per cent. The frequency of these fatal road accidents, now over 7000 per annum, is even surpassed by the number of fatal accidents

occurring within the home and during leisure pursuits of other kinds than motoring; and here the human factor must be fully as important.

The causes and the reduction of factory and traffic accidents have been studied by statisticians, by engineers, by Government inspectors, by means of coroners' inquests, through the police, and more recently by safety-first and welfare experts. All of them have done excellent work in helping to eliminate danger points, and both in paying and in calling attention to the important part played by the human factor in accidents. But it is hardly yet recognized by the public that the most fit and proper person to invoke for the study of the human factor in accidents is the industrial psychologist; for he alone can be regarded as expert in the relevant processes of the human mind and living body, and as therefore most competent to approach the problem from the requisite psychological and physiological points of view.

Let me illustrate this approach by describing one of several investigations conducted by the National Institute of Industrial Psychology into the problem of restaurant breakages—that is to say, of 'accidents' to lifeless material. The average man in the street is disposed to ascribe breakages, like all other accidents, to 'carelessness', and hence

to regard punishment, usually in the form of dismissal or fines, as the most appropriate measure for their reduction. But 'carelessness' has no precise psychological significance, and punishment is now recognized educationally as an inadequate and often ineffective remedy for defective conduct. To allege carelessness, as the cause of an accident, merely implies the fallacy that if sufficient trouble or attention had been given, the accident would not have occurred. Both punishment and the notion of carelessness are merely excuses for not inquiring into the ultimate causes of defective behaviour.

In the investigation which I am now describing, the Institute's staff first proceeded systematically to determine the frequency of breakages at different places in the restaurant—at the counter, at the customer's table, at the lift, during the washing-up, etc., and their frequency throughout the restaurant at different hours of the day at these various points. Next, the persons who actually broke the material were interviewed, their complete confidence having been gained so that they revealed, so far as was humanly possible, the mental or material causes determining each accident. The Institute's investigators then endeavoured to eliminate these and other mental

and material causes, so far as possible, by introducing better mental and material conditions in directions, some of which I shall indicate presently. By these means the breakages were reduced to over 53 per cent. of their former frequency—indeed, in certain articles the breakage frequency was lowered by over 70 per cent.; and the waitresses were unanimous in their appreciation of the greater smoothness and greater ease of their work.

Now factory accidents and traffic accidents, involving the injury or death of human beings, are breakages merely of living, instead of lifeless, material. It is not therefore surprising that factory and traffic accidents are found by the psychologist to be due to precisely the same general causes as are found to determine the breakages of cups and saucers in a restaurant. For example, they are not equally spread among all who might be subject to them. They are more frequent among novices who have not acquired sufficient skill; they are more frequent among the youngest and oldest workers; they are also more frequent among certain individuals ('accident-prone', as we shall later call them), however experienced or of whatever age they may be. Further, they are more frequent during conditions of overpressure, irritation and worry or other conditions of mental

strain. The frequency curve of the breakages of china obtained for different hours of the day, at the start of the investigation just mentioned, showed an enormous rise between the hours of 4 and 6 p.m., when fatigue from the day's work might be supposed to reduce the dexterity and caution of the waitresses. But ordinary fatigue alone is probably not an important cause of increased breakages, nor indeed of any other accidents, whether in the factory or outside it. It is more especially when, in the presence of fatigue, undue effort is made to maintain speed that accident frequency is increased; and in restaurant work this condition must be most acute at the last of the 'rush' periods of the day. Other causes of accidents have also been ascertained. Factory accidents, e.g., tend to occur with more frequency on Mondays and towards the week-ends; also under bad conditions of temperature, lighting, and ventilation.

But hitherto scant opportunity for the adequate study of traffic accidents has been given to the European industrial psychologist. In this country an analysis of 3000 inquests on deaths from motor accidents has been made, over a period of six months, by the National Safety First Association; but, as Lt.-Col. Pickard wisely observes, the

information thus obtained is most inadequate, for such inquests necessarily take place in the absence of the victim, and the most important object of the coroner is to determine not the cause of the accident but the cause of death. Scarcely more reliable is a similar investigation into fatal road accidents, of which a report has been published by the Ministry of Transport based on information supplied by the police. For the police are concerned rather with the allocation of blame for an accident than with an exact determination of the various predetermining, as well as immediate, causes that have contributed to the accident. Moreover, the reliability of notes made by the police, the accuracy of witnesses, and the reports of their evidence and of other evidence tendered, must inevitably be unsatisfactory for such a determination. For this purpose, so far as the human factor is concerned, an accident must be investigated by an expert trained in psychology, and the persons concerned in the accident must, so far as possible, be lengthily and confidentially examined by him.

It is not sufficient to know what persons were doing when they were involved in an accident. If we want to treat a disease, we must investigate not merely its signs and symptoms but also the

causes which have produced them. If we want to reduce 'crime', we must get behind the acts of the 'criminal' and endeavour to ascertain why he came to perform those acts. So, too, in order to reduce accidents, we must inquire into *why* the persons concerned came to incur an accident and not rest satisfied merely with what they did to cause the accident, or what they were doing at the time of it. We must realize, too, that an accident, like a revolution or a strike, is hardly ever attributable to a single cause. Previous irritation, worries, anxieties, sleeplessness and overstrain, and previous habits, attitudes and accidents (both threatened and actual) have to be taken into account. An attempt has been made in the just-mentioned report of the Ministry of Transport to classify the condition of drivers involved in fatal accidents; but they are classified only under the heads of 'ill' (17 cases among over 4000 drivers!), 'under the influence of drink or drugs', 'asleep', 'not known', and 'apparently normal'. Police-court evidence is obviously inadequate for a satisfactory classification of this kind.

Some light on the underlying causes of road accidents has been obtained by expert psychological investigations, especially in the United

States and in France, conducted among the drivers of tramcars and omnibuses. For example, a batch of American drivers was divided into two groups, the one having a high, the other a low, accident-rate. It was found that 31 per cent. of the former, but only 5 per cent. of the latter, were men who showed unco-operative, rebellious and anti-social behaviour in their disregard of regulations and in other undisciplined and insubordinate conduct; that 49 per cent. of the high-accident group, but only 9 per cent. of the low-accident group, were suffering from bodily infirmities, particularly from malnutrition and from such conditions of senile deterioration as high blood-pressure, arterio-sclerosis and kidney disease; and that 40 per cent. of the high-accident group, but only 12 per cent. of the low-accident group, failed to pass a certain single laboratory test devised to help in selecting reliable drivers.

Laboratory selection tests depend for their efficiency on a previous determination of the mental qualities which it is required to test. Probably the battery of tests, recently devised by Dr G. H. Miles with the assistance of Mr D. F. Vincent and now employed by the National Institute of Industrial Psychology, is as effective as any. Their nature corresponds closely with

certain important ascertained causes of road accidents, so far as the driver is concerned. That these causes are important is shown by the close correlation found by the Institute between the scores made at the just-mentioned tests, on the one hand, and the reported-accident record combined with the opinion of their employers' supervisors on their driving ability, on the other hand, in several batches of about two hundred waggon, lorry and van drivers employed by as many different firms. Considering the uncertainty of accident records and supervisors' opinions, the correlation coefficient of 0·77 obtained may be regarded as highly satisfactory.

It is clear that the ability to drive well, like the ability for other occupations, is not dependent merely on the will of the worker. Some persons are born with a slow or irregular rate of response or reaction to alternative signals; a difference of more than half a second is found to exist between the slowest and the quickest individuals, which means that the quickest can bring a vehicle moving at 30 miles per hour to rest with nearly 30 feet more to spare than the slowest can. Some persons are born with poor powers of estimating the speed, distance, size, etc., of other vehicles with which they meet on the road. Some, too, are born

with susceptibility to excitement and flurry, and to alcohol and its ill-effects. Training and practice may improve the use of our native abilities; but, proverbially, nothing can 'make a silk purse out of a sow's ear': there are persons who, whatever their training or practice, will never make good drivers. The total scores made by a novice or by an experienced driver at these various tests, and the observations made while he is carrying them out, will indicate whether or not a wise instructor is likely to make a good driver out of him; whether he is likely to be immune from or prone to accidents; whether he is fit to drive only on a comparatively safe and quiet road; and what is amiss, for possible correction, in the case of a driver of known inefficiency. They will serve to select the man who will make a good or fair driver and to reject him who will be a dangerous driver.

The psychologist has been given ampler opportunity in his studies of factory accidents. These have revealed the liability of beginners, especially of young beginners, to accidents, under conditions where the lack of skill and dexterity and the ignorance and rashness of youth have special play. So, too, a high labour turnover (i.e., a too frequent 'hire and fire' of employees), which, of course,

affects particularly the young worker, has been found to be associated with a high accident-rate. And as youths recover from the effects of accidents more rapidly than their older comrades, such increase in accident-rate affects the frequency more than the severity of accidents. Fatigue, on the other hand, and particularly fatigue caused by an increase in the length of the working day, is apt to affect the older rather than the younger worker, and so to increase not merely the frequency, but especially the severity, of industrial, at all events of coal-mining, accidents. Each factory worker, too, is found to have his own most suitable speed of work; consequently, accidents are liable to occur when he is engaged on a machine which runs at a rate that is too quick (or even too slow) for him to give it the optimal amount or distribution of his attention. Industrial accidents may be also due to 'psycho-neurotic' and to so-called 'epileptiform' causes, e.g., to uncontrollable impulses and to momentary complete lapses of consciousness.

In these circumstances, it is not surprising that, as was first demonstrated by Prof. Major Greenwood and Miss E. H. Newbold in this country, certain factory workers are especially prone to accidents, both trivial and severe. During an

investigation into accident-rate in a textile mill by the National Institute of Industrial Psychology, a lad employed in a dangerous occupation was found to have already sustained five accidents within the period under inquiry. Before effect could be given to the Institute's recommendation that he be transferred to less risky work, he lost his hand while cleaning the machinery. In a sample of 200 men of considerable experience employed in driving street cars and motor omnibuses for the Boston Elevated Railway Co., in the U.S.A., 50 per cent. of the accidents were found to occur among only 20 per cent. of the men. In a far larger group of the same Company's employees, 50 per cent. of the accidents were confined to less than 33 per cent. of the men. Similarly among the drivers of the Cleveland Railway Company of Ohio, 44 per cent. of the total accidents were found to occur among only 30 per cent. of the men.

A group of taxi drivers employed by the Yellow Cab Company of Chicago who passed the laboratory tests 'satisfactorily' had, during the ensuing four months, one-half the number of accidents sustained by another group who proved 'unsatisfactory' at the tests. Exactly the same result was obtained at Pittsburg. On the Greater

Berlin Tramways in Germany, fifty apprentice drivers selected by such tests had in their first year of employment 50 per cent. fewer accidents, and in their second year 40 per cent. fewer accidents, than fifty who had not been thus selected. In Barcelona, 35 omnibus drivers who did poorly at the tests had an average accident frequency three times that of 45 drivers who did well at them. In the same city a group of taxi drivers unselected by tests had five times more accidents than those selected by tests and were four times more often summoned for breaches of traffic regulations. (One-fourth of the total taxi drivers in Barcelona had been previously submitted to the tests; and of these one-sixth had been rejected.) When in America the records of 100 motor-car drivers who had caused fatal accidents were compared with those of 100 other motor-car drivers selected at random, 35 per cent. of the former group were found to have had bad records during the preceding year, whereas this occurred among only 5 per cent. of the latter group. Often the accidents sustained by any one member of the 'accident-prone' group were found to be of the same kind and to be due to a single feature of bad driving peculiar to himself.

The remedies for accidents become obvious as

soon as the nature and importance of their various causes have been accurately ascertained. We shall then no longer glibly ascribe accidents to mere 'carelessness', 'recklessness' or 'bad luck'. We shall continue to pay regard, as in the past so much close regard has been paid, to material and mechanical conditions, by providing machine guards in factories, by improving driving mechanisms and their controls, by attending to special danger points, and by imposing regulations and penalties for their infraction. But we shall realize that, however fool-proof we may render mechanisms and physical events, however perfectly we adapt car signs and controls, street lamps and signals to mental needs, however carefully we may regulate by law the movements of drivers and pedestrians, however completely we may reduce by material means temptation to court danger, we are unlikely to diminish the present frequency of accidents in any marked further degree unless we pay closer and unremitting consideration to the human factor, i.e., to the psychology and physiology of those concerned in accidents.

Doubtless something can be done merely by the offer of suitable incentives. Our insurance companies allow commonly a bonus for no claim;

but this provides an incentive rather for making no claim than for actually reducing accident frequency. A few industrial firms have offered their employees similar incentives, paying, for example, a contribution to the holiday or benevolent fund of the latter when no factory accidents have been reported during a prescribed period; but here again there is a danger of at least minor accidents being concealed in order to reap the offered reward. There can be no doubt as to the desirability, in factories and, in fact, everywhere, of reporting the most trivial accidents, in order to avoid the occurrence of sepsis through neglected treatment, and in order to prevent the later occurrence of more serious accidents.

It would appear wise to offer incentives for the adoption of measures of 'prevention' rather than to offer them for doubtful evidence of 'cure'. This is already done by insurance companies in regard to fire: the premium paid being dependent on the risk of and on safeguards installed against fire. As we know now that accidents are especially likely to occur when unselected persons are employed in dangerous operations, it is clear that insurance companies should offer special advantages where attempts are made to reduce accident frequency by eliminating these 'accident-

prone' persons. So far as road accidents occur, it has been found that commercial vehicles are involved in about one-third of these. Clearly, therefore, a beginning might well be made in selecting the drivers of road lorries, waggons and vans. One insurance company has recently shown this desired spirit of progress and of social service by offering companies engaged in such transport (and also private individuals) a reduced premium for accident insurance where drivers have satisfactorily passed the tests already mentioned, devised by the National Institute of Industrial Psychology. Similar tests for factory employees engaged on machine work are not yet available, but through the investigations of the Industrial Health Research Board a beginning in this direction has already been made: thus the results of applying certain tests devised by Mr Eric Farmer, with the assistance of Messrs E. G. Chambers and F. J. Kirk, to a group of nearly 400 Royal Dockyard apprentices, whose accident records were available, indicate that the 25 per cent. of them who made the lowest scores at the tests had an accident rate 100 per cent. above that of the remaining 75 per cent.

Such selection tests, if properly devised and applied, cannot fail to reduce the frequency of

accidents. Thus in Paris, whereas the frequency of accidents caused by all motor vehicles between the years 1929 and 1933 *increased* by 5 per cent., the accident-frequency incurred by drivers of the Paris omnibus service since their selection by tests during the same period *decreased* by 66 per cent. So, too, the rate of accidents due to collisions was reduced by more than 35 per cent. in the street railways and omnibus services of the Boston Elevated Railway Company in consequence of such selection work; and on the Milwaukee Electric Railway it was actually reduced from 14·1 to 0·6 per cent. But selection tests will do more than this: they will also reduce the period, and thus the cost, of the training required by drivers, and the number of engaged drivers who later prove unsuitable and have to be discharged. On the Greater Berlin Tramways, the drivers selected by tests required on the average 120 hours less to train. By the General Transport Company of Paris less than $3\frac{1}{2}$ per cent. of drivers were found unsuitable during or after training, when they had been previously selected by suitable tests; whereas before the use of selection tests there had been a wastage of 20 per cent. Apart, too, from reductions in actual human and material damage and wastage, there ensues an enormous diminution

in the wear and tear of the vehicles driven, due to the more efficient use of them by the better selected men.

When 'accident-prone' persons already engaged in dangerous occupations have been identified, they need not necessarily be discharged. If the causes of their defective conduct be subjected to close medical and psychological investigation, it is found that many of these causes can be removed by appropriate measures. In one American group of 181 'accident-prone' drivers, more than 50 per cent. were cured, and in all but 10 per cent. of them some improvement was effected, by appropriate treatment, especially when their accidents were due to some definitely bad habit in driving (e.g., cutting in too soon on overtaking a car), or to ignorance of certain risks, or to bad home circumstances which could be dispelled. Such a 'reformation' programme yielded a reduction of 42·7 per cent. in accident-frequency among an 'accident-prone' group during six months after reinstruction and treatment.

Adequate training is indeed essential for all those who are likely to be involved in danger, whether they be factory machine-hands, motor drivers or pedestrians. Until recently the general

rule has been that each picks up, as best he may, his habits of avoiding, or dealing with, a dangerous situation. But with the rapid increase of risks in workaday life and in human and mechanical locomotion, we shall surely, sooner or later, be forced to arrange suitable systematic instruction for all who are exposed to those risks, so that intuitively the correct response is made to a dangerous situation. Selection methods will improve the suitability of those who manipulate dangerous machines; but it will not train them in the use of such machinery and in the purpose of machine guards. Moreover, as we have seen, there are numerous factory accidents which cannot be attributed to the misuse of machines or to the neglect of their guards, while on the road there are innumerable pedestrians who are the prime cause of driving accidents. Selection is not only universally impossible; it is never a complete substitute for adequate knowledge, which can only be obtained by systematic training.

Posters will serve, and have already served, materially to reduce accidents by their inculcation of 'safety-first' measures. But unless posters are frequently changed, their forcefulness diminishes and they tend to be neglected. Psychologically, they may err by promoting fear, rather than

knowledge, in their aim at the exercise of greater caution: the sometimes gruesome pictures of accidents that may result from erratic conduct engender, in many persons at least, such grave apprehension of danger as to produce the very misconduct which it is the object of the posters to prevent. However useful, they are also inadequate because they rest on the mistaken notion that accidents are attributable mainly to carelessness and recklessness. Educationally, too, the mere exhibition of posters is insufficient: visits to such a museum as the Home Office Museum, personal instruction and the actual demonstration and explanation of the nature of likely accidents, of the objects and use of the guards and fencing provided, and of the correct habits and responses required in dangerous situations, are likely to prove more effective than the mere display of pictures or diagrams: they afford fuller knowledge and attract a greater and better interest.

Increased interest in the subject of factory accidents is also readily evoked by the establishment of safety committees on which representatives both of management and of labour meet in order to discuss methods of reducing accidents and in order to inquire into the causes of accidents as they occur. Too often, however, in the past,

managers have failed to maintain their practical interest, and hence the interest of their employees, in the work of these committees, whose functions have consequently deteriorated through laxity and indifference.

The effect of punishment on accident-frequency may be compared with its effect on the commission of crime. There are the 'accident-prone', as there are the 'crime-prone', some of whom are unalterable by punishment or by any other treatment, others of whom require suitable training or removal to more favourable conditions, rather than punishment, to effect their improvement. Indeed, few people are deterred from misconduct, or from incurring accidents in particular, through sheer dread of punishment: the fear of cirrhosis of the liver or of arterial degeneration is unlikely to abolish drunkenness, nor has the fear of capital punishment abolished homicide. Punishment, like reward, owes its virtues rather to its expression of social opinion: a person who commits, when he might have resisted, an anti-social action is punished because he has sinned against his fellows and because he is thus regarded as an outcast until he has atoned for his misconduct.

Enough has been said to indicate that a person who causes an accident is not necessarily re-

sponsible for that accident, and that accidents are relatively seldom due to chance. Neither defective willing nor misfortune is responsible primarily for most accidents. They are in great measure due to the unconscious workings of the human factor, and the remedies they demand lie in selection and training and in adapting as perfectly as possible external conditions to mental requirements.

Chapter III

The Psychology of Musical Appreciation[1]

In his book entitled *Musical Composition* the late Sir Charles Stanford relates (p. 143) how, at the age of fourteen, he vainly tried to set to music a long dramatic poem but had to abandon his attempt when he came to tackle the fourth verse of it. But, meeting with the same poem once again when he was ten or eleven years older, he sat down and composed music for the whole of it straight away without any difficulty. An identical interval has passed since last I published anything concerning the psychology of musical appreciation. Like Stanford, I have not pursued this subject during the interval. And now that I have been induced to reconsider it, I wonder whether, like him, I shall be able to achieve my aim with improved success. In one important respect, however, our conditions differ. When Stanford met with his poem for the second time, he had completely forgotten about his previous

[1] The Sixth Joule Memorial Lecture, delivered before the Manchester Literary and Philosophical Society on 14 March 1932.

attempt. Indeed, it was not until fourteen years after his song had been written and published that he came across his imperfect juvenile effort in an old box, when he discovered to his surprise that the music to the first three verses which he had then written was virtually identical in melody and harmony with his later, maturer composition. I, on the contrary, in preparing this address, have had before me the published results of my previous work carried on for twenty-five years between 1898 and 1922, which was concerned with primitive music and rhythm, with synaesthesia, and with individual differences in listening to tones and music. I can only hope that in reviewing and trying to integrate these past researches, the same influences of maturer age and thought, the same unconscious processes of consolidation and the same removal of any unfavourable inhibitions may be operative.

It seems to me that we can most profitably approach the subject of musical appreciation by considering the probable stages in mental evolution which have enabled man to experience music as he does, and the earliest functions which human music appears to have served. Accordingly, I will begin by describing the following reported case. A gifted musician was helping one day at a local

opera in a performance of *Der fliegende Holländer*, when suddenly, at the end of Senta's ballad in the second act, the music became for him a series of extremely unpleasant sounds—not mere dissonances but the most intolerable noise. He left the theatre in tears. On the following day he happened to hear a barrel organ playing in the street, but again the tune seemed to him only utter noise. He could, however, still appreciate rhythm in dance music, and he could still read music from a written score as well as ever; but whatever he heard was but a toneless noise. I will not stay to discuss the cause of this condition, but it may be regarded, not fancifully I think, as a reversion to a far distant pre-vertebrate stage at which heard tones could not be discriminated from noises.

When in the course of evolution tones had begun to be discriminated as such, further improvements must have followed in the awareness of finer differences between them in respect of such qualities as pitch, timbre, loudness, etc. It is noteworthy that, especially by the less musical among us, these qualities still tend to be confused: a loud tone is judged by the most unmusical to be of higher pitch than when it is sounded softly, and a tone rich in higher overtones appears to all of us as higher in pitch than one of the same pitch which

is of different timbre because it is poorer in such overtones.

In the cries of different animals we find all the material actually used in the music of various primitive peoples of the human species. The cries of some animals are characterized by their glissando character where well-defined pitch is hardly discernible, of others by the use of small distances between successive notes, and yet of others by the use of intervals which appear to us approximately 'consonant'.

An important step making possible the evolution of music in man appears to have been the appreciation of equal tone distances: some of the most primitive examples of human music consist in a phrase of two, three or more descending tones separated by small, more or less definite and equal distances one from the other. Then came an important development based on absolute pitch, which also arose early in animal life—long before names were given by man to tones of different pitch. It has been observed that when parrots are taught a tune, they will always repeat it in the same absolute pitch; and this is said to hold often for young children. Certain musical instruments, too, such as the pan-pipes and the harmonica, which have a wide distribution throughout the

world, the former, e.g., occurring both in Melanesia and in Brazil, the latter both in Burma and in Africa, have been found, despite their wide wanderings, to retain the same pitch. This is probably in part due to the early influence, in primitive man, of absolute pitch. In the construction of tunes, absolute pitch has been important in permitting the pitch of one note to be retained in memory, and thus to serve as a primitive key note. In savage music it is sometimes the first, sometimes the last note, which plays this role, influencing the number of descending steps and ensuring that the melody as it recurs in the song shall always recommence or terminate on the same tone.

There can be little doubt that the memory for absolute pitch is also responsible for the development of tone *intervals* as contrasted with tone *distances*. Tone intervals are based on the experience of 'harmony' between two successive tones, the remembered pitch of the first tone appearing in a certain degree 'harmonious' with the heard pitch of the following tone. Whereas the tone distances first employed in primitive music were narrow, the tone intervals, on the contrary, were relatively wide. But these relatively wide intervals arose through an awareness of harmony,

not from the summation of small tone distances, although later they were broken up to give rise to a series of smaller tone intervals.

Our own tone intervals are so often experienced through the *simultaneous* sounding of the two tones constituting any interval, that it is generally supposed that their selection has been due to the 'degree of consonance' or 'fusion' experienced when two tones of different pitch are sounded together. But many primitive peoples who use harmonious intervals sing only in unison, and these intervals occur in the songs of peoples who employ no musical instruments and hence no instrumental accompaniment whatever. The first use of tone intervals seems therefore to depend on the pleasure derived from the relation of two *consecutive* tones, not from the consonant effects of fusion obtained by hearing the two tones *simultaneously*.

It is obvious that the memory for absolute pitch has played an essential part in developing this relation. Indeed musical instruments, so far from developing the appreciation of harmonious (or consonant) *intervals*, have often helped to maintain scales based on tone *distances*. Thus the Siamese and Javanese instrumental scales divide the octave into seven and five *equal* steps, respectively; and

our own pianoforte scale now consists of twelve *equal* semitones—a method of tempering which was independently adopted or advocated also in Indian and Chinese music. The ancient Greeks, too, appeared to have formed their scale by adding note after note or by joining tetrachord to tetrachord on their instruments. Indeed, they gave a different letter-name to each note, ranging from α to ω; only in Byzantine times was the note following η given the name of α—the identity of octave tones being at length recognized by identity of lettering.

Some years ago, the essential distinction between tone distances and the fusion effects of tone intervals was demonstrated by the description of a case of disordered hearing, in which the apparent pitch of a certain note was so lowered that its *distance* from another lower note, when they were sounded *successively*, was judged by the patient to be much reduced; but when the same two notes were sounded *together*, the true *interval* was at once correctly reported.

