Directing mental energy / by Francis Aveling ; with diagrams and one plate.

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TO

MY WIFE

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INTRODUCTION

THIS book may be regarded as an attempt to present and solve in part a problem of great importance—the problem which, in its widest aspect, might be stated in the terms "*How can the most be made out of life?*" But, thus stated, the problem is so cumbrous and unwieldy that it offers apparently insuperable difficulties for solution. Like many other problems, if we would hope to solve it, it must be broken up into its elementary parts and these dealt with one by one. Life is too vast, too complex, to be dealt with as a whole or held in any single grasp of thought; just as human knowledge is too complex and too varied to be confined within the boundaries of any single science. We may realise the unity of science as a whole; but no one of us has the opportunity or the time—even if he had the ability—to unify its immensities of detail in his mind, and grasp it in one synthetic intuition. And so it is with regard to life. We must examine it piecemeal, and try to answer the questions it suggests as they arise. We can take no general, no synthetic standpoint; but leave such standpoints to the moralists and metaphysicians.

Accordingly, in this little book the problem will be narrowed down to a special aspect. We shall not be concerned here with "making the most" of life; for that, after all, would mean appreciating life itself

in the light of absolute values. We shall concern ourselves with making economies instead—little economies in the expense that living at all entails—economies in our physical and mental energy. That is something everyone, no matter what his metaphysical theories or his moral ideals may be, and even if he has none of these at all, can easily understand.

We shall not, therefore, seek how best we may invest our capital of life-energy in order to bring us in the greatest return. That, from the very nature of the problem, would be a sheer waste of time, where investments of one's capital are so hazardous and the values hoped for by the individual so different from one to another. One man may stake his hopes on Heaven, and labour to achieve it in a monastery; another may spend himself and his energy in the amassing of a bank balance; while a third may risk both Heaven and fortune in the hectic pursuit of moments that have passed before he even has the time to enjoy them. Tastes differ.

But all of us have to live, and spend life-energy in one way or another. Whatever the aim may be, it is the same human energy that is used up in trying to attain it. Accordingly—leaving morals to the moralists and metaphysics to the metaphysicians—we shall here review what solid scientific facts we have to guide us in preventing overdrafts upon a capital which has its fixed and unchangeable limits.

DIRECTING MENTAL ENERGY

CHAPTER I

WASTE

THERE is no known and recognised science of living, though there are many sciences which are occupied in studying life from one aspect or another. Yet living is a far more important thing to each and every one of us than anything else can be. We leave the sciences which have a bearing, more or less direct, upon life for the most part to others whom we pay to help and advise us when we break down, in one way or another, and need their expert guidance. Thus, when we are sick, we send for the physician, trusting that his knowledge of human ailments will serve to put us right. When we are involved in serious disputes, we invoke the man of law in the belief that he may be able to extricate us. In our doubts as to the rightness or wrongness of actions we may consult the moralist.

Still, though there may be no science of living, there is an art of life, more or less—but generally less—perfect as to technique, which all of us have to learn for ourselves. We are forced to learn it, since we must live. And in the main, perhaps, we learn this art with some degree of success, by way of imitation

of others; by following examples, or tradition, or teaching; by methods of trial and error, and by shots of the "hit or miss" type.

While we are learning this art of living—a process which goes on as long as we live—most of us are unaware that we are pupils in a school; for there are few of us who have ever definitely set before themselves at all any purpose in life, or ever reflect upon what they have already learned in its regard.

The canvas which each one of us covers with bright colours or with monotonous greys—the web each one of us weaves out of the threads of desire and achievement or loss—bears all the marks of our lack of skill and of our failure, as well as those of our success. There is seldom, if indeed ever, time to go back in order to put right what in the light of subsequent experience has been found to be wrong. The art of living is the longest of all the arts, and in it, more than anywhere else, we find the time at our disposal short. Anything, no matter how little, that will help us to learn it will be useful; for even this art, crude and imperfect as it often is in practice, presupposes like any other art a science of some kind. The painter knows the effects of contrast in laying his colours on the canvas; and the sculptor of the human form has some acquaintance with anatomy. Even a little child's attempts at drawing show a striving to express something he already dimly knows. The knowledge, indeed, may be inadequate; the conception may be faulty and skilfulness of execution lacking. But knowledge of some sort must be there as well as some degree of skill; or there would be no work of art—good, bad, or indifferent—to contemplate.

So it is with regard to the art of life. Painted in the most fluid of all mediums, moulded at the outset in the most plastic of materials, the artist of life has some plan, however vague, to which he works—even if it be a plan which changes from one moment to another. It is only later on, when habit dries up the paints and the brush becomes clogged and stiff—only when the clay so hardens as to be no longer workable—that the plan, too, becomes seemingly fixed and inevitable. There is a plan; and there is knowledge, too fragmentary and scattered, perhaps, to be dignified by the name of science, but none the less directive of such means as we employ in the working out of the plan.

And day by day for each of us, or century by century for the race, our knowledge becomes a little more extended, a little more profound; so that if we care at least to acquire what is known, it may be pressed into the service of the art of life.

Hence we may look upon living and such knowledge as we may have learned about it, and about the possible economies which can be made in the energies that are expended in living, not so much as upon a perfected science as upon a science in the making. We may conceive it as a rudimentary science, such as was astrology or alchemy in ancient times or in the Middle Ages; when men made use of what they knew of the properties of earths and metals in their arts and crafts, and translated the appearances of the heavenly bodies into the predictions of eclipses and the like.

But living is, or may be, more than this, if we lay the sciences which deal with life piecemeal, as it were, tributary to it. To take examples: what scientific rules for an art of living, as far at any rate as the body

is concerned, have not been already borrowed from Physiology, Bio-chemistry, Hygiene ? These sciences view partial aspects of living beings on the material side—functioning of the different organic systems of the body, chemical reactions within the individual cells, relations between organism and environment. Psychology, too, has built up a mass of knowledge with regard to the mind, from which similar scientific rules for the conduct of life may be framed—rules with regard to the economic management of such mental processes as Memory, Emotions, Will. May not the partial aspects taken by all these biological sciences constitute a general science lying behind the art of life, and so help us in pursuit of that art ? It would appear that there is little doubt that such is, indeed, the case. Some day, perhaps, even so complicated a thing as life itself in all its aspects will have its rules and norms which we may apply in the effort towards right living ; just as we apply the norms of logic now towards exact thinking, or the rules of ethics towards the moral life.

But no such general science of life has yet been formulated ; and so grandiose a project as the sketching out of a science or an art of living must, from the nature of the case, be far beyond the scope or purpose of this book, even if it were—which it is not—in the present state of our knowledge a possibility.

It is possible, however, even with such knowledge as we do possess, to make some attempt towards the solution of the more restricted problem as to how we may *economise* our lives. I do not mean that there is some universal panacea to be proposed by which all human ills, mental and bodily, may be cured or

avoided, with a consequent prolongation of the vital span. From time to time such schemes have been advanced by zealous advocates and tried out. Fasting cures, and water cures, and lactic-acid cures have been proposed for every kind of ill; and gland transplantation has been advocated to stave off the ravages of old age, and bring rejuvenation to worn-out tissues. Yet the more modest considerations I propose to discuss—the little, possible economies which, in the aggregate, mean so much—might well, indeed, have their place even in a work upon the lengthening of life; since, if we are able to find any means of saving, we need not spend so much; and if we do not spend, it is reasonable to conclude that we preserve our vital energy.

The problem of this book, then, is really one of economy. How, in living, can we best economise our powers? How can we achieve the most with the least effort? How live our lives as fully as we can without exhausting, or unduly draining, our vital energy, physical and mental?

The problem is clearly in reality a problem of wastage; for economy, in this respect at any rate, consists in the elimination of waste. It is all very well to save and hoard; but that is seldom, if ever, true economy. We must spend something if we live at all. And if we are to spend, it is generally a fact here, as elsewhere, that the best of things, which may cost more than inferior products, are cheapest in the long run. This is particularly true of life, in which we cannot really hoard at all; though we certainly may be able to eliminate unprofitable expenditure.

Many people are struck with the apparently tre-

mendous waste which goes on in Nature, even though they are often unaware that they themselves are often the worst prodigals in real wasting. Nature is so lavish in its production of forces which spend themselves in vain—or so it seems to us; so careless in the way it brings forth only in order to destroy.

Examples are not far to seek. There is the incalculable amount of power that runs to waste in the unharnessed waterfalls and streams and rivers of the five continents. There is the dissipated energy of the tides of the seven seas. For untold centuries Niagara has rushed over its rocky ledges from the level of Lake Erie to Ontario, wearing away the channel of the lower river, and infinitesimally eating the rock backwards towards its source. What incredible waste was there, until man pierced its enclosing cliffs with channels, and drew its water through flumes and aqueducts to the great turbines that work the dynamos and generate electric forces which provide power for workshop and tramway, heating and lighting, over a radius of scores of miles! It is but one instance of Nature's "wastage"; it could be multiplied a thousand times.

Another example from another sphere—the sphere of life. Consider the vast number of embryonic lives which never come to maturity. The spawning of the codfish presents a striking case. Millions of eggs are spawned by the female; and in each generation, millions more. The sea would be stiff with the fishes did all those eggs hatch out and live. But they never do hatch; and only a very small proportion of them ever reaches maturity. Subject to a thousand chances, preyed upon by other fish, most of them come

into being only to be destroyed. Nature here, surely, seems prodigal and careless; bringing forth only to squander, using up energy in vain. And this is so, not only of the example taken, but, at least in a large degree, with respect to all forms of life. Nature seems to care nothing for the individual, but only for the type.

Are these things really, when we come to think of them, examples of wastage in Nature? Surely they can be called waste only when they are regarded from our human point of view alone. There is an economy in Nature which transcends all our views. Nothing is in reality wasted or destroyed. What we call waste, in water-power or life, is only waste from our own personal view-point. That water-power might have been serviceable to us. We might have used it, and turned it to our own advantage. Therefore it can be conceived, as indeed it is conceived, as having value. The fish we might have eaten—someone might have made some use of them. That other creatures did make use of the spawn we are apt to forget; just as we forget that the flow of rivers is a necessary part of a larger scheme than the erosion of the land. For value, as we conceive it, in anything consists in its relation to ourselves.

Nature sweeps on from age to age, grandiose, impersonal and overwhelming, until we learn how to conquer its riches and harness its forces, and use both riches and forces in the service of our own desires and needs. It is only in relation to our own desires and needs that they have any value at all for us. What we do not want is worthless.

And this must give us the clue to what waste really

means, and at the same time indicate in what way economies in life may be secured.

Waste is useful material thrown aside, or energy uselessly dissipated in the achievement of an end which we desire. The carpenter sets about the making of a bench. He planes his rough boards, and chisels out his tongues and mortises. The shavings which come from his plane and the chips from the chisel are wasted as far as his purpose in making a bench is taken into account. They are waste in so far as the material actually employed in making the bench is considered; for it is the intention of the carpenter to make a bench, and not chips and shavings. It is true that these may be of use for some other purpose, such as lighting a fire. The carpenter, even, may have this in mind; and so even chips and shavings may be looked upon as possessing some value. In so far considered they are by-products, and not sheer waste. Indeed, there are instances in which the by-product becomes the main product of an industry. But they are waste, none the less, though necessary waste, from the point of view of the carpenter who has the bench only in mind.

Wastage such as this is not encountered in the pursuit of all the arts and crafts—least of all in the fine arts, in some of which, at any rate, it may be reduced to a minimum or not occur at all. While it must be allowed for in such arts as sculpture, it need hardly be involved in painting; and in arts like music and dancing it need not be reckoned with in any way.

In the art of living, however, with which we are here concerned there is no such thing as waste in this

sense. We cannot, so to say, slough off from ourselves the material of life. We can make use of it wisely and well, or work with it badly and with bungling hands, without skill, even without care. But we must carry the whole product with us to the end. Good or bad, beautiful or misshapen, fully developed and symmetrical or stunted, cramped and deformed, there is no wastage in the sense of loss or depletion.

But there may be waste in the other sense of energy dissipated uselessly in the achievement of desired ends. Indeed, if we review our lives as so far lived, it is safe to say that there is no one of us who will not discover some sort of wastage here. There are goals proposed but never attained, ends never realised, despite the labour that we expended towards them; labour, we realise it, wasted to no purpose. And there are ends and goals which have only partially been attained, or, if attained, have been found to be not worth attainment—not quite what we had laboured for after all—so that much energy has been spent, much endeavour lost, to little profit. And even when the ends proposed have been achieved, and the goals reached and found worth while, this has not seldom been secured by the expenditure of far more energy than was needed. It could have been done with less expense, less effort, and consequently less waste.

We can see this, again, in the homely carpenter's shop. The skilled craftsman who strikes the nail upon the head truly, drives it home; and every ounce of muscle necessary, just that much and no more, is utilised in the work. There is no wasted power,

except what is inevitable—the energy dissipated in heat and other like changes which accompany the biting home of the nail, through the resisting wood, into its place. But this presumes both some knowledge and some skill—the right grip and poise of the hammer, the co-ordination of hand and arm with eye, the delicate adjustment of many muscles which execute the design and the orders of the mind. Even here, and in all such seemingly trivial operations, there is scope for economy of energy, both bodily and mental, as we shall see.

Over and above the necessary knowledge and skill required for the performance of the simplest actions, the emotions and the will have also parts to play. The man who has pride in his craft, pride in himself as a craftsman, enjoys his work and positively gains, rather than loses, energy in working at it. The clumsy craftsman blames his tools ; and the angry workman quarrels with his material as well as with his instruments. He not only wastes, and often spoils, the former ; he cannot use the latter to their best advantage, and he drains away his energy uselessly in handling them awry. The love-sick worker "moons," and achieves little with his thoughtless and unhandy movements. The timid and the fearful is often over-careful, and errs by very carefulness in the carrying out of his task. The emotional drain of the man with a grievance not only interferes with his work but saps his strength.

But the will, in the long run, may be above all the arch-enemy of economy in living, the spendthrift above all others ; for it is the will which releases all the other powers or holds them in check. The

workman may spend his energy careless of the issue, neither wanting to economise nor to save. He may work, conscious of his lack of knowledge or of skill, and of the wastage these entail, and yet not take the pains to acquire the one or the other. He may go on working while he knows he is the prey of an emotion which is spoiling his work, from which, or from the occasion of which, he might easily protect himself.

The reader will have noticed that all these causes of wastage in human endeavour which we have noticed—lack of knowledge, lack of skill (which is largely habit), emotion, will—are psychological, mental rather than physical, facts. These factors, entering into the problem of waste in vital energy and the economising of life, exhaust the whole field of Psychology and show our problem to be in the main a psychological one. It is not altogether psychological, since physical energy must also be considered. It is mainly psychological, because our physical is largely directed by our mental energy ; and, where it is not so directed, there can be no question of preventable waste or of economy Saving and waste, as we have seen, can only have reference to human purpose and plan ; if we cannot purpose, plan, and carry out, if we cannot direct our physical powers or manage our mental ones, economy is impossible. But purposing, planning, directing, managing, are mental achievements—not physical ones. Accordingly, the following pages will be chiefly occupied with a study of mental process.

Nevertheless our problem, limited as it is, and no matter how simple we attempt to make it by breaking it up, as we proposed, into parts, must necessarily remain an enormously complicated one. When the

whole mind—and, indeed, for the matter of that, the whole body too—is involved, we cannot hope for simplicity. We shall therefore attack the problem piecemeal; and if the solutions we have to offer appear to be fragmentary and disjointed, that, from the very nature of the case, is inevitable.

One further preliminary *caveat* is necessary. It may seem that most of the economies suggested are small ones, and hardly worth the trouble of practising; that the title of the book is misleading, asserting a claim which is not made good in the text. But this, surely, is not the case. No economy is so small as to be worthless. In general, "A stitch in time saves nine" is a good axiom; and "Take care of the pennies and the pounds will take care of themselves" is a better. There would be little use advocating saving which was impracticable, which had not been scientifically investigated so that the method of securing it was not scientifically approved. What may, at first sight, appear to be small losses or gains may have immense consequences. A mild boredom may grow into an incapacitating fatigue. A "square-peg" boy or girl stuck in a "round-hole" occupation may mean immense wastage to the community in the long run, as well as much useless suffering to the individual himself. Unrestrained and undirected emotionality may lead to untold misery, to the prison or the mad-house. A just abnormal will, a just distorted ideal, may end in a wholly wrecked life.

CHAPTER II

WASTE IN HUMAN ENERGY

We have seen that economy in life is to be secured, not by over-production, but by the prevention of waste; and that this can only have meaning for us with regard to ends desired and pursued, in so far as those ends are not reached, or, when secured, are reached with an unnecessary expenditure of physical or mental energy.

With respect to the real nature or worth of these ends this book has directly nothing to do. The ends which we propose to follow up may be moral ends, such as the formation and perfecting of our characters; they may be material ends, like the amassing of a fortune; or spiritual, as are those of the man who makes the pursuit of knowledge his goal. Indeed, ends like these are both material and spiritual and moral at the same time, according to the view one takes of them. And the value or worthwhileness of all such ends must be measured by the standards of ethics, or of economics, or of some one of the other sciences which deal with such matters.

Nor must it be forgotten that ends like these and many others constitute remote goals towards which desire moves, often through a long series of means which succeed one upon another. And much wastage of life may certainly occur during a long course of action which persists through many years. But this aspect of our general problem, if we attempted to

treat it at all, could only be treated in an abstract and superficial way. It would be of little practical use for us to philosophise upon the need of keeping our far-off goals, whatever they may be, steadily before our eyes, in order to ensure that our desire to reach them at last might guide us in the selection of suitable means in their regard. Everyone knows all this without being told ; but it is with a knowledge of too vague and general a kind to serve us save in a vague and general way.

If we are to look for information of any practical utility, we must turn, rather, to nearer ends—ends which may themselves be means towards some further goal. We must study thoughts and actions in the concrete, to be performed here and now, and give up useless speculations on generalities which can lead us nowhere. Indeed, such speculations might prove to be themselves one of the worst forms of wastage of our energy. Thought is for action ; just as action itself is for life. Both the one and the other are means, not ends in themselves. For to live at all we must act, and to act as human beings we must think about our action. To live economically we certainly must think and organise and plan. The thought that contents itself with mere thinking, and goes no further, exhausts itself in vain. Some people imagine that philosophy consists in such unprofitable thinking ; that purely speculative thought is proposed as an end in itself by the philosophers—an end towards which all other activity is to be directed. But, surely, this is not the case. Philosophy occupies itself with values ; and, though these may be difficult to ascertain, and still more difficult to apply and put in practice, the

thought that aims at them may well be, in regard to action, the most valuable of all.

But, at the other end of the scale of thinking, as far removed as possible from the ordered and related speculation of the philosophers, are the ineffectual reveries of the chronic day-dreamer. Sheer waste, to no effect! Energy that might be used for life and living is drained away into the ineffectual desires and phantastic images of the builder of Castles in Spain; until at last, if his day-dreaming go so far as to replace action altogether—as, indeed, it does in certain kinds of insanity—the introvert can only properly be cared for within the wards of an asylum.

When we turn to thoughts and actions in the concrete, however—thoughts necessary as guides to action, and actions necessary to develop life—we are at once met by the problem of the relation of the one to the other. In attempting to economise life, which is the most to be studied, the action or the thought? Action is of the body, thought of the mind; though thought is also clearly a kind of action. Is it the life of the body or of the mind which most concerns us? Or must we deal with both body and mind as inseparable parts of the one living individual, in such a way that they cannot, in the concrete, even be considered apart?

To reach a satisfactory answer to such questions we must have some working theory as to the relation which obtains between mind and body; and the precise nature of this relation has been the cause of secular controversy. For those who are interested there is a short appendix[1] dealing with the theories which have

[1] Cf. p. 256.

been put forward ; but here it will be convenient for us to take up the standpoint that there are two kinds of energy to be distinguished, physical and mental ; that there is a force, or capacity of doing work, which belongs to the mind and another which belongs to the body ; and that one of these may influence the other. We might express this, perhaps, in a different way. We might say that the conscious individual is capable of expending, or using, energy in two different ways ; and that either one form of its energising may affect the other, or that in using its energy in one of these ways it is *also* expending it in the other. A working theory of this kind has the advantage that it can be made to square with several of the philosophical ones which have been proposed. It also greatly simplifies the manner in which we may deal with our problem ; since it allows us to treat of mental energy as something which may be wasted or saved, quite apart from any necessary consideration of the physical energy accompanying or affected by it. And we may similarly consider our physical force *as if* it were unconnected with mind. These, no doubt, are abstractions ; but they are convenient for our purpose.

Many people are puzzled by the way in which the different applications of Psychology—to Industry and Commerce, to Education and Medicine—seem to be so much concerned with matters which have nothing to do with the mind. To take but one of these branches of Applied Psychology only as example, Industrial Psychology appears to be far more concerned with hygienic conditions, with lighting, heating, and ventilation, with bodily aptitudes for various kinds of occupations, with muscular habit-formation and the abolition

of useless movements, with the securing of greater output, and the like, than with purely mental questions. From the nature of the case—since it is precisely to such matters that the knowledge acquired by psychological research is applied—this must seem to be so. None the less it is the effect upon the mind of the worker of cheerful light and proper warmth, as well as on his body; it is the effect of his mind, his intelligence and good-will, upon his body in such matters as efficient muscular habit-formation, and so on, which justify our giving the title of Psychology to this study. And this practical and already very efficient application of the science to Industry—no less than to Medicine and Education—is a further reason in favour of the working hypothesis of the relation between body and mind which we propose to adopt.

One further point to be considered is that our energy, whether physical or mental, like that of any other finite agent, is strictly limited in amount. There is a point beyond which we cannot go in using it. If we work a muscle too much, a moment comes at which we can do no more work. The muscle breaks down in its task. So, too, if we persist too long in carrying out any mental operation, a fatigue sets in which affects both the output and accuracy of our work progressively until we are incapable of doing any more. These facts have been experimentally demonstrated with great minuteness; but in their general bearing they are within everybody's knowledge.

What is not so generally realised, however, is that the amount of mental energy at our disposal at any given moment is also limited, as well as that which is

successively expended in carrying out a continuous task. This has been known from very early times; and it is well illustrated by a very simple experiment. If a person is shown a number of dots or letters, simple diagrams, words, etc., for a very brief interval of time—all the stimuli, as far as external conditions such as illumination, distance from the eye, and the like, are involved being presented in an identically similar manner—it is found that only a certain number of them can be actually perceived. Thus, we are able to grasp five or six dots or letters, or three or four short words, at a time, and no more. We may, of course, know that, over and above what we clearly saw, there were others; but we do not know how many or what they were. This simple experiment teaches us that what is called the "span of consciousness" is limited in extent. There is only enough energy available at a given moment to allow us to perceive a limited number of things.

A pretty illustration of this law of limited mental energy has probably been experienced by all the readers of this book. Watch a flight of birds wheeling across the sky. A flock of three or four pigeons or starlings needs no counting. We know that there are two or three or four—perhaps five—at a glance. But let there be only a few more, and we see "a flock of birds," and not so many single birds which together make up the flock.

In this illustration, while we see that the law of limited energy is borne out, we also stumble upon another principle. This may be called the law of grouping in higher units; and, since it is a law which gives us an example of what we might call the

natural economy both of mind and body, it is worth while to consider it here in some detail.

As far as mental saving is concerned, if our total mental energy is limited it is clearly an economy for us to group together units which, if taken singly, would exhaust it in our grasp of only four or five. Take the instance of the flock of birds again. We can perceive, say, five birds at a glance, as five. But by grouping together the birds in each flight as a flock we can just as easily percieve five flacks. In this way when we read we do not only grasp, say, four or five letters of the line upon which our eyes rest, but as many words, or more. Had we to spell out our words in reading it would be both a costly and a slow method of procedure. By grouping letters into words, and neglecting the details of the letters themselves, we can, and naturally do, ecomonise. We realise this when we condiser how seldom, if ever, we are aware of misprints in the text. (There are several intentionally left here and there in the last few lines.) Originally we had to learn the letters singly, and the words; now we group many, and without attention to them reach the meaning. We achieve the end proposed—the reading of the letter or the understanding of the book—with less expenditure of mental energy.

So it is also with the acquisition of bodily habit or skill. Almost any learned and more or less complicated muscular action will serve as a good example of this. Perhaps one of the best is typewriting, in which there is a very notable grouping of more elementary muscular contractions into higher and higher units. The beginner, like the beginner at the piano, picks the simpler movements out one by one. Such a

key has to be struck. The arm and hand move towards the position from which the finger will press down upon the required key. At first each movement has to be executed as a separate one, with much awkwardness and fumbling. Mental energy, in the shape of thoughts of the direction in which the hand must move, of the amount of pressure to be exerted, and the like, is expended ; and the key-letter must be kept in view while the hand is executing its movement. More mental energy may be drained away in the shape of vexation and annoyance ; while strong efforts of the will may be necessary to keep going at all. Little by little, however, a co-ordination is established between the visual pattern of the keyboard and the felt position of the hands and fingers in striking the keys. The correct amount of pressure on these comes to be regulated automatically. One thinks no longer of the directions in which the hand must move, nor of the position of the keys in terms of visual imagery. Vexation and annoyance cease to interfere with the work ; and sustained effort of will grows less and less, until it finally tends to disappear. As learning progresses and skill is acquired, the typist no longer types letter by letter, but word by word. The higher units in which we grasp, as we have seen in the case of reading, not single letters but even words and phrases at a glance, are paralleled by the higher units of co-ordinated muscular movements involved in typewriting, again not single letters, but words and phrases. If the typist is typing from copy, the eye outruns the fingers ; and while he reads ahead, phrase by phrase, in the manuscript, his finger movements, with all the muscular contractions each involves, " take care of

themselves" with sure precision. He thinks no longer either of the written characters he sees nor of the complicated movements to be executed—no more than a skilled musician thinks of the individual characters of the musical notation before him, or of the complicated patterns of muscular adjustments by which he translates them into actual melody. It is evident that in both these processes, that of grasping together elements in higher units of perception and of combining simpler movements in higher units of execution, a natural economy of energy is secured, provided always that the higher units in either case are serviceable ones. Not only is precision reached when skill is acquired by learning and practice; but the conscious effort at first expended gradually becomes less and less until it is minimal. In reading, the point is at length reached at which only meaning is attended to, and little, if any, attentive energy is wasted upon the actual printed words. The same is true of skilled movements, especially of those which are mainly of a repetitive nature. Once started, they tend to be carried on in a quasi-mechanical way.

The many and varied meanings of the separate words standing in different relations to one another in a text, however, require that each separate meaning shall to some degree be attended to; just as, in typewriting, the varying order of words in a phrase undoubtedly requires some effort of attention both to understand and to execute it. But anyone who has reached even a moderate degree of proficiency will recognise that the minimum of thought-energy and muscular guidance is all that is required for words frequently typed in a passage. It is only when the

words are unfamiliar or unusual that our attention is compelled to them ; and the same is true for phrases and sentences the elements of which are of frequent occurrence in the same relational order.

All learning—all training of inborn native abilities, whether mental or physical, until they become serviceable economic habits—apparently follows this course of building up higher units out of more elementary ones. But two facts will at once become clear from the examination we have already made.

First of all, it will be evident that, as far as bodily skill is concerned, it is acquired, on the basis of original aptitude, not only by building up higher and higher muscular co-ordinations and by practice, but also by mental guidance. Whatever may be true of mental skilfulness or ability which we have acquired, the acquisition of physical skilfulness in any given direction involves both body and mind. The simplest bodily movement performed wilfully must be thought, or mentally represented in some way. Mental energy, as well as physical, is involved in it. In this respect it is impossible really to separate the two ; and Industrial *Psychology* again is seen to be the most appropriate term for the study of skilled movements, in the same way as Educational *Psychology* is the most appropriate term for the study of the laws of the development of purely mental abilities.

In the second place, it will be obvious that, in comparing the higher units of either kind as built up by different individuals, we shall find that some of these are more serviceable, and therefore more economic, than others. Some people can remember, understand, plan out courses of action better than others ; just

as some excel others in skilled movements of various kinds. In part this is no doubt largely due to differences in the original aptitudes of the individuals concerned. But that is not the entire explanation of the fact. Theoretically, there is a "best way" of doing things—of mental performances as well as of physical actions—to which the actual ways followed by the individuals more or less correspond. Bad, slovenly, wasteful mental habits can as well be formed as bad, wasteful, and costly physical ones. And bad habits of either sort can as easily be learned as good ones. The finished product in each case is largely, if not entirely, due to methods of learning. Whether by "hit or miss" methods of trial and error, or by casual imitation, or by serious attempts to understand and master the principles involved in advantageous learning, the loss or gain in permanent efficiency depends to a very large extent on the initial steps taken. The "best way" must undoubtedly be suited to each individual; but for each individual there is a "best way."