Not only does each tone, or each successive tone relation, develop its own significance, but also a definite 'musical meaning' is acquired by a whole group of successive tones when integrated and appreciated as a pattern, phrase or melody. Cases

have been reported where the ability to hear noises and tones and to distinguish different pitches and timbres has been retained, but musical meaning has been suddenly and entirely lost. 'I hear well', said such a patient, 'I hear everything, but it is all a jumble.' When a selection from a familiar opera was played to him, he was quite unable to recognize it. Finally, with mental development and experience, we reach the ability to appreciate, and to analyse, the component parts and the construction of polyphonic, e.g., fugal and contrapuntal, music.

The music of some extremely primitive peoples is distinguished by its *récitatif* character, that of others by its rhythmical character. In the former case it is closely related to speech, in the latter to movements of the limbs and trunk. In the former case its usual function is to add to the feelings conveyed by language in song, in the latter case to induce and to add to the pleasure and ease of regularly recurring bodily movements. Could we but trace speech and music far enough back we might conceivably reach a common origin in sounds conveying a pre-linguistic meaning, an almost wholly affective non-cognitive meaning—neither verbal nor musical, but comparable to those vocal expressions of contentment, pain,

alarm, anger, lust, etc., with which we are familiar in infra-human animal life. From such an origin may have arisen in one direction the irregular, continuous changes of pitch (and rhythm) and the largely cognitive, utilitarian meaning, characteristic of prose language, and, in the other direction, the regular, interrupted changes of pitch and rhythm and the largely affective, non-utilitarian meaning, characteristic of music. If we may very broadly define meaning as what a stimulus or a definite series of stimuli or a state of consciousness stands for, that is to say what movements or conscious experiences it tends to call forth, then the meaning of a single written word consists in the *cognitive* ideas and images and consequent actions aroused by it; the meaning of a word or sentence spoken in a voice, say, of anger or contempt, consists besides in the *affective* recognitions or experiences produced; whilst the meaning of a heard musical phrase consists primarily in the emotional and other *affective* mental processes and in the impulses to movement which it evokes, and in the cognitive awareness of its structure.

There are also secondary cognitive meanings in music derived indirectly and personally from suggestion and association, and more directly and

universally from the intellectual process of analysing its increasingly complex structure. Beyond this, however, music conveys no meaning. What we call to-day 'programme' music utterly fails to achieve its mistaken aim of communicating concrete, objective situations and specific acts—unless the hearer is expressly supplied with a programme verbally describing to him what cognitive experience and activities the music which he is about to hear is intended to represent. But all music, whether it be programme music or pure ('abstract') music, succeeds in evoking very broadly similar appreciations of its structure and similar affective experiences in different members of an audience, producing joy or sorrow, appearing harsh or tender, or being soothing or exciting, and thus evoking corresponding visceral, glandular, circulatory, respiratory and other bodily movements among those of average musical ability who listen to it.

More or less artificially, we may divide the enjoyment of music into the enjoyment of sound, the enjoyment of tune and the enjoyment of rhythm, although few musical tunes are ever wholly devoid of rhythm, few musical rhythms are ever wholly devoid of tune, and neither can be said to be ever devoid of sound. The effects of

melody are different from those of rhythm, for melody and rhythm, as we have seen, serve different purposes, and the appreciation and enjoyment of each differ in different individuals. But the complex developments which they have undergone are essentially similar. Just as the enjoyment of melody has been enhanced by the simultaneous combination of different melodies or other accompaniments, or by variations in the melody, especially as practised in advanced European music, so too the enjoyment of rhythm has been enhanced by the simultaneous opposition of different rhythms or by complex changes in rhythm, especially as developed (to an amazing degree) among certain primitive peoples. Alike in the higher development of harmony and of rhythm, and for the full comprehension of musical thought, the intellectual acts of synthesis and analysis are required.

It is already clear that music has had various fundamentally different relations in its past history. It may be related to speech; it may be closely associated with bodily movements, especially with workaday movements and with other rhythmical movements—with dancing in particular; and there can be no doubt that it may also be intimately connected with sexual feeling and

courtship. But it would be erroneous to say, as has often been variously said, that every kind of music has arisen from one source—from speech, or from rhythm, or from sexual activity. All one can truly say is that in its various appeals music is closely related to each of these. And thus it is that owing to individual mental differences the same music may show extraordinarily wide differences in its intellectual, motor and emotional effects on different individuals, and that different music may make different appeals to the same person.

We have now reached a stage in which we can examine and better interpret other wide individual differences which are found in listening to music. They consist, however, in differences rather of degree than of kind. Although we shall without difficulty be able to distinguish different kinds of attitude towards music, these different attitudes cannot be strictly and severally allocated to different individuals. In other words, we cannot say that an individual A exhibits solely an X type of attitude, an individual B exhibits solely a Y type of attitude, and so on. No one individual belongs to a pure type. All that we are warranted by our experimental evidence in saying is that in some persons one attitude predominates, in others

another. Moreover, in a given individual, sometimes one attitude is predominant, whereas at other times and in other mental and musical circumstances a different one predominates. Let us realize, then, at the outset that the different kinds of attitude which we are about to distinguish are not separately distributed, but vary in extent and employment both among different individuals and in the same individual under different conditions.

The first attitude in listening to music, to which I will draw attention, arises from what may be termed its *intra-subjective* appeal. It evokes in the listener sensory, emotional or other affective experiences and tends to arouse in him experiences of active or passive bodily movement or desires for or impulses to movement. Let me cite a few examples gathered from the introspections of certain persons who in my experiments listened to various pieces of music: 'I felt a restful feeling throughout...like one of going downstream while swimming...I wanted to throw myself back and be carried along.' 'During the dance movement I...felt diaphanous things floating in the wind....The breeze came in contact with my right cheek.' 'A circular movement. I was being turned round very slowly.' 'A great feeling of

happiness, followed by expansion inside, leading to great excitement and breathlessness for a moment.' 'I felt the effect of being carried away, partly emotional, partly strain and tenseness of body.'

The next attitude to which I wish to draw attention is closely related to, and doubtless often derived from, these sensory, affective and motor excitements. It may be ascribed to the *suggestive* appeal of music. Here we may meet with every stage between the simple colour images or synaesthesiae relating to pitch, timbre and tonality, the passing associations due to similarity, and the elaborate day-dreams of phantasy. E.g., 'I saw a beautiful grey, a lovely grey with light shadows ...I saw another grey, just lovely, like glacier water...Don't you see the expanse, right on top of a hill?' Having obtained this 'lovely grey' because the music 'reminds me of dawn—grey, fresh and nice—I then saw a frieze, not a real good Greek one, but a Thorwaldsen or a Canova frieze'. 'There she is', said another of my subjects, 'the little fairy...Children dancing, not grown-up....Men dressed in red with feather plumes. Don't you see the fairies? Yes. It's a sylvan sort of thing.' 'A cave, rocks, sea-waves ...a sea-serpent poking its head out of the cave,

dancing spray, with the sun on it. I could draw the exact picture.'

The third attitude arises from the *critical* consideration of music. Here the listener is concerned neither with the sensory, emotional or conative experiences, on the one hand, nor, on the other hand, with the suggestive images evoked in the two previous attitudes to music which we have been considering. He regards the music as something of worth, critically appraising the standard which he considers it to reach, its merit and its value. 'It was a mere mechanical imitation...', said one of my subjects, 'like a painter imitating a great master.' 'I noticed the second horn was too loud...', reported another; 'when the second tune came with the 'cellos, it didn't stand out enough.'

From this objective attitude we may pass to the fourth or *characterizing* appeal of music. Here the music, instead of being criticized as an independent inanimate *object* of practical worth, is regarded as an independent, self-active *subject*, and is endowed usually with human qualities, such as joviality, playfulness, recklessness, daintiness, stupidity, insincerity, which personify it. 'It tried to be light-hearted', said one of my subjects, 'but it was all the time very sad.' 'There is something

sinister about it.' 'The music seemed as if it were joking with me.'

Sometimes the music is characterized not as an independent living being but as a self-active geometrical pattern. 'It falls into a pattern...', said one of my subjects. 'Then came a pattern of a different type, beginning with zigzags, obliquely transverse strands from lower left to upper right, going through a horizontally moving pattern.' It is easy to see analogies between the forms and movements of such geometrical designs and the rising and falling pitch, the blending and segregation of different simultaneous themes, and the effects of various rhythms and syncopations in music. 'Following the pattern', said one of my subjects, 'is my greatest enjoyment in music. If I cannot follow it...there is no longer meaning in its movement.' When, however, this subject can get no patterns of polyphonic or rhythmic origin to enjoy, when for example he is listening to a simple melody, he 'characterizes' the music at once with such human qualities as languor, gloom, plaintiveness or menace.

Let us now deal with these four different appeals of music in closer detail, and with their interrelations, taking the characterizing attitude first. It might be, and indeed it has been, thought

that the characterizing attitude originates 'empathically' from the intra-subjective attitude—in other words, that a piece of music comes to be termed by the listener, say, high spirited, just because it evokes high spirits in him. But that this is by no means necessarily the case is revealed by the following among many other similar reports of my subjects: 'I noticed first the mournfulness of the music and then its effect on me.' 'The piece sounded cheerful in certain parts, but I felt in a contrary grain all the time.' 'I got the impression of people dancing, I think on the stage.... There was a note of sadness among the dancers, a sort of regretfulness. I think that the sadness affected me and came secondarily to the stage sadness.' 'It's all so intensely sad. All the time I was wondering whether it was cheap or not. I came to the conclusion that I ought to be moved. I *was* much moved by it after this conclusion.'

It might similarly be thought likely that the characterizing attitude was derived from the suggestive attitude, a tune being characterized, say, as trivial because of the triviality of the suggested ideas and images that it evoked. But, in point of fact, the converse is sometimes demonstrable, some human characteristic being first ascribed to the music and this characteristic then

suggesting appropriate ideas and images. Sometimes the character aspect of the music and the train of ideas evoked develop side by side and distinct from each other. Thus to one of my subjects the music seemed trying to be persuasive, while the scene was imagined of a persuader and one who was to be persuaded: 'There is no response to the persuasion: it is a failure. The characters disappear: and the music behaves like a Greek chorus, going over what has occurred in a philosophical manner.' Sometimes, too, there is a blend of the character and intra-subjective attitudes. E.g., 'I felt the yearning character of the first *motif*—a sense of tears in it—which was partly in the *motif* and partly in me.'

We can hardly come to any other conclusion than that such characterization of music is but a persistence of the primitive and deeply rooted tendency of mankind to personify all natural objects, whether animate or inanimate, and to regard them as independent entities, wholly apart from their practical value or their import to or effect on the listener. It is indeed through this detachment from the human self of art-material and of its immediate experience, and through its contemplation for its own sake, that awareness of beauty becomes possible.

If characterization is the attitude most favourable to aesthetic enjoyment, the intra-subjective and suggestive attitudes are most favourable for complete sensual and emotional surrender and for inducing a state of transport or ecstasy; while the critical attitude enters readily when the three other attitudes are impossible or are obstructed. When it is the resort of the expert, the critical attitude may facilitate, although it cannot induce, the experience of beauty. Among the less musical, it may, on the other hand, help merely to give music sufficient meaning to arouse the intra-subjective and suggestive attitudes. These latter attitudes are clearly and closely interrelated. The sensory, emotional, and motor effects of music tend to evoke trains of images and phantasies which in their turn, whether thus or directly aroused, contribute to the affective experience of the listener. When the listener surrenders himself to emotion and phantasy, any tendency to characterization must inevitably be suppressed. But the temptation to such surrender is often resisted, as in the following example: 'A distinctly pathetic ring about it. I should have felt distinctly wretched if I had got regularly into it, but I keep myself from this at a concert. I very rarely let myself go.' Where, as among the most unmusical, the intra-subjective

attitude is congenitally weak, the feeble sensory and affective responses aroused would not be expected to evoke trains of ideas and imagery. The suggestive attitude appears consequently to be rare among the extremely unmusical. But this same attitude is also rare among most highly trained musical people, because they tend to inhibit it largely owing to their adoption of the critical attitude. Thus, one expert musician reported to me: 'I now nearly always view music from the critical standpoint. I conduct: I compose. I always want to know how the conductor is getting effects if it is a new work, and what will be his rendering if it is an old one.' So he remarked of one composer: 'I noticed by what simple means in these modern days he gets his effects. I noticed also...how he gathered up his climax by syncopation.' And again—'As always in Beethoven, one must notice the tremendous... contrasts, especially dynamic contrasts. His *crescendos* always give me pleasure. Beethoven makes scale passages so much more interesting than, say, Liszt.' Or once again, 'As usual, the violinist uses too much *vibrato*....The sweep up the strings made me feel quite sick.'

It is highly interesting to observe that this same subject is nevertheless prone to characterization

and that he yields to it when, through dislike of, or lack of interest in the music, he is off his guard. 'The cadenzas are rather vulgar and horrid', he reported; 'the introductory solo accompaniment ...is in the last degree trivial.' And when the music seems trivial, meretricious, 'stagey' or unreal, not only does its character appeal, but also its more lowly suggestive appeal, escape from suppression even among expert musicians. This same observer reported: 'I opened this with a dog fight....The opening of the second part was a dance of savages—*this is amazing to me*. I could see the red and blue round the loins....*It is not like me at all*', he protested; 'then, I think, I pulled myself together.' 'The beginning', reported another, highly artistic, subject, 'reminded me of a stage, people coming on. It was trivial, theatrical.' But see now what follows. 'Then it passed to out-of-doors, real, not stagelike, in a wood, with sunlight, a vast procession of people slowly moving...with gold-coloured dresses, some green, all brilliant.' So too another unaffected subject responded to 'unreal' music—'I was up in the theatre, looking down.' And yet another—'*I* felt no deep emotion. But there was much emotion in the *soldiers*.'

May we not compare these various attitudes of

the listener with the alternative attitudes of the actor who may be either dispassionately looking on while portraying the emotions of his part or, at the opposite extreme, so much more immersed in his part as to feel these emotions in himself? Similarly, the listener to music may be so carried away as to feel emotion in himself; or he may, in the characterizing attitude, as we have seen, attach the emotion to the personified music; or he may, in perhaps some intermediate way, attach it to some person or persons suggested by the music, as in the report of one subject who said: 'I was in the Queen's Hall, a fair girl in a pink dress was playing and another girl was accompanying her. The violinist had a sad look about her. I felt she had had a sorrow in her life.' 'I cannot feel emotion in listening to music', observed one of my subjects, 'unless I feel that I am moving in the same emotional attitude as the persons [imaged].'

In the exercise of the suggestive attitude, fairies, fauns and goblins may make their appearance—indicative of long-past juvenile imagination; lovers may appear, indicative of sexual influences; in warlike, barbaric or folk-tune music, soldiers, savages or villages are visualized, respectively; and in orchestral or religious music a concert hall,

or church, a conductor, and one or more musical instruments may appear on the scene. What opportunity the interpretation of many of these forms and symbols of phantasy would provide for the psycho-analyst!

At first sight it may seem difficult to decide on the relative values of these four attitudes adopted in listening to music, when one of my subjects asserted: 'Music always gives me the sight of so many charming things. That's why I like listening to it', whereas another insisted—'I always try and banish all imagination when listening to music', and yet a third reported—'Sometimes I listen to music seeing the orchestra and attending to the *technique*, sometimes enjoying visions of forests, etc., that come before me, sometimes paying regard to the meaning. . . etc., of the piece.' The correct decision must surely be that through the sensations, emotions, actions, phantasies, patterns, colours, etc., which it arouses, music may give exquisite enjoyment, but that in addition music has an inherent meaning, inexpressible in terms of spoken language or felt emotion—a meaning which becomes more and more clearly recognized, less affective, and more intellectual in character, the higher be the development of musical appreciation and of musical composition.

As one artistic subject of mine observed—'When I see the pictures [i.e., the ideas and images evoked] they take up almost all my attention, so that I have the feeling "Dear me! I'm not listening", and then I get back to the music.' To his satisfaction one of my subjects reported—'The middle of the second movement [which he started to enjoy] switched me off my imagery and I returned to the pure consideration of the music.' And another objected—'I cannot...conceive music *saying* anything'; and as yet another—a highly accomplished musician—explained: 'Music has a meaning, but always in musical terms. I couldn't put it into words. It always irritates me to be asked to do this.'

But if we admit that the highest appreciation of the highest music is to be derived from contemplation of the music itself rather than from mere surrender to its resulting emotions and suggestions, let us not lose sight of the originally manifold derivations and functions of music, viz. to express and to communicate emotions, to excite our imagination and to induce rhythmical movements and other bodily, e.g., sexual and workaday, activities. And let us not make the mistake of assuming that the primary function of every art is to arouse an *aesthetic* experience—the

appreciation of beauty. For in its widest sense an art is a craft. No beauty is aroused in the practice of the art of medicine, seamanship and the like. From certain pictures or from certain buildings beauty *may* be evocable. But many pictures are merely portraits, that is to say copies of persons, or, as in the illustrated press, fulfil the function of recording events; and not all houses or factories can be so designed as to produce an aesthetic appeal. So it is with music. Music may be useful; it may be regarded from the practical point of view, say of dancing, marching or fighting, from the standpoint of its intra-subjective and suggestive effects, or from the critical consideration of its standard and value for the listener. But for the appreciation of its beauty the listener's personal and practical interest must cease. A certain psychical 'distance', as it has been well termed, must be interposed. The sailor who is impelled to rescue the heroine in a melodrama by climbing down to the stage from his seat in the gallery is psychically too 'near' the play to appreciate its beauty.

Clearly the characterizing attitude marks an important approach towards the conditions of 'distancing' necessary for aesthetic appreciation. In it the listener regards the music as something

existing quite independently of himself and his experiences, and of his value and use of it. He no longer surrenders himself as a passive instrument to be played on, as it were, by the music. As one of my subjects averred—'To me music is never sad or joyful. I only get aesthetic impression.' If he regards a composition as marvellously well-fitted to express its purpose, his critical attitude must be impersonal; that is to say, he must not regard the music as being well-fitted merely to give him enjoyment. If he regards it as ill-fitted, he will be debarred from readily finding beauty in it. If he finds it well-fitted, his experience of beauty may be enhanced by his admiration and wonder. But the mere realization of appropriateness or perfection will not suffice to evoke an aesthetic experience. A thing of beauty must be viewed not as a satisfying piece of man-made mechanism, but as a 'distanced' living organic whole. And the adoption of the character attitude strongly favours this view.

But it is possible for us to 'distance' not only the music we hear, but likewise the phantasies, the feelings—even the sensations—to which it gives rise. And so, a day-dream evoked by music may itself become beautiful; a feeling of joy or sadness aroused may, by its 'individualization', itself

become beautiful; while to the most sensual even the warmth of a bath may become beautiful—if only it can be adequately 'distanced'. As one of my subjects insisted—'The special *feeling* I get from music makes it beautiful. It gives me a tender poetic feeling, almost pity.' And as another explained—'Certain short phrases give me quite a beautiful thrill, localized in the diaphragm—like the feeling that early morning brightness gives one.' Thus beauty may still be appreciated in music, even although the aesthetically more lowly intra-subjective or suggestive attitude is adopted.

Are we then justified in concluding that we need not realize the musical meaning of a piece in order to obtain from music aesthetic enjoyment? The answer in the affirmative to this question involves an examination of the term 'musical meaning'. I have already used 'meaning' in its widest sense, as being what any external object or state of consciousness stands for or prompts to. According to this broad use of the word, the peculiar auditory sensation of pitch produced in us by the middle 'C' of the pianoforte becomes the meaning of 256 to-and-fro movements or periodic vibrations of the air outside us; and the situation which confronts a duckling on its first sight of water has also a certain (extremely vague)

meaning for the fledgling. But these are *innate* meanings common to and closely identical in all members of the same species. The more usual use of the term 'meaning' limits it to what has arisen through *acquired* experience and is confined to smaller numbers of any species. Thus the word 'elf' has meanings very different for the Englishman and for the German; and such an object as a motor car has meanings very different for the lady of fashion and for the engineering expert. Moreover, the term is usually applied to meanings which are fairly permanent, not to those which are established for temporary use and are to be later discarded, as, for example, the meaning of a knot tied in a pocket handkerchief for a reminder.

I propose to employ 'musical meaning' to the exclusion of any extreme possible uses of the term. I shall not apply it to sensory experience, common to and innate in all men, as the meaning of certain external vibrations in the air. Nor shall I apply it to the purely individual, rarely or never recurrent, associations, phantasies, or emotions which may be experienced on listening to music. Excluding these uses we are left with much in music that may be rightly said to have musical meaning—much that is fairly permanent in the

listener and is fairly common to a large number of listeners of the same musical ability and experience. We may, I think, correctly speak of the emotional musical meaning of a composition when it evokes some similar emotional response in large numbers of an audience. But unless the listener is absolutely devoid of musical ability, it has always at least some intellectual, in particular some formal, musical meaning, as well. Such meaning is given to music by the mere apprehension of the pattern of its melody or of its rhythm, as well as by the understanding of its polyphonic, fugal, or other formal complexity, or by the appreciation of the thought and the balance of the entire movement, sonata or symphony; and among the more musical it is essential for musical enjoyment.

Musical meaning enables a song to be enjoyed even when its words are sung in an incomprehensible language; as a Papuan once remarked to me when I asked him how he could appreciate a certain song, the music and words of which had been introduced to his island from another island, of the language of whose inhabitants he understood nothing—'It is not the words, but the music that counts.' It is the difficulty in discovering the musical meaning of ultra-modern and exotic compositions, in addition to the repulsive un-

familiarity of new combinations and complications of tones and new musical idioms that prevents their initial appreciation. The violent criticism and opposition with which Mozart, Beethoven and Wagner first met is always repeating itself in the history of music. The meaning and hence the values of music are ever changing in appreciation.

So long as the listener (in his critical attitude) is worrying about the cognitive or intellectual meaning of music, it is impossible for him to enjoy it or to appreciate beauty in it. 'No central idea in it', reported one of my subjects; 'never knew where I was.' Or as another said—'Too much bothered about finding meaning to be able to see any beauty.' When the listener fails to find a meaning, his attention may *faute de mieux* revert to mere fleeting sensations, emotions, or images. Thus, one subject reports: 'The whole has no meaning in the least to me. I don't understand it. I am catching hold of any image I can get.' Some understanding at least, then, is necessary for the musician's enjoyment of music; otherwise what can at most happen is the mere enjoyment of sound—the substance, not the form, of music.

We have seen how incompatible the character attitude is apt to be with the intra-subjective and

suggestive attitudes, and the critical attitude with all the other three attitudes. We know that the repression of any incompatible mental process or attitude may be often successful: it will then lie dormant and cause no trouble. Yet try as the more musical may to inhibit all emotion, phantasy, or characterization in their desire to obtain aesthetic enjoyment from the intellectual contemplation of music, these are, as we have seen, never permanently kept under control but are ready to emerge from their repression whenever they have the opportunity to do so. The musician does not usually welcome the intrusion of 'associations'. Yet, as one of my subjects observed—'I object to these suggestions, for I find that the music...is not listened to for itself. But when the suggestions and the music absolutely blend, there is the completest and greatest enjoyment, greater than when there is music alone. They won't blend here', she adds, 'because the dramatic scene will go on quite well independently of the music.' And so we must conclude that the fullest and highest appreciation of music occurs when the whole of its varied and complex influences to which I have endeavoured to draw attention—when all the different attitudes which it may evoke—are in the most perfect harmony.

Chapter IV

A Psychological Regard of Medical Education[1]

Approaching this subject from my experience as an industrial psychologist, I feel that my position is not unlike that in which he often finds himself placed when he is asked by an employer how, in his ignorance of many technical details, he can be expected to increase the efficiency of a particular business. This criticism he meets by his contention that wide previous experience enables him the better to realize and to remedy defects in analogous situations; and that, just as commonly 'the outsider sees most of the game', so the industrial psychologist can often recognize and remedy defects which tend to be overlooked by the expert who has lived too long and too closely in their midst. So, too, I hope that my acquaintance with psychology, general and applied, and my long distance from medical training and practice may

[1] Based on the Bradshaw Lecture, delivered before the Royal College of Physicians, on 2 November 1933.

help me to throw a little light on a problem which is of such extreme interest at the present time—the problem of medical education.

For the outlook of the industrial psychologist is a singularly wide one. He does not deal merely with industry and psychology: he is concerned with every aspect of the human factor, physiological, social, economic, etc., throughout every kind of occupational life. He is engaged not only in investigating and improving all kinds of business and professional working conditions that affect the mental and bodily health and the happiness and efficiency of the 'worker', but also in studying the best methods of his training, his recruitment and his selection, and in helping him even earlier to make such a choice of a career as accords with his innate mental and physical abilities, his acquired knowledge, his temperament, character and interests, and his social and financial position.

Of innate mental abilities or aptitudes there appear to the applied psychologist to be three kinds—the first kind known as 'special' abilities, the second as 'group' abilities, and the third as 'general' abilities. The last are common to the exercise of all mental processes, though varying in them widely in degree, whereas the first are

each particular to some one kind of mental process. The most important general ability is known as 'general intelligence'—the ability to discern and to utilize relevant relations—whether between ideas or written symbols, or between concrete objects, or between living persons. Now two of the most obvious essentials for entry into the medical profession are at least a minimal amount of general intelligence and at least a minimal amount of what we may usefully (if loosely) term 'scientific ability'—i.e., the ability to employ scientific methods and to appreciate scientific evidence.