And, even if the "best way" has not been learned from the outset—and, generally, it has not—the uneconomic habit, mental or bodily, that has come to be formed can usually be remedied. This, of course, means a further expenditure of energy in correcting, or even counteracting, what has already been acquired; an expenditure the greater from all three points of view of knowing and feeling and willing, as the habit in question is indurated. Nevertheless, at least in the great majority of cases, it is worth it; for the energy expended in altering a wasteful habit, just as that expended in forming an advantageous one,

though possibly in a less degree, proves really to be a means of economy of energy in the long run.

To illustrate once more the natural economy of mental and bodily energy which we unconsciously secure, and to show how actions originally requiring both thought and muscular guidance ultimately come to need no consciousness of either the one or the other, an instance may be taken of some very simple combination of a few more or less elementary muscular actions grouped into a higher unit pattern which recurs over and over again in exactly the same form, with no intrusion of any other patterns into its sequence. Knitting is a fairly good example of this. When once one has taken the trouble to learn to knit, the first clumsy and unhandy movements, attentively guided, come to an end in the deft manipulation of the needles and the wool. The hands move automatically, each similar link in the chain of patterned movements acting as a cue to the next one ; the feel of the wool and needles and of the position of the fingers at each moment releasing the movement which has to follow. But these feelings quickly sink to the level of the subconscious. No longer do the will to knit nor the feelings exhaust any conscious energy. We cease to be aware of them, though they certainly still operate. The knitting goes on. This is so far true that, when we are knitting, we can carry on an animated conversation, or read a book, with full attention. We are no longer even calling upon the reserves of our energy of attention for the guidance of our fingers. It is only when something goes wrong —when a stitch, for example, is dropped—that we become consciously aware of what we are doing, and

are obliged to adjust ourselves to it afresh with a new effort. Like the miller who is unaware of the sound of the grinding of his millstones until it has ceased, the accomplished knitter is entirely unaware of the detailed operations of his knitting until some obstacle arises which hinders their performance. In the one case, as in the other, a principle of natural economy is at work. In doing, as in perceiving, energy is saved by habit.

None the less, to obtain the best results with the least output of energy, this natural principle of economy is not sufficient; though it is one of the principles which must be employed. In physical as in mental work we must find the "best way," and aim to follow it as far as possible. The determination of "best ways" in various directions, both in general and in the case of different individuals, is the task of Psychology; and, as far as that task has been successfully carried out, the following pages will attempt to illustrate it.

CHAPTER III

WASTE IN BODILY ENERGY

In this chapter we shall consider the question of economy of bodily energy, as being, on the whole, more familiar to us than mental economy.

We have already seen that any physical cause, in acting towards the production of an effect, not only produces what, from our point of view, is the effect desired, but also dissipates or loses some of its energy in other directions. This loss, in so far as it is considered in relation to the effect desired, we look upon as wastage. This is not a strictly scientific view on our part ; but it is an entirely natural one. When we use natural agents as causes, what we desire is only one particular result out of several which they bring into being. We are not interested, for instance, in the heat which is produced by the driving home of the nail, any more than we are in the sawdust and the shavings which litter the floor of the carpenter's shop when he makes his bench.

No doubt some physical energy is always wasted in this way when we direct our own bodily forces towards the attainment of any end we may have in view. There is no single contraction of a muscle which is not accompanied by an expenditure of energy in heat, electricity, and the like. But this cannot be avoided ; and if, from our point of view, it is a waste, it is also a necessary one. No economy can be effected in

its regard. But we can economise energy in bodily movements, none the less, in a great number of ways, each one of which tends to prevent unnecessary wastage in the attaining of our ends.

There are, of course, labour-saving devices of all kinds which can be employed. Machines are more and more replacing men ; and with machines one man can do what it would take a dozen or a hundred or a thousand to do without them. Modern industry would be impossible without machines. But mechanical labour-saving devices do not fall within the scope of this book. Whatever machine we employ, and if we use none at all, physical energy may be wasted or saved, having regard to the purely human element in work.

Of late years a very considerable amount of study has been given to this question, particularly in respect of wastage of energy as against output in industrial undertakings ; and an extremely important branch of Applied Psychology has come into being which bids fair, before many years, to revolutionise industrial methods. It has certainly made good its claim to very respectful consideration.

In this chapter, dealing as it does with waste in bodily energy, physiological facts and laws must be largely taken into consideration. Nevertheless, as we have seen, the psychological aspect even of the bodily processes looms large ; and it has been found impossible to deal with the problems involved in bodily movement, fatigue, and the like adequately without introducing the psychological factor.

There are two points, by way of cautions, which should be held in view throughout the present chapter.

In seeking for causes of wastage, in order to avoid them and so economise, the investigators first in the field approached the whole problem from the point of view of the employer of labour. Their aim was to speed up production. How—they set out to ascertain—can greater output be secured relatively to the costs of production of the finished article ? Their tendency was to look on the employee himself as a machine to be standardised—a vastly complicated machine, no doubt, but one which none the less should be treated as any other machine. They forgot, or did not take into full consideration, that the human " machine " consists of more than levers and pulleys and driving bands ; that it has within it possible prejudices and suspicions, together with a host of other emotional forces which might upset its working as a " machine," even if the best possible objective conditions were secured for it to work in. As a matter of fact, the first " efficiency engineers " neglected these finer psychological factors in their industrial investigations. In consequence, while they no doubt were able to make observations of real value, they prejudiced the workers against both their aims and their methods. That prejudice still to a large extent exists.

It is only by enlisting the co-operation of the employees, by letting them see for themselves that the object of studying their methods of work, their output, their fatigue, and the like, is as much—and even more—in their own interest as in that of the employer of labour, that fruitful investigations can be made. And it is this sort of investigation, made in workshop and factory with the co-operation of the workers, together with the researches carried out in

psychological laboratories, that has yielded the best results. Such work has indicated the lines along which wastage may be avoided and economy of energy secured.

The second point to be borne in mind is that these investigations "in the mass" do not always allow us to draw conclusions which are applicable to each and every individual worker. As in all mental and physical achievements, individual differences are here marked. By careful study it may be possible to discover what we have called a theoretical "best way" of performing any given bodily task—the way which involves the least amount of movement, the least degree of fatigue, the least boredom, and ensures the greatest efficiency in output. But it does not follow that this "best way," or method of working at any given occupation, is the best way for Smith or Jones. Some other way —his own way, for example—may be the best in his case. Accordingly, we must remember that the "average" or "type" individual is largely a fiction, and consequently interpret the "average" results of research in a broad fashion only when we wish to apply them to individuals.

Moreover, in applying any results of motion-study or fatigue-study obtained from one particular occupation to individual cases, we must bear in mind that what holds good with regard to that occupation or task may not hold good exactly with regard to another. Even when they are very similar, the tasks are not necessarily identical. We are only entitled to use the principle of analogy for what it is worth when we generalise from the established facts of one case to another more or less similar one. In point of fact,

each case should be studied in detail and on its own merits.

The wisdom of keeping these cautions in view in this, as well as in the following chapters, will be apparent if we consider that, in imitating or learning the actions of others, it is the end-result we have chiefly in mind, and not the actions themselves. For instance, in attempting a drive at golf, or a losing hazard at billiards, we know beforehand in each case the effect we wish to produce; and we try to co-ordinate in higher units simpler muscular movements which we have already practised singly. But, in imitating the stroke of others, we imitate in our own way. We may be told, or shown, how to hold the club or cue; but the position of our hands and the posture of our body are not copied—in the sense of being a fac-simile—from anyone else. The same is true of work in contrast with sport. Little by little we acquire skill or craftsmanship; but it is by way of intelligently varying the patterns of the higher muscular units with which we are working. Consequently, we may be taught that there is a "best way"—a way in which we may eliminate all unnecessary movements from our performances; but that best way must be adapted to our own individual peculiarities before it can become a best way for us.

We may now turn to some of the detailed results already obtained by motion-study with regard to the economising of bodily energy. The first of these, though no scientific investigation is needed to appreciate its importance, is that tidiness and order conduce enormously to economy, as well as to efficiency. This is as true of mental as of bodily tidiness. How much

time is wasted in looking for a mislaid note or book or collar-stud! But it is not only time that is wasted. Bodily and mental energy are wasted too. We search among the notes in the docket or in the drawer, making movements all the time which lead to no useful result as far as the object of our search is concerned. We think, and probe the corners of our memory for traces of where it was last seen. We may even—it is not a remote possibility—lose our temper in the end and expend a vast amount of emotional energy to no advantage. Indeed, so trivial a thing as a mislaid collar-stud in the morning may induce in us an irritable mood which lasts throughout the day; and everyone knows how great and how continuous a drain of energy, both mental and bodily, such moods expend in sheer wastage.

Tidiness, method, order, are fundamental safeguards of economy. To have things in their proper places, so that they can readily be found, and used, when wanted—whether those things be notes and studs or ideas and items of information stored up in the memory—is to prevent waste. It is really only the lazy man who is not tidy; and, in the long run, the lazy man it is who takes the most out of himself in accomplishing the least.

Experimental investigations have, however, been carried out with regard to what we have called tidiness; and it has been found that immense wastage in industrial occupations frequently occurs through lack of planned and orderly arrangement of tools and materials. For instance, it is clear not only that untidiness in the ordinary sense of the word makes for unnecessary labour, but also that unnecessary movements can be

avoided if the materials and tools employed in making any given product are so placed as to be, each in its turn, easily available—just in the right place to be handled with the least amount of movement and trouble. This appears to be so obvious that it hardly needs noting. Yet, in actual fact, it is a point often neglected in factory and workshop. In all the investigations into conditions of this sort in industry, the possibility of enormous saving has always been discovered; and the carrying out of improved methods of arrangement suggested by the industrial psychologist has been attended with almost unbelievable results.

To cite only one or two instances: the management of one factory in which machines were built up out of their separate parts had left the method of assembly of the parts to the individual workmen. Each man assembled as he pleased, or thought best. According to the account given, the men worked in a more or less haphazard way, reaching out for the parts, or the tools they happened to require at the moment, wherever these might chance to be. They wasted both time and energy, not from inefficiency, but from sheer lack of a convenient order and system. The output of the factory in assembled machines averaged eighteen a day for each worker. A professional psychologist, skilled in movement-study, was employed to investigate the conditions of the factory; and he studied and planned the most convenient positions in which the parts to be assembled and the tools used in their assembly should be arranged for the workmen. In this particular instance, he devised a table and frame to hold both tools and parts in such a way that they were all immediately

to hand, and arranged in the order in which they would be required. A learner was employed to keep this frame properly stocked.

The results were startling. Instead of an average of eighteen finished machines a day each, the output per worker rose to sixty-six machines. In other words, an increase of 266 per cent. was secured. The employees earned more wages; and there was no increase of fatigue.

Again, take a still more simple instance, that of brick-laying—a trade old enough for improvements in labour-saving to have been introduced long before the advent of Applied Psychology. Movement-saving in this trade was the first attempt of motion-study by psychologists. It is evident that the continual stooping and lifting to pick up the bricks and set them in their place constitutes a drain of physical energy which might be avoided if the materials were more conveniently placed than in a heap on the ground. The perpetual bending and lifting of the weight of the body is not a necessary accompaniment of laying bricks in position. Both the time taken and the efforts expended in it are wasted. Accordingly, the materials for the craft were placed on trestles in more suitable positions. The result proved that, with the expenditure of no more energy, more than three times the amount of actual work was done.

According to the present regulations obtaining in trades unions, it might be argued that there is no advantage in adopting methods which increase output of work, since the amount of such output is limited by convention. But that is not the point. We are here concerned merely with work done as a measure of

wastage, or effort expended uselessly. If the aim is not to lay the greatest number of bricks in a given time, but to lay a certain fixed number with the minimum expenditure of energy, the results of the brick-laying investigation will show us the lines upon which it may be secured. For the number of bricks laid is measured by the product of the time taken to lay them and the amount of energy usefully expended. Clearly, if energy which before was wasted is now employed, the economy will be shown in terms of time. The bricklayer need not work so many hours. His working day may be reduced; or it may advantageously be broken up by rest-pauses.[1]

Labour- and energy-saving methods, of which the foregoing cases are examples, have already been applied in a large number of cases of widely varying industries; and always with advantage and economy. It is evident that each different kind of operation, being, as it is, a higher unit built up of different elementary movements, must be studied for itself and on its own merits. The particular saving to be effected in each may be different. Nevertheless, in principle, the question is resolved into the elimination of all bodily movements which do not directly contribute to the end in view. And that principle may be applied by anyone who has in mind the economising of bodily energy.

It must not be thought, however, that methods of research such as these exhaust the technique of Applied Psychology. Though they roughly illustrate the general principle of investigation, they are more or less of a rough-and-ready kind. In studying bodily

[1] Cf. p. 47.

movements even the most careful observation of this sort leaves much to be desired; and methods have accordingly been devised to obtain, not mere observations, but permanent records of movements executed in performances of skill both in sport and in industry. Such records once made can be compared one with another in the laboratory at leisure; and improvements can be suggested in the way of acquiring skill and deftness in the case of individual workers.

The most useful records of this kind consist of wire models of the actual course from beginning to end of the movement studied. The models are built up from stereoscopic photographs of an electric light fixed to the instrument actually used in any operation, or to the hand, etc., of the worker. The moving light traces the path of the movement exactly upon the photographic plate; while a register of its duration, or any part of it, is secured by regularly interrupting the current which makes the lamp incandescent. Thus the photographs show lines, giving the direction of the movement, with breaks which indicate the time any part of it took to carry out. The resulting wire models are known as chronocyclegrams.

A very large number of manual operations has been studied by this method. The movements made can easily be analysed into their component parts; and practical instruction in movement-saving can be demonstrated from the models.

One fact of great importance for securing economy in bodily movement clearly arising from a study of chronocyclegrams is that the various partial movements required for any manual operation are most economically performed when they are combined into

higher-unit movements of a sweeping kind; that is to say, the general direction of which lies not in straight lines, but in a curve or curves. It is not always possible to secure this; as, for example, in typewriting, when the hands must move in more or less straight lines; but in very many manual operations it is quite feasible to change straight-line movements into curved-line ones. And the saving is all the greater in those cases in which both hands are employed in any task.

Economy, however, is not only secured in the simultaneous use of the two hands in similar circular movements, but in similar straight-line movements also. An example of this, familiar to most people, is piano-playing. In this, once the higher-unit movements of both hands are organised, there is apparently no more mental and very little more physical energy required to use both hands than one alone.

In many movements there is a tendency towards using both hands in the same way. The old trick of trying to pat the head with the one and rub the chest with the other shows how difficult it may be at the outset to use them differently. And very simple experiments suffice to show how much more natural—and therefore easy—it is to carry out similar movements with each hand than dissimilar ones. Let the reader raise and let fall both hands simultaneously a number of times, and then let him alternately raise the one while the other is let fall; and compare the difficulty of these two simple sets of movements. Both, of course, are very elementary and extremely easy; but there is a distinct gain in ease in the first case over the second. Or let him make a circular

movement in the horizontal plane with the right hand while he attempts simultaneously to make an up-and-down movement with the left. The result will probably convince him of the economy of energy secured by building up the elementary movements of both hands, as far as this is possible, into higher-unit patterns of a similar kind, until they ultimately become one single pattern.

Allied to what has just been said with regard to the gain made by co-ordinating separate movements of the two hands (or limbs) is the question of making full use of rhythms in our movements ; for a rhythmical movement requires less expenditure of energy than an arhythmical one. In a general way, this fact has long been known in practice—as witness the team work of sailors in the days when anchors were weighed by means of capstan-bars, or sails trimmed by hauling upon ropes. In cases like these the rhythms were fixed and accentuated by song. Even in breaking up the concrete foundation of a road by the old and laborious method of driving steel wedges into it with sledge-hammers, one may observe a rhythmical sequence in the actions of the men who wield them.

It may be said that rhythmical movements enhance the pleasurable feelings, and so advance the smooth output of energy by the heightened general tone due to emotion. Dancing—though other factors largely enter into this—is an instance in point. But, in any case, rhythms are evidently more easy of execution, whether they are natural or learned, than broken, jerky and interrupted movements.

Rhythm plays a large part, as is well known, in all skilled sports, such as golfing, skating, and the like.

It is also now realised, from the scientific point of view, how important a factor it is in manual work. This is admirably illustrated by the study of chronocyclegrams, in which progressive advance in learning from clumsiness—in which much energy is vainly spent—to skill—in which it is economised—accompanies the acquisition of rhythmical continuity in the operation studied.

Much more investigation than has so far been carried out with regard to these problems of the factors involved in the economising of bodily and mental energy is obviously needed. If it is true that we cannot apply the results obtained from research in one industry to another industry unless these industries resemble each other almost to the point of identity, it is clear that there is an enormous field still open to the exploration of the industrial psychologist. Nevertheless the progress already made, and the facts definitely ascertained, justify the largest hopes. Money which has been spent by employers in having investigations carried out has proved to be money well spent. But it has not merely increased output. It has improved the conditions of the employees as well. In increasing profits, it has lessened drains on energy. In the cases in which the results of special investigations have been applied in practice, decrease in wastage of both manual and mental power has been secured. There has been less emotional disturbance and conflict, less misunderstanding and dispute, and more contentment among the workers. For it has been in studying their interests that the best interests of the employers have been served. Further instances of this will be given in the next chapter. Here it is only necessary

to register the hope that more employers of skilled—and even of unskilled—labour, in view of the facts, will make increasing use of the "efficiency experts." At least some of the general principles by the application of which work may be furthered and economies in life may be secured are already sufficiently demonstrated to warrant their wider extension and use.

CHAPTER IV

FATIGUE

THE methods for securing economy in bodily energy already considered are also in a general way methods by which fatigue may be minimised; for fatigue is a symptom of over-expended energy. In so far as this is true, fatigue is no necessary sign of waste; since it may appear in no matter what way energy is used. We may become tired when all our energy is used economically in our work just as easily as when some of it only is used in the work and some of it dissipated.

Fatigue is a natural indication of the coming into play of a general tendency towards inactivity. It is aroused whenever there is a biological need for economy of effort. Just as there is in us a natural tendency towards activity, expressed in "play" or in "work"—a tendency to "do something" when we are feeling fit and buoyant, and so work off surplus energy—so there is this natural counter-tendency to save, manifested in fatigue, when our surplus energy is used up. The interplay of these two tendencies is interesting.

During the first few years of life, the activity principle shows itself in various forms of solitary "play," or activity which is satisfying on its own account. This is seen, for example, in the squirming and kicking of an energetic baby, the putting of its fingers in its mouth, the drumming on the table with a spoon, or dropping this again and again upon the

floor, to be again and again picked up for it. This last " game " takes at least two people to play ; but it is closely allied to the solitary " games " with which the infant amuses itself. All these and many similar performances may be observed in any healthy, well-nourished, and well-rested baby. Originally, all the movements which come to be combined in play were random ones. But some of these become chosen out and repeated with evident enjoyment. And it is clear that from the chance and random achievements of the child learned actions come to crystallise. When the baby, having thus played for a time—during which it has been steadily acquiring co-ordinated higher-unit movements which will serve it in later life—is tired, it sleeps. But from these play movements in which it becomes exercised grow the work habits of the adult. They become serviceable to him when, instead of carrying them out for their own sake, he utilises them in following up and obtaining his desired ends. They are no longer then ends in themselves, but means to further ends.

Of course the adult may, and even, to economise effectively, must, play also. " All work and no play makes Jack a dull boy " is a thoroughly sound principle. But this need not be considered here, as a later chapter will be specially devoted to it.

Very beautiful examples of the activity principle spurring on to play in which useful accomplishments are acquired for adult life are to be seen in the gambollings of young animals, such as kittens or puppies. The stalking prowl of the kitten, the intent gaze, the baring of claws, and sallies and pounces, are play activities which later on become serious means towards

catching the mouse or bird. The amicable quarrelling of the puppies, their mad races one after the other, their mock bitings and worryings, are the patterns of their adult fighting and hunting proclivities.

The general activity principle thus exemplified has its counter-principle, as has been said, in inactivity or inertia. A law of fatigue operates against the law of facilitation. In virtue of the latter, any mental event or bodily performance once it has occurred tends to occur again the more easily ; while in virtue of the law of fatigue, its prior occurrence produces a tendency in just the opposite direction. It occurs the less easily because it has occurred before. Accordingly, while by properly exercised repetition—either of mental items (as in memorising or learning by heart) or of physical actions (as in accustoming ourselves to hold a knife and fork or to ride a bicycle)—we acquire information and learn how to do things ; by too long-sustained repetition we become fatigued, and in the end unable to memorise any more, or to perform any action at all. Indeed, such fatigue will tend to make us forget what we have already learned.

This, of course, is the last limit of fatigue, which, as we shall see, for reasons to be considered later, is hardly ever reached. But the fatigue principle operates in some degree against the activity principle from the outset ; and we shall also see how it contributes together with the activity principle in raising and lowering the amount of output.

If fatigue, then, is a general symptom of over-expenditure, it will be possible to evaluate wastage of energy against the bad results obtained which are

due to it.[1] And, further, any methods of reducing fatigue—provided the results obtained are not diminished, but possibly even are increased, in quality and quantity—will also be energy-saving methods, and thereby in the long run economical of life.

Such methods have been widely and scientifically studied; and their introduction into various forms of industry has been remarkably successful. While it is not claimed that the results of experiment in this field are exhaustive any more than are those of motion study, still here, as there, definite general principles of economy can be laid down. By adaptation to the special circumstances and needs of any given industrial occupation, these can make for greater output, higher wages, shortened hours of work, less expenditure of energy, with consequent improved health and greater enjoyment of life.

In a book of this kind it is hardly necessary to treat at length of the physiological and psychological causes of fatigue, though they may be very briefly stated.

On the physiological side, fatigue has been held to be the result of the excessive using up of the fuel which is consumed in all muscular activity. This fuel has to be restored by the organism during its rest periods.

Another view is that fatigue is caused by the accumulation within the muscles of chemical waste products (lactic acid, carbon dioxide, etc.) of their own activity. These waste products, until they are dissipated, act as poisons which progressively hinder further muscle contraction.

Yet a third theory consists in the explanation that

[1] This is not an absolute measure; since fatigue does not *at once* affect output by diminishing it.

fatigue really comes from a nerve inhibition which is set up in the spinal cord by the contraction of the muscles. When any muscle, or group of muscles, is voluntarily contracted, this contraction is brought about by nerve impulses passing down to it from the central nervous system through the end plates in which the nerve fibres terminate. These end plates are liable to fatigue before the muscular tissue itself is, and their fatigue constitutes a safeguard against the absolute fatigue of the muscle. Further, in contracting under the influence of the outgoing nerve impulses from the brain, the muscle itself originates inward-going nerve impulses which make their way to the spinal cord. Here they stimulate nerve centres, the action of which is to impede or suppress any further outgoing impulses to the muscles. This nervous apparatus constitutes a further safeguard against the exhaustion both of end plates and muscle tissue. Clearly it does not indicate that the muscle itself is exhausted and incapable of further work. As a matter of fact, it can still contract under the influence of an external stimulus such as an electric current, or even at will when the amount of " work " it is required to do is lessened.

Physiological fatigue of this kind is a nervous phenomenon rather than a muscular one. It is caused essentially by the monotonous repetitions of the same muscular contractions rather than by any true using up of the muscular energy available.

We shall here anticipate a word on mental, as distinguished from bodily, fatigue. Physiologically, it may be considered to be connected with essentially similar nervous mechanisms to those sketched out above but on a higher level than that of the spinal cord.

If we give our concentrated attention to the performance of any mental task, such as adding up columns of figures, or crossing out the i's and t's in a page of printed letters in which the whole alphabet is irregularly mixed, we find at the outset that we are wholly concentrated on our task. Irrelevant thoughts do not come to mind. They are impeded or suppressed, just as in physical work other muscular contractions are at first suppressed, by the task in hand. But as we go on, monotonously repeating the same mental operation, other ideas and thoughts tend to force themselves with greater and greater insistence upon us. We become distracted in our work, and perform it with less speed and exactness. At last the irrelevant thoughts crowd in upon us so persistently that the task becomes well-nigh unendurable. We can conceive of nerve inhibitions occurring in the higher levels of the brain to account for this phenomenon, just as we account for " muscular " fatigue by inhibitions taking place in the nerve connections of the cord.

In both cases, however—that of repetitive muscular action as well as of mental—the efforts of attention made to overcome the growing resistance of fatigue is what we experience as " boredom." We become bored and tired of our work before we actually break down at it; and this boredom is a psychological danger-signal of the onset of mental fatigue, just as the heat, cold, or pain sensations coming to us from the skin are warning signals of the approach of danger from our external environment. When the point of psychological fatigue is reached, a breakdown occurs. Mental exhaustion has reached its limit. Sheer muscular

fatigue does not often lead to such an absolute breakdown.

We have to consider the question of physical and mental fatigue from the point of view of vital economy. From this point of view, even when the fatigue might occur as a direct result of energy wholly expended in the pursuit of a desired end, it would seem to be obvious that no immediate end can possibly be so desired or desirable as to lead us to risk an utter breakdown in seeking to attain it. As far as scientifically obtained results are available in the matter, however, we need not speculate at large, but keep to details. As in the case of motion-study, our results will be confined to a few of the investigations of fatigue, carried out in the actual conditions of industrial life as well as in the laboratory.

We may take it theoretically, as has been hinted, that fatigue can be measured directly by the reduction in output which it causes. But there are so many factors other than fatigue involved in output that any direct practical measure is scarcely possible; and, at any rate in the present state of our knowledge, is not possible at all. For example, the nervous irritability often aroused by the oncoming of fatigue may be the cause of increased and better work rather than of a decrease either of its quality or quantity. "Spurts" in output also not infrequently occur even when fatigue—as towards the end of the working day—may be presumed to be at one of its highest points. Interest in the work being done, as we shall see, also tends to ward off, and even to dispel, fatigue. In consequence of these, as well as of many other factors, if we plot out in a curve the records of output taken at

different times during the working day or week, the precise amount of fall or rise in the curve at any given moment that is directly due to fatigue will be masked by other influences. Nevertheless, though we may not be able accurately to disentangle these, fatigue has as a matter of fact been lessened by the adoption of appropriate measures suggested by its study in industrial work.

One of the principal problems that has been attacked with regard to the question of fatigue is that which has to do with rest-pauses interposed in the normal course of the working day. This problem has been investigated in the psychological laboratory as well as in the factory; and, in general, the introduction of rest-pauses has been proved always to be greatly beneficial.

Though such rest-pauses do certainly make for economy of energy, however, it is obvious that the number, length, and relation of these pauses to the spells of work must vary from one occupation to another. Each industry or employment must, here again, be investigated on its own account. No hard-and-fast rule can be laid down as to precisely how we are to apply the information gained in the investigation of one kind of industrial occupation to another.

But when a research into the conditions of any particular kind of industry is made, and the effect of practice, "warming up to the work," "settling down to it," "spurts," and the like allowed for, the optimal duration and incidence of rest-pauses can be determined with great exactness for the majority [1] of workers in that industry. And in any case, since the general

[1] On the assumption that they tend to be closely grouped about an "average."

principle of the elimination of fatigue by the introduction of these pauses is already scientifically established, we are to consider it as effectually conducing to economy in life. Accordingly, where we are at liberty to apply it in our own individual cases, we shall gain by its application. It is a principle of leisure in work; but leisure which is properly distributed with regard to the work—a scientific formulation of the common adage "The more haste, the less speed."

A few examples will illustrate the bearing of this principle, with regard to which we must not forget the distinction drawn above between sheer physical and mental, or psychological, fatigue. In carrying heavy loads many different methods are possible; and some of these have been investigated with respect to the physiological cost entailed by the Industrial Fatigue Research Board.[1] The particular weight-carrying methods commonly used do not greatly concern us here; but the general conclusion is of interest. "The continuous carrying of a load exceeding 35 per cent. of body weight, if so disposed as to disturb normal poise and movement, is likely to cause rapid impairment of working capacity"; in other words, fatigue and wasteful expenditure.

Not only is this so, but in an older investigation it was ascertained that in carrying heavy weights to be loaded in trucks, a very great increase in the amount of work done, involving no increase in muscular fatigue, was secured by actually carrying the weights for a seven-minutes period, and then resting for ten. The labourers studied in this case were picked men;

[1] Report No. 29.

they had had instructions as to how to lift, shoulder, and carry the weights ; and the result of interpolating the ten-minutes rest-pauses was to increase the amount of work actually performed by some 300 per cent. This method enabled the men substantially to increase their wages, and at the same time was of very great pecuniary advantage to their employer. The converse would, of course, within limits, hold good. With roughly about a fourth of the expenditure of energy (or of time), the labourers could have carried out the original amount of work.