Within the medical profession the field of possible occupations is so wide that opportunities are afforded for unusual excess or defect in almost every other kind of mental ability and in almost every trait of personality. The student who is temperamentally averse from close or frequent social intercourse may gravitate towards medical research or to preventive medicine; if he excel in manipulative work, he may specialize in surgery; should his interests lie predominantly in the young, in the poor, in the workings of the mind, or in country life, he may satisfy them by engaging in corresponding medical practice. But unless he be endowed with at least the required

minimum both of general intelligence and of scientific ability, no applicant for vocational guidance can be advised to enter as a medical student; high general intelligence being useless to him, if it be conjoined only with literary, musical or other special abilities, and adequate scientific ability being hardly conceivable in the absence of sufficient general intelligence.

Within the field of industry and commerce, the industrial psychologist always insists that those of the new entrants who have the innate aptitudes requisite for them to rise later to the higher positions in their firm, should be recognized as soon as possible and should receive early suitable training to fit them ultimately to such posts. At the Universities, in other than purely medical studies, a similar separation is made: the 'pass' man and the 'honours' man are segregated at the outset to receive different educations and to undergo different examinations. Even in the elementary schools it is becoming more and more usual for the bright, the average and the stupid children to be grouped and instructed separately, so that the more highly intelligent are not unduly hindered by the needs of the less intelligent and the latter are not harmfully pushed with the vain object of keeping pace with the former. Despite

certain conceivable objections, the advantages of such differentiation have become generally recognized. But in medical education, as in the case of other professional curricula, whatever be their general intelligence and their special abilities, students are given the same technical instruction; even though only the ablest may take a University medical qualification, there are nevertheless vast differences in the general and special abilities of those who obtain it.

Let us consider the medical student whose general intelligence is relatively weak in regard to abstract relations and ideas but strong in regard to relations in the practical and social affairs of every-day life. His comparatively humble interests lie in the art of healing, and by virtue of his other mental abilities and of his temperamental qualities he may ultimately make an excellent doctor. But his vision is neither wide nor abstract enough to enable him advantageously to profit by the kind of professional education which is admirably suited to the medical student of higher and more abstract intelligence—the more strictly 'centripetal' kind of education which begins with a number of different, more or less separate, scientific subjects and gradually becomes more and more centralized in the science and art of

medicine. In the case of such a student as we are considering, the *applicability* of the details of pure science to his medical interests needs to be more often kept before him: he demands a more 'centrifugal' education. The question naturally arises, therefore, whether during their five or six years of medical education, as year by year it becomes increasingly complicated, differently gifted medical students will not one day receive correspondingly different training, according as they are innately fitted rather for abstract thought or for practical action.

It is the function of the industrial psychologist not only to attempt to give vocational guidance, i.e., to choose the best 'job' for a given man, but also to select the most suitable applicants for vacant posts, i.e., to choose the best man for a given 'job'. The latter he achieves first by observing what are the abilities and the traits of character and temperament necessary for success in that job, and then by devising and applying such methods of examination as will best determine whether or not the candidate possesses those abilities and traits. The candidate's abilities are assessed by specially devised tests, his temperamental and character qualities by a systematically conducted interview. The tests employed by the

industrial psychologist are usually intended for the novice and are therefore usually of such a nature that they assess innate abilities, not specially acquired knowledge and skills; and the interview is so planned as to consist in the separate assessment of the various traits of personality which are needed for success in the particular occupation, as well as in a final assessment based on the general impression which the candidate gives the interviewer.

But as I have pointed out, the wide field of the medical profession provides opportunity for the exercise of so many varieties of special ability and of temperament and character, that these general methods of vocational selection obviously require appropriate modification. Nevertheless, they could be readily applied to eliminate the unsuitable entrant to the medical profession on the grounds of his lack of innate general intelligence and scientific ability, thus taking the place of the present examinations which are too often rather tests of memory and the ability to reproduce the acquired *minutiae* of general and scientific knowledge, and on these grounds allow the candidate to enter repeatedly for them until he has 'crammed' sufficiently to satisfy the examiners.

If the prime object of 'pre-medical' scientific

study and examinations had always been to teach the broad principles of natural science, selecting only such facts and details (apart from those needed to establish and adequately to confirm those principles) as are likely to be of practical help to the average doctor in his professional career, there would not have now arisen the general complaint against the teaching of physics, chemistry and biology to the medical student. These subjects, however, are taught not by persons who have any medical training or interest, but by professed physicists, chemists and biologists. They are not sufficiently taught, as conceivably they might be taught, for the school-leaving examination with a view to improving general culture; nor are they taught, as conceivably they might be taught, for the first M.B. examination with a view to training doctors. The same holds for the higher school-teaching of classics or of mathematics: the teacher is thinking too often of what is ultimately needed to make his pupil a 'classic' or a mathematician—in particular, what is needed to enable him to gain a classical or mathematical scholarship at the University. Too often the teaching proceeds on the assumption that there is only one way of teaching and examining in a subject—namely in order to prepare his pupil to become a specialist

in that subject—a fallacy which, until recently at least, has been recognizable throughout the medical curriculum—in physiology, anatomy, pathology and even to some extent in the special departments of medical and surgical practice. It seems well worth consideration whether the time has not come to recognize and to establish a definite 'medical discipline' throughout the training of the medical man.

A research by Dr J. W. Cox, which has recently been completed at the National Institute of Industrial Psychology, has demonstrated that the effects of *routine practice* at any given manual operation (and the same appears to hold for any given mental operation) are hardly transferable at all to other manual (or mental) operations; whereas the effects of a *systematic training in the general principles* underlying the performance of any one operation are very distinctly transferable so as to improve the performance of other more or less similar operations. Such experimental results demonstrate the wastefulness of mere routine practice, wherein methods of technique are picked up haphazard without training in the general principles underlying them, the resulting improvements being virtually non-transferable to other conditions of work. In particular, they bid

us no longer assume that the routine exercise of memory in learning masses of formulae or other details, or the routine practice in acquiring various skills through hours of titrating, staining, dissecting or other laboratory work, provides a useful practice-ground for the subsequent learning of other material or for acquiring skills of other kinds. It would appear that routine practice improves a given mental or manual operation and increases the speed and accuracy of its performance mainly by the elimination of needless and harmful mental or muscular processes and by the spontaneous co-ordination of necessary processes so that they become integrated and can be performed more automatically, no longer individually needing directive assistance by consciousness. It would also appear that although by systematic training we cannot *improve* any innate ability, we can improve methods of *making the best use* of what is inherited. What is of special value for this purpose is a knowledge of underlying general principles; and this, in the case of physics, chemistry and biology, should be largely imparted before the age of seventeen, while these subjects are being taught, as they should then be taught, not as introductory to a purely scientific nor to a medical future, but as a necessary and compulsory subject of general education.

At the present time, a lad's general education ceases at a secondary or public school when, say at the age of sixteen, he has passed his 'school-leaving examination'. Thereupon he proceeds to specialize; and if he chooses the medical profession, he devotes his whole time to physics, chemistry and biology, just as if he were training to become a physicist, chemist or biologist. Surely the medical student of only average and less than average ability need not spend so much time as at present on masses of physical, chemical and biological detail which, having no medical importance and having little bearing on general principles, will inevitably be later forgotten; nor should his practical work be carried to such an extreme that it has no corresponding educational value for the doctor. Even if we regard such acquisitions as excellent for the man of high scientific ability and as valuable generally in providing an ideal unconscious background for the student's subsequent professional career, their enforcement implies the assumption that at sixteen a lad's general culture no longer needs encouragement: it implies that henceforth he may forget and make no progress in what little he has learnt of literature, history and languages, and that he may devote himself entirely to the special subject of natural science.

Almost any subject can serve to promote general culture, if only it be taught from a sufficiently wide point of view. But obviously there are few teachers of natural science who are competent thus to teach their subject.

If the countless hours now spent in practical work in physics, chemistry and biology served a commensurate psychological and educational purpose in the case of the average and sub-average medical student, less objection could be urged against them. There can be no doubt that the value of such work could be enormously enhanced if it were more carefully directed towards training and exercising what is so essential for the successful diagnostician—the ability to select and to collect appropriate evidence and to draw accurate deductions from the available evidence. Such training, however, has tended to be relatively neglected, not so much because its importance has been underestimated, but rather because it is so much more difficult to examine the candidate in these abilities than to examine him in and to mark memorized facts.

Two other important objects of practical work in natural science are: (i) to improve the student's memory and realization of facts by getting him to reveal and to see them by his own handiwork

instead of by merely hearing and reading about them in other people's words, diagrams and pictures; and (ii) to impress on the student the general scientific principle of not relying unduly on others' statements but of verifying them by actual experiment and personal experience. But many would agree that these objects could be attained with less expenditure of time. Yet another object is often advanced in favour of practical work—that it is 'heuristic' in character and that it therefore encourages and stimulates the spirit of discovery in the student. But in fact it seldom does anything of the kind. For the student is always forewarned in his practical work what he is to expect; and if he fails to find it, he seldom learns why he has found something different. All that he realizes is that he has done the experiment wrongly, and he repeats it until he gets the text-book result. In other words, his practical work consists merely in confirming what is already known to him; in his subsequent anatomical dissections his aim has even been to 'make it look like "Gray"' (i.e., like the illustrations in Gray's large work on human anatomy).

As regards human anatomy there appears to be reasonable ground for the prevalent criticism that the *average* medical student would not suffer if he

were no longer required, as in my day at least, to recognize the form and side of each of the small bones of the wrist and hand, or to be able to describe, as he is to-day actually asked to describe, say, the origin and relations of the thoracic duct or of the obturator nerve, or the course and tributaries of the inferior mesenteric vein; and if he were no longer expected to dissect the entire body, on the ground that by recourse to demonstrations much time could be saved and equal results achieved. The divorce of the old human anatomy from physiology has resulted in the former becoming a subject of medical study which, as such, affords little scientific training and indeed is hardly a science at all. It consists too exclusively in learning merely an innumerable and unnecessary quantity of facts; embryology may throw a little of the light of science on them; comparative morphology hardly finds room for admission. Moreover, what the medical student learns of human anatomy is usually derived almost entirely from dissection of the cadaver, the desiccated viscera of which have lost their true form and their relations in the living body. Little attempt is made at this stage of medical education to gather anatomical information from the recently alive corpse in the *post-mortem* room; the

living subject and the teachings of radiography are also too often equally neglected. The movements of the viscera are hardly ever seen by the student of human anatomy, and the synergic actions of the skeletal muscles are not explained to him: structure is taught too entirely divorced from function, both normal and disordered. Even the acquirement of manual dexterity by dissection cannot be assured.

Other defects in medical education are largely attributable to the inadequate selection of teachers and to the increasing number of specialized subjects and specialist teachers. From the start to the finish of his purely medical education, the student is taught by those whose only qualification to teach is their professional eminence and reputation. The industrial psychologist has had ample experience of the fact that the most successful and efficient 'worker' does not necessarily make the best instructor. Not infrequently the expert worker who tries to teach, proves unable to describe correctly how he carries out a skilful industrial operation; or when he illustrates it at a slow pace, he is found to employ movements quite different from those which he employs to perform it at his normal speed. Because there may be many different styles of procedure adopted,

e.g., by various surgeons of equally high skill, that is no reason why the student should not be instructed in the general principles which must underlie all good methods and be taught how to avoid undoubtedly bad methods of operative procedure. The industrial psychologist recognizes that there is no *one* best way of doing anything, but that there are a number of equally good ways suited to different persons; he also recognizes that there are undoubtedly bad habits of work into which the operative must not be allowed to fall. Similarly, there are good and bad methods of the doctor's approach to and general handling of his patient. Yet how seldom is systematic or adequate instruction given to-day in such technique, and how rarely is the medical student examined therein!

At the Universities it is notorious that the ablest professors may make the very worst lecturers. Yet, alike at the Universities and at the medical schools, no attempt is made to select or to train teachers, whereas to those who are preparing to teach in elementary and secondary schools systematic instruction and subsequent examination in the science and art of teaching are given. It is not surprising, then, that medical and other undergraduates complain of the inadequate, indifferent

teaching which they too often receive, and of the number of unwanted lectures which they are forced to attend. Facts, they rightly argue, may for the most part be readily learnt from textbooks; 'tips' and mnemonics, if alas! necessary, may be learnt from special 'grinds'; it is the co-ordination of facts and their practical application, and it is technical skill which they seek to learn through their teachers.

Moreover, from the start to the finish of his medical education, the student is taught by specialists in far too water-tight compartments—by chemists, physicists, biologists, anatomists, physiologists, pathologists, pharmacologists, gynaecologists, oculists, aurists, dermatologists, paediatrists, etc. The average medical student, it must never be forgotten, will become a general practitioner, having on the average one thousand insured persons, and often very many more, under his care. Yet from the start to the finish of his medical education, he never comes in touch with one of his own future kind. Even in the general wards of a general hospital he is taught by consultants who are usually specialists in some branch of medicine or surgery, or at all events cannot pretend to as full a knowledge of the whole of either of these subjects

as is expected from the student at his final examination.

Physiology, pathology and the like can be taught by their specialists, as pure sciences should rightly be taught, in total disregard of their applied value—their practical applications to medicine and surgery. Knowledge of, and research in, pure science are very properly prosecuted for their own sake, not for their possible usefulness. The life history of bacteria or the histology of tumours may be studied by one who has never seen their manifestations or appearance in the sick person. But what can the terms 'anthrax' and 'carcinoma' mean to the medical student if he is introduced to them in the laboratory at a time when he has never seen a case of them? Disproportionate stress tends to be laid both in lectures and in practical work on problems which have been subject to current or recent research, with the corresponding neglect of more commonplace and practically important knowledge. The physiologist, for example, has carried out relatively little research on the rate of progress of food through the alimentary canal, on diet, or on the physiology of growth, childhood, youth and old age. He may remember little, and does not prepare the student for what he will later learn, of physio-

logical knowledge derived from clinical observations. The physiologist's capture of histology from anatomy is but an index of his naturally dominant interest in minute physiology—the physiology of the cell and of abstract tissues and organs—rather than in the physiology of the intact organism.

Until recent years, our British practice has been to keep the medical student in his early years as if he were in a monastery, remote from and unsullied by contamination with the external world of medical experience, while he bathes in the pure sciences of anatomy, physiology, pharmacology, and general pathology. Surely, the right course lies midway between this and the opposite extreme of the French practice of making the student spend one-half of his time in the wards as soon as he begins his anatomy and physiology. Present tendencies of progress in British medical education point assuredly in this direction of compromise.

Psychological experiments have shown that it is generally easier to learn a whole as a whole than by learning separately its constituent parts. Therefore, should not the future clinician in his hospital period receive first a more general education in the *whole* range of medicine and

surgery before he visits the too water-tight departments of the specialist physicians and surgeons expressly to learn about the rarer diseases, say, of the skin, throat, nose, ears, eyes, and nervous system? At present the commoner manifestations of these specialities are not usually seen in the general wards and the general out-patient departments: unlike the individual cells of the multicellular organism, the general consultant physician and surgeon is not concerned with them and has inevitably lost touch with modern knowledge about them. And the specialist cannot help being more interested in the rarer diseases of his specialty which are relatively of less importance to the future general practitioner, who would confessedly prefer instead a fuller training, say, in incising the tympanic membrane, in injecting varicose veins and piles, and in becoming familiar with remedial exercises and with the rudiments of orthopedic boot-making. The special departments become inevitably havens of specialization; but clearly specialization should follow, not form part of, elementary medical education.

Instead of traversing the path of biological differentiation, medical education has evolved rather along the lines of mechanical analysis—as

if a chemical compound had previously been analysed into its constituent radicles and elements —instruction being confined too closely to these different isolated factors into which the whole has been split, regardless of the fact that the whole is far more than the mere sum of its parts and that it is dependent for its properties not only on those parts but also on their relation to the whole and on their relation one to another within that whole. Biologically and psychologically, first comes the vague undifferentiated whole—the unicellular organism—and later appear the more discrete parts into which it becomes differentiated. Logically, but unpsychologically, in medical education the parts are first learnt without any reference to the whole; and somehow, without adequate system, those parts are expected to be synthesized by the learner. Thus is perpetuated the fallacy of treating each patient not as a living unitary individual, but as a 'case' of a certain single disease; and the tendency persists to divide diagnostic and therapeutic methods into those belonging to the clinician and those belonging to the laboratory scientist, and into those belonging to the physician and those belonging to the surgeon, each of these workers maintaining a long tradition of con-

tempt for, if not neglect of, the methods pursued by the others.

For the origin of this harmful attitude the history of medicine is largely responsible. In bygone times surgery was not regarded by the physician as his proper or even decent province, and has therefore developed on separate and independent lines. The psychological effects of this isolation of two equally important therapeutic methods are not yet eradicated. They are only too readily imitated from their chiefs by young house-physicians and house-surgeons, the former regarding the latter much as a philosopher might regard a manual labourer, the latter regarding the necessarily less direct procedures of the physician as mysterious and unprecise gropings in the dark no longer of interest or of use to him.

Not less is the mutual contempt and distrust of the clinician and the scientist. Medicine began as an 'art', based on few systematic principles and on scant scientific information. Especially within the last half-century its technique has grown to such enormous proportions, and medical research and knowledge have so vastly increased, that in some quarters medicine tends to be regarded far too strictly as a 'science'. As an art, it demanded, like other arts, the exercise of intuition—the

arrival at decisions concerning diagnosis and treatment, not always through reason and intelligence, but through the flashes of insight due to the unconscious workings of the mind which were determined, in direction and value, no doubt by previous experience. To-day so often

> "...in our schools of thought 'unconscious mind' is call'd
> a contradiction in terms; as if the embranglements
> of logic wer the prime condition of all Being,
> the essence of things...".

Rather is Reason's

> "..... troublous task
> to comprehend aright and wisely harmonise
> the speechless intuitions of the inconscient mind;
> which, tho' a naked babe (as men best pictured Christ)
> is yet in some sort nearer to the Omniscient
> than man's unperfect Reason, baulk'd as thatt must be
> by the self-puzzledom of introspection and doubt."

Thus, with profound wisdom, wrote our physician-poet laureate, Robert Bridges, in his *Testament of Beauty*.

In former days, too, medicine was forced to lay greater stress than now on drugs, diet, external environment, on the *vis medicatrix naturae*, on the constitution or diathesis of the patient and his

family, and on the personal influence of the physician. The medical student acquired his training by apprenticeship to a distinguished private practitioner. But now, as virtually in all other occupations, the place of apprenticeship has been taken by technical education. Within the memory of many of us, a period has passed away when injuries to joints and bones and visceral diseases and disturbances were ascertained largely by the doctor's own ear and hand, and when it was usual for the student himself to carry out blood-counts, the examination of urine, etc., of any of his patients within the hospital wards. Since then elaborate buildings have been established and elaborate apparatus and new methods of examination have been devised, the patient's fluids being removed to the pathological building for report or he being submitted to the radiographic or electrical department for the taking of an X-ray photograph or an electro-cardiogram. Of the practice of all these improved, more elaborate, less subjective, more scientific methods of procedure, the student learns something by his visits to these departments and especially through the few University clinic teams which have of late years been established in the more important hospitals.

But inevitably the hospital consultant's knowledge of these methods and his faith in them are less profound than the scientist's. He may be opposed to the scientist not merely because, like the rest of mankind, he tends to despise and to condemn what he does not fully understand, nor merely because ultra-conservative leanings may prompt him to resist progressive changes and to rest content with ancient authority and practice. On more rational grounds he knows that diagnosis and especially treatment cannot depend always and wholly on the aids which scientific laboratory methods can render. He realizes that the teachings of physiology and pathology in their experimental work on various living fractions of an entire organism are not always applicable to the entire organism—that, as an individual, the patient cannot be considered a mere negligible appendage to the bacterial invasion or other cause responsible for a disease or a growth. From long practice he is convinced that the subjective experience and insight of the clinician must always work hand in hand with, and stand guard over, the applications of modern medical research. Well may he feel disposed, even if he lack the courage, sometimes to re-echo the exhortation contained in an address of Trousseau's some seventy years ago, 'Pray,

gentlemen, let us have a little more art, a little less science.'

Just as, however, the really ablest clinicians recognize to-day not only the limitations of medical research, but also the enormous improvements in the treatment and prevention of disease and the inestimable value of many new instruments of technique with which medical research has provided them, so there are medical research workers who fully realize the profound differences between pure and applied (or clinical) medical research. They are aware that pure research must always be the servant, not the master, of the physician or surgeon, that many other considerations must be taken into account in the practice of treatment besides the conclusions drawn from often inevitably abstract experiment and based on the restricted standpoint of present 'natural' science. Nevertheless, they complain, not without foundation, that the excessively empirical attitude of many hospital consultants tends to discourage and to extinguish the research spirit of some of the ablest medical students. They urge that, both for this reason and because physiology—or more particularly biochemistry and biophysics—cream off some of the most promising clinical research workers and thus seduce them from completing

or appreciating their medical education, a number of valuable recruits is now lost to medical research of a more strictly clinical kind. They urge that in the education of the medical student he should be better prepared, before he comes in touch with his patients, for the wide gap he will abruptly discover between the relative simplicity of experimental science and the complexities of medical practice.

As for the average medical student, he realizes too late that in actual practice he cannot always depend for his diagnosis and treatment on the elaborate methods which he has seen employed during his hospital education. It is small wonder that he comes to wish that he had not spent so much time in learning about the technique of these methods, and in attending 'grinds' and in being otherwise 'spoon-fed' for examinations where he may be (as he is now) questioned on the characters of the organism responsible for bubonic plague, the common varieties of malignant tumours of bone, the pathology of hypernephroma, the naked-eye appearance and the microscopic structure of teratomata of the testicle or the part played by the reticulo-endothelial system in disease! It is small wonder that he comes to wish that he had spent more time in the

wards, and less time in seeing the rarer operations in the operating theatre, that he had learnt more about prescribing drugs and diets, and that he had had more personal, practical experience and instruction in bandaging, passing an Eustachian tube and other activities involving the acquirement of special manual dexterities, particularly in such common or emergency operations as empyema drainage, blood transfusion and those needed for amputations, appendicitis or strangulated gut. He will regret that he had been encouraged to give so much attention to the methods of *diagnosis* of rare conditions and relatively so little to *treatment*, particularly in the early stages of diseases, especially in such common diseases as colds, 'throats', rheumatic and gouty affections and disorders of digestion, and in the late stages of 'incurable' diseases, of which he had gained so little experience in hospital education.

The general practitioner realizes too late how unprepared he is for the practical, as compared with the ideal, conditions of general practice; how often in his far too busy professional career he is forced to rely on intuition as to whether or not a patient deserves systematic examination for the diagnosis of his condition; how little he has learnt of the palliative, as contrasted with the

curative, functions of the physician and surgeon; how ill-equipped he is to give advice on general health and hygiene, particularly in the case of children, and expectant or actual mothers, and on prognosis in relation to insurance companies; how little he has been taught of preventive medicine and of the public-health services that are now required of him; how ignorant he is of the best attitudes and approaches of the practitioner towards his patient, of the motives and other determinants of human behaviour, and of the anxieties and the marital difficulties of his patients which are so often a fundamental cause of their bodily ill-health. Similar conditions are encountered by the young worker in industry and commerce: it is one of the industrial psychologist's aims to bridge over the gap which intervenes inevitably between leaving school or college and entering on an industrial or commercial career, so as to give the tyro the introduction he so badly needs to the conditions of practical life.

Fundamentally, it seems to me, the whole problem arises from the conflict between the ideals, needs and interests of the general practitioner, on the one hand, and those of the medical scientist and the consultant, on the other, who are

his sole teachers during his years of clinical study. If a common curriculum must at present be maintained for the education of all three, can there be any doubt that just as an appropriate training is provided immediately after qualification for the future medical research worker and for the future consultant physician and surgeon, so immediately after qualification an appropriate further training given by experienced general practitioners should be provided for, and required of, the future general practitioner before he receives his diploma or degree? The desirability of some training of this sort was evidently in the minds of the General Medical Council when formerly it recommended that six months of the fifth year of medical study might be passed as a pupil to a practitioner possessing such opportunities of imparting practical knowledge as would be satisfactory to the medical authorities. But this recommendation disappeared nearly thirty years ago.

It is hardly necessary to point out how different is the life-work of the consultant and the general practitioner and the relation between them and their patients. To the difference in outlook of the medical scientist and the general practitioner I have already drawn attention, but it deserves some further consideration. The physiologist and the

pathologist tend to regard the human being as a collocation of physical mechanisms. They restrict the term 'science' to the mathematics, physics and chemistry of matter. If living matter consists in more than these, then that 'more', they argue, lies beyond the domain of science: anything in life resembling the direction and purpose which we all recognize in our own minds is foreign to 'natural' and to 'medical' science. And so the medical student learns, from start almost to finish, to regard the living organism merely as a huge, blindly working aggregate of machinery, as if mind did not exist and as if the whole of medicine rested on a purely materialistic basis. While he is taught in the utmost detail the functions of the normal human body, he learns virtually nothing of the functions of the normal human mind. All that he is taught of this in his physiology is a mere smattering of facts about touch, taste, hearing and vision, mainly in so far as they can be brought into some more or less hypothetical relation with material structures in the skin, tongue, cochlea or retina; and a mere smattering of facts about visual, auditory and verbal perception and imagery, partly because, on quite erroneous grounds, it has been supposed that the 'seats of consciousness' for percepts and images have been

experimentally localized in definite areas of the cerebral cortex.