Conclusions similar to the above have recently been established by laboratory experiments,[1] with the addition that, during the rest-pauses, change of posture should be secured. The experiments carried out consisted in pulling rhythmically against the spring of a balance fixed to the floor. It was found that, with rest-pauses during which the subjects of the experiments did nothing, but remained motionless, less total work was performed than when there were no pauses at all. But when in the periods of rest the subject " gently bent his shoulders back and moved his arms about, these changes of posture caused a tremendous reduction in the fatigue effect." We are justified, then, in drawing the further conclusion that, for this sort of work, not only rest-pauses, but even mere changes of posture during the performance of the work, may be of great service in securing economy of energy.

Even of greater importance is the introduction of pauses into periods of industrial occupation in which the muscular element is not necessarily the predominant one. Very many investigations have been

[1] I.F.R.B., Report No. 29.

carried out in this field with singularly unanimous results. One of the most recent of these, corroborating the previous ones, is set out in Report No. 32 of the Industrial Fatigue Research Board. The operations studied consisted in the folding of handkerchiefs, hand-ironing, and working stamping presses for the manufacture of cigarette-tin lids. These are not particularly laborious operations from the muscular point of view; but, while they involve some amount of muscular work, they are tedious, monotonous, and boring. They require a certain manipulative dexterity, a power of spatial judgment and endurance. The introduction of a ten-minutes rest about the middle of the spell of work was found to bring about an increase in the rate of working of from 1·5 to 8 per cent., both in the period following the rest and also in that preceding it. Except in the case of stamping out the tin lids during the afternoon shift, an increase in the total output of work was secured in all the performances as follows: handkerchief folding, 2·3 per cent.; ironing, 1·6 per cent.; stamping, 0·7 per cent. (this last in the morning shift). There was a notable reduction in the amount of time lost—wasted, in the usual way—while the spell of work was going on. And, finally, increased contentment and satisfaction were secured for the operators.

As this book makes no pretence of being a manual of industrial psychology, there is no necessity of going into the question here of methods of payment, time or piece, bonus, overtime, or the like. Where relevant as incentives to interest, which is one of the most important factors in the prevention of fatigue due to monotonous occupation, these will be touched on in their proper place. What concerns us here is that rest-

pauses in industrial, or manual, occupations, like "spacing-out" repetitions in learning,[1] make for elimination of fatigue, and consequently for saving of energy.

The rest-pauses we have just considered clearly constitute one way of shortening the actual number of hours of the working day, if even only by a small amount. The question of reduction of the length of the day as spent in periods of rest or of work has also to be considered. Shortening of the total length of the working day, like most of the other methods of economical production, has been investigated mainly from the point of view of the employer of labour, as affecting the output, and largely during the conditions of the War when the securing of the maximum possible results of labour was imperative. It has been definitely found that shortening the working day does not necessarily decrease production, but rather, in very many cases, has had the effect of increasing it.

What does this mean from the point of view we are taking as to the expenditure of energy and its wastage? To do more work in less time appears to indicate a greater spending; and so, indeed, it does if we take the "more work" merely into account. In the particular task performed each day more physical energy is clearly used up in proportion as more work is done. But this, provided it is not excessive, is not a matter of very great concern, as we have already seen. The actual physical fatigue, though it is not always so, may be negligible. What is, however, of enormous importance is that shortened hours of work, with equal or increased wages, is a desirable end at

[1] Cf. *Memory*, p. 94.

which to aim from the point of view of the employee. And, moreover, shortened hours, especially in routine or monotonous occupations, make for relief of psychological fatigue. This is important from every point of view. Above all, it secures a real and substantial economy of energy.

Many experimental researches have established and corroborated the principle that hours of work may often be shortened with a positive gain in output. There is obviously, however, a limit to the application of this principle; and the fact that it is applicable at all points only to the further fact that the original longer hours worked were not the best for the workers in the occupation concerned. Nevertheless, since the longer hours were fixed, not by any scientific principle, but by custom, tradition, and general economic factors which are essentially variable, it remains true that the working day in most industrial concerns can still often be reduced in length with advantage and profit.

This may be an industrial heresy; but it is certainly a scientific fact. Labour-saving devices in machinery and tools, though in the long run their introduction may justify itself a hundredfold, may mean a large initial outlay. Shortening the day of the workpeople may, unless conditions are carefully studied, prove a costly experiment. But, where machinery is antiquated or the day in fact too long, real saving may be effectuated by substituting new machinery for old and reducing the hours of the working day.

One or two examples will illustrate what has been said.

An investigation into the hourly output of a number of women workers, engaged during the War in a

particular operation connected with the turning of six-inch shells, gave the following results. Employed in two shifts of twelve hours each, as against three shifts of seven or eight hours, they showed that they were able to work at full output right up to the end of the shorter shift ; whereas this was not possible in the long shift of twelve hours. The average hourly output during the shorter shift was 8·7. That obtained during the longer was only 8·17.[1]

Another example is that of a factory in which the working hours were reduced several times. Beginning with ten and a half hours, they were lowered to ten, then to nine and a half, nine, and finally to eight and a half hours a day. The operators were paid the same wages throughout the experiment ; and the amount of work actually done, as measured by output, was found to have increased.

There is a very considerable amount of literature grown up around these and similar problems ; and experimental psychologists are paying continually greater attention to them. In this country the National Institute of Industrial Psychology has been founded with the aim (among others) of carrying out further research, and of applying the principles already known to the economic organisation of industries and businesses. And it has already realised this aim with conspicuous success, especially in so far as the human factor is involved in industry.

In all these applications of psychological principles to industry and commerce it is evident how great a saving of energy may be secured for the individual worker. This holds good in the conditions of organised

[1] I.F.R.B., Report No. 2.

industry, in which the principles are applied in the mass. But they are none the less applicable in the case of individuals engaged in the performance of any operation or task, even so simple as those of the minor details of housework, the writing of a manuscript, and the like. Tidiness, saving of unnecessary movement, making use of rest-pauses, shortening the working day, can be usefully applied by anyone to the work he has to do. He has only to make use of the principles, and try them out in his own case. For there can be a scientific way of managing one's household affairs, or of carrying out any seemingly simple and unscientific task, just as well as a bungling, wasteful, and unscientific one.

There are numbers of other factors which also make for economy of human energy in industry to which allusion only can be made here. These are, in the main, hygienic factors, over which the operatives in a factory and the individual workers in any occupation generally have little or no control. Lighting, heating, ventilation, a proper degree of humidity, and the like, come under this head. For these the reader may consult the works on Industrial Psychology.

But there is a further and most important factor which cannot be omitted. It is a psychological factor which has a decided bearing upon the fatigue arising from monotony of occupation, rather than from excessive muscular work. Such fatigue is known as boredom. It not only arises from work, however, but frequently also from the absence of occupation. We may be bored by doing nothing just as much as by monotonous repetition. We may be bored by play which has become work as well as by work itself.

The remedy here in all cases is interest ; to arouse an interest in something, on the one hand, and to do it ; or, on the other hand, to take an interest in the work we are doing. Interest in work can even be a joy, thus setting up an emotional mood in which the maximum is accomplished with the minimum expenditure of vital energy. Accordingly, the securing of interest is of prime importance for economy. The problem is : how is it to be secured ?

Interest consists in a feeling of worthwhileness ; and it is originally connected with our instinctive actions. We perceive the object of an instinct and have an impulse to act in some way in its regard. Thus the maternal instinct—to take an example—prompts the mother to fondle and care for her child. We have also this " worthwhile " feeling connected with the impulse which, if our action is thwarted, is transformed into a feeling of unsatisfyingness ; while, on the contrary, it becomes a feeling of satisfaction if the action is successful. This, if a summary, is a fairly simple account of the matter which is generally acceptable.

But human beings do not act entirely by instinct, though no doubt all their actions are fundamentally prompted by this. They act towards ends conceived and planned in the service of instinctive needs ; and the drive of their action is derived from the same source as that of the instincts themselves.

This will be clear if we examine a—much simplified —case. A basic tendency of life is expressed in self-preservation ; but this supposes the activity of other tendencies necessary to supply the needs of the organism. Hunger, for example, or thirst, is the expression of tendencies of this kind. Without food

and drink life is impossible. But food and drink are not always to hand. Accordingly, we find such further instinctive tendencies as those of curiosity, hunting, acquisitiveness, gregariousness, coming into play; and these, of which there are many instances throughout the animal kingdom, all help to secure the provision of food and other necessities for the life of the organism.

We may suppose the lion, driven by hunger, instinctively going in search of his prey and bringing the carcase back to his lair, thus providing food until what time it is eaten, and hunger again prompts a fresh hunting. Or we may likewise suppose the savage acting in similar circumstances in much the same way. Only in the case of the savage there is the added complication of behaviour in that he uses weapons artificially fashioned for his ends. He shows intelligence superadded upon instinct, and often guiding it.

The more complicated the conditions of human life become, the more does intelligence take charge of the instinctive tendencies, masking them, guiding their action into new and newer channels, and securing their primitive aim by more and more circuitous routes. At length, in a highly organised society such as that in which we live, it is often difficult to discover instinctive action in a pure state at all; and we find people labouring, and obliged to labour, in all sorts of ways, at all sorts of avocations and professions, in order indirectly to secure the means of livelihood which will satisfy their appetites and instinctive tendencies. This state of things, which is far removed from primitive conditions, is brought about by many influences; among which are the increased complexity of social relationships, the consequent division of

labour, and the various complications of production, distribution, and supply.

In this long process of development, however, interest, primitively connected with instinct, becomes in a derived form fixed to other than purely instinctive reactions. Frequently it fails to develop in connection with any given action; and even when present to a moderate extent may be destroyed by any monotony that induces boredom.

In such a case the remedy is to create an interest by relating the task with its significance in the mind of the worker. This really means to derive the interest from its original instinctive drive, and attach it to reactions which are no longer seen to be connected with instinct. The task, indeed, may be monotonous and dull; but it is never an isolated bit of work. Somehow and somewhere it fits in with other tasks, all of which conduce to a desirable and useful end, just as the worker himself is not an isolated unit but one individual related to all the others in the social community. The more the relations of this kind are understood, the more the employee will understand the employer and the employer the employee. The better the factory management, its problems and difficulties are known, the better the distributing organisation as well as the actual producing plant—in short, the whole industry and its personnel—is within the mental view of the workers, the more likely it is that even monotonous work will be accompanied by interest.

Over and above this, added incentives may also be found and attached to the work. The interest of co-operative profit-sharing or some form of co-partnership, co-management, or the like, deriving from other

instincts, may be allied to that of the derived interest itself with advantage. These may be mentioned, though it is outside the scope of this book to enlarge upon them. Such subjects may be found treated in works on Economics as well as Industrial Psychology.

The principle none the less stands that when boredom in any form of occupation arises, it can be relieved by interest either direct or derived. Where interest cannot be stimulated, some other form of occupation should be chosen, either as a purely temporary measure or, as we shall see in a subsequent chapter, as a permanent change of avocation.

CHAPTER V

WASTE IN MENTAL ENERGY

In the two previous chapters we have been chiefly concerned with wastage in bodily energy, with which we are all familiar. In the present chapter we have to consider mental energy, which is a less familiar concept to many of us; though, if we reflect that we are able to perform mental work, just as we are able to do physical tasks, its use is seen to be justified.

The output of mental energy, as far as the different processes of "knowing" are concerned, tends to be constant and limited. This may be inferred both from the fact that the span of consciousness[1] is limited in extent, and also from the further fact that the exercise of any one definite kind of cognitive process, or "knowing," impedes the simultaneous exercise of others. Thus, for example, there are various kinds of "knowing," such as perceiving, judging, remembering, and the like; and we cannot be intensely occupied in any one of these except at the expense of the rest.

The theory has been advanced, and supported with much experimental evidence,[2] that more than one kind of mental factor is involved in each of these different processes. It is maintained that there is, on the one

[1] Cf. p. 18.

[2] Spearman, *The Nature of Intelligence and the Principles of Cognition.*

hand, a single central or general energy concerned in all the processes of knowledge; while, on the other hand, there are separate "engines" in which this works, or "channels" through which it flows. The channels, or engines, in the theory, would account for the specific kinds of mental performance, while the energy itself explains how there can be any mental performance at all.

In the present chapter we need not so much concern ourselves with the special "engines" as with the general energy. Even in the supposition that there were special energies as well for each sort of performance, what has to be said here as to economy will equally well apply.

What mental energy may be in itself we do not know; but, then, neither do we know what any form of energy is. When a body is raised from the ground and supported above it, we say that it has potential energy, since it has the capacity of doing work. When the support is removed and it is falling, we say that it has actual energy. It is then doing work, and may be able to subserve our ends in doing work which we wish done. A charged accumulator similarly has potential energy, which becomes actual when it is discharging and lighting an electric lamp, or ringing a bell, or magnetising a bar of iron. But what these "energies" are we have no way of knowing. We do not know the nature of the "forces," such as gravity or electricity, which we postulate to explain the observed facts, though we give names to them. These are concepts which are useful for summarising facts: electricity for electrical phenomena, gravity for gravitational phenomena, and the like. The changes which take

place among these phenomena we call work done ; and we ascribe these changes to hypothetical " forces " as to agents which bring them about.

Concepts like these must have their origin somewhere in our own immediate experience. But we possess no immediate experience of gravity or electricity or such like forces. We must therefore look elsewhere for some immediate experience on which they can be supposed to be patterned. This experience can be no other than that of we ourselves doing work—we ourselves bringing about changes in the phenomena, the flow and interconnection of which constitutes consciousness.

Thus in two ways we reach the notion of mental energy, even if we do not and cannot know *what* it is. We form the concept from a direct experience of our own energising, and from the mental work which we do.

This mental work is readily distinguishable from bodily work, even though it may never in reality be separated from it. When we are adding up columns of figures, the addition is clearly mental, though the physical eye is concerned in seeing the figures, and we may at that same time be silently repeating them over to ourselves, and so making muscular movements of the organs of speech. When we are watching a football match, our understanding and appreciation of the play are mental, though we may, and often do, find ourselves making incipient movements in imitation of the players whom we are following with our eyes. In any case, it is to be presumed that physical changes of which we are not aware take place in the central nervous system while we are performing any mental operation whatever.

Mental output cannot, obviously, be registered without bodily movements of some kind—gesture, speech, writing ; and it may be that it never occurs without bodily changes. But it is not in itself bodily change. The train of logical thought which issues in the writing of a letter, or planning out a course of action, is clearly mental. Being work, it necessitates the concept of mental energy as the cause of that work.