He learns nothing in his physiology of the relations between mental and bodily activity; he is taught nothing about the emotions, despite their intimate connection with endocrine and visceral activity. He learns nothing about intelligence, although later he will have to consider it in relation to mental and endocrine deficiency. He learns nothing of the psychology of suggestion, despite its frequent use by him in everyday practice. Of memory, impulse, and volition, of the differences between the mind of the child, the adolescent and the adult, he also learns nothing. All that is now required by the General Medical Council,[1] in a regulation exactly forty years old, is that before qualification the medical student shall have attended at least four-fifths of a course of twelve lectures on mental diseases and twelve clinical demonstrations at some recognized institute for the insane. That is to say, the medical student's training in the normal and abnormal processes of the mind may be officially limited to a few lectures and demonstrations mainly concerning certified cases of advanced insanity. Of the 'mechanism',

[1] Some small improvements have since been effected.

of the results, and of the treatment, of the common *quasi*-normal mental disturbances, and of the uncertifiable disorders of the mind, he learns virtually nothing.

Is this an adequate preparation for appreciation of the important part which the mind is now universally recognized to play in bodily disorders? Does it not tend to perpetuate the hardly bygone times, when a psycho-neurotic patient might be sent from department to department of a general hospital to be treated according to the temporary bodily manifestation of his unrecognized psycho-neurosis; or when in private practice such a patient might be successively submitted to a series of operations for gastroptosis, nephroptosis, and to the operations of appendicectomy and hysterectomy? Does it prepare the general practitioner to recognize the psycho-neurotic element so common in, and indeed frequently responsible for, some of the commonest disorders of digestion, respiration, menstruation and circulation? Does it give him any knowledge of the nature and phenomena of mental conflict and repression, of mental mal-development, fixation and regression, so that he knows how to treat, say, mental depression, drug addiction and sexual aberrations and malpractices in adults, and truancy, stealing,

stammering and enuresis in the young? Does it prepare him for the increasingly recognized fact that the general practitioner can do much to prevent not only ill-health but also juvenile delinquency?

What depths of psychological ignorance the medical practitioner of to-day betrays when he declares (as he has been said by a distinguished specialist to declare) that the fear of cancer cannot be very prevalent among his women patients because otherwise they would talk more frequently to him about their fears, whereas in fact very few do so! Consequently, he prescribes a tonic or he gives his patients a few words of hope without allaying the fears which have prompted them to visit him. What mental and medical damage was caused in the later years of the Great War by the unpsychological practice of affixing, during their transit to England from France, to 'cardiac cases' caused by mental and physical overstrain, a label bearing the letters D.A.H., the meaning of which —'disordered action of the heart'—the patient quickly learnt and in a doubly tragic sense 'took to heart'! And what mental damage is often caused to this day by telling a patient bluntly that his blood pressure is unduly high!

Is such needless suffering to continue? And is

psychotherapy, with the psychological training preparatory for it, to be excluded from medical education because of the wild claims and generalizations of certain 'schools' of psychologically untrained, self-styled 'psycho-analysts', whose rival extravagances, nevertheless, are based on discoveries made by them which, in broad outline, are generally of undoubted truth and of inestimable importance? Just as it has been urged that biochemistry and biophysics, which originated not from chemistry and physics but from physiology, need recruits from among pure chemists and pure physicists, so it is important that modern psychotherapy, which arose not from psychology but from medicine, should obtain recruits from those who have received the rigid, systematic training of experimental psychology, so as to place this latest specialty on a firmer scientific basis.

Even if a long period of expert treatment by psychotherapeutic specialists is requisite in certain cases and especially in neglected cases, it is undeniable that there are numerous cases, particularly early cases, which can be successfully treated by the general practitioner if only he had been trained to recognize the prevalence and presence of the psycho-neuroses and had been instructed as to their general treatment? Surely

the adequate teaching of psychology, psychopathology and psychotherapy is not to be excluded from normal medical education because hitherto the physiology and pathology of the body and pharmacology have appeared to be so much more important that it has been impossible to find time for instruction in the normal and abnormal processes of the mind; or because the study of the mind can never be recognized as a science until suggestion, memory, will, hysteria, hypochondria, anxieties, and fears have been allocated to a material basis?

'Imaginary diseases', I recall my chief once saying to me during my house-physicianship, 'require imaginary remedies.' This was the view largely prevalent thirty or forty years ago, when it was the practice to treat medicinally or surgically every disorder which could be attributed to localizable and visible disturbance in a bodily organ or system, and to consider psychotherapy as an outcast Cinderella sister, justifiable only when the bodily disorder was palpably and solely of an inexplicable, 'functional' nature. The fallacy underlying such a view is, I fear, by no means extinct to-day. Because we cannot touch or see mind as we can touch or see matter, mind is held to be 'imaginary', not 'real', and to have no

'real' influence on the living body. Where, we may well wonder, would be the 'reality' of matter if it were not for the mental, and therefore 'imaginary', processes of touch and vision by which we become aware of matter?

It may reasonably be urged that my psychological training and my applied psychological experience prejudice me unduly so as to exaggerate the importance of this subject. But the industrial medical psychologist has clearly demonstrated in recent years the importance and prevalence of emotional and psycho-neurotic disorders in the factory and the office, not only as causes of industrial unrest, but also as responsible for much of the long or repeated absenteeism ascribed to gastritis, rheumatism, 'heart attacks', dysmenorrhoea, 'debility', etc. Moreover, since psychology, psychopathology and modern psychotherapy have had hitherto no appreciable place in the official general medical curriculum, any distortion of their claims on my part (which I do not for one moment admit) becomes of little importance. Similar objections must indeed confront every advocate of progress in medical education. For medical education is, as we have seen, almost wholly in the possession of specialists, each with his own vested interests, each main-

taining the supreme importance of a full knowledge of his subject for the medical student, and strenuously opposing any reduction in the time devoted to it.

Escape from this *impasse* is only possible if a conscientious, impartial effort can be made, by the wisest of those who teach and of those who have been taught, to determine and to agree upon the fundamental and the diverse objects of medical education.

Chapter V

The Modern Development of Social Psychology[1]

The object of this chapter is to show how, with the recent progress of psychology and its applied branches, the true nature of social psychology has been determined and how the most promising lines of its future development have been laid down.

One important outcome of this progress is that no reputable psychologist can be found to-day who believes that mental processes, as we know them, occur as such (upon this earth, at least) outside the living organism. For present-day psychological science, mind means the mental activity of an individual. In particular, there is no possibility of the separate existence of a Social (or Group) Mind. All that can be justly said is that when individuals are associated with one another in groups, their experience and their conduct differ from their experience and conduct

[1] Based on a paper presented to the International Congress of Anthropological and Ethnological Sciences, London on 31 July 1934.

when they are as far as possible isolated and freed from such social relationship.

Social psychology must therefore be based always on the study of those inner mental processes and outward responses of individuals, and of modifications in them, which arise from membership of a group. Each member of a group, when he is isolated from its influences, may entertain attitudes and feelings different and discordant from his fellows; but, under group influences, these attitudes and feelings and their resulting conduct may be affected and overruled by a uniform and harmonious attitude and by uniform and harmonious feelings and conduct. Such group influences on any individual may arise either (*a*) from the actual presence of other members of the particular group to which he belongs, or (*b*) from the psychological effects of the social institutions, beliefs, customs and traditions of that group.

Fundamentally, this must be regarded as the true basis and starting point of modern social psychology. Yet, in fact and in practice, social factors are so powerful and extensive that they can seldom, if ever, be wholly eliminated even in purely individual, i.e., *non*-social, psychology. The *non*-social, or the *pre*-social, individual, that

is to say the individual who can be studied psychologically under conditions entirely removed from the influences of the group, can scarcely be imagined. We can so rarely isolate and study an individual's responses to purely physical stimuli: even the study of individual mental differences cannot be wholly divorced from social factors. Whether consciously or unconsciously, the individual always acts in some degree as a social individual. As Prof. F. C. Bartlett has so ably demonstrated in his remarkable book on *Remembering*, even individual memories depend for their recall (alike in manner and in matter) on social influences. Even the mental tests given to individual persons depend on the language, education and other social experience of those tested. The difference, then, between social and individual psychology cannot be regarded as strictly absolute: it is rather a matter of relative interest or emphasis between the hypothetically pure non-social personality at the one extreme and the social personality, collectively regarded, at the other.

But, as has been already mentioned, and despite their individual mental differences, the members of any social group do tend to act uniformly, and often very differently from their behaviour in relative isolation from one another. Much the

same characteristic is to be found within the individual person, who, as such, is characterized by an integrated (broadly) harmonious organization, despite the minuter differences and conflicts which occur within the parts of his mental composition. The personality within the living organism considered as a unitary whole is not the mere sum, resultant or average of its component idiosyncracies. Nor is the behaviour of persons comprising the unitary social organism the sum, resultant or average of their individual differences. In each case, moreover, the *milieu* of the whole is different, both in nature and in action, from the *milieu* of its isolated parts; consequently, the resultant experiences and conduct are different. Further, just as we recognize in individual persons psychological resemblances and differences, so, in individual social groups, we recognize certain psychological features shared by all groups and others which are characteristic of particular groups. The latter depend to some extent on innate group (e.g., racial) differences, but more especially on social tradition and social environment.

Racial differences, however, are differences between *individuals* who belong to different races; and social tradition and social environment are

merely conditions determining the separate or collective conduct and mental processes of *individuals* considered as members of any given society. In no literal or psychological sense can they be regarded as being relative to a Social or Group Mind. For although social psychology is more than the psychological study of separate individuals, involving as it must the study of individuals feeling, thinking and acting *as, or in relation to, a common group*, it is only figuratively—not scientifically—that we can ever speak of mental activity (in any sense that is accepted by psychologists) as existing outside the individual organism. Hence, while we can fractionize the mental activity (or at all events the unconscious mental activity) of the person, the mental activity of the group is nothing but the mental activity of 'socially minded' and 'socially active' persons.

It is important to recognize that various products of mental processes and of behaviour, including those which are specially due to social influences and are of special social interest, e.g., customs, beliefs, folk-lore, institutions and the like, may be studied (particularly in their more 'crystallized' or 'tangible' forms) apart from the standpoint of social psychology. Such studies have indeed long been the partial concern of ethnology,

sociology and history. The difference between the standpoints of these subjects and the standpoint of social psychology may be thus illustrated. It would be possible to trace the evolution of the bicycle (or of any other invention) without specific study of the genius, intuitions, feelings, intelligence, motives and detailed conduct of successive inventors; at most a hypothetical, purely conjectural, mention of one or two of these psychological determinants might be included. In the same objective fashion economic problems have been abstractly studied quite apart from relevant social psychological influences, such studies involving psychologically no more than the purely imaginary creation of an 'economic man' whose conduct is supposed to be determined solely by the desire for gain. So, too, the solution of industrial difficulties has been often attempted without reference to the complex social and 'human' factors which are commonly involved.

Such an objective examination of mental products and actions is always possible; but only in certain cases and for limited purposes is it really adequate. The sociologist may study, for example, the development of, and modifications in, social institutions, customs and beliefs. He may trace the various changes (e.g., of assimilation, elabora-

tion or simplification) which he observes when the cultural elements of two different social groups meet one another—the effects of borrowing through the travels of individual persons or other causes of intercommunication, or the effects of impact and conflict through immigration or conquest. Similarly, he may study objectively the social problems of religion, art, crime and marriage.

Such knowledge of social data, in their thus coarser, more consolidated and stereotyped forms, the social psychologist also requires for his further work. But the sociologist—as indeed the ethnologist and the historian—must realize the value of the more refined work of the social psychologist on the more elusive, more 'living' aspects of the same knowledge—the close study of the mental processes, and the individual and collective behaviour, of persons arising from their membership of social groups and of the results of their different social relations to one another within the same and different groups. For without this study, few satisfactory general principles can be established and no sure practical guidance for the future can be expected. It is imperative also to undertake the detailed study of all the determining conditions of such behaviour, together with the study of

subjective experiences associated therewith. It is therefore not enough to trace objectively, or to speculate from the arm-chair on, the history and relations of the beliefs, folk-lore, social institutions or conduct of different communities. These provide merely a starting point for the work of the social psychologist, who from his psychological training is only too well aware that similar responses may from time to time occur during widely different mental experiences and that widely different responses may from time to time arise from the same mental experience. Nor can he be content to rely on the arm-chair studies of the psychologist (useful and necessary as these may be)—on compiled lists of possible social instincts, sentiments, attitudes, tendencies, etc., as constituting an adequate vocabulary for the description and explanation of his data.

Modern views on the psychology and importance of *unconscious* mental activity cannot fail to influence the direction of the work of the social psychologist, even although exaggerated stress is at present laid by the various psycho-analytic 'schools' on symbolic interpretations, on sex, on inferiority, on the inheritance of unconscious processes and products of social origin, etc.; and even although psycho-analytic training appears

at present to involve a too-blind, uncritical subservience to the particular 'school' in which that training has been received. No one can doubt the importance of phantasy, dramatization, imagery, symbolism, repetition, and the solution of conflicts (by compromise formation or by other means) in the study of creative products, alike in primitive societies, in juvenile individuals and in dreams. But the wild interpretations and speculations which have too often characterized these studies have yet to be replaced by more sober, less dogmatic, judgment and by more scientific methods. Psychology has yet, too, to determine in what sense, if any, the notion of the inherited 'collective unconscious' is admissible. She has yet, like biology in general, to ascertain, in this connection, how far the characters acquired from experience, conduct or environment are inheritable. To my mind there is nothing inherently more improbable in the heredity of individual (or even group) ideas, memories and beliefs—or at least in the tendencies to them—than in the heredity by man of the definite kinds of sensation, emotion and other mental states that his species experiences under definite, known, environmental conditions.

Most of the generally accepted contributions

from the psycho-analytic approach have originated largely from studies of abnormal persons. It is therefore hardly surprising that the consideration of such influences as conflict, repression, inferiority, suggestibility and defence mechanisms, as applied to social problems, has given rise to a pathological interpretation of what is often really normal social behaviour. The psycho-analyst would be the first to insist on the general identity of unconscious mental activity in normal and in abnormal conditions: there is nothing necessarily pathological, of course, in ordinary social life, in relation, say, to sex, crime, class distinctions, political rivalry, etc. Nor are mental maladjustments, conflicts and their solution necessarily pathological, although they are unquestionably related, in ways many of which have yet to be determined, to deplorable or, at least, to undesirable social attitudes.

With the modern development of psychology has come about the general rejection of any essential difference between the savage and the civilized mind. In mind, as in body, primitive man of to-day is not radically different from his more advanced brother. The mental differences between them which we observe seem to be analogous to those between the various levels of any civilized society, and to be almost wholly due

to social factors dependent on environment and tradition; they thus become a subject of study for the social psychologist. Many of the differences distinguishing the civilized from the primitive human mind appear to involve the repression, rather than the obliteration, of earlier characters: at any moment, under suitable environmental conditions, the civilized may revert to many of the social characteristics of the savage mind. Nevertheless, these differences obviously demand study, even if most of them cannot be attributed, in the strict sense, to mental evolution. On the other hand, in the case of the growing individual great developmental changes obviously occur. Hence an important branch of social psychology lies on the genetic side, i.e., in tracing the rise of social behaviour through childhood and adolescence to early and later adult life; while our knowledge of the evolutionary aspect will be best advanced by observational and experimental study of the social life in apes and other infra-human groups and by genetic and eugenic inquiries.

The history of psychology points to the advantages of examining first the simpler, more backward forms of mental life and processes. Experimental psychology began with work on sensations, imagery and reaction times; intelli-

gence testing started from attempts to recognize the mental defective, and education in manual work from efforts to educate the dull; vocational guidance has proceeded from the guidance of elementary school children to that of secondary and public school and University students; vocational selection and the study of working conditions have progressed from the study of the rank and file of workers to that of the higher positions in business management. We might therefore conclude that in its present stage the study of social psychology should centre about primitive, rather than about advanced societies which are, in appearance at least, so much more complex and contain so many more internal groups than the former. Not only for this reason may it be urged that the social psychology of relatively primitive communities demands immediate attention; but also in order to rescue fast-perishing knowledge and to record fast-changing conditions, and in order, by the results of such study, to safeguard primitive communities, and indeed other civilizations, from the present dangers of having a European culture blindly forced upon them.

On the other hand, our own civilizations present vital problems demanding immediate study, such

as the post-war developments of unemployment, nationalism and 'racial' conceit, and the relative advantages and dangers of various recently adopted forms of government, the solution of which can hardly be expected save by their direct study. Our own societies—as an illustration we may consider the study of discontent or unrest in industrial life—also yield a more intimate knowledge of the actual experiences of their members and of the meaning of their behaviour than can be readily elicited in primitive communities whose language, thoughts, attitudes and traditions are so alien to our own. If social psychology consisted merely in the sociological task of observing and comparing social institutions, customs and beliefs—their origins, modifications and spread—if it consisted merely in arm-chair 'philosophical' speculations on the psychological conditions determining such origins, modifications and spread, its practice in primitive societies would present less difficulty. But the social psychologist, as I have urged, must study the psychology of individuals as members of the society and as influenced by and determining the society to which they belong. The mere observation of social products and their *ex parte* interpretation are not only inadequate but even

dangerous. The social psychologist must live long and intimately among the groups which he studies, if he is to investigate their conscious and unconscious social mental processes and their common social behaviour—the essential subjects of his science. How else, too, can he hope to realize the practical value and the practical object of social psychology—to promote the art of living, to improve intra- and inter-social relations, to establish better principles and methods of education, work and leisure, and to prevent social maladjustments and misgovernment? In these circumstances it would be unwise to discourage immediate research in social psychology among advanced communities.

Finally, the history of psychology and of its applied branches points to the advantages of an adequate training in experimental psychology, not only in the uses and practice of introspection, but also in the psycho-physical and statistical methods which it employs. Such methods, indeed, have of late years been actually employed by social psychology in attempts to measure public opinion, e.g., by ascertaining the ethical, political and other social attitudes of one particular group towards other groups or towards crime, warfare, propaganda, etc. But even when

they are not actually employed, previous familiarity with them establishes an unconscious background, an ideal scheme of methodological procedure, which is, I believe, essential to any reliable psychological research, but is unattainable by any other means. From his training in experimental psychology in its most catholic form the social psychologist will realize in his work such perils and pitfalls as those relating to suggestibility, expectation, adaptation, rationalization, dogmatism, interpretation, language and expression; and he will appreciate the need to assure himself of the reliability of his data and of the adequacy of the sample of the group which he examines, and to preserve in his interpretation a sane outlook on the relative importance of conscious and unconscious mental processes and of outward behaviour.

Chapter VI

Towards Internationalism[1]

The union or federation of originally independent kingdoms and states is nothing new: we all know that England was at one time a conglomerate of small separate kingdoms; that less remotely Scotland and England were independent of one another; that both France and Italy arose from a union of originally separate states and kingdoms; that Germany was similarly formed from the federation of Prussia, Bavaria, Würtemberg, Saxony, etc.; that originally separate states were welded into the United States of America; and that in more recent times federation has been at work in Australia. The principal conditions determining the formation and success of such unions or federations appear to have been—geographical propinquity, linguistic identity, and similarities of race, culture and interests.

In many instances each of the combining countries has retained a certain administrative independence or certain idiosyncracies of its own,

[1] From an Address given to the University of Sheffield Students' Union on 27 November 1933.

particularly in laws, methods or customs relating to land tenure, marriage and education. Perhaps their most distinctive losses have been in language and in dress. The Cornish, Gaelic, Welsh, Breton and Basque languages afford good examples of the former: the characteristic dresses of the various cantons in Switzerland, of the latter. But while there is relatively little general permanence in words and clothes, historical, cultural and racial differences are not so easily obliterated: Scotland still teaches her children a history different from that taught in English schools; the Provençal or the Neapolitan still preserves his individuality and ideals, distinct from those in other parts of France or Italy.

Clearly the success and the permanence of such unions and federations depend on the treatment received by their constituent parts. Where misunderstanding or oppression ensues, dissolution, usually involving warfare, is sooner or later inevitable—as we see in the case of Southern Ireland, Hungary, Poland, etc., each of which has regained its former national independence. Dissolution may also be dictated merely by expediency or by the force of circumstances. All such rejuvenated nations begin their new career by imposing excessively high tariff barriers in order

to develop and protect their infant industries; just as all effete nations risk ending their career by imposing excessively high tariff barriers in order to preserve from competition their decaying industries. Indeed, newly established nations behave as young children would behave who, after suffering years of ill-treatment, suddenly find themselves in the position of being able to do exactly as they choose. They run riot in their newly acquired freedom, thinking only of themselves and acting in utter disregard of the fact that a re-established nation is not a whit freer to do exactly as it likes than is an individual who has just been liberated from prison. Thus, nationalism in its extreme form reigns triumphant: scant room is left for the spirit of internationalism or for a League of Nations. Such is the age through which much of Europe is now passing, since the treaty of Versailles.

But sooner or later must come a clearer recognition that no nation can harm others without harming itself, and that the complete independence of a people, wholly neglectful of the interests and welfare of other peoples, is as impossible as the complete independence of an individual within the country to which he belongs. Just as there are national regulations for the mutual benefit of a

nation's citizens, so there must be international regulations for the mutual benefit of different nations and countries. It may well be that a federated United States of Europe is neither desirable nor realizable; the spirit of internationalism does not demand this. But nothing is more certain than that a complete independence of European countries must lead to extravagant competition and to repeated warfare. A state of union, or even of federation, may be needless, dangerous or impossible; but internationalism, in the sense of a certain degree of what we may term international 'rationalization', is essential.

We can learn much about the advantages and dangers of such international rationalization by considering the advantages and dangers of industrial rationalization. For industrial rationalization a combine of firms having certain common interests is essential. The combine may vary from a complete and permanent union to only a loose, even temporary, federation of the combining firms. Its prime object is to prevent needless waste of effort and especially extravagant competition. The combine may buy up weak rival firms, strengthening them if they can be made of value, or extinguishing them if they are useless, instead of watching them suffer a gradual, painful death

and being hampered by their working inefficiency. The combine will allot different specific manufactures to its component firms, in accordance with the special facilities enjoyed by each of the latter. It will allot different areas of sale to constituent firms manufacturing the same product, so as to avoid the waste of sending precisely the same goods from factory *a* in area A to area B and from factory *b* in area B to area A. It will extend and organize technical research, pooling its results among all constituent firms. It will fix prices for the sale of its products and fix the quantity of their output, so as to avoid the extravagant wastage of needless rivalry and over-production. The more complete the union, the more readily are these and other similar advantages obtained; and the more extensive the union, the more obvious are the dangers of the combine, due to the consequent excessive departmentalization and functionalization, to over-centralized and hence defective leadership, and to the discouragement of individual initiative and enterprise.

It is important to realize that in the evolution of the higher living organisms such specialization of function has seldom arisen from the combination of formerly separate units. The origin of the many-celled organism cannot be traced to a

combine between one-celled organisms. It *starts* as a uni-cellular organism, which divides and subdivides, but retains within its unit these divisions and subdivisions which now take on special differentiated functions—respiratory, digestive, excretive, reproductive, etc. Such differentiation of function accompanies the gradual differentiation of structure from that of the original unit. But another important feature must be recognized: the differentiated parts are never reduced to a state of mere automatism. Despite the allocation to them of specific functions, the parts are intimately connected with, because indeed they have never been wholly separated from, one another; and, in some degree, they each retain many of the undifferentiated functions of the original unicellular organism. Thus are avoided, on the one hand, the dangers of excessive departmentalization, resulting in water-tight compartments each of which pursues an independent policy. Nevertheless, in virtue of the allocation to them of specific functions, the parts are given certain powers of independent direction. Thus are avoided, on the other hand, the dangers of excessive functionalization, where bands of commercial or industrial specialists, organized, informed and directed from remote headquarters,

dictate the working even of the most distant parts.

Man, however, cannot thus imitate the ways of living nature. The union of families to form the nation, and the union of businesses to form the rationalized combine, have proceeded on the lines of knitting together formerly discrete units, not on the lines of developing a more and more complex and multipartite organism from a single, simple one. Similarly it is impossible for man to proceed with the rationalization of nations too literally on the biological lines which I have been indicating: generally speaking, existing nations have to be brought together in harmony, rather than new nations differentiated from old ones. If human beings had been differentiated from the nation to which they belong, if different nations had been differentiated from a (non-existent) world-nation, the ideals of internationalism would be far more easily attainable. But the fact is that the 'group mind'—the spirit of nationalism (and of internationalism)—has no existence apart from the human individuals which by their social co-operation create these larger units. Nevertheless, a closer acquaintance with these biological lines of differentiation may well preserve the human species from various dangers.

I have drawn attention to industrial rationalization not merely because I can claim to have made some study of it, nor merely because its consideration may provide suggestive help in the internationalism of the future. I have done so more especially because there can be no doubt that the present developments of industrial rationalization are encouraging more and more the spirit and growth of internationalism; indeed they depend more and more on it for their own success.

When the representatives of two huge combines meet to discuss international business interests, far greater mutual confidence is commonly displayed than when two small houses of business meet with a similar, but smaller-scale, object. Far less reticence occurs: the cards are placed far more openly on the table. As in the wider political world, so in the big business world, secrecy is giving way to publicity. Herein we see a prelude to internationalism—greater faith in the ideal of an increase in that *general* prosperity and happiness on which *individual* national prosperity and happiness must depend. In bygone days wars were determined largely by industrial considerations. But now the big men of business are coming to recognize that warfare is inimical to true industrial progress. Moreover, a properly

rationalized industry realizes that weak inefficient business units are a serious hindrance to its own welfare. It buys them up, and if they are not too effete it strengthens and improves them. Just, too, as civic duty and state interest encourage charity and the support of the unemployed, so international considerations and world interest bid us help the weaker, distressed nations—if only for selfish reasons.

Business men have now become aware of the extravagance of senseless competition with their rivals, not only at home but also abroad, and of the absolute necessity for an understanding with them. Otherwise they must ruin one another by over-production and cut-throat prices, leaving no profit for research and technical improvements; and they must ruin the physique and mentality of their work-people by the low wages which, through their internecine competition, they are compelled to pay. The once universally accepted belief in the sanctity of unfettered business competition has now been generally abandoned. At one time every one was convinced that if competition were diminished, improvements would cease, excessive prices would be charged, and the general community would in this and many other ways suffer.

So too biologists of the past have held that life could not be long maintained without nature's ruthless struggle for existence. Each individual, so argued the early evolutionists, must fight his fellows for his life: only thus can there be selection and survival of the fittest. But the growth of the modern spirit of social welfare, involving as it does the protection of the weak and care for the infirm, has overthrown this notion. It has led to the growing ideal of the future replacement of the operation of blind natural selection by the operation of systematic human control. There is an increasing belief that one day the crude, cruel methods of nature will give place to the scientific methods of eugenics; that one day we shall be breeding the desired types of man just as we are now beginning with success to breed the desired types of animal; and that one day we shall avoid excess or defect in quantity and quality of reproduction or population, just as the large business combines are beginning now to regulate the quantity and quality of production or output in accordance with human demand.

Nevertheless, there are still many who believe that international warfare is essential for the maintenance of vigorous, courageous and enterprising nations—that, as von Papen and Mussolini

stated recently, war is for man what motherhood is for women. When man used to fight in single combat, there may have been some foundation for this belief. But the conditions of modern warfare are totally different: it is fast becoming an affair not so much of the amateur or conscript masses as of expert technicians; so clearly will victory in the future depend rather on the dastardly use of the most destructive discoveries of science than on national courage and pertinacity or on mere numerical superiority. The cruelty and suffering involved in war have already become humanly wellnigh intolerable. It is no longer the bravest who survive in battle to perpetuate their species: they are the surest in modern warfare to suffer early death; and the gaps left in their social rank, if their rank be high, become filled by the more cunning and more vulgar folk who have been busy at home in making a fortune out of warfare. Are these the kind of adventurous and courageous folk that we desire to perpetuate through the struggle in warfare for national existence?

In savage races individual fighting is seldom carried on until the actual death of one of the combatants. In the Middle Ages this was reflected in tilting; and later, individual fighting ended

often with the merely trivial wounding of one of the duellers, whose 'honour' was declared thus to be 'satisfied'. But since the decay of tilting and duelling, mankind cannot be said to have suffered in enterprise, initiative and courage. Nor need nations similarly suffer by the abolition of warfare. Just as society has established within each nation courts of justice for settling personal wrongs, so to-day we see nations attempting to establish courts of justice and tribunals for adjudicating on international differences. But whereas any one nation can enforce the verdicts of its own courts and can forcibly prevent individual citizens from coming to blows by the help of its police, hitherto no effective provisions have been employed for enforcing the verdict of an international tribunal. The institution of a police force within any one nation embodies the consent of a majority of its citizens to secure the punishment of the minority of their refractory fellow-citizens. At present, however, the majority of nations are not yet prepared to enforce the verdict given against their refractory fellow-nations. The nation that feels its honour unrequited, or through anger or greed refuses to submit its case to arbitration, can still flout the tribunal and have recourse to war. Sometimes the very governments of nations,

whose representatives at the League of Nations have reached a certain verdict, are unsympathetic to that verdict, even though they be not the governments of the contending nations. Indeed, it may be maintained that any act, however wrong, committed by a nation or by its government, is justifiable if it can thus be saved from threatened or imaginary disaster: as Arnold Bennett makes Culver say in his play *The Title*—"The first duty of a Government is to live."

But would those who urge this justification or duty countenance it in the conduct of an individual? Does not a nation's honour need to be maintained as strictly as an individual's? Is the desire for success, the instinct of self-assertion, the struggle for existence, to be satisfied, nationally, at *all* costs? Is suffering, or even martyrdom, for a righteous cause justifiable in an individual but unpraiseworthy in a nation? Is the notion that 'might is right' to be upheld by a nation but to be condemned in the case of an individual? On the other hand, is a person or a nation always to eschew fighting for what he regards as a righteous cause—always to accept the views of a majority of fellow-individuals or nations who are usually behind-time in the progress of ideas? At present the verdict of the League of Nations has little more

than a moral effect: it is based on an impartial, and relatively public, review of the secrets and intricacies of the situation, and it puts a nation on its honour to abide by it. If that nation disputes the competence of the League, if it declines to place its case before the League or if it refuses to abide by the League's decision, its punishment results merely in severe disapproval, condemnation, or even ostracism, by its fellow-nations, which it may largely cover by resignation from the League. So far the infliction of what are termed 'economic sanctions' has not been rigorously or effectively enforced.

This state of affairs might suffice to secure obedience in a well-run public school. A boy sentenced to a certain punishment task, who was placed on his honour to perform it without any compulsion, would generally prefer to do so rather than to be 'sent to Coventry' by his schoolfellows. But if an adult citizen were sentenced to a fine or to imprisonment, or felt himself wronged by arbitration, and if there was only moral sanction to enforce obedience to that sentence or decree, he would in many cases refuse to pay the fine or to present himself for imprisonment or to submit to the referee's decision. Still more often must the verdict of a League of Nations be re-

WITH THE AUTHOR'S COMPLIMENTS

jected, in cases referred to it for adjudication perhaps in the first place only by one of the two sides, or in cases where the League itself makes the first move towards a settlement.

Are we to suppose that from the small beginnings that have hitherto been made, the respect felt by individual nations for international opinion will one day so far increase as to enforce an almost automatic obedience to its tribunal? Or is it not more likely that such respect will one day prompt the demand for an international army, or rather police force, in order to secure the acceptance of international decisions by a recalcitrant nation? It is not difficult to foresee the attractiveness, to the growing numbers of pacifist citizens throughout the world, of enlistment in an international force, enjoying a holiday period of periodic military training, say in Switzerland, with the object of using international compulsion, when necessary, in order to prevent warfare. No one was readier to fight for his own convictions than the conscientious objector in the recent war: he would often rather lose his personal liberty than don khaki for even manual labour. Perhaps the chief difficulty in raising such an international force lies in its leadership—a difficulty not yet solved even for itself by the League of Nations:

in order to satisfy national jealousies, five architects, each of different nationality, had to be engaged, so it has been said, in the construction of its new building. But surely time and necessity may be expected to solve even this difficulty, as the corresponding problem was ultimately solved between the British and French armies during the Great War. Time and necessity will surely evoke between nations, as they are evoking between huge industrial combines, a spirit of comradeship between rivals, a spirit of fellowship in common, though competitive, useful effort. With the decay of feelings of superiority, international contempt will vanish, while with the decay of feelings of inferiority, international jealousies will vanish.

For no two individuals can ever be wholly equal; there must similarly always be differences between nations: some are gifted by nature in one direction, others in others. A strict equality between nations is as impossible as it is between the citizens of any one country. It is absurd to give the same food to the race-horse as to the cart-horse. Those who are fitted to carry on and are engaged in carrying on the most responsible work of a community cannot be reduced to the level of those who are needed and fitted to be mere hewers of wood and drawers of water. International

differences of climate, too, have always to be considered. For these reasons an absolute equality of national standards of living is similarly impossible. And tariffs may well prove always necessary for international welfare, so as to compensate for the cheapness of production due to such irremovable causes, even after the international unfairness of state subsidies, such as those on shipping and those which lead to 'dumping', have been recognized.

Each nation, too, has its own defects, and it must come to recognize these defects instead of glossing them over with what the psychologist calls 'defence mechanisms'; Germany, for example, hiding its brutality by its love of culture, France its emotional reactions by its love of logic, England its distrust of systematic thinking and doing by its love of liberty of thought and action. Just as the vocational adviser does not attempt to enforce his expert opinion on an applicant for guidance in the choice of his career, but places the facts before him in such a way that ultimately the applicant chooses voluntarily the occupation for which he is best fitted by nature—so, it may be hoped, the various nations will each be induced voluntarily to take up the work which, in the cause of common humanity, it can best perform.

With the abolition of the danger of warfare, a given nation needs no longer to have as its aim self-sufficiency.

What the individual can justly demand in present social conditions is not equality of wealth, but equality of opportunity. And this must be the legitimate demand of nations. Moreover, just as the individual, although retaining his personal pride and ambition, comes more and more in modern times to temper these feelings with the spirit of social service, in the same way national pride and ambition must yield before international welfare—the common good of humanity at large. Patriotism should be no more incompatible with internationalism than are our own individual interests incompatible with those of the society to which we belong. In considering his own welfare, an individual citizen must always consider whether any step he is taking is harmful to the community in which he lives. So, too, collectively, we must be filled not only with the pride and love for our own nation but also with the pride and love for humanity at large—of the whole world.

It is essential that an individual's own conflicts be satisfactorily solved if his mind and his conduct are to remain wholesome. Neither the warfare

between two conflicting emotional systems, nor the repression of one of them so that it becomes a discordant unconscious 'complex', constitutes a satisfactory solution. As within the individual, so among the individuals within a nation, and so again between the nations of the world, conflicting feelings, desires and aims must be solved—and solved, wherever possible, by the creation of far higher-level feelings, desires and aims, whereby national differences, if not subsumed, are at least intelligently recognized, understood and co-ordinated.

Unadulterated individualism implies the fallacy that the human unit can act within society in isolation from his fellows. Communism and fascism, on the other hand, reduce individuals to the mentality of ants, all acting unthinkingly, impersonally and uniformly for the promotion of the welfare of the whole. But the truth is that the social individual only exists by virtue of what James Ward called 'inter-subjective intercourse'. There must always be a give and take between individual ideals, each recognizing the good points in others and the defects in its own. The imposition of uniform ideals is hopeless. There should be room in the nation for every individual difference and for every type of social experiment, so long

as it can fit in with the rest. Such are the principles that should govern not only the life of any nation, but the life of internationalism.

Again and again history has shown how prone warfare is to beget further warfare—and at no time more obviously than during the years that have followed the Great War. What is more natural than that France should have heaped indignities on the German nation after all that it suffered during the Great War, or that it should still feel apprehensive of yet another invasion after vainly seeking unconditional promises of protection from individual nations which it has appeared to them impossible to give? What is more natural than that at the close of that war the Allies should have resolved the effete and impossible monarchy of Austro-Hungary into a number of small independent peoples who had long been demanding their freedom, thus creating Czechoslovakia and Jugoslavia, leaving a small remnant of country about Vienna to constitute Austria, cutting Austria and Hungary from the sea by reason of the promise of Trieste to Italy on her joining the Allies, driving a Polish corridor right across Prussia so that Poland, a recreated nation, might also have ready access to the sea?

What is more natural than that Germany, in its

defeat and friendless condemnation, in its commercial ruin and poverty, should—even though at a time when it was beginning to gain the sympathy of Great Britain—seize, like a drowning man at a straw, upon the demagogic platitudes and promises of a Hitler, and, in order to regain its self-conceit, despite its largely Slav and Alpine (Asiatic) population, proclaim the necessity of regenerating and purifying a purely suppositious Aryan (Nordic) race by physical and even military training and by persecuting, maltreating and murdering its Jewish citizens, attributing to them, through the well-recognized psychological process of projection, its own recent misfortunes, and making it impossible not only for Jews, but also for all other Germans who refused allegiance to the Nazi party, to earn their former livelihood? Can disarmament be expected when the Nazis and the Soviets are so confident of the respective merits of their antagonistic policies that they have been actively engaged in propagating them and in stirring up civil warfare in countries other than their own? Even when they have seen the folly of their ways, what years it will take to restore mutual international confidence, and how likely will it be that at first that confidence will prove to have been misplaced!

A treaty enforced without some measure of mutual consent can never lead to an abiding peace. Punishment is never a true cure for national—as it is never a true cure for individual—misdeeds. National prestige can never ultimately suffer by a just agreement. It will, of course, wax or wane, just as civilizations rise and fall, or just as an individual's prestige waxes and wanes during their, or his, life-history. But it depends not so much on temporary possessions as on national characteristics; and national characteristics may remain unchanged (as indeed they have so often persisted) from time immemorial. England's love of fair play, France's leadership in women's fashions, and North Italy's prowess in engineering have been recorded and recognized for many centuries past. The time is not far distant when a nation, like an individual, is no longer esteemed on the ground of its wealth and its possessions; it may be enviably happier, like an individual, and as in the case of Scandinavia, Holland and Switzerland, in the modesty of its pretensions and in the excellence of its conduct. If a country were assessed by its size or by its actual or potential wealth, Russia and the United States of America would stand out as the greatest nations of to-day.

Internationalism does not demand a United

States of Europe. Nor does industrial and commercial progress require the abolition of all small businesses. There is room and there are separate functions both for the huge business combine and for the small individualist business; so it is in the case of nations. But the employer of even the smallest business finds in these days increasing difficulty in standing alone: he is forced to enter into at least some measure of understanding with his 'rivals' or 'colleagues'; so it is in the case of small nations. Economically, Czechoslovakia, Jugoslavia and Roumania are finding it impossible to exist without agreements with one another: the regular conferences of the Little Entente are already promising to bear valuable fruit, and even to extend to larger neighbouring nations. No progress can be expected when a small nation endeavours to struggle on, without a real understanding with other nations. No progress can be expected from modern children who rebel against the slightest measure of parental control and advice. A young nation may require similar tutelage before it is capable of self-organization and of acquiring the necessary outlook towards internationalism. It is above all necessary for the most advanced and most powerful countries to show these younger countries an example, by

their courageous leadership and combined efforts towards achieving the ideals of internationalism, despite the contempt, amusement and cries that 'it can't be done' with which opposition to a new ideal inevitably meets from smaller, narrower minds.

I recall talking with an American in 1915 who had been busy throughout the United States in persuading his fellow-citizens to join us in the Great War. He informed me that he had met with no little 'patriotism' among Americans for the city or town in which they dwelt, a small amount of 'patriotism' for the State to which they belonged, but virtually no patriotism for their country as a whole. The entry of America into the war did much to enhance the wider, national, American patriotism. So, too, may we expect the exercise of the pacific and far wider spirit of internationalism to engender the far vaster 'patriotism' to which I am now referring. Aided by increasing suitable education, and with the growth of enlightened public opinion, this larger view, this larger consideration of world-social and world-economic ends and values, will surely be ultimately obtained.

Whilst human nature remains as it is, such a Utopia cannot conceivably be realized. Under

ideal conditions of human nature, either socialism or individualism could work to perfection. But so long as political parties and class warfare continue, each striving selfishly for its own aggrandisement, each opposing other parties and classes merely for its own glorification, a smoothly working national government is impossible. We have therefore a very long way to go before a truly international government, a truly international mind, is possible. But will anyone deny that we are perceptibly nearer this ideal than we were, say, a hundred years ago? I do not mean to imply necessarily that the individual person shows improvement. But his thoughts, sentiments and conduct depend not merely on himself, but also on the social mental environment in which he is brought up. And it is that environment which—despite momentary interludes of violent, jealous nationalism—is slowly moving in the direction of a wiser internationalism.

Chapter VII

Psychological Conceptions in Other Sciences[1]

I propose to consider in this chapter how far our knowledge of the mental world is helpfully applicable to the material world, how far conceptions and attitudes which have been specially employed and developed by Psychology may also prove—or have also proved—useful and common to other Sciences.

At one time it was usual to distinguish 'primary' and 'secondary' qualities in objects. The secondary qualities, e.g., those of colour, sound, smell, taste, and temperature, were regarded as purely subjective, due to stimulation of some appropriate sense organ. On the other hand, the primary qualities, e.g., those of size, shape, hardness, movement, and weight, were held to be independent of the sense organs through which they were experienced. They were the 'real' properties of matter; and so long as the physicist regarded them as such, the philosopher naturally

[1] Abridged and modified from the Herbert Spencer Lecture, delivered at Oxford on 14 May 1929.

tended to rest content. Not so, however, the psychologist. By him the primary qualities have long been regarded as not a whit more real than the secondary. Even Spencer in his day fully recognized—'What we are conscious of as properties of matter, even down to its weight and resistance, are but subjective affections produced by objective agencies that are unknown and unknowable...symbols of actions out of ourselves, the natures of which we cannot even conceive.'[1] For him not only Matter and Motion but also Space and Time are derivable from 'mental relations'.[2] The physicist has been fast approaching a similar point of view, discarding, one by one, conceptions (which were once crudely accepted as ultimate realities) of force, mass, inertia, gravitation, etc.

It has also long been recognized by the psychologist that there is nothing 'absolute' about the conscious products of mental activity: they are 'relative' both to the present conditions of mental activity and to the past experiences of the experient. 'A Crustacean,' said Spencer, 'everywhere enclosed in a hard exo-skeleton, can have no such tactual impressions as those which are

[1] *Principles of Psychology*, vol. I, p. 206.
[2] *First Principles*, p. 169.

possible to a soft-skinned animal. The impressions received from the ends of its limbs and claws when they come into contact with external objects, may be compared to those which a man receives from poking objects with the end of his walking stick.' And, he adds, 'various aquatic creatures that have undeveloped organs of Hearing, are nevertheless affected by those vibrations which to creatures better endowed are sonorous... the quality of the feeling excited in these lower animals by sonorous waves, is wholly unlike the quality of the feelings which such waves excite in higher animals'.[1]

The same holds good, as Spencer also pointed out, for spatial and temporal experiences. 'Animals having great locomotive powers are not likely to have the same conceptions of given spaces as animals whose locomotive powers are very small.'[2] It is likewise 'impossible to suppose equality between an interval of time as present to consciousness and any nexus of things which it symbolizes'.[3] Psychological experiment and common observation prove that our estimate of time varies according as it is filled or empty, and according as we are pleasantly occupied or

[1] *Principles of Psychology*, vol. I, p. 195.
[2] *Ibid.* p. 212.
[3] *Ibid.* p. 219.

monotonously bored during the interval. The apparent order of two exactly or nearly simultaneous stimuli has been shown to be dependent on the direction of our attention to the one or to the other of them at the moment of their reception.

So too our estimate of space, whether afforded by sight or by touch, varies according as it is filled or empty, and our visual estimate of the length and direction of lines varies according to the presence of other lines presented simultaneously with them. The estimated distance between two points applied simultaneously to our skin differs in different regions of the body surface, recalling the difference which Spencer indicated between the tactual impressions of the Crustacean and those of Man. The appreciation of movement when a blindfold person is passively rotated or moved in a straight line depends not on the absolute speed of the movement but on the change of speed of movement. The old aphorism, *semper idem sentire ac non sentire idem est*, proclaims a deep and wide truth.

Our estimation of the weight of an object is found to vary with the speed with which we happen to lift it, and hence often with the object's size whether judged by grasp or by vision. For

example, a pound box full of feathers when lifted appears to weigh less than a pound box full of lead, because the box of feathers, being by far the larger, inevitably evokes a bigger lifting effort, rises therefore more rapidly, and hence appears to be lighter, than the smaller, but in fact equally heavy, box full of lead.

Our appreciation of colour is modified by successive or simultaneous contrast. That is to say, the effect of any colour stimulus upon a given area of the retina is determined by the manner and result of previous stimulation of that area and by simultaneous stimulation of neighbouring retinal areas. Everywhere, indeed, within his field of study the psychologist has insisted on the importance of relativity at a time when the physicist was considering that his subject, and indeed that all Natural Science, depended on the retention of the absolute.

On two occasions at least in its history, Psychology has suffered by the incursions of physicists who endeavoured to replace the relative there by the absolute. When a grey strip is placed on a uniformly coloured (e.g., red) background and the whole is covered with a piece of tissue paper, the grey strip assumes a colour (green) complementary to that of the background. Helmholtz

supposed that this was due (*a*) to our regarding the now green strip as coming through from behind the red background, and (*b*) to our previous experience that for a grey strip to be seen through a red background it must in reality be green. That is to say, he ascribed the greenish colour of the really grey strip to an interpretation based on false inference of its position and on past experience.

We now know from an abundance of other evidence that it is the contrast colour which is primary and sensory, and that what is secondary and interpreted is not, as Helmholtz supposed, the awareness of the contrast colour in the grey strip, but its neglect. Through experience we discount, we do not produce, the contrast colour. It takes an artist to return to sensory innocence—to paint things as they were before interpretation substituted the absolute for the relative. Only the artist can fully appreciate the blueness of shadows on a yellow ground or their greenness on a red ground. The ordinary man conquers his native, naïve, relativism; he 'knows' that a shadow is grey or black, and accordingly he 'sees' it as such. He 'knows' that a snow mountain is white; and he 'sees' it as such, to a large extent regardless of the coloured light by which it may happen to be

illumined. One has only to look through a cardboard tube at the edge of the shadow of an object cast in daylight by a candle on a white sheet of paper, to realize its surprising blueness; or to view through such a tube a snow mountain at sunset, to appreciate the wonderful, otherwise imperfectly recognized, depth of its redness. It is the relative that is primary and innate, and the absolute that is secondary and acquired. Helmholtz sought to reverse this statement in colour vision.

Just as there is nothing absolute in our spatial or temporal experience or in the quality of our sensations, so there is nothing absolute in the intensity of the latter. We cannot estimate in terms of its stimulus the absolute intensity of any sensation. All that we can say is what Weber in his well-known law declared, that the *difference* in intensity between two sensations depends on the ratio which the difference between the strength of their corresponding stimuli bears to that strength. We cannot, save indirectly, judge that one sensation has twice or half the intensity of another. All that we can say in the comparison of intensities of sensations is that one is equal to, greater than, or less than another, or that the difference in intensity between one pair of sensations is equal to, greater than, or less than the

difference between a second pair. We can no more add together two sensations of different intensity than we can add together two pleasures or pains.

But by methods which depended on purely mathematical and apparently logical manipulations, but were wholly unwarranted and contradicted by psychological considerations, the physicist Fechner claimed to prove that the absolute intensity of one sensation could be compared with that of another and that it is proportional to the logarithm of the strength of its stimulus. Here we have a second example of the vain attempt of the physicist to replace the relative by the absolute in psychology.

It is perhaps idle to ask whether, if Physics had been willing to learn a lesson from Psychology, instead of trying to teach it one, its present position might have been sooner reached. We now find Newton's absolute time and absolute space discarded and replaced by concepts of relativity. There is now for physicists no absolute location of objects in space: their location varies with, and is relative to, the surrounding frame of space. Time is now inferred to run more slowly in such a place as the sun than with us, because the sun's mass is greater than that of the earth. Regarded as a mathematical point, an instant of time has

vanished for the physicist: the psychologist's conception of the enduring 'specious present' seems to be replacing it. And the question has been lately raised whether matter itself is not for the physicist merely the way in which our minds perceive certain aspects of its structure.

Indeed Physics is now largely engaged in dealing with geometrical structure rather than with material substance. Substance, which was once supposed to distinguish Matter so clearly from Mind, has gone from electrons, quanta, and ether. What are primarily sought now are the mathematical relations in terms of which the Universe can be described. Not only the ether, but also electrons and quanta are unimaginable and unknowable entities. They are no longer modelled on what we know in the 'big world'; the electron may indeed be subject to change in the very act of becoming known to us. They are—to use Spencer's words again—'symbols of actions out of ourselves, the natures of which we cannot even conceive', except—we might in these days add—by applying a non-Euclidean geometry to the purely mathematical conception of a space-time continuum. In erecting such a four-dimensional structure, how far are we removed from the simple, naïve standpoint assumed by

Lord Kelvin, when he said, 'I never satisfy myself till I can make a mechanical model of a thing. If I can make a mechanical model, I can understand it. As long as I cannot make a mechanical model all the way through, I cannot understand, and that is why I cannot get the electro-magnetic theory of light'?[1] In Lord Kelvin's time the ether was regarded as material—as a sublimed kind of matter. He felt himself therefore able to declare of it—'That is the only substance we are confident of in dynamics. One thing we are sure of, and that is the reality and substantiality of the luminiferous ether.'[2] Few physicists would speak to-day with such confidence about what they are sure of, when 'realities' and 'substantialities' are being shattered in such succession and profusion, and the Universe seems scientifically coming to be regarded as a vast corpus of mathematical necessities and possibilities, certain of which, as expressed for example in the laws of mechanics, gravitation, etc., through the further operation of mind become 'physical'.

The domain of Physics has not only been deprived of substance and absoluteness: it is also relinquishing its claim to being solely swayed by

[1] *Nature*, 1885, vol. XXXI, p. 603.

[2] *Popular Lectures and Addresses* (London: Macmillan and Co., 1889), vol. I, p. 310.

determinism. Deal with the average conduct of individuals *en masse*—and prediction is relatively easy. But Psychology is concerned primarily with the intact *individual* 'organism'; and while it fully recognizes the play of 'mechanism', it has at the same time been compelled through the very nature of its study also to recognize 'direction' as a characteristic of each whole individual system, over and above the mechanical characteristics better visible in its abstract parts or in a chaotic medley of such individual systems.