We have seen that, at least in its cognitive aspect, mental energy is limited. But all forms of cognition—as perceiving, remembering, and so on—are the result of the application of our minds to the things known, or perceived, or remembered. This would seem to indicate that the energy of willing, if it is different from that of knowing, must be limited also. For wish as we will and try as we may, there are certain limits of knowledge at any given moment which we are unable to overpass ; just as there are limits of muscular endurance beyond which, by willing, we cannot go. Indeed, we might reasonably hold that the only form of mental energy at all lies in the will, taken in its broad sense as including all forms of conation or striving towards ends. And we shall see, when we come to deal with the emotions, that emotional wastage of energy—one of the most costly of all forms of waste—can also be referred to the will.

Mental energy then, whether it is to be conceived as being constituted of only one or of several forms, is to be regarded as something expended in doing mental work. According to the purpose at which we aim, any energy expended in some other way than that necessary for the fulfilling of our purpose is waste.

To economise here, like economising in our physical energy, is to economise vital force.

What has been said may, perhaps, be made clearer by a comparison of mental and bodily energy, work and achievement. When we contract a muscle or group of muscles in order to lift a weight, it is the latent energy of the single muscle or group that is principally expended. When exhausted, other muscles are still capable of doing work. No doubt, as we have seen, we must also conceive of nerve energy as being drained away in the process. Indeed, in one way or another the whole living physical organism is involved in the activity of any one of its parts.

With mental performances, however, if we take the view that there is a central fund of mental energy which may flow wholly or partially in different channels or work through various " engines," we must suppose that this becomes exhausted only by an overdrain upon it ; or that the failure of the performances in output (either in quantity or quality) is in some way connected with the working of the particular engines concerned with them. The former supposition can hardly be right if the total (cognitive) mental output is constant. If there is over-drainage, it must be due to an attempt to go beyond the normal output of the individual, an attempt to produce more than the available powers can effectuate. This brings us back to the notion that it may be the will rather than the understanding which becomes fatigued in our fruitless attempts to over-produce mentally. The tendency towards constancy of output might be forced ; and when forced might bring about mental exhaustion—though with no achievement of better results.

The question of the "engines" remains. Since these are essentially vital in character, and in no sense mere mechanical machines, they too may become fatigued, either by being pushed towards the limit of their working capacity or by monotonous repetition. The mental work-curves, like the muscular ones, show the effects of "warming up" to the work, of practice, and of fatigue; this last being betrayed by restricted output and increase of errors in whatever task is being performed.

There are many problems which suggest themselves in this connection, of which the final solution is not yet available. One of these is the question as to in how far fatigue induced by the carrying out of one kind of mental work extends to others. This is the converse problem to that of the benefiting of one mental process by the exercise of another; the problem, namely, of formal training. This question clearly has the greatest importance for the theory and practice of education, since its solution will determine how the learning of one subject affects the learning of another, and what subjects are mutually affected in this way.

Even if there is no over-drain upon the central mental energy, nor fatigue set up by the forced or protracted use of any particular one of the "engines," it is evident that there may yet be wastage of energy upon work performed which is not directly conducive to the end we have in view. For the principle that there is normally a tendency towards a constant output does not mean that the energy necessarily flows in any single given channel. Theoretically, it might be supposed to flow in one channel or in many. If it is

constant in amount and flows in one channel, then the amount of the particular kind of mental work done will be maximal. But, if it flows in many, it must be distributed amongst them all. In that case, each will only share in a part of it, and that part the more diminished as the channels are the more numerous. Accordingly, we must look upon the distribution of the central mental energy as an extremely important factor in the securing of mental economy. The amount which may flow in channels other than that leading to the end we have in view, the achievement at which we are aiming, is, for our purposes, wasted. No doubt it produces its effects ; but those effects are not being employed for the purpose in hand.

We may crudely illustrate what has been said by supposing a tank containing water at a constant pressure, with a pipe regularly draining the water away from it. This pipe leads to a receiving chamber from which there are many more drainage pipes, each capable of carrying all the water, and leading to turbines, so fitted with valves and cocks that one or several or all may be working at once. If one of these pipes only is carrying water, its turbine will be working to the limit of capacity of the motive power. But if the water is flowing through many pipes, their turbines will revolve only according to the quantity of water passing through them. The total output of work actually done by the turbines will always be the same whether one or many be working.

A practical illustration may be drawn from common experience. We all know that we can accomplish more in any mental task we have in hand by concentrating our attention upon it than by allowing ourselves

to be distracted. We cannot do several things at the same time, as, for instance, understand what we are reading and remember what we were doing yesterday. Distracted attention means loss of efficiency for any mental performance; and when the performance is undertaken in view of an end, it also spells wastage and failure in economy. There is nothing more familiar to us than wanting to get on with some mental task and being unable to keep our minds to it. Our thoughts wander, because other thoughts or things claim our attention, because we are tired of the work and bored, or for some other reason.

In all this it must not be forgotten that we can only speak of lack of economy in the use of mental energy which should be directed towards the end we have in view but is in reality diverted from it. For the tendency towards a constant output is realised whether we are aiming at definite ends or not. While we are awake, and to some extent also when we are asleep and dreaming, mental processes continue to go on; and we cannot speak of waste or of economy with regard to them. Like the water flowing over the stone ledges of the fall, the stream of consciousness flows on. From the point of view of desirable ends, in a sense they may be considered as waste. From the larger point of view of mind, as the fall from the larger point of view of Nature, there is no waste in them.

Bearing these general principles in mind, we shall consider some of the ways in which we may economise our mental energy, using it to the best advantage in the pursuit of the effects which we desire.

Here, again, we may begin with the principle of tidiness and order, which is even more important in

mental than it is, as we have already seen, in bodily economy. The mind in knowing, as we shall see, works principally in a way which may be said to exemplify logical rules.

One of the most important recent contributions to the science of Psychology has been the formulation of three principles of cognition, or "coming to know."[1] These may be stated as follows :

1. The mind tends to become aware of all experience through which the individual passes or lives.

2. The mind tends to become aware of the relations which obtain between the items of experience so known.

3. The mind tends to become aware of further items of knowledge, not necessarily given in experience at all, when it actually is aware of any one item of knowledge together with any one relation.

The proof of these basic principles is too detailed and intricate to be presented in a book of this kind, which aims at practice rather than theory. But sound theory is necessary, if practice is to be satisfactory, no less in Psychology than in any other applied science. If action, either physical or mental, is for life, truth is certainly a condition of useful or right action ; and truth here means no more than sound theoretical knowledge generalised from observed facts.

If we wish to save ourselves the trouble of walking from one corner of an open square to the opposite one round two sides of it, we walk across it diagonally. We know beforehand that this is the shortest way of reaching the goal because of the relation which obtains between the two sides of the square and the diagonal

[1] Spearman, *loc. cit.*

which together make a triangle. We need no mathematical proof, once we have seen the relation between the two sides and the diagonal, to know this. We observe the facts; we generalise if need be; and we act accordingly.

An illustration of the facts upon which the principles stated above are based, and embodying all three principles, may be found in one of the so-called Intelligence Tests, with regard to which a word may be anticipated here.

If a testee is required to complete such sentences as "White is to black as long is to . . . ," or "Fish is to water as bird is to . . . . . ," [1] he will probably give the words "short" and "air" as the most appropriate ones. We can trace the mental operations by means of which his selection of these words is made.

In the first place, in order to complete the sentences at all he must have understood the meanings of the words given him; that is to say, he must have experienced what "white," "black" and "long," "fish," "water" and "bird" *mean*. But the testee must further, if he is to be successful, also grasp the relation between "white" and "black" (opposition), and between "fish" and "water" (normal *habitat*), in order to apply these relations to "long" and to "bird." The examples given are taken from such familiar things that, in adult life, the relations here are simply recalled, and not newly discovered; but quite unfamiliar items may provide a basis for becoming aware of a relation between them. Herein is an illustration of the second principle. Lastly, the

[1] Cf. p. 109.

relation found in virtue of this second principle is applied to the items "long" and "bird," with the result that "short" and "air" are selected as the most appropriate to stand in the same relation to "long" or "bird" as "white" stands to "black" or "fish" to "water."

These principles of cognition, or knowing, have been stated and thus very briefly illustrated in order to show the immense importance of mental neatness or tidiness for the economising of mental energy. They are expressed as tendencies merely, since as a matter of fact the mind may not actually become aware of all the experience through which the individual passes. Indeed, it is safe to say that most of our experience at any given moment never comes to consciousness at all. Nor do we always in presence of items of knowledge become aware of the precise relations between them. Still less, by applying the relations we know to other terms, do we always reach new terms. We have tendencies to do all these things; but they cannot be expressed as more than tendencies. The normal adult human being is continually becoming aware of experiences, relations, and correlates, at least during his waking life; he is translating his tendencies into action. But he is not carrying out the mental processes connected with them with regard to all the material of known experience which he has at his disposal.

It is in respect of the second and third of these principles, but mainly in respect of the second, that mental tidiness, neatness, or order may be secured. The immense importance of grasping relations between items of knowledge can hardly be overstated.

Not only does it make for further progress in the way of reaching new items of knowledge; not only is it fundamental to the exact understanding of behaviour and language in any form; but, as we shall see, it is the most vital of all the factors which enter into what is popularly known as a "good" memory.

This last point is reserved for treatment in a special chapter.[1] In the meantime we may consider the second point very briefly—that, namely, of understanding human behaviour and language.

If there is one thing that saps mental energy, and, indeed, physical as well, it is emotional disturbance;[2] and this, in our intercourse with other people, arises in the main through misunderstanding either of their actions or of their words. But the meaning of the actions and words, as revealing the mind of the agent or speaker to the onlooker or listener, consists almost entirely of the relations between them. A jumbled string of unrelated words conveys no meaning, other than by way of symptom of a disordered mind; a set of random and incoherent actions is difficult, if not impossible, to interpret. (I except, of course, single words which are packed full of relational meaning, such as "Fool!" or "Liar!" as well as isolated actions, similarly full of relational meaning, such as a clenched fist brandished in one's face.)

Accordingly, to attempt to avoid misunderstandings we must have as exact as possible an appreciation of the niceties and shades of meaning, not only of words and gestures, but of the relations obtaining between them. And we must realise that such shades and niceties of meaning are not exactly the same for all

[1] Cf. Chapter VI. [2] Cf. Chapter IX.

minds, nor even for the same mind at different times. There is a certain elasticity of signification for which allowance must always be made. This must necessarily, in the avoidance of misunderstanding, also involve sympathy ; but the radical basis of misunderstandings, none the less, lies in the inexact apprehension of the meanings of gesture, word, and their relations, as these exist in the mind of the person between whom and ourselves misunderstandings arise. It may be impossible ever to be in so exact a touch with the mind of any other person as thoroughly to understand it ; but close approximation may certainly be made—especially if sympathy intervenes.

What has been said here also applies to the meanings of individual words—substantives, verbs, adjectives, and the like—which themselves mainly consist of relations notionally put together, and are formed in our minds on the plan of the actual concrete relation in which the objects, actions, or qualities they denote are found in experience.

Mental order or tidiness may be secured mainly by the possession of a fund of relations, sufficiently elastic to fit the various circumstances for which they may be required, yet sufficiently exact to meet all purposes of accuracy. For exact relations may always be used elastically ; whereas inexact ones are useless in any case.

We have seen that relations, in the first instance, can only be derived from the items of known experience. It is therefore of the first importance that they should be accurately so derived at the outset. And this can only be secured by careful and accurate observation of the objective terms which they relate. For many

relations admit of degrees. We may, for example, know the relation of likeness which obtains between two men in the vaguest possible way, as that they are two entities ; or, less vaguely, as that they are animals ; less vaguely still, as that they are animals having all the specific characteristics of man. These are all degrees of likeness. But the generic knowledge is superficial knowledge, and of very little use. The more specified does our knowledge become the more useful it is. We save ourselves an infinity of labour later on if we look to the foundations of our knowledge when we begin to build.

It is easier, perhaps, to illustrate all this by reference to the meanings of words which, as we have seen, imply systems of relations. Most of us have had the experience of discovering that words with which we were perfectly familiar—which we had ourselves used frequently, and perhaps for years—have for us had wrong or inexact meanings attached to them. We originally heard them used, or read them, in a context from which we guessed at their meaning, and guessed wrongly. We never took the trouble to ask, or look them up in a dictionary. And the wrongly constructed meanings persisted until we found they would not fit the words used in new contexts, or until we were covered with confusion as a result of using them incorrectly ourselves. I am, of course, not referring here to the commoner words of daily use. The relations in the meanings of these impose themselves upon us by the brute force of the frequency with which they are used in all sorts of contexts. But the more rarely used words are not in the same case ; and everyone can find instances in his own experience.

We should have saved ourselves the waste of energy involved in inexact thinking, and the embarrassment of inexact speaking or writing, had we taken the trouble to fix the meanings of our words with precision when we first used them, or at least to have corrected them according to their proper usage. What is true of words, moreover, is obviously true of thoughts, into which, and into the sequence of which, relations so essentially enter.

There would seem to be two types of mind in respect of this matter—the slovenly and the tidy. But the sloven in the long run suffers from his initial laziness ; and the neat and tidy mind continually economises at the expense of a little extra trouble taken at the outset.

If neatness and order in our mental furniture are essential to economy, how are we to set about acquiring them ? In much the same way as a sensible housewife puts order into a room and keeps it tidy. In much the same way as a man who plans to write a book makes notes beforehand on its subject-matter, and sorts them into groups under convenient headings. One of the ablest men of science known to the writer makes a practice of noting all the newly ascertained facts connected with his science, as he comes across them, on little squares of paper. These he collects and sorts out into packets, each having to do with some one point in which he is interested. The packets are then themselves sorted into an orderly arrangement in such a way that, when he is ready to write, his task is more than half done. This is a labour-saving device, like card-indexing, or the arranging of books on the shelves of a library according to their subject-

matter. It not only embodies neatness; it makes also for precision. And, further, it secures that nothing should be overlooked or forgotten. The muddled and disorderly mind forgets much which it has to relearn; it recalls useless things, and remembers with difficulty. But this may sometimes also be a defect of tidy minds as well. Even Darwin, we are told, made a practice of noting in writing any facts which apparently went counter to his theory of evolution, and any criticisms of it which seemed to have weight. But this was because experience had taught him that it is easy to forget what one would rather not remember. None the less, even so orderly a mind as his found a value in making notes. And notes *can* be made mentally as well as on paper.