There was a time in the history of Psychology, before it had obtained its independence from Philosophy, when it was chiefly valued and used by the philosopher to support his own metaphysical views, and when each philosopher thought he could justifiably generalize on psychological problems merely from an introspective examination of his own mental processes. He supposed that all minds were virtually the same—that they consisted only of a small number of faculties differing little in degree in different individuals. Psychology now recognizes that the number of individually different mental characters is enormous, and that the total resulting differences are so vast as to produce the apparent effect that individual minds differ not merely in degree but

in kind. Psychology is not primarily concerned in determining the *average* threshold, the *average* memory, the *average* imagery, the *average* emotionality, the *average* conduct of an unorganized mass of individuals under given conditions. Its primary interests lie in the study of the *individual* and in the study of the *differences* between individuals. For Psychology average statements, average values, correlation coefficients and the like, are a mere blur or blind to individual differences; the average may well be but a statistical figment having solely abstract value.

In Physics and Chemistry attention has only in recent years begun to be paid to the study of the individual and of individual differences. Physicists and chemists are no longer content to share Clerk Maxwell's belief in the regularity and uniformity of minute units of matter, or his satisfaction with such regularity and uniformity as being indicative of that spirit of order in Nature which we also realize in our ideals of truth and justice.[1] The 'laws' of mechanism, the 'properties' of elements, etc., are now coming to be regarded as adequate only to describe the average of a host of individual entities. It is becoming recognized that we cannot

[1] *Theory of Heat* (London: Longmans, Green and Co., 1871), p. 312.

definitely predict what an individual atom or electron will do next, nor which of the possible jumps of a quantum will occur next. Each single entity is in fact an aggregate of probabilities—having probable mass, probable velocity, probable position, etc. It has been asserted of the electron that at any instant it may be allowed *either* a precise velocity *or* a precise position, but *not both*.

The second law of thermo-dynamics holds only as a mass effect for a huge collocation of individuals. That collocation always contains smaller and more or less mutually independent units, magnitudes, or systems, which are not at the moment illustrating the general law of the running down of the energy of the Universe. The study of Brownian movement shows the non-applicability of this irreversible law of thermo-dynamics when we consider the action of the molecular movements of water on minute particles of solid matter.

So too within the individual living organism, creative as well as destructive powers, both mental and material, manifest themselves. Guidance within Mind and Life and what is called 'chance' action among the individual units of the inorganic Universe may lead temporarily, at least, in one or

in the other direction, and thus make prediction of individual conduct impossible.

But surely, 'chance', in the sense of pure 'luck' (in contrast to guiding 'fate' or 'fortune'), is a mere cloak to cover our ignorance of determining conditions: 'accidents' are scientific impossibilities. Our inability to predict the conduct of any organized individual and our ascription of its conduct to 'chance' or 'accident' arise, as in the fall of dice, merely from our impotence to foretell the precise determining conditions that will be present. This impotence does not necessarily imply the presence of some mysterious *quasi*-'vital' force, which is performing miracles by running counter to mechanical principles. It may merely mean that results can only be foretold after the original event, because we can never know precisely the determining conditions and seldom know the outcome of them in new combination; and that (from the standpoint of meticulous accuracy) history never repeats itself.

Even the acceptance of such a psychological conception as 'guidance directed towards some end' does not imply a denial of the sufficiency of mechanism for Physics in the past. Nor does it necessarily deny that in the realm of Physics, as in the phenomena of volition, of heredity, and of

evolution, if all the conditions could be known and had been observed together before, prediction would be certain. What it does suggest is that for Physics, as for Psychology and for Biology, the past is really different from the future, that the future of any organized (or individual) unit is unpredictable, and that the passage from one side of a mathematical equation to the other is strictly and actually irreversible throughout Nature. We may by abstraction display the blindly working *machine* in Evolution. But the machine needs directive *guidance*, whether along already laid rails that predetermine, or by some 'mechanician' that ever selects and adapts, means to ends.

The second law of thermo-dynamics, as commonly understood, involves the assumption that at some remote time the Universe was wound up and set going, since when it has been running down by random movement towards an increasingly unsorted state. This assumption, it is true, the physicist regards as lying outside Physics: if he is bound to assume that the Universe was once wound up for it to be now running down, he bothers no more about the fact. The psychologist, on the other hand—as indeed every evolutionist—sees more in the Universe than this ceaseless process of irreversible degradation. He

insists that there is more in Mind (and suspects that there is more in any organized or individual unit throughout the Universe) than mechanism—that just as a chance shuffle of musical notes or a chance throw of the compositor's type will never satisfactorily account for the production of a musical or a literary masterpiece, so chance variations of the countless components which enter, say, into the bodily forms and into the mental instincts of living organisms can never account for the appearance and evolution of those forms and instincts. 'Conservation of energy' and 'conservation of matter' are important enough principles —whether or not their universality be one day questioned. But at least as fundamental and certain is the psychologist's peculiar principle, 'conservation of self'—or, more generally, conservation of the individual system—which makes for preservation of pattern, endurance of identity, and unity and continuity of the individual throughout its history. Even each of the various individual sub-systems within the 'universe' of the individual mind endeavours to conserve and to assert itself; e.g., impressive memories strive to recur, to intrude—or as the psychologist says, to 'persevere'—in consciousness. The biological 'struggle for existence' is essentially a psychical

struggle—an illustration of the 'conservation of self'. The same principle is surely involved in that stereotyping of patterns which is responsible for the permanence and distinctiveness of genera and species throughout animal and vegetable life. May it not also be invoked to account for the distinctive patterns and types of movement and configuration observable throughout the physical, chemical, and stellar world?

Closely allied to the psychologist's conception of the conservation of 'self' is his conception of the conservation of 'nexus'—which may also prove applicable in the physicist's world. When the same two external objects or events, *A* and *B*, are repeatedly presented to us in succession, we acquire an association, linkage, or nexus between our experiences of them which we may represent as *a–b*. A psychical integration has occurred, so that *a–b* now forms a unitary whole, and when *A* is presented to the subject *b* tends to be revived. If the acquirement of this association *a–b* is followed by the acquirement of another association *a–c* (*a* and *A* being common to the two cases), the association *a–b* seems to disappear; that is to say, when *A* is presented to the subject *c* tends to be revived. But *a–b* is not really annihilated or destroyed by *a–c*. The older nexus is merely

inhibited or repressed by the younger one; it tends to return in course of time.

So, too, if we lift first one, then the other, of a pair of canisters of equal size, the second of which has been weighted more heavily than the first, and if we practise repeated lifts of this sequence of light and heavy weights, a condition of 'attunement' is finally established. The result of this attunement is that the second of two *equally* heavy canisters will be lifted with greater force than the first, causing it to be judged lighter than it. The nexus responsible for this attunement can be apparently counteracted by subsequent practice in lifting pairs of canisters in *reverse* order, the first now being heavier than the second. But the same result of apparent counteraction can also be obtained by repeatedly lifting pairs of *equally* weighted canisters. There is therefore no true counterbalance. Moreover, the older nexus is not destroyed, it is merely inhibited by the later nexus. Experiment has proved that, like the earlier acquired association, the earlier acquired attunement tends to return in course of time and, other things being equal, to outlast the one later acquired.

This inhibition, repression, or repulsion of one acquired disposition by another—this indestructi-

bility of the nexus—is analogous to the more familiar inhibition, repression, or repulsion of one discordant or uncongenial idea by another; what is here repressed is again very far from being inert. Whether such a psychological conception of inhibition as an active repulsive force is applicable to other examples of purely physiological inhibition, or even to purely physical happenings, must be left to the future. The older view of physiological inhibition is that it is due to a passive blocking or exclusion of the inhibited nervous impulses, in which reciprocal struggle and counter-struggle play no part.

Let us turn now to quite another field of psychological experiment which would perhaps have been more suitably considered when we were considering the intensity of sensations, had it not led us too far from the subject then under discussion. We now know that there are two classes of sensations—those whose intensities increase continuously and those whose intensities increase by sudden jumps. The sense organs concerned with the latter class respond by 'all-or-none' changes. For example, the heat and cold spots on the skin are punctuate end-organs, each varying in sensitivity, and hence each requiring a different strength of stimulus to cause it to react.

If any one of these end-organs receives too weak a stimulus, it will not respond; if it receives a very strong stimulus, it will not respond more intensively than if it had received a weaker, but nevertheless adequate, stimulus. Each such end-organ either responds with its maximum effect—as if a trigger started always the same explosion—or it does not respond at all. In addition to such 'all-or-none'-responding apparatus, the skin also possesses a 'mechanism' for giving 'continuously graded' sensations of moderate temperature.

It is difficult to resist drawing an analogy between the existence of these two systems of sensibility and the dilemma concerning the undulatory and corpuscular hypotheses of the transmission of energy with which Physics is now confronted. Both of these hypotheses, it seems, are at present needed to explain all the physical facts; the difficulty is to combine them consistently. The quantum hypothesis is analogous to the 'all-or-none' reaction. According to it, a molecule vibrates in different modes, each mode being a different frequency of vibration. But none of these modes can be excited to any desired grade of intensity. The energy is carried away in units, each mode of vibration having its own particular size of unit. The exciting cause may be strong

enough to produce a unit; if it be too weak, it will produce nothing, i.e., no energy at all. Energy is therefore radiated in finite quantities, increasing or decreasing in jumps. How such 'all-or-none' behaviour is to be combined with the 'continuously graded' undulatory behaviour of the ether is at present undetermined. The same problem confronts the physiologist in his study of medullated nerves and of striated muscle, the fibres of both of which similarly respond in the 'all-or-none' fashion, differing among themselves in sensitivity: how is this action consistent with the 'continuously graded' contraction in virtue of which prolonged muscular tone is exhibited? Have we psychologically, physiologically, and physically, in each of the three cases, two distinct sets of apparatus, or does the same apparatus, differently co-ordinated, function now in one way, now in the other?

There are many senses in which the psychologist's statement holds true, that the organized whole is greater than the sum of its parts. Special attention has been paid of late years to what psychologists, imbued with the dangerous desire of founding a 'school', have unfortunately described as a special psychology, the *Gestalt-psychologie*, i.e., the psychology which stresses the

importance of shape, form, and order rather than that of 'material' and its abstract localizable parts. As we all know, the same melody may be reproduced in a different key, by using notes that are quite different from those previously employed; or the same notes may be combined afresh to produce a quite different melody. Further, it is impossible to change one part of an organized whole or to admit a new part into it, without changing the relations, and hence the characters, of the other parts that constitute it. Memories and ideas are dependent for their appearance in consciousness, not merely, as we have already noted, on their own intrusive, intrinsic force, but also on meeting with and conforming to a suitable, favourable constellation so as to be congruous with and congenial to the just vanishing and the just appearing 'patterns' of consciousness. Everywhere throughout Mind, in somewhat different shades of meaning, we can recognize this fundamentally psychological conception that the orderly organized unit is something greater than the sum of its relatively disorderly parts. In actual 'material' the 'individual' is never precisely the same for two consecutive moments, but it is constant in general 'form'. And we can see this conception spreading throughout other sciences.

A further question has to be considered—In what sense does the whole originate from a combination of its parts? The physicist of the past has felt little doubt that first come the elements, and that next appear, from their combination and from successive combinations of combinations, more and more complex compounds. In this way a machine is seen to be constructed out of parts, a new army to be established from conscripts, a new town to arise from settlers. Spencer adopted the same attitude when he wrote that 'organic evolution is primarily the formation of an aggregate, by the continued incorporation of matter previously spread through a wider space'.[1] Psychology, on the other hand, has found it necessary to lay greater stress on differentiation than on integration, as regards their respective roles in Evolution. Biology, too, is coming to adopt the same attitude: it tends no longer to regard the multicellular organism as the product of an aggregation of unicellular organisms. We do not start from simpler independent units which combine and fuse to form a larger, more complex unit. On the contrary, the simpler units within the whole have rather been, like the parts of a statue, carved out of an originally vaguer, less

[1] *First Principles*, p. 311.

differentiated, whole. The multicellular adult develops from a single ovum: the structure and functions of the once primitive whole have become specialized and differentiated among a number of now discrete parts.

Psychology has long insisted on this standpoint. There was a time when, *more physico*, the belief was held that in its mental development the infant first experienced separate elementary 'sensations' of whiteness, softness, warmth, etc., and that by combining these it ultimately obtained the 'perception' of an object, say of its mother's breast. But we now realize that the percept of the whole object is given, with meaning however vague, from the start; that with growing experience it acquires ever fuller meaning; and that from such maturer percepts the so-called 'sensory elements' become differentiated. These sensory elements in their pure form—that is to say, stripped of all meaning save that relating to their quality, intensity, extensity, and the like—are not the first, but among the later, to appear. They are the narrower abstract formations constructed by broad experience. First comes the relatively homogeneous, which already contains within itself the germs of the later heterogeneous.

This conception has also found biological

acceptance in the Mendelian study of heredity. The variations exhibited in later species are believed to be determined by a resolution and differentiation of the germinal Mendelian units of the earlier, more homogeneous, species. The elements are, as it were, carved out of the pre-existing and evolving whole; they are not combined to produce it. The future is already contained within the past and present, from which somehow it becomes distilled.

Such 'distillation' accounts probably for the gradual development of consciousness. It has been distilled from originally lower mental states, from something very different from itself as we know it; and through the privations resulting from such distillations, the lowest of these levels, within the living organism has been reduced to the condition of 'reflexes', almost mechanical, practically void of adaptation to experience. The old view expressed by Spencer, and not yet wholly extinct among biologists, was that consciousness has arisen as an 'epiphenomenal' product of living matter when physiological processes became too complex to work automatically. The modern psychological view is the direct converse of this—namely, that consciousness, however primitive, fulfilling, however feebly, the functions of orderly

direction and purpose, is primary, and that it has grown by distillation, differentiation, and restriction to narrower, more dominating, higher levels within the organism. Once again we see the same principle illustrated—that the new is already contained within the old.

No one would be so foolish as to suppose that the new is clearly manifest as such in the old or that integration and co-ordination have not played an important part in Evolution. The questions we have to consider are—how far does the conception of the construction of the heterogeneous out of the homogeneous by differentiation instead of by aggregation and how far does the conception of the simple having been resolved from, instead of combining to form, the complex —how far do these conceptions deserve consideration in regard to the evolution of the Universe as a whole? If the elements in it are comparable to the notes of a tune or to the words of a language, which came first—the compounds, music and language, or the elements, scales and grammar?

In a book written eighty-six years ago by a physicist who achieved only posthumous distinction, entitled *Thoughts on some Mental Functions*, occurs this striking sentence: 'We are led to

expect that if molecular philosophy is ever destined to advance into the region of [biological] organization the phenomena of perceptive consciousness will admit of being applied to illustrate the physical aspect of the elementary process of matter.' 'Organization', this author maintained, 'is to be viewed...as a grand exhibition of the capabilities of the elements of matter.... It is from molecular adaptations that the amazing monuments of creative intelligence have emanated.' He ridiculed 'the old system of explaining organic phenomena by mechanical arrangements' without the help of what he called 'molecular adaptations'.

The physicist who in 1843 gave expression to this view, that the phenomena of Mind will one day be employed to throw light on the phenomena of Matter, was John James Waterston, whose works have lately been collected and published, with a memoir, by a distinguished *alumnus* of this University. He was the same Waterston who in 1845 offered a paper to the Royal Society containing an extension of what he termed 'molecular philosophy' so as to avoid further use of the old conception of 'caloric'. The rejection and neglect of this paper, in which Waterston had the genius and pioneering courage to ascribe heat to mole-

cular motion, retarded the development of the subject, according to the late Lord Rayleigh's estimate, by ten or fifteen years. Waterston also declined to accept the second law of thermodynamics, preferring to ascribe the relevant phenomena to the chaotic nature of the molecular movements.

Waterston realized that there was more both in Mind and Nature than merely 'mechanical arrangements'. If the psychologist's conceptions of the part played by direction, guidance, and selection in Mind and in mental evolution are extensible to the evolution of living and celestial bodies, then we must admit the play of some guiding and sorting activity, which is the agent of Evolution. We are compelled to question the sufficiency of Spencer's view that a medley of strains and forces, now (in James Ward's words) fanned by a winnow, or now shaken in a sieve, can be responsible for all the known forms of differentiation and segregation occurring in the lifeless and in the living world. If we deny a guiding δαίμων, we have to consider why Evolution should occur at all, why the homogeneous should ever develop into the heterogeneous, why primeval stability should decrease, and why complexity should increase in the history

of the Universe. Must we not include among our First Principles something more than general physical laws to account for the evolution, and hence for the history and conduct, of Mind, Life, and the Universe? That 'something' is certainly not 'mental' as we know it, however akin to it; for we must guard against the danger of crude 'psycho-morphism'. Psychology can help only a little in indicating its nature. It can help only a little in stressing the probable coexistence of Guidance and Mechanism. It can perhaps also help in putting forward other conceptions which it has found necessary for its own use in addition to those which it has gained from Biology and Physics. These conceptions it ventures to offer humbly, in its position as the youngest sister Science, for consideration and possibly for ultimate acceptance by the maturer Sciences.

Chapter VIII

The Absurdity of any Mind-Body Relation[1]

The conclusion which I reach in this chapter is that the notion of any *relation* between mind and body is absurd—because mental activity and living bodily activity are *identical*. The most highly specialized forms of these two activities are, respectively, conscious processes and the processes of living brain matter. At first sight, they appear so different from one another as to make it seem absurd to assert their identity, and hence absurd to deny the possibility of any relation between them. But I shall hope to show the untenability of this *primâ facie* view. I shall also give reasons for the view that the mechanical principles, with which the natural sciences have so far been solely concerned, are only an abstraction from the *quasi*-dual set of principles—direction and mechanism—that govern the activities not only of living organisms but also of lifeless matter and of the

[1] From the Second L. T. Hobhouse Memorial Lecture, delivered at University College, London, on 19 May 1932.

entire universe. Direction, involving order, purpose, and end, is no more confined to mind than is blind mechanism to living or lifeless matter. Both are universally widespread. Each is an abstraction from the whole activity—an abstraction totally different from the other. For direction (as abstracted) involves none of the physical attributes of mechanical energy, etc., which we utilize in the physiological, physical, and mathematical sciences; and abstract mechanism knows nothing of direction. Direction is inherent in the system of the living individual organism. In regard to the dead and lifeless world, it seems to be inherent only in some far more widely organized system.

The notions both of direction and mechanism are, I submit, derived from conscious mental experience, the former especially from our own individual *personal* activities, the latter especially from our common environment, the *public* world in which we live and act: in other words, we realize direction best in mind and mechanism best in external matter. But mental activity involves and is controlled by mechanical activity, just as mechanical activity is guided by directive activity. All that we know of conscious mind or spirit is derived from that supreme mental activity which

we term *self*-activity; its directive aspect is expressed in striving, conation, impulse, and will, i.e., in 'acts', or processes, of consciousness; its mechanical aspect is expressed in many of the inter-relations of sensations, percepts, ideas, i.e., of the 'contents', or products, of consciousness.[1] All that we know of matter is derived from the interaction of its own purely mechanical activity with our own self-activity. In reality, there is neither spirit in mind nor substance in matter; they are the creations of the self's activity and of its naïve experience. My conclusion is that we know nothing of the so-called properties of matter in themselves. We must assume that matter is 'something' *active*; but the forms or results of that activity—the notions of energy, mass, weight, resistance, size, position, movement, like those of colour, sound, taste, and smell, with which we endow matter—are 'psychomorphic'. They are the result of the interaction of the activities of the external universe with the directive activity of our own living individual selves. The former we commonly call matter, the latter conscious mind or spirit. Further, there is nothing, I maintain, distinctive between conscious

[1] The place of feelings will be conveniently discussed later.

mind and certain collocations of *living* matter. Conscious mind is essentially a specialization, a distillation of that directive activity, inherent in certain mechanical activities, that distinguishes living from lifeless matter. The characteristics of mind and life, in general, are identical. There can, I shall argue, be no possible *relation* between mind and living body. Mind and life are identical properties of what we term living matter—a peculiar form of activity, differing from that of lifeless matter, in the inherent purposive, self-directive, and finally purpose-felt struggle for existence.

If this is so, the hypothesis of psycho-physical parallelism falls to the ground. According to it, there exist side by side two activities, the one psychological or spiritual, the other physiological or material, the one knowing nothing of and being uninfluenced by the other. Strictly speaking, the hypothesis should be termed 'psycho-physiological', rather than psycho-physical, parallelism. For it implies either an impassable dualism between mind and *living* nervous substance, or the superposition of one concomitant over the other. Its only attempt to escape such dualism or reciprocal epiphenomenalism, thus established between consciousness and brain substance, is by

supposing that the psychological and physiological activities are comparable, say, to the opposite convex and concave surfaces of a mirror —two inevitably present surfaces of some inherently unknowable *tertium quid*.

Equally impossible becomes the hypothesis of interactionism, which frankly posits an even wider gulf between mind and living matter, each of which is assumed to follow its own laws and to be able to act on the other, just as an operative and his machine might at one time interact, now in co-operation, now in antagonism, and at yet another time act in independence of one another. Give a person a sufficient dose of alcohol, and his intoxicated brain-substance acts on his independently active mind, causing him to show all the mental signs of alcoholism. Cause a person to be emotionally excited, and his mental processes act on the independently active living substance of his adrenal glands, liberating adrenalin and hence finally pouring sugar into the blood-stream.

As I have already said, I maintain that such dualism, such separation of, and antagonism between, living body and mind, is unfounded. The only distinction that we are justified in drawing is between the living organism and the

lifeless universe. In the latter directive activity is inherent only in the universe: in the former it is also inherent in the individual.

Equally absurd is the monistic view which would express both mind and mechanism solely in mental or solely in mechanical terms—the spiritualistic hypothesis declaring that all material phenomena are of mental nature, the materialistic hypothesis retorting that all mental phenomena are of material nature. For the spiritualist all matter, every activity of matter, including living matter and, for example, living brain-matter, has no existence but for the mind that perceives it. Its *esse* is *percipi*. Without consciousness, not only would there be no colour, smell, or taste in matter, not only no extension, hardness, shape, energy, etc., in matter, but matter, even brain-matter, would cease to exist.

Such solipsism is surely as absurd as it is to suppose, at the other extreme, that the properties of matter are wholly independent of the mind to which they are revealed, that colour, sound, touch, or size are the same in the mind of the humblest of living organisms as in the mind of the most advanced. We may freely admit that the properties of matter depend not merely on the material stimulus presented to the living organism,

but also on the effects of that stimulus in relation to the present and past activities of the living organism.[1] We may freely admit that apart from our own activity we can conceive nothing as to the nature of that stimulus. But we are surely not justified in affirming that were it not for our mental activity that stimulus would cease to exist. Such idealism is unwarrantable. All that we can say is that without mind we cannot *interpret* the activities of matter. Our common sense, however, forbids us to deny the continual existence of material activity, independent of our own mental activity. Its *esse* is not *percipi*, but *agere*. Each of us is bound to posit activities other than his own. And the very conception of such activities is impossible without positing time and space. True, our conception of all activity is compelled to be 'psychomorphic'; so is that of time and space, and likewise that of purpose and direction—when they lie (or when we suppose these to lie) beyond our personal experience of them. We are forced to think in terms of our individual human, mental experience. We can only proceed by abstractions from our total experience. And just as the physiologists and the physicists have concerned themselves with pure mechanisms by ruling out all purpose and

[1] Cf. pp. 161–7.

direction, so further by ruling out mechanisms recent mathematicians have reduced the universe to abstract symbols and equations relative to a space-time continuum.

But neither physical mechanisms nor mathematical equations present a complete picture of the history and the conduct of the living and lifeless world. They are powerless to account for its past evolution or to predict its future evolution. All that they can state is that, given such and such factors, such and such effects have resulted and must result. But they cannot foresee what factors will present themselves, nor what role direction will play; and admittedly the course of nature is uni-directional and irreversible. Otherwise we must suppose that the evolution of the living and lifeless world is merely the outcome of blind mechanism—that it consists merely of chance shots fired hither and thither, with the persistence of those which happen to succeed by accidentally 'hitting the target' of adaptation to environment. Otherwise, too, we must accept as wholly satisfactory the physical conception of entropy—that the total energy of the universe is everlastingly being transformed from higher to lower forms, and that its essential characters are those of a wound-up mechanism which is gradually un-

winding; with this view the broad conception of evolution disappears.[1]

But however true be such mechanical conceptions from the standpoint of physical science, they cannot be held sufficient when we take into account our equally certain experience of direction and purpose—our experience of the anabolic and morphological creation of ever higher and more complex substances and forms, or of the psychological creation of new ideas and discoveries which are characteristic, respectively, of the evolution of life and of mind. Chance variations in the germ plasm seem as inadequate an explanation of the evolution of species as chance combinations of mental activities are of the creation of masterpieces of sculpture, painting, or music. Blind mechanisms stand revealed in the products both of heredity and of mind; but alone they are inadequate to explain actual history. Many mathematicians and physicists to-day are dissatisfied with the sufficiency of the old views of entropy, conservation of energy, determinism, absence of guidance, and the like. But I suggest that their efforts to introduce other conceptions are likely to fail because their new conceptions rest essentially on the same bases as the older. So,

[1] Cf. pp. 174–5.

too, even if we find little adequate warrant on experimental grounds for assuming the direct inheritance of acquired characters in order to account, say, for the marvellously complex instincts of certain insects, may we not assume some unknown *non*-mechanical relation between the origins of such behaviour and the corresponding modifications in the germ plasm—perhaps some common factor of purposeful direction, not amenable to experimentation, which is responsible for both?