It may not, at first sight, be apparent in what way such examples help us to realise how we may achieve mental tidiness and order. It must be pointed out that the mind works most naturally in the way of storing up like items, related things, together; and that we already possess this natural basis of order within us. More than this, the mind tends to classify, on the basis of relations, all its experiences, in much the same way as we classify intentionally, as in the examples given. A slight acquaintance with what is known as the "Free Association" test shows us this.

Let a person be shown words in a list, one after another, with the instruction that he is to respond as quickly as possible to the meaning of each word with the first word that comes into his head. It is found that for the great majority of people, and for most common words, the replies will be for the most part alike. Thus let the reader suppose a list of words like

the following, and make his own replies to the words given.

Long.
Day.
Nose.
Lion.
Father.
Seven.
Chair.
Lock.

He will find that, in every case, there is some easily discoverable relation between each word in the list and his reply. There is a principle of association working naturally in his mind, in virtue of which meanings (for the sound or sight of the mere word is of little account save as a meaning-carrier) are grouped together in an orderly way. To secure the best and most economic results from the working of this principle, it is only necessary to take note of the relations which actually do hold between meanings, and by careful and repeated noting to allow these to become uppermost in one's mind. As one of the early psychologists taught, the meanings or ideas become grouped together, the like with the like—and, it may be added, the unlike with the unlike, the part with whole, and in a variety of other ways. By attending to our ideas, or seriously applying our minds to meanings, we cause them not only to become fixed in themselves, but fixed also in relation one with another, in such a way that they are quite comparable to the little packets of notes to which reference was made in the illustration given above. They come to cohere

together, and yet they remain available for use singly ; just as the notes are arranged in closely allied sequences, and yet admit of being taken out of their packets and used one by one. Like the notes, further, the ideas can, if necessary, be rearranged in almost any order we please—provided a relational scheme runs through it.

With regard to the list of words given above the reader was given no instruction as to how he should reply, except that he was to answer with the word that first came into his head. If he had been told to reply with a word the meaning of which stood in some particular relation to that of the word given, he would have been able to do this equally well, provided the relation in question were applicable at all. Supposing he had been told to answer in each case with a word that meant a part of that which the given word signified, for example, he would more than likely have replied with such words as are in the following list.

Less long (cumbrous ; but the *meaning* is clear).
Hour.
Nostril.
Head, Mane, etc.
Hand, Arm, etc. ; Authority, Responsibility, etc.
Three, Four, etc.
Seat, Leg, etc.
Key hole.

On the whole, if the time taken in replying were accurately measured, it would be found shorter in the case of the second list than in that of the first. Controlled word-reactions, as they are called, are on the average shorter in time—and therefore inferentially

more easy—than free ones. The point made is that order, time-saving, and energy-saving are secured by the use of relations. This is in part due to the third principle of knowing stated above.[1] We tend to become aware of other items of knowledge when we are actually aware of any one item together with any relation. In free association *any* relation may come to function; in controlled reactions the relation is given beforehand.

We shall see in a subsequent chapter how these principles underlie all "improvement" in memory, and are at the basis of all the so-called practical memory-systems. It is sufficient here to note that they are of vital importance for the saving of mental energy. Just as the workman is saved useless labour by having his tools and materials placed in position ready to his hand and easily available, so the thinker is saved useless searching and endeavour by having his thoughts set in order and his ideas arranged in neat and tidy schemes. But in order to secure this end a certain amount of preliminary concentration upon our ideas is required. Such concentration is, indeed, a spending of mental energy, just as the pre-arrangement of the tools is a spending of physical energy; but, in both cases, the result is an economy in the long run.

From what has been said it might appear that one set out in childhood to stock one's mind with a certain amount of mental furniture in the way of ideas and their relations; and that, once so stocked, the available amount remained fixed and constant throughout life, to be used as occasion demanded. But this is clearly

[1] Cf. p. 67.

not the case. All through our conscious life what we have just designated as " furniture " is in a process of slow change. Our ideas become more—or perhaps less—precise ; the definite relations between them more, or less, exact. They require watching and reviewing if they are to remain serviceable to us ; for, like ourselves, they are living things, part of the living mind itself. And living things never remain crystallised and stationary, but necessarily grow or decay.

To be sure, the fact that we are able to recall them shows us that in some way past experiences are conserved in the mind ; and there are sound reasons for believing that no experience through which we have once lived, which we have once noted, has passed away without leaving some trace of its occurrence. But the " sound reasons " are mostly drawn from abnormal phenomena, such as those observed in certain pathological states and in hypnosis. And despite the enormous individual differences observed from one person to another in this matter, we have all of us ample personal experience of the fallibility of our power of recall, not only over long but often even over very short periods of our lives.

It is true that our more general ideas—the universal concepts or notions—together with the more generalised relations in the network of which they are bound, are all practically of a fixed and changeless kind. The notion of " being," for example, which is at the same time the broadest and most fundamental notion the mind possesses, is a case in point. It is a changeless notion, to which all ideas whatever can be referred. But as we descend from such a concept as this to the more determinate concepts like those of physical being,

animal, man, and the like, we achieve determination at the expense of rigidity. The more determinate a concept can be, the more fluid it may also be in any given mind.

Such concepts and relations none the less can without impropriety be designated as mental furniture; though we cannot be said so much to remember them as to employ them in carrying out our mental operations. As they are the instruments of all our subsequent knowledge, it is of the greatest importance for the sake of economy that they should be adequate instruments. They can be adequate only by being properly constructed and kept in working order.

CHAPTER VI

MEMORY

In the previous chapter we briefly touched upon Memory in connection with the principles of knowledge, and particularly with that one which has to do with originating knowledge from former knowledge and with recall.

When we come to consider memory more particularly, however, we find that here there are many devices, all founded upon scientifically established principles, by the use of which we may save ourselves great wastage of mental energy, and so economise. Undoubtedly, so far as knowing is concerned, and as far as at present has been ascertained, the most valuable of all the methods for securing mental economy may be practised here. Memory has had the advantage over the other forms of cognition of having been most carefully and scientifically studied for a considerable number of years. It should not astonish us that so early and so great attention at the hands of psychologists should have been given to it ; for a good memory is one of the greatest mental assets that a man can possess. So much in every way depends upon it for success in one's profession or business, that problems concerning memory were bound to be tackled as soon as Psychology had left the domain of Metaphysics and entered upon the path of the experimental sciences Urgent problems concerning education—

problems having to do with methods of teaching and learning—forced themselves to the front and clamoured for solution. And little by little, in the course of the investigations which were carried out, the faculty of memory came to be analysed and the most advantageous ways of employing it were discovered.

Most of us would say offhand that we know perfectly well what memory is; and that it needs no analysis. We remember things—people, facts, names, events, and the like. Our minds somehow go back to past experiences; and, though we know them to be past, we know them now in the present. But the problem of memory is not quite so simply disposed of as this. On slight inspection it breaks up into two problems —How do we memorise? and How do we remember? And these problems in their turn each break up into two more:—How do we retain experience after it has passed? and What are the conditions of retentivity? on the one hand; and, on the other, How do we recall past experience? and How do we know that it was ever in reality experienced?

The problem of memory is not, then, so simple a one as it at first sight might appear. Indeed, it bristles with theoretic difficulties, into which we need not at present enter.

We may, however, indicate the answers to the fourfold question into which the problem first breaks up.

There is no saying how, or in what form, we retain past experiences. We can only state the principle of Retentivity. The mind tends towards retaining any experience which has affected it. Having thought a thing, it tends to think it again. We know this principle only in its effects; it is because we think

things again that we suppose them to be somehow retained. It is consequently rather with the way in which experiences are revived, and the order of their preferential revival, than with the principle itself that psychologists are concerned.

The conditions of retentivity are no more than the conditions of learning, whether voluntary or involuntary. With these, in the main, the present section will be occupied.

We recall past experience always as a mental reaction to a present stimulus, exciting cause, or cue. This also will be considered.

Finally, recognition, and location of the object or experience remembered in a past time-perspective of our own, as far as it need concern us here is connected with the "feeling of familiarity." This arises as a part of the mental reaction to the object which is of the same order as that by which we originally responded to it.

Without memories not only should we be unable to deal with new and unfamiliar situations in which we find ourselves placed. We should not even be able to direct our actions easily and economically in situations precisely similar to those in which we have acted before. This is true not only of memories properly so called, but also of those physiological sequences of muscular movements which we call bodily habits, and are involved in all forms of dexterity and skill.

What is of greatest importance in this matter is clearly the ability to recall the past experiences which we need to serve as guides to present or future action. Such recall is dependent upon several factors, of which

the first and most fundamental is the native capacity of the individual for retention. It is, to say the least, extremely improbable that this can ever be improved in any way. It may alter with our age, or with health and sickness; but there seems to be no method by which we can voluntarily increase it.

Accordingly, whatever means we adopt for rendering memory more serviceable to us must be connected with other factors than retentivity itself. Such factors can be found in Association, in the providing of clues or cues for recall, and in methods of learning what we wish to remember.

With regard to the first of these, we have just seen that recall is a mental reaction prompted by a present stimulus. Suppose that you have memorised a list of words or set of verses. Provided it is retained, it can be recalled if the first few words of the list, or the first line of the verses, becomes mentally present. And this can happen if you hear or see them, or something connected with them, or even if you only think of the list or verses as a whole and vaguely.

Thus if you have the stimulus given you, "Say the multiplication table," you will have "twice one is two," and so on, come to mind. Or, if for any reason you have need to multiply eight by seven, and forget that the product is fifty-six, you will probably reach that sum by starting from "seven times seven is forty-nine," or some other point in the table. There are always cues for recall, provided they can be found. As we shall understand when we have examined the saving methods of memorising, the economical way to secure such cues is to create them while we are learning what we wish to remember.

The process may be illustrated by a very simple example. It is astonishing how easily simple commissions undertaken for others, such as posting a letter or giving a message, are forgotten. The writer once had occasion to undertake one such commission for a friend. He was asked to find out from one of his colleagues where a certain officer named Craig was to be found. The colleague's name was Poole; and the person for whom he was to make the enquiry was Miller. He would be seeing Poole in the ordinary course of events; but feared the commission might slip his memory. Accordingly, he simply repeated to himself in order the names Poole, Miller, Cra(i)g; and thus secured both the association of ideas and the occurrence of the necessary cue which would enable him to carry out his friend's request. This particular association was formed some eight years back; it is as strong now as it ever was, and probably will come to mind whenever the subject of the association of ideas is thought of throughout his life!

The reader will at once realise for himself the principle involved in such a labour-saving device, if he will take the trouble to repeat the three names over to himself aloud.

The provision of cues for recall is important; and a cue, or clue to that which we wish to remember, is no more than some idea, or thought, or thing which calls it up. Thus the thought of the multiplication table, or the sight of Poole, were cues to the recall of the table itself or of the commission to be done; and we secure the wished-for result by associating the cue with the matter to be remembered.

In general we may state the principle of Association,

which here assumes great importance, as a law in virtue of which any mentally apprehended items which have been experienced together in relation mutually tend to reinstate each other, if for any reason one of them again becomes present to the mind. We may neglect all other statements of the law in favour of this one; since the laws of revival of experience by reason of similarity and contrast are really not laws of *association* at all but laws of suggestion. The recall of like items experienced in the past is *suggested* by present items. Like or unlike items need not necessarily have been experienced together in order to be recalled. Moreover, spatial simultaneity is reducible to temporal contiguity.

Our cues, then, will be linked to the memories of which they are the clues by the bond of association. Cues and memories have been made to cohere; and, when the cues are given, the memories will tend to arise.

The word "tend" is used in this connection because sometimes, even when the cue is given, we cannot remember. It is a frequent occurrence to have a name "on the tip of the tongue" without being able to recall it at once, though it may come to us later on. We see a man whom we know quite well; but we cannot name him. The sight of him was the cue to the name, as to a great many other things about him; but the cue does not work.

Or, again, consider the child attempting to recite his well-learned poem before a—for him—unaccustomed audience. He begins, stammers a few words, repeats himself—and breaks down. He has not forgotten; but he cannot recall.

In the first case, we may perhaps explain the matter by saying that either the cue is not a sufficiently powerful one, or that it is a cue to several different things at the same time. These, competing among themselves for the available mental energy at the moment, cannot come to full consciousness, because there is not enough energy for each to do so. This sort of an occurrence is known as an "inhibition." If the presence of A tends to recall both B and C, it is possible that neither may come to mind.

In the case of the reciter, many influences unfavourable to recall are probably at work; among others certainly emotional disturbance and distraction. Here the available energy is drained away from the channel of remembering by the unfamiliar sight of the expectant audience which takes his mind from the words of the verses; and, still more, by the self-consciousness which overcomes him, and the emotional anxiety to acquit himself with credit.

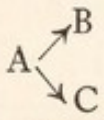
The story is told of the boy who moved up to the head of his class in repetitions by the simple expedient of playing with a button of his waistcoat while he was reciting his lessons. He lost his place when another boy cut the button off. The manipulation of the button had been the unconscious outlet of the emotion and excitement which would have interfered with his performance had it not thus smoothly and regularly been drained away, leaving his mind clear for the task in hand.

Difficulties of the kind mentioned above in the way of recall are obviously causes of great wastage of energy. There is no certain way of overcoming them all directly. But practical considerations call for some

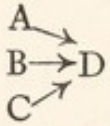
way of meeting them; and, indirectly, it is possible to do so.

Emotional difficulties will be considered in the chapter on emotional wastage. The best plan with regard to most of the others is to reinforce the cue which is already present by allowing all its allied circumstances to become operative with it. Thus, if the cue is the sight of the man whose name we seek, we may reinforce it with the sound of his voice, the memory of those in whose company we met him, his place of business, and the like. These all tend to act in a way precisely contrary to that of the divergent associations which cause the inhibitions. They bring the mechanism of convergent association into play.

The two processes may be illustrated by diagrams.



Divergent Association. A stands for a cue capable of recalling B *or* C. The arrows show the direction-tendencies of the cues, here expressing a sharing of energy *between* B and C.



Convergent Association. Here A stands for the sight of the person whose name—D—we are seeking, B stands for his voice, and C for his place of business. The arrows show the direction-tendencies of the cues; here expressing a summation of the energy of A, B, and C towards D, the wished-for name.