Both mind and life are clearly more than blind mechanism. Directive activity is inherent in each living organism. May it not also be inherent (in some unknowable form) in larger non-living organic units, of which the largest is the universe conceived as a whole? If this be so, are not the physical concepts of mechanism merely an abstraction from the whole, adequate for the scientific, but incomplete for a total, description of nature?

The conclusions to which I have thus come are closely similar to Hobhouse's own views. He, too, was impressed with the fact that other orders of experience had just as much claim to be considered as that particular aspect of reality which is envisaged by the physical sciences. He, too,

insisted that the interweaving of the teleological element of mind with the mechanical element of the physical and organic constituted 'the fundamental characteristic of reality'.[1] He, too, refused, on the other hand, to reduce all reality to the spiritual. 'When everything is spiritual', as he wisely expressed this refusal, 'the spiritual loses all distinctive significance.' He regarded neither matter nor mind as stuff or substance. Neither of them, therefore, can be regarded as a mutually interacting substance nor as a substance of which the other is a quality, but (as Prof. Ginsberg says in his account of Hobhouse's views) 'both qualify the total reality, which may include also other elements which as yet elude our observation and powers of inference'.[2] Nor could Hobhouse accept the modern mathematical attempts to abandon some of the fundamental hitherto accepted principles of mechanism. In a letter written to Prof. Ginsberg he said: 'I cannot think that mechanism counts for so little as its recent exponents are telling us'.[3]

[1] *Contemporary British Philosophy*, edited by J. H. Muirhead. London: G. Allen and Unwin, 1925, p. 177.

[2] *L. T. Hobhouse: His Life and Work*, by J. A. Hobson and Morris Ginsberg. London: G. Allen and Unwin, 1931, p. 238.

[3] *Ibid.* p. 255, footnote.

Mass and energy have now become interchangeable terms for the mathematical physicist. A material particle is regarded by him as but a very condensed and localized quantity—an organized, finely grained centre of energy or activity. Sometimes the physicist explains material phenomena in terms of a corpuscular, sometimes he finds it easier to explain them in terms of an undulatory hypothesis. In either case, stuff and substance are not the physicist's ultimate realities; the true nature of things is to be found in process—in happenings, events, or acts in a space-time continuum. Why then, we may well ask, is it necessary to separate conscious activity and cerebral activity? Surely not—in face of this conclusion—because of the apparently wide difference between consciousness and living brain-matter, but merely because the former is only known to us individually and personally, whereas the behaviour (i.e., the activity) of the latter consists of public properties amenable to scientific treatment and partly common to the properties of non-living matter. Indeed, the *primâ facie* difference between all mind and protoplasm, between 'spirit' and living 'matter', disappears as soon as we deny substance to either and conceive each as consisting in mere activity.

But although both mind and living matter and lifeless matter consist only in activity, what I am here endeavouring to urge is (*a*) that living matter differs from dead and lifeless matter not merely in certain differences of mechanical activity, but owing to the possession by the living individual of directive activities inherent in the organism, whereas in the lifeless world directive activity is external to matter; and (*b*) that the common characteristics of all matter (substance, colour, etc.) depend on individual conscious experience due to the interaction between the mechanical activities of matter and the directive activities of living nervous matter.

Once again I find myself in close agreement with Hobhouse's standpoint. For Hobhouse believed that what he termed a 'Central Mind', which courses through the universe, must have operated long before life and individual minds made their appearance and is responsible for the order, direction, and wholeness of the universe. Life, according to Hobhouse, arose not from dead elements, but from pre-material elements which also gave rise to inanimate matter. For him, therefore, all life contains a germ of mind.

Mind is thus to be regarded as the expression of the directive activity of living matter; and as

living substance becomes specialized in function and differentiated into tissues and organs, this directive activity of life and mind becomes sublimated, particularly within the nervous system, in the form of a conscious 'self'. The self is the highest and the most highly integrated form of living and mental directive activity; and only the self is conscious. There are other forms of directive activity in the nervous system; some of these unconscious forms *may* become conscious, when self-activity is involved. (But so long as they are unconscious, we are powerless to describe them in terms of consciousness.) There are yet other forms of directive activity, both in the nervous and in other systems differentiated within the higher animal organisms, which *never* become conscious. Just as what is commonly called the total 'life' of such an organism consists both of the 'lives' of its several parts and of the 'life' of the unitary 'individual', which is more than the sum of the life of its several parts—so the total directive activity of such an organism consists not only of the directive activity of its several parts, but also of that unitary directive activity of the self which is more than the sum of the directive activities of the several parts of the 'individual' organism. Thus the directive activity of the self

is to be regarded as the highest unitary activity of the nervous system. The lower directive activities may not always be in harmony with the highest; there may be mental conflicts, conscious as well as unconscious, as we all know well.

Just as the universe consists neither solely of mind nor solely of matter, just as neither spiritualism alone nor materialism alone is capable of embracing the total reality, so in regard to directive activity there is, it seems to me, no true monism and no true dualism in its relation to mechanism. This view I find admirably expressed by Hobhouse in a letter written by him to Miss M. L. Davies, and published in Hobson and Ginsberg's account of his life and work. He wrote: 'The world is neither mechanism nor spirit, but a spiritual struggle for wholeness or harmony in discordant parts, and the struggle makes evolution because it has a drive behind it which the inert mechanical parts have not.'[1] This drive, as Hobhouse points out, is essentially conative in character, progressing (to use Ginsberg's and his own words) 'from its earliest manifestations in the gropings of unconscious effort to the clearness of articulate purpose, and that the development of not "a side product of

[1] *Op. cit.* p. 259.

natural selection but the central fact in the history of life upon earth"'.[1]

Throughout the universe, then, there are parts or elements which are 'indifferent' to one another —parts which are self-determining—as well as a single unifying and harmonizing principle which 'runs through all things'. Yet this principle, as Hobhouse rightly insists, not only 'conditions all elements, but it is also conditioned by them';[2] the latter are as necessary for the former as the former is for the latter. Conflict and antagonism, as well as a higher organizing unity and harmony, are inherent in the world order. We have, therefore, to admit the antinomy of higher and lower directive activities, and also that of directive and mechanical activities. Mechanisms, too, are necessarily encountered in the activities, even of the highest, conscious levels of life. They play their part not only at lower levels, e.g., in tropisms, but also at higher levels, e.g., in the acquisition and display of associations and of skill. Mechanisms may be 'rung', as it were, or 'controlled' by the play of directive activity. But it is only by the directive activity of the self that we can ever

[1] *Op. cit.* p. 122.

[2] *Development and Purpose.* London: Macmillan and Co., Ltd., new edition, 1927, p. 451.

become conscious of them. And it is only in terms of that activity that we can ever fully express the differences between living and dead matter.

The molecular arrangements of living protoplasm are sustained and controlled by its directive activity. They are mechanically active, whereas the directive activity involves no consumption of energy; when it ceases, life ceases, and therewith living protoplasm changes in its molecular arrangements, and hence in its activities, to those of dead matter. It is only for scientific purposes that mechanical and directive activities are separable in living matter; in reality they form an interdependent whole, perpetually acting with and reacting on one another. There is no question of vital forces *replacing* mechanical forces during the life-time of an organism. Guidance does not mean any addition to, or subtraction from, the total mechanical energy of the living system. We might compare the purposive, orderly working of a living organism to the intimate co-operation of a chauffeur with his car, which, moving in his absence, first runs riot and finally becomes inert. But such a dualistic comparison overlooks the inseparable connexion between direction and mechanism which is inherent in living matter.

Why then, I ask again, should we separate

mental activity and cerebral activity, seeing that the two are identical, all consciousness being the expression of the highest form of directive activity of the living organism, all life involving directive activity, and all matter being known to us only as the interaction between other non-directive, mechanical activities outside our individual selves and the activities of individual living organisms? Whereas the interactionists and the parallelists assume a clear distinction between living substance and conscious mind, I, on the contrary, am attempting to show that conscious mind *is* living substance in our immediate personal experience, and that all substance, whether living or lifeless, merely becomes revealed to us as the interaction of (*a*) the highest 'levels' of the directive activity of our own living substance (i.e., of our conscious or self-activity) with (*b*) the activities that lie in lower 'levels' (cf. pp. 212, 213) or outside us. The spiritualists and materialists equally err, I maintain, in neglecting one or other of these two forms of activity, the former in denying the existence of activities other than those of our individual selves, the latter in denying the existence of activities other than those of lifeless matter.

But it may be argued that self-activity can only

express itself in terms of striving, directing, and aiming, whereas conscious experience consists not only in such conative activities of the self, not only (*a*) in *acts* and *processes* of the self, but also (*b*) in *modifications of* the self—what we term affects—and (*c*) in *presentations to* the self—what we term sensations, percepts, and ideas, i.e., the cognitive contents of consciousness. In order to solve this difficulty, let us consider a possible explanation of the relations and origins of these three modes or forms of consciousness.

Inherent directive activity must have been of a very low order at the first appearance of the most primitive forms of life. It has remained low in plants, where indeed we can barely envisage mind at all. But with the evolution of locomotion, with the consequent ability of the organism to select its environment, and with the development and choice of alternative reactions by the whole organism to its environment, directive activity became of increasing importance in relation to mechanical activity. Even in the amoeba and in other protozoa, as has been proved by the well-known observations of Jennings, the purely mechanical play of tropisms and the like cannot afford an adequate explanation of the behaviour of these organisms. Throughout every form of

life, the mechanical activities are controlled by the directive. As the nervous system develops, it assumes more and more, but never completely, such control. And as higher and higher levels of the nervous system develop, such control is largely 'distilled', as it were, from the lower to the higher nervous levels, where it becomes more and more refined and concentrated. Thus in such a highly differentiated organism the lowest nervous levels, fulfilling the functions of what we term 'reflex' activity, have had practically all their directive activity removed from them. But reflex action cannot be regarded as primitive: its appearance is not early but quite late; and its almost purely mechanical nature is due to the specialization of the directive activity inherent throughout the nervous system into higher and higher levels of that system. Evidence of the same process of distillation is afforded by the results of brain injuries in the higher organisms; the higher the animal, the more profound are the effects of a lesion in the highest levels of the central nervous system, and the less independent or separately viable are the directive activities of its several parts.

The emergence of new biological and psychological forms, functions, and levels rarely occurs

merely by the addition of new increments, but rather by higher specialization in and distillation from lower, earlier, and undifferentiated forms, functions, and levels. Thus intelligence, I believe, is not, as Rivers and others have maintained, to be regarded as something suddenly superadded, at a certain stage of evolution, to instinct. Intelligence and instinct are to be regarded as one primordial whole, and as having been differently developed in the evolution of different forms of animal life. Instinct is never so nearly mechanical as the reflex; it always involves some directive activity, being generally modifiable by experience and according to the environment.

In no form of life is directive activity wholly absent. I regard mental activity as identical with the directive activity (combined with the peculiar mechanical activity) of any organism, and hence as omnipresent in every living individual. And I regard *conscious* mental activity as identical with the supreme directive activity of an organism, the directive activity of its organized 'self'. Self-activity, I repeat, is conscious activity. We can no more fix the earliest appearance of a recognizable self in organic evolution than we can fix the earliest appearance of conscious activity. Indeed, the recent study of viruses is apparently making it

difficult to draw a definite line even between the behaviour of living and non-living matter.

With the development of self-activity, the lower levels of directive activity do not wholly cease. They are hardly recognizable in reflex levels, but (as I have insisted elsewhere) they persist in other and in intermediate or relatively independent 'levels' or spheres of mental activity. 'The inspirations of genius and the intuitive judgments and decisions, which, crude though they may be before submission to the self's judgment, arise apparently from the "depths" of the mind with impulsive force and compelling conviction afford striking examples of this fact. The well-known improvements in learning which continue after we have ceased to practise, so that it has been said of us that we learn to skate in summer and to swim in winter, are further examples of such activity—whether or not we choose to ascribe such improvement to the gradual disappearance of adverse initial inhibitions or to the direct strengthening ("consolidation") of acquired integrations (or associations). Further, the self is continually being played upon both by the impulsive and by the perseverating forces of lower mental systems. They struggle, not less than the self, for their own existence and for their own lower

"self"-ish ends. Where they are modified by inhibition (or repression), it is only to ensure general harmony and general compatibility. Inhibition is not to be viewed as a mere act of passive drainage of mechanical energy from one mental constellation to another', but as the consequence of a more highly organized directive activity 'against which the inhibited constellation ever tends to rebel in its endeavour to gain somehow or another liberty of action, in some lower degree purposeful and directive.... The self is the highest controlling and directing power. The orders which it consciously gives, and the efforts which it consciously makes, may, once started, continue to be carried on unconsciously, i.e., without the conscious participation of the self. Thus we may consciously but vainly try to recall some past experience or to solve some difficult problem; and after giving up the effort, this directive activity may still persist unconsciously until suddenly the forgotten object, or the abandoned solution, suddenly flashes full-born and unbidden into the self's consciousness. So, too, we may go to sleep determined to wake up at a given hour, or we may accept, in the hypnotic state, a decision to carry out some prescribed act on the lapse of a prescribed period of time after emerging from that

state; and at the ordained moment the sleeper wakes, or an uncontrollable impulse is felt to perform the suggested act.'[1]

Our lower nervous levels are *mentally* active, although *consciousness* is the mental activity of that highest, unitary, pontifical system which we may call the self. I regard our sensations, our percepts, and our ideas as the unconscious directive (and mechanical) acts of certain relatively lower mental (sensorial, etc.) 'levels'. And I suggest that it is only when these lower-level *acts* are accompanied and received by the self-activity of the highest nervous 'level' that they become conscious *presentations* to the self. Thus there arise two forms of consciousness—one the directive, purposeful, evaluating, activities of the self, expressed as the conscious, 'conative' *acts* of apprehending, recalling, deciding, inferring, etc., and the other the conscious, 'cognitive' *products* of sensation, perception, memory, decision, inference, etc., what is sensed, perceived, remembered, thought, etc. Both depend on self-activity—conative experience

[1] Quoted from my Presidential Address to Section J (Psychology), 'On the Nature of Mind', delivered at the Centenary Meeting of the British Association for the Advancement of Science, London, 1931. Cf. pp. 240–2 of this volume.

being its direct expression, cognitive experience being the result of its interaction with certain lower forms of nervous activity.

But this differentiation of the conative and cognitive forms of consciousness must have been preceded by, and indeed dependent on, the prior differentiation of self-activity into 'acts' of the self and 'modifications' of the 'acts' of the self. These modifications arose both from internal happenings within the organism and from external happenings in its environment. Both kinds of modification of the acts of the self were experienced primitively as *affects*. All sensations were originally affects of self-activity. It was only with the subsequent differentiation of higher and lower levels and thus of higher, more unitary, less diffused guidance and control, that some of these affects became cognitively objectified as *contents* of consciousness or conscious *presentations to* the self, whereas others, dependent on the persistence of primitive (e.g., thalamic) activity, continued as mere *feelings of* the self.

The ability of the self to appreciate modifications of the self rests on the ability of all directive activity both to register and to revive its own previous activity. Without such ability, purpose and direction throughout the universe would be

inconceivable. There is thus a continuity in the life of the self which enables it not only to be consciously active but also to be conscious of a self and to appreciate modifications in such self. It can revive bygone experiences of acts of the self. It may even suffer such temporary dissociation as to enable it to view (as in some cases of multiple personality) the acts of some other self.[1]

Thus whether our conscious experience is conative, cognitive, or affective, whether it concerns the 'why', the 'what', or the 'how' of conscious life, it is identifiable with self-activity—the highest unitary integration of the directive activity of the organism. Where, as in plants, locomotion and plasticity are minimal, there, I repeat, we find self-activity and consciousness to be inappreciable. But throughout vegetable and animal life, directive activity is characteristically inherent, and it is identical with mental activity—unconscious if unconcerned with adequate self-activity.

There can be no definite locus for this self-activity. Although I have spoken of it as the most highly distilled or sublimated essence of the various directive activities of the living body, as the highest pontifical system of the mental

[1] Cf. pp. 235–6.

activities within the individual organism, the self is not to be regarded as localized merely aloft within a narrow sphere of the living matter of the brain. It is only the lower directive activities—those of the relatively simple movements and those affording relatively simple sensory experience—to which a fairly circumscribed cerebral localization can be imputed in vertebrates. All our evidence points to a far wider spread of the directive activities which concern more complex and, in particular, acquired skills, and likewise percepts and ideas. Self-activity signifies but the unitary co-ordination of these various directive sub-activities—a supreme divinity harmonizing and integrating the acts of numerous lesser divinities—and about as widely spread spatially as a supreme divinity may be held to be. Directive activity of the highest kind relates to the whole organism; it is well nigh as widely spread as the many directive activities which, more or less immediately, it guides and controls. These, together with other, non-controllable, directive activities, all of which may be broadly described as mental, are spatially identical with the dimensions of the living body.[1]

There is therefore, I conclude, no *relation* to be

[1] Cf. pp. 230–46.

sought between mind and living body. Dead matter is but blindly mechanical activity, and living matter is but a unique combination of certain unique mechanical activities with non-mechanical directive activities. There is no separable mental or vital force; and the mental must be regarded as identical with the vital. The only distinction that remains is between the living or the mental, on the one hand, and the lifeless or the non-mental on the other hand, in which no directive activity is present, no struggle for existence, no individuality, and hence no life or mind. But directive activity is not confined to the living organism, any more than mechanical activity is confined to the physical universe. There are types of blind mechanism in the morphology of species and genera and in living or mental processes, just as there are in the configuration and movements of atoms, molecules, and stars. Direction and purpose which employ these types are, however different, similarly universal. But whereas in the living universe they are largely inherent in the individual, in the lifeless universe they are only external—responsible for the history, order, and evolution ultimately of both universes.

Chapter IX

The Nature of Mind[1]

Psychology was specifically recognized by the British Association for the Advancement of Science as a separate science in the year 1913, when for the first time it was constituted a Subsection under Physiology, which had itself been established as an independent Section (distinct from Biology) in 1893. This Subsection of Psychology continued to function as such at the successive meetings of the Association held in the years 1915, 1916, 1919, and 1920, when it was accorded the rank of a Section.

It is perhaps noteworthy that so long ago as 1906 Sir Edwin Ray Lankester, in his Presidential Address to this Association at York, included a short section devoted to Psychology, in which he said: 'I have given a special heading to this subject because its emergence as a definite line of experimental research seems to me one of the most important features in the progress of science in

[1] Modified from the Presidential Address to Section J (Psychology), delivered at the Centenary Meeting in London of the British Association for the Advancement of Science, on 28 September 1931.

the past quarter of a century....Hereafter, the well-ascertained laws of experimental psychology will undoubtedly furnish the necessary scientific basis of the art of education, and psychology will hold the same relation to that art as physiology does to the arts of medicine and hygiene.'

Since then the applications of psychology have extended to medicine, industry, anthropology and other branches of knowledge. The importance of its relations to physiology and biology was clearly enunciated in the Presidential Address of Sir Charles Sherrington at the Hull Meeting of the British Association in 1922. He asked—'And if we knew the whole how of the production of the body from egg to adult, and if we admit that every item of its organic machinery runs on physical and chemical rules as completely as do inorganic systems, will the living animal present no other problematical aspect? The dog, our household friend—do we exhaust its aspects if in assessing its sum-total we omit its mind? A merely reflex pet would please little even the fondest of us....But this Association has its Section of Psychology....It is to the psychologist that we must turn to learn in full the contribution made to the integration of the animal individual by mind.'

I can vividly recall the doubts which were

expressed, not so much in words, as in general attitude, by the Committee of Recommendations of this Association when in 1920 it was asked to consider the formation of a separate Section of Psychology. Such hesitation was probably based on several grounds, not wholly on any one of them. Psychology, it must have been realized, is not immediately concerned with *material* phenomena; unlike these, its 'subject matter', the mind, cannot be weighed or measured; nor can mind be satisfactorily regarded merely as a blind mechanism. Moreover, as each scientist carries his mind about with him, be he mathematician, physicist, zoologist, physiologist, physician or educationalist, he has always himself felt competent to speak from everyday experience on psychological problems without previous systematic training in the subject, sometimes thus advancing, but probably as often retarding, its progress and its reputation, and always suggesting by such intrusion that psychology neither possesses nor needs any special discipline of its own.

More than thirty years' experience has convinced me that a thorough familiarity with the practice and theory of the psycho-physical methods is essential for reliable systematic psychological investigations of any kind. It is largely to

the uncontrolled genius of psychologically untrained experts in other fields that we owe the exaggerated importance which has been variously attached of late to conditioned reflexes, sex, inferiority, behaviour, mental tests, correlations, etc., in psychology. Thus have often arisen the various 'schools' of modern psychology, characterized by the same narrow bigotry as is to be found among contending religious sects, each school almost worshipping its founder, each contributing something of truth and value, but each refusing to recognize truth and value in its rivals, and blind to other important conceptions than its own and to other important problems the investigation of which is essential for the progress of psychological science.

But some of the grounds for hesitancy in recognizing psychology as scientific or as a separate science have lost much of their force to-day, because of the pronounced change that has since taken place in the attitudes and beliefs which were in vogue among physicists of that time. No physicists would then have dared, as now, to suggest the impossibility of predicting what any *individual* atom (or still smaller *individual* entity) will do next. None would have questioned, as now, the universal truth of the second law of

thermodynamics or of the principle of conservation of energy. None would have ventured, as now, to suppose that electrons change in the very act of becoming known to us, and that therefore the mental factor is ultimately inseparable from physical investigations. None would then have dared, as now, to conjecture that particles of matter correspond in their properties to certain *group* waves of the ether, the *constituent* waves of which, travelling at an enormous speed, 'guide' and 'direct' the group waves without any energy of their own.

In those days one of the most distinguished physicists refused to accept a theory unless he could make a mechanical model of it; whereas to-day we are asked to believe, e.g., in an inconceivable space or ether of ten dimensions in order that the theory of wave mechanics may describe in the simplest terms what happens when three electrons meet one another. In those days it was urged that 'nothing can be more fatal to progress than a too confident reliance on mathematical symbols; for the student is only too apt...to consider the *formula* and not the *fact* as the physical reality'.[1] But to-day (whether rightly or wrongly)

[1] *Treatise on Natural Philosophy*, by W. Thomson and P. G. Tait. Oxford: University Press, 1867, vol. I, p. viii.

we have passed far beyond the study of mere 'physical realities'. At first called in as a servant, the mathematician has now come 'to assert himself as master'. 'He does not ask permission from Nature when he wishes to vary or generalize the original premises....In geometry...he has forgotten that there ever was a physical subject of the same name, and even resents the application of the name to anything but his network of abstract mathematics.'[1] The mathematician is not *primarily* interested in the physical significance of the variables that he is discussing. His particular interests lie in mathematical operations and in numbers and figures *for their own sake*.

Psychology has been similarly bereft of 'reality' by the operations of mathematicians, present and past. The earliest example of this was the derivation by Fechner of the 'law' which now bears his name, that the intensity of a sensation is proportional to the logarithm of the magnitude of its stimulus. This statement was deduced by purely mathematical procedure from Weber's law that just appreciable differences between sensations depend on a constant ratio between the magnitudes of their respective stimuli. Weber's law,

[1] *The Nature of the Physical World*, by A. S. Eddington. Cambridge: University Press, 1929, pp. 161, 162.

however, was based on direct observation and experiment; whereas Fechner's 'law' was the outcome of purely mathematical calculations which not only neglected a constant appeal to the 'reality' of experience, but ran actually counter to it—neglectful, for example, of the 'facts' (i) that Weber's law holds for only moderate magnitudes of stimuli; (ii) that from the standpoint of conscious experience it implies a *single experience* of difference, not a *difference between two* separate experiences; and that (iii) from the same standpoint we are quite unwarranted in adding together or subtracting from one another two intensities of sensation or two sensation differences as such.

Elsewhere in his treatment of psychological data, as in his treatment of physical data, the mathematician has arrived at results that can directly be neither verified nor rejected by conscious experience. The establishment of 'general mental factors', involved in and influencing the performance of various mental tests and other processes, affords us another example. By mathematical operations on experimental data we can, it is claimed, deduce the possible existence of such general factors. But from the strictly psychological standpoint the nature of these factors

cannot be interpreted; for we are unable to appeal to direct experience to ascertain what these factors are. At best their significance in terms of actual experience can only be conjectured by abstraction and imagination; or it is expressible only in terms of general behaviour. At worst, as in the case of *g* (the so-called 'general intelligence'), we are quite ignorant of their psychical nature. We cannot hope for direct psychological evidence as to the precise mental nature of such mathematically deduced, hypothetical, 'factors'.

It may be argued that the same ignorance holds in physics, say for electricity or gravity, the relations of which to other physical phenomena we can experimentally and mathematically determine, yet of the *nature* of which we are entirely ignorant through direct experience. But it may be retorted that electricity or gravity is an independent *external non-mental activity*, which is only related to conscious experience for its interpretation and conception; whereas the results of psychological investigations must ultimately be expressible in terms of concrete *conscious experience*, not merely in terms of mathematical abstractions or of any physical activity which is fundamentally independent of such experience.

With perhaps greater force it may be argued

that introspection, by which alone conscious experience can be directly studied, is unreliable and not amenable to scientific methods—valid only for the particular individual who introspects, communicable to others only by outward behaviour, and fallible owing to illusion, rationalization and other causes of error; and that just as physical experiment deals with such terms as electrons and quanta which are beyond the sphere of immediate experience, just as mathematical calculations yield for physics conceptions the realization of which may be inconceivable by conscious experience, so modern experimental and mathematical psychology has a perfect right to express mental processes in terms which are foreign or even unknowable to conscious experience.

The escape from such difficulty on the physical side—so as to avoid dethronement of the literally divine claims which some mathematicians have made for the fundamental truth of their own science—is to regard the Universe as constituting a vast nexus of ultra-physical and mathematical necessities and probabilities, only some of which can become physical through the further operation of the human mind. We might perhaps adopt a corresponding attitude towards some of the subjectively unverifiable conclusions arising from

the applications of mathematics to psychological data.

But in psychology an additional difficulty confronts us. We have to recognize that the data with which the 'mathematical psychologist' operates are not measurements of the fundamental subject-matter of psychology—conscious mental processes. (Nor can they probably be measurements of unconscious processes, so long as the latter are regarded as mental in character.) For mental processes are not directly measurable: we can *grade* a series of conscious experiences according to their degree or amount, say of hue, brightness, loudness, pitch, temperature, extent, duration, clearness, pleasantness, etc.: we can say that one member of such a series has more or less of any one such character or quality than another member, or that the difference between two members of a series in respect to any one of these characters or qualities is greater or less than, or equal to, the difference between two other members. We cannot deny that 'whatever exists exists in some amount'.[1] But the psychologist can only *measure*

[1] *Measurement in Education*, by Thorndike. Seventeenth Yearbook of National Society for the Study of Education, 1922, Pt. I, l. 9. Bloomington: Public School Publishing Company.

the amount of any conscious experience indirectly —either by reference to behaviour, i.e., to the organism's *physical* response or expression, or by reference to the *physical* character of the relevant stimuli, in terms of objective standards of number, space and time which are immediately independent of actual subjective experience.

Let us remember, then, that when we are attempting to measure any mental ability or character or quality by means of a test or series of tests, we are not directly measuring that mental ability or character or quality, but only the corresponding stimulus or the outward response or expression by which that mental ability or character or quality is manifested. We are, no doubt, justified in assuming a broad correlation between the speed, accuracy, amount, etc., of the response or expression of a mental ability or character or quality and the degree in which that mental ability or character or quality is present. Even this broad assumption, however, is sometimes unjustifiable, as in the case where too much of a given mental ability or character or quality may lead to a deterioration, and no longer to an improvement, in the corresponding performance. But we are certainly never justified in assuming that we can accurately measure any mental process

by measuring its objective response—that, for instance, twice the amount of the response necessarily means twice the quantity of the mental process of which the response is the expression. All that we are measuring is *behaviour*—that is to say, something largely on the efferent side, something largely physical and indescribable in terms of pure immediate experience, involving a complex of factors many of which, indeed, may be remote from those which we commonly believe we are measuring; whereas what we ultimately aim to deal with in psychology is *experience*—the meeting point of the afferent and efferent sides.

In fact, then, the 'behaviourists' are quite right when they insist that scientific measurement is applicable only to the behaviour of the organism. Where they are quite wrong is in their assumption that conscious processes must necessarily be ousted from scientific psychology, because measurement is excluded; the truth being that, even where measurement is excluded, the possibilities of systematic observation and experiment still remain. Natural science has surely a function wider than that of merely reducing its subject-matter to units of space and time. Highly valuable and deserving of the utmost encouragement as is the

measurement of behaviouristic data, however helpful be the light they may ultimately throw on mental processes and their general characters, however wider be mental processes than the range of mere conscious experience, the scientific study of the mind by direct observation and experiment is never to be discountenanced or discarded.

Just as experimental physics patiently pursues its researches into Nature, heedless of such mathematical conclusions as are not amenable to verification by experiment—so experimental psychology must realize that its progress is not primarily dependent on, however much assistance it may receive from, the work of those who fail to recognize that the fundamental subject-matter of psychology is conscious experience, not conduct. Now conscious experience can only be enjoyed by the active self, i.e., the 'individual' (i.e., undivided) mental activity of the entire living organism. It is the fundamental function of such self-activity—by recourse to past experiences, by receiving present experiences, by foreseeing future experiences and by creating new experiences—to select from alternative responses and from alternative environments those which are most advantageous to the ever evolving and developing

organism. To secure the most suitable movements and environment and thus to help in the evolution of the organism are the prime objects of consciousness; and where, as in plants, mobility and plasticity are at a minimum, self-activity and consciousness are inappreciable. Self-activity is to be regarded as the highest, unitary integration of the directive mental (conscious and unconscious) activity of the organism.

Self-activity and its inherent consciousness may presumably be traced back to a stage where self and not-self are but just distinguishable. At this remote stage in animal evolution there can hardly have been more than a differentiation of self-activity into 'acts' of the self and 'modifications' of the self. These modifications of the self became differentiated early into (*a*) those which are due to internal happenings within the organism, and (*b*) those which are due to more variable external happenings in its environment, and later into (*a*) those which we come to recognize as 'affects' *of* the self and 'feeling tones' and (*b*) those which come to be regarded as 'presentations' *to* the self or as 'contents' of the self's consciousness. Sensations, perceptions, memories and thoughts—all that we finally come to recognize as conscious *presentations* to the self—have been differentiated

(onto- and phylo-genetically) from modifications of the self: instead of being *feelings* of the self, they have become *contents* of consciousness.

We end by 'projecting' certain of these original feelings. The external 'objects' of our perception have been separated from or carved out of originally vague external 'situations' of which we or our remote ancestors were first conscious merely as diffuse modifications or feelings of the self. So, too, any colour or sound comes to be regarded no longer as a self-feeling but as a something projected and existing outside us. The degree to which such projicience and presentation is carried out varies with different sensations: colours clearly have a projected, apparently independent, existence; sounds, smells, tastes, hardness and temperature are only imperfectly projected; the painful prick of a pin and our sensations of movement, though not projected, are nevertheless regarded as 'presentations' to the self; whereas our experiences of visceral sensations are hardly even presented: they seem almost as clearly modifications of the self as are our emotions and other affects.

This difference between the acts and the contents of consciousness—between the conscious *acts* of apprehending, recalling, deciding, inferring and *what* is consciously apprehended, recalled,

decided, inferred—is a most important one. It is exemplified in the two kinds of memory which are distinguishable. On the one hand, we may recall the *separate acts* of the self, say, in the course of solving a problem or of acquiring some specific skill; these are individually unique and only individually revocable. On the other hand, we may recall the *generalized contents* of our consciousness, i.e., of presentations we have received by a repetition of such acts—e.g., in learning a prose passage or series of skilled movements.

I would suggest that the distinction between conscious acts and contents has come about with the gradual differentiation of higher and lower levels of mental activity—and in the following manner. There is no awareness of self-activity when we sense a colour or a temperature, or when we perceive a familiar object, or when an idea 'occurs' to us. Our sensations, our perceptions and many of our thoughts and ideas are, I suggest, the unconscious 'acts' of relatively lower mental levels. But when these lower-level 'acts' are accompanied and received by the self-activity of the highest levels, they become *ipso facto* 'presentations' to the self. A loud noise to which we are impelled to attend or an idea which 'occurs to the mind' is not a conscious presentation

(or content of consciousness) until the self receives it.[1]

I suggest that such differentiation of higher and lower levels has never occurred to the same extent in the case of our kinaesthetic and, especially, coenaesthetic sensations and in the case of our feelings (which depend on a more primitive, thalamic, activity): we fail, therefore, to objectify them immediately as presentations, and they continue to be received in their primordial undifferentiated state.

By virtue of recall, however, even the acts of the self and its feelings can become more or less objectified as 'presentations' (although, of course, they are not 'projected' as independent objects). The acts of decision or apprehension and the emotions, attitudes, etc. of the self at one moment can through lower level transfer become at the next moment themes of contemplation by the self. Thus, we may account for the occurrence or absence of presentations in many varied circumstances. E.g. (*a*) the fully developed human self not only knows, but knows that it knows, and so on. (*b*) A really efficient actor must not so wholly lose 'himself' in the part that he is playing as no longer to know that he is acting; he must have at

[1] Cf. pp. 212–3.

least some measure of objectivation of and self-control over the self that he is portraying. (*c*) So, too, for its full aesthetic enjoyment of a play, an audience must not wholly lose its 'self' in the scenes it is witnessing: an audience must enter in some degree into the play, but for the highest appreciation of beauty a certain 'psychical distance', as Bullough[1] has called it, neither too close nor too remote, must be preserved. (*d*) In certain cases of multiple personality (cf. Morton Prince's Sally[2]) the self may look down upon the acts of one or more other selves who behave as actors in command of the situation. (*e*) In the abnormal condition known as 'depersonalization' the self's experiences may temporarily seem strange and the very acts of the self may seem strange, so that it appears as if some other personality than the self were acting and experiencing, the highest self once again looking on, so that what in normal conditions would be regarded as the self's own experiences become projected as the experiences of another lower self. (*f*) Similar changes

[1] Cf. '"Psychical Distance" as a factor in art and an aesthetic principle', *Brit. J. of Psychol.*, 1912, vol. v, pp. 87–118.

[2] *The Dissociation of a Personality*, by Morton Prince. London: Longmans, 1906.

occur in certain phenomena of hypnotism and ecstasy.

It is a matter of common experience that in our normal selves our personality is ever changing according to our environment. We are one person in the conduct of our business or profession, another during our play, yet another in the bosom of our family; and we act and feel accordingly. But whereas, normally, our single self is behind all the acts and other experiences of these different personalities, there also occur those well-known abnormal conditions of 'multiple personality' in which these personalities exist as alternating selves, often in the apparently complete absence of such single higher activity. It is interesting, however, to observe how redintegration may occur in those cases of alternating personality where a highest self seems to be continuously present, however far banished to the background. This is well illustrated in the case of the Rev. Thomas Hanna, who thus describes the final phases of his recovery:

'The first mental struggle was during the very next primary state, which, by the doctors' earnest request and my own extraordinary effort, was already prolonged to three or four hours.... Suddenly there was a glimpse of the secondary

life, only a glimpse, it is true, yet a revelation of infinite wonder as being the first real insight into one state from the other. Instantly the thought came "What is the use of enduring this severe struggle when invited into that attractive life, the secondary state?"...But saying mentally again, "What is the use?" there was a letting go, and the primary life was again lost....

'I was still in the secondary state, but the other life dawned on me, and nothing but my will pertinaciously clung to the secondary state.... While both lives were presented to the mind, where was the possibility of combining them? And had not I lived and felt each life? Yet how could one person live and feel both lives? Here was the critical point....But the lives were constantly becoming more and more personal, until at last, by a deliberate, voluntary act, the two were seized, and have both remained...though for some time after the recovery it was difficult to dovetail together the detached portions of each life so as to present a continuous history.'[1]

Let me return to stress once more the fact that the development of presentations *to* consciousness out of what were originally modifications or

[1] *Multiple Personality*, by B. Sidis and S. P. Goodhart. London: D. Appleton, 1905, pp. 225, 226.

feelings *of* the conscious self is to be regarded as one of the most important features of mental evolution. It has occurred, as I believe, *pari passu* with the fuller development of the self and with the increasing complexity and differentiation of mental levels. The early self in more primitive organisms functioned in a manner so diffuse that it can barely be called unitary. Its later, more highly concentrated, unitary character developed with the differentiation of higher and lower levels and with the gradual distillation of supreme control into ever less diffused, loftier and more 'pontifical' spheres of influence. (Perhaps roughly corresponding, on the material side, to these primitive and later mental stages are the early plexus structure and the later synaptic plan of the nervous system.)

We might compare the earliest stage with that of a primitive monarchical government whose king was the weak, diffusely moving spirit in all its varied activities. At an intermediate stage we might envisage a stronger government whose cabinet consisted of a large number of members, each, however, busily acting in considerable independence of his colleagues and of his chief, the prime minister. At the highest stage we may conceive differentiation, co-ordination and integration as having so harmoniously co-operated

as to produce a prime minister who is in perfect sympathy with, and hence functionally identical with, the king, and has such complete control that he regards the more important 'acts' of his hierarchy of lower-level colleagues (even those of his deputy and assistant prime ministers) as his own 'presentations'. By some such analogy as this, I suggest, we can dimly portray the evolution of the self, its increasing powers of control and devolution, its development of the function of presentation, and its ability, in certain conditions, to look down on what appears to be itself, or on one or more other selves, acting and experiencing feelings and presentations.

The humblest servants of such a highly complex government would be entrusted with duties which they can perfectly well perform without ever troubling, or indeed being able to have access to, the members of the cabinet. Such functions are comparable to our present reflex actions (e.g., the pupil reflex), which are inherited, unalterable, and are absolutely divorced from consciousness. There would, also under the government, be servants of a higher level, comparable to the instincts which are improvable by experience, the activities of which affect consciousness in the form of impulses to action. One manifest purpose of the

consciousness or awareness of impulse is to enable the self to modify or to control the relevant instinct. Instincts may war with one another (so, too, may alternative motives to voluntary action). The self may *passively* allow the stronger instinct (or the stronger motive) to predominate. But it may also, by using its own *activity*—implying the whole, most highly integrated, mental system or personality of the individual—interfere with and repress an instinct (or a motive) which, left to itself, would otherwise predominate and yield involuntary action.

Whether or not we can regard all instinctive activities, e.g., walking, as accompanied by emotional consciousness, it is certain that a close association between instinctive action and many emotions generally holds. Emotional activity is psychologically and neurologically older than higher intelligent activity. Where an emotion, closely related to some instinct, enters consciousness, its probable object is to prevent the self from intelligently inhibiting the related instinct, and to insure the carrying out of the instinctive act. Such emotions, indeed, are more strongly felt in proportion to the amount of conflict or other obstacles impeding expression of the relevant instinct.

We have noted two paths of differentiation of the modifications of the self—those of feeling and of presentation. Feeling develops, on the one hand, into emotion and thus into sentiment, and on the other, into feeling-tone (pleasure and displeasure). Feeling-tone, emotion and sentiment are recognized as being largely dependent on thalamic activity; whereas with the development of the cerebral cortex arise the increasing integration, discrimination and grading of presentations, the elaboration of their meaning and of their spatial and temporal relations, and the evolution of thought and speech, on all of which the rise of rational intelligence depends. Finally, valuation and volition achieve their highest plane with the harmonious co-operation of the highest products of these two evolutionary paths—sentiment and intelligence.

The self is the highest controlling and directing power. The orders which it consciously gives, and the efforts which it consciously makes may, once started, continue to be carried on unconsciously, i.e., without the conscious participation of the self. Thus we may consciously but vainly try to recall some past experience or to solve some difficult problem; and after giving up the effort, this directive activity may still persist uncon-

sciously until suddenly the forgotten object, or the abandoned solution, suddenly flashes full-born and unbidden into the self's consciousness. So, too, we may go to sleep determined to wake up at a given hour, or we may accept, in the hypnotic state, a decision to carry out some prescribed act on the lapse of a prescribed period of time after emerging from that state; and at the ordained moment the sleeper wakes, or an uncontrollable impulse is felt to perform the suggested act.

But not only is purposive activity not limited to the duration of conscious activity; it need not originate there. The inspirations of genius and the intuitive judgments and decisions which, crude though they may be before submission to the self's judgment, arise apparently from the 'depths' of the mind with impulsive force and compelling conviction afford striking examples of this fact. The well-known improvements in learning which continue after we have ceased to practise, so that it has been said of us that we learn to skate in summer and to swim in winter, are further examples of such activity—whether or not we choose to ascribe such improvement to the gradual disappearance of adverse initial inhibitions or to the direct strengthening ('consolidation') of

acquired integrations (or associations). Further, the self is continually being played upon both by the impulsive and by the perseverating forces of lower mental systems. They struggle, not less than the self, for their own existence and for their own lower 'self'-ish ends. Where they are modified by inhibition (or repression), it is only to ensure general harmony and general compatibility. Inhibition is not to be viewed as a mere act of passive drainage of mechanical energy from one mental constellation to another, but as an active repressive force against which the inhibited constellation ever tends to rebel in its endeavour to gain somehow or another liberty of action, in some lower degree purposeful and directive.

Despite certain unscientific methods and no little prejudice in interpretation and procedure on their part, we owe a debt to the psycho-analysts for their detailed study of the conflicts responsible for such repressions and of the ways in which repressive forces exert their influence and are not infrequently, as it were, outwitted. But let us not imitate the psycho-analysts in their failure to recognize that we can never describe the nature of unconscious mental processes in terms of consciousness. We are as powerless to do this as we are powerless to describe the nature of God in

terms of the human body and mind. 'Psychomorphism' in psychology is an error not less cardinal than anthropomorphism in religion. We are bound to adopt an agnostic position as to the nature of the unconscious. To describe in the language of consciousness an 'unconscious wish', an 'unconscious motive', an 'unconscious emotion' or an 'unconscious idea' is a contradiction in terms. At best we can but say that if a particular unconscious mental process were to become conscious, it would manifest itself as a certain wish, motive, emotion or idea. But the extremely uncertain nature of such statements must be kept ever before us.

While consciousness always implies self-activity, and while the self is to be regarded as the expression of the highest level of mental activity, we must guard against the notion that such high-level activity implies a narrowly-limited zone of mental processes. On the contrary, it implies a wide sphere of activity rather than a punctuate, pineal gland-like, soul. It follows, therefore, that we cannot hope to localize any act, or any content, of consciousness in one small region of nervous substance. Afferent-efferent localizations of function undoubtedly occur—regions where the incoming impulses become deflected to outgoing

processes: our knowledge of the physiology and structure of the spinal cord clearly points to this. Sensori-motor localizations may, in a sense, be said to exist similarly in the brain. The occipital region of the cerebral cortex, for example, is concerned with vision. But because vision ceases when the *area striata* in this region of the cortex is injured, we are not justified in saying that this area is the *seat* or centre of our visual consciousness. All that we are warranted in concluding is that it is *essential* for our visual consciousness, that without it vision is impossible—a very different statement.

Once again, let me repeat, consciousness implies self-activity. There are no separate loci for different kinds or modes or qualities of consciousness. The nervous system and the system of self-activity works as a widespread unity. Different regions of the brain are more particularly concerned in *giving rise* to certain kinds of consciousness. The thalamus, for example, is especially concerned with the emotional consciousness; but we are not justified in calling it the *seat* or centre of such consciousness.

It is impossible to localize consciousness. There are no specific 'mental' symptoms diagnostic of cerebral tumours in different regions of the brain.

The work of recent experimenters[1] suggests that the *more complex* skills depend for their acquirement on the activities not of any particular cortical area but of wide areas of cerebral tissue. The larger the area of brain destroyed, the slower is the rate of subsequent acquirement of such skills, and in the rat, at least, this seems independent of the locus of the lesion. The same conditions appear to hold for the destructive effects of cortical lesions on complex skills which have been already acquired. Various *simpler* skills, on the other hand, appear to depend for their performance on the integrity of isolated mechanisms specific, in the normal animal, to definite areas of the cortex; but after their destruction, their functions may nevertheless be taken on by other regions of the nervous system. Such skills, once acquired, are hence abolished by injuries to some particular cortical area, but to no other area. Nevertheless, in the rat the destruction of that particular area does not appear to affect the subsequent acquisition of the *simpler* skills, and there is no relation between (*a*) the magnitude (within certain limits) or the locus of wide cortical injury and (*b*) the ease of such acquisition. Doubtless the number of

[1] Cf. *Brain Mechanisms and Intelligence*, by K. S. Lashley. Chicago: University Press, 1929.

such localized mechanisms increases *pari passu* with mental evolution, and at the same time their diffuseness diminishes. But the number of possible complex skills, involving the activity of wide areas of the cerebral cortex, must simultaneously increase also.

It would appear, then, that the *higher* processes of learning, of comparison, and indeed of all that underlies higher intelligent activity, have a *generalized* localization—comparable, perhaps, to the *diffusion* of epicritic sensibility over the skin as contrasted with the more primitive, ungraded, *spot* systems of protopathic cutaneous sensibility, which in turn may perhaps be compared with the *narrow* so-called localization of visual, auditory and other 'sensory' and low-grade areas in the cortex. But even where it exists, cortical localization is only relatively definite. The boundaries of a given 'motor area' in the cerebral cortex fluctuate widely in different individuals; they vary also in the same individual according to the direction of exploration, previous exploration and other factors; and, as we have already noted, other areas may successfully assume the function of that area when it is destroyed. A certain degree of 'equipotentiality' exists throughout the brain, although some cerebral regions appear normally

to have fairly definite, circumscribed, lower-level functions.

We are, in fact, neither warranted in supposing that there are definite seats or centres of sensation or emotion, nor justified in supposing that our manifold percepts, images or ideas each have their seat in different narrowly localized centres of the brain. And a similar truth holds for the association (or integration) of such experiences. We can *mentally* picture an integration of two 'patterns' of conscious activity occurring when two experiences *a* and *b* follow one another repeatedly, so that when *a* is later given, *b* (or rather the whole *a–b*) recurs. But *neurologically* we can form no simple corresponding picture of two collections of nerve cells being associated together. We have no evidence to support such cerebral localization of association areas; indeed such experimental evidence as we have is against it.

Even if there were no evidence pointing in one direction or the other, how could such localization of memories and habits possibly occur? Consider the babe that is learning to associate its mother with the satisfaction of its hourly wants. Its mother is never twice the same—now in one dress or facial expression, now in another; and the visual image of the mother received by the retina is never twice

the same, e.g., sometimes the mother is very near, sometimes farther off; sometimes the image falls on one part of the retina, sometimes on another. How can we imagine, then, any definite collection of retinal or cortical nerve cells responsible for developing the image of 'mother'? What develops is surely rather a 'meaning'—a generalization of images, 'standing for' something, i.e., for the assuaging of certain needs, for the execution of a wide range of adjustments of the infant.

Relationships and meanings are therefore the all-important mental acquirements. The acquisition of such relationships is shown, for example, in the many experiments conducted on a large variety of species, high and low in the animal scale, where by long practice the organism is trained to enter *B*, the brighter of two alternative compartments, *A* and *B*, in order to reach its food. When later, in place of *A* and *B*, *B* and *C* are substituted, *C* being now brighter than *B*, does the animal go to *B* to which it had previously been trained to go? Generally, no. It enters the *C* compartment. That is to say, it has learnt to enter not a *particular* compartment, but the *brighter* of any two compartments. It has not learnt to select a 'particular' object. It has learnt a 'relation'. Surely evidence of this kind is contrary to any

atomistic localization of individual mental functions in separate cerebral areas.

The fundamental purpose of consciousness is to enable the self to preserve the organism by guidance and direction—by the formation and satisfaction of ends and values. As in the evolution of living species something far more is involved than the mere blind running down-hill of a wound-up mechanism, so in the mental and bodily life of each organism the physical conceptions of 'entropy' and of mechanical energy are inadequate. On the physical side we can form no conception of the mode of working, throughout life and mind, of anything resembling Clerk Maxwell's directive 'demon'. Physiologically, that is to say physically, the brain-worker should need food with a far lower caloric value than he actually takes and requires for the successful maintenance of his purely mental activities. But in fact[1] mental work appears to make far greater demands on metabolism than it should according to purely physical considerations of the expenditure of mechanical energy.

At present we can form no conception of the

[1] Cf. *A Study in Nutrition*, by E. P. Cathcart and A. M. T. Murray, Medical Research Council's Special Report, No. 151. H.M. Stationery Office, 1931.

nature of the undoubted connection between chemical metabolism and direction in the living organism—between senility of body and senility of mind, between the rise and decay of procreativeness and the rise and decay of the creativeness of genius. At present we can form no bridge between mechanical and creative, directive activity. We can only say that both activities are essential to a conception of the evolution and working of life and mind. Mental activity is but the quintessence of the non-mechanical, directive activity of life; and consciousness is but that activity raised to its highest power. Even lower-level mental and neural systems, even the activities of the lowest living organisms are characterized by unconscious creation, direction, guidance and purpose, in varying degrees. But conscious creation and direction, the consciousness of *acts*, is limited to the highest-level psycho-neural activity—the self.

In this chapter I have suggested that, when the physiological activities of the lower-level systems meet with the highest-level activities, they may become manifest as conscious *presentations*; these highest-level activities are, I believe, to be regarded as arising from the supreme organization and distillation of the directive activities of the living organism. The acts at this highest mental

level constitute the purposeful, directive, creative and contemplative self, and are the recipients of presentations from lower cortical, and also of feelings from lower, primordial, thalamic activity.

The psychologist's principle of the *conservation of self*, which corresponds to the biologist's inevitable principle of the *struggle for existence*, is the fundamental function of this conscious activity. It is as real and important as the physicist's principle of *conservation of energy*. We must leave to the future the task of bridging the present impassable gulf which yawns between these two principles. Meanwhile, let us always remember that blind mechanism in the material world is a truth not more fundamental than the reign of guidance, creation and purpose in the world of life and mind, and, it may well be, throughout the Universe; indeed, our very notions of these two principles governing perhaps both the living and lifeless world appear to be the outcome of, even if they do not wholly depend upon, the experiencing, reasoning and imagining self.

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