As to distraction, this can best be avoided not so much by efforts to overcome it at the time as by systematic will-training and the general cultivation of self-confidence.[1] Distraction is often no more

[1] Cf. Chapters X and XI.

than a habit of mind, or rather of the will, of which we can rid ourselves by implanting a contrary habit; though this is not always possible, for it may be temperamental. And the feeling of confidence and mastery is better brought about by a belief in one's own powers, based on the knowledge of success due to effectual purpose in the will, than in any other way.

Not infrequently, however, when other means fail, and our cues do not bring about recall, the best and only practical course to pursue, if we wish to secure economy, is not to attempt to force memory, but to wait. Leave the search for the name, the wanted quotation, the place where you saw the reference, and so on, alone, until the inhibitions or blockages have died down; and, as a rule, we know by experience, what is wanted just "comes into mind of itself."

The factors facilitating and impeding recall are too numerous and complicated to permit the setting out of any definite and clear-cut laws in their regard. Indeed, taken as a whole, we know very little about them. But such rough-and-ready rules as those suggested have proved to be useful, even if they are somewhat general and vague. It is worth while making use of anything that is capable of helping us to secure results in the easiest and most economical way.

What has been said with regard to the creation of cues for recall has already introduced us to the fundamental principle which underlies all learning. This is the principle of Association. Movements, by taking place together or in close sequence, become associated. Thus we learn to walk or swim, to knit or use a typewriter. And, as the associated movements are more frequently repeated, so do they tend

to become more closely linked together; until at length they grow to be so automatic as to be performed without attention, and with the least expense of mental, or indeed physical, energy.

Ideas also, by being grasped together in a single pulse of thought (which need not be an instantaneous occurrence), tend to become so linked one with another that if one of them, or an idea *like*[1] one of them, becomes present to the mind, the other tends to be thought as well. This is, as was seen, the law of Association baldly stated. But, if it holds good, it must be that all our ideas are linked together in this way—some perhaps with stronger bonds than others—all in the network of mental association. And, if this is so, how comes it that our minds are not one hopeless jumble of thoughts and ideas, each striving at the same moment for pre-eminence according to the working of the law?

Our minds are surely not like that; and there must be some reason for it. One of the principal reasons is to be found in the subsidiary laws of the preferential revival of experience. These, to a large extent at least, determine why one rather than another past experience is recalled.

Ordinary experience in memorising, as well as experimental investigation, make it plain that things *recently* learned (i.e. associated) have the advantage in recall.

So, again, in lists of meaningless words or nonsense syllables—with which much of the experimental work is done—as well as in sensible material, the first

[1] This includes suggestion by similarity in the statement of the law of Association. Cf. p. 85.

few words and the last have the advantage over those standing in the middle of the list.

So, again, as we have seen, convergent associations tend to determine those items which come to mind; while divergent associations tend to suppress others. Thus even the local environment in which we learn, our study place with its usual furniture, our habitual posture in learning, and very many similar details which are generally overlooked, may provide a host of convergent associations for the material we are memorising.

Another principle, still more important both for memorising and for recall, is what is known as mental attitude or "set." We "set" ourselves for learning, and thereby limit our consciousness to the matter in hand, keeping out irrelevant facts and details. The whole "memorising consciousness" is involved in the task, the factors of striving and feeling playing their part as well as that of knowing. It is often by recalling the attempt to learn or the feelings which accompanied it, that the learned material is itself recalled. This is true of things which we have consciously set ourselves to learn; it is true also of those which we have "learned" unwittingly. For example, if we are thinking generally about sport (mental attitude), the cue "rod" will probably evoke the thought of "line," rather than that of "pole" or "curtain"; and "hook" will evoke "bait" rather than "eye." And with these evocations more definite reminiscences of this or that fishing trip are likely to arise.

What has so far been said has to do with more or less mechanical factors in memorising. If we repeat

often enough a list of nonsense words, such as Rafec, Robud, Ferod, Mevoz, Petul, Digep, Goral, etc., in time we shall be able to recall them by rote; and the principles of Recency, Frequency, Primacy, etc., will come into play. But that, as a matter of fact, is not the way in which we actually do learn. Moreover, it would be a most uneconomical method of learning. Even with meaningless words we do not trust entirely to the mere force of repetition. On the contrary, we notice all sorts of facts and peculiarities about them while we are repeating them. We observe similarities between them and words which are meaningful (Robud—Rosebud; Ferod—Ferodo). We spot the same initial or terminal letter occurring in more than one of them (*R*afec—*R*obud; Petu*l*—Gora*l*). In other words, we are, even in learning "by rote" words like these, continually observing relations, or forcing relations, even far-fetched, between them. We group them together in spatial or temporal relationships, or by accenting their syllables we put similar or unlike rhythms into the list.

Precisely similar remarks might be made with regard to memorising *any sort* of material. When there is meaning, there are many more possible relations to be discovered. And, in principle, we group and recall scenes, events, and the like in exactly the same way.

These are not mere mechanical devices on our part. They are exceedingly active ones; though we may never have been taught them, or consciously have learned them for ourselves.

Nevertheless, it is in this, above all else, that the secret lies for true economy in memorising. By the

conscious application of this natural principle we shall secure better results with less expenditure of energy. Improvement in memory is in reality no more than improvement in our methods of memorising.

The first and most important of all things in this connection is that we should give our whole and undivided attentive observation to that which we wish to remember. This is an affair of the will. The will to remember secures the best possible conditions for memorising. For the lesson, facts, events, or what not to be remembered come to the highest degree of consciousness when attention is turned towards them ; and the more consciously anything is lived or realised, the more profoundly it is imprinted upon the memory. Moreover, in attentive observation the relations linking the various parts together stand out with greater clearness ; and it is chiefly by reason of our grasp of these relations, as we have seen, that the whole coheres together in such a way as to be more easy of recall.

In illustration of this most important principle we may consider the inaccuracy with which observed events are often reported. Take several witnesses of, say, a street accident and compare their reports of it even a short time only after its occurrence. They are, as a rule, highly discrepant, and both inaccurate. Such facts frequently come out in courts of law, and a very large number of experiments has been carried out to determine the fidelity of such reports, given even under oath. It has invariably been found that ordinary passive observation is not reliable. But if we wish to secure reliability, it is quite possible to do so by attentive and orderly observation, especially

if this is summed up at the time in language. Thus " the car was on the wrong side of the road ; the horn was not sounded as it neared the corner ; the pedestrian was looking in the wrong direction," etc. (It will be noticed that these are all statements of facts and relations.) The difficulties in the way of attentive and orderly observations are, here again, distraction and emotional disturbance. But these difficulties can be overcome by practice, and in the ways to which reference has been made above.

Next in order to this absolutely fundamental condition for memorising come a number of devices by means of which economical learning may be promoted. These devices are all results of exact experiment ; and, though they have been ascertained by working with nonsense words and logical material, they are applicable to all forms of mental learning whatever.

The first of these devices—which well may be called principles—is that an attempt at active recall, after a little learning, is far more advantageous for memory than the mere continuance of repetition in learning itself. The results of experiment in this matter are conclusive. The amount of repetition (as in learning a lesson) or of observation (as in attempting to fix a scene in memory) necessary before attempting the recall will doubtless vary from one person to another. Individual differences have to be reckoned with. But so soon as we feel that we have " got the hang " of the material, whatever it may be, we shall do well actively to try to reproduce it, checking our recall with the original when necessary, until learning is complete. In this way a very considerable economy in learning may be effected.

A second principle of economical learning lies in what is known as "spaced repetitions." We may learn a passage by repeating it again and again attentively until we can say it by heart; or we may learn it partially at one sitting, and later on learn it again. Of the two methods the latter, or "spaced repetition" method, is far the less costly to us. We save mental energy by using it.

The classical proof of the economical effect of spaced learning is found in work done with nonsense syllables. The following are the results of an investigation carried out some years ago. Sets of twelve nonsense syllables were repeated twenty-four times in all; but the number of repetitions for each set was distributed over different days according to the following table. The "scores" for recall of the learners are given in the columns; and it will be seen that the greatest score is made when the repetitions are most widely spaced. Similar work has also been done with sensible

	Score 1	Score 2
8 repetitions a day for 3 days . . .	18	7
6 " " " " 4 " . . .	39	31
2 " " " " 12 " . . .	53	55

material—prose or poetry—to be learned; and the same general advantage of "spaced out" over continuous learning has been established here. But, in this case, the meanings of the words and phrases link up together to form the comprehensive and global meaning of the whole which they together constitute; and around this global meaning the more particular ones come to cluster as round a central nucleus. Just as in forgetting the general meaning of a passage that has been learned is the last part of it to be lost, so in

learning it is the general notion which comes to be formed first. If by one or two readings we fix this in our minds, it forms the core or skeleton around which the whole, by subsequent readings, comes to grow up. The growth is even more apparent, and more economical, in this case than in that of the nonsense material which is learnt by rote memory; for the principle of the association of mental items by their relations has free play in this sort of "logical" learning, whereas in the other it has not.

A third principle of learning in an economical way has to do with the memorising of the material to be learned as a whole, rather than by splitting it up into parts and learning these separately. Experimental investigation has shown that, in general, there is a great advantage in "whole" learning, at any rate for sensible or logical material—except in the case of difficult passages.

For instance, in one case a comparison was made between learning 240 lines of poetry, 30 lines at a time (each day) and learning a similar whole (240 lines from the same poem) by reading it over 3 times a day. When the two passages could be recited equally well by heart, it was found that 12 days (or 431 minutes) had been taken to learn by the first, "partial," method, while only 10 days (348 minutes) had been necessary to learn by the second. In this case a saving of nearly a fifth of the time of learning was effected by the use of the "whole" method—an economy well worth securing.

Results of this kind have been reached by many like experiments, and the principle is well established; though apparently it does not hold good for all kinds

of material learned. Indeed, considerably more than one factor in memorising, but especially meaning and relations, are involved in the success of "whole" or global learning; and it is the combination of these factors to which the economical result is to be attributed.

Experiments in learning to thread mazes have resulted in different conclusions. Here "part" learning, not spaced out, has given the best results. But learning to trace mazes which are not seen is not a usual or practical procedure of ordinary life, and need not detain us here; though it does put us upon the track of a secondary device for economy. While global learning has been found to be on the whole advantageous, it has also been ascertained that breaking up the learning of the whole by short pauses between the parts is of use.

We may perhaps ask why global should have the advantage over partial learning. The answer lies in the character of the associations formed between the elements of the material to be learned. We have seen that these associations are strongest when they consist in relations perceived between the elements. Let us again take a concrete case in illustration—the case of the child making his public recitation.

He begins: "Casabianca! The boy stood on the burning deck—deck—deck; The boy stood on the burning deck"; and can get no further. He grows red and pale by turns, rubs his twitching hands on the seat of his breeches, and finally, perhaps, breaks down and gives up altogether. The statement which alone he was able to repeat was one complete in itself, with all its items and their relations. We may neglect the

emotional embarrassment of the situation, which is only increased by his inability to say more than one line, and ask why he could manage to say so much and no more. We shall find the answer in the way he learnt the poem. In learning it he had said the stanzas over line by line; and so had isolated each higher-unit or "structure" of meaning from the other rather than consolidated them together. The item "deck," followed by the beginning of the line, in "the boy," just as he had memorised them by repeating the line over and over again, tends merely to reinstate it when he attempts to recall, and not to carry his mind on to the qualifying phrase "whence all but he had fled" which follows it in the poem. The central meaning of the stanza, around which the subsidiary ones should have been grouped or "structured," is lacking. Each statement has become a solitary fact.

The main associations actually formed in his learning the poem may be symbolised thus:

$$\underleftarrow{A \rightarrow B \rightarrow C \rightarrow D \rightarrow E};\ \underleftarrow{F \rightarrow G \rightarrow H \rightarrow I \rightarrow J}$$

instead of, as they should economically have been:

$$\overbrace{A \rightarrow B \rightarrow C \rightarrow D \rightarrow E} \rightarrow \overbrace{F \rightarrow G \rightarrow H \rightarrow I \rightarrow J} \rightarrow,$$

(Subsidiary associations are not indicated in the diagrams).

where each item is linked by relations to all the other items, and groups of meanings to subsequent groups, within the global meaning of the whole.

To sum up, it may safely be said that, in general, the order and arrangement of the partial ideas around

the central one is of the highest importance for economical memorising. Most of the material we may be called upon to learn is already presented to us in a logical (i.e. relational) form and order. But, if not so presented, we ourselves by a careful analysis of it can impose an order upon it. And this is as true of isolated facts and situations which we wish to remember as it is of prose passages or verse. The all-important point is to seize clearly upon the relationships obtaining between the elements to be memorised, whether those relationships are grasped as being in themselves logical or merely sensorial. We may remember by picturing things together, one beside the other or one under another, as well as by thinking them as like each other or unlike, or being in some relation such as that of cause and effect.

The best proof of this for the reader will lie in his personal experience. If he will read through the two lists of words given below, attempting to see some relation between each pair in the first list, and paying no attention to relations between the pairs of the second, he will find that the second member of each pair is more easily and more correctly recalled when the first member is presented (read again) in the case of the first list than in that of the second.

He should just read the pairs of words in the first list through once carefully, and note the relations. Then, covering the words in the second column, he should attempt to recall them when he looks at those in the first column. Exactly the same procedure should be adopted with regard to the second list of paired words, with the exception that he should *not* seek to find relations between the pairs of words.

1st List		2nd List	
Thought	Seldom	Memory	Upright
Fire	Mouse	Storm	Horse
Oblong	Root	Formula	Frame
Statistic	Window	Circle	Leaf
Bread	Card-index	Pencil	Acre
Famous	Blotter	Tennis-court	Salt
Clarify	Shilling	History	Noose
Magic	Firefly	Glade	Aeroplane
Pipe	Telephone	Etheric	Gladiator
Onslaught	Mystery	Siphon	Coal

Lest it should be thought that the first list is easier to learn in itself than the second, the reader may reverse the order, learning list 2 in one reading while paying attention to the relationships between the pairs of words, and list 1 without such attention. In any case, he will probably find it difficult *not* to be aware of some relation or other holding good between each of the pairs of both lists.

The foregoing are the most important of the scientifically established devices for economising energy in memory by the use of psychological principles in learning. These are at the basis of all the so-called "memory-systems" which have been put before the public.

There are also other general subsidiary devices, and devices for use on special occasions, into which it is not necessary to enter in a book of this kind. For instance, there is the factor of emotional feeling or setting which may facilitate association, and thereby recall, as in the case of actors entering into the emotions of the characters they portray upon the stage; the familiar surroundings by which, again, recall may be facilitated, and the like.

But all these, in principle, can be reduced to instances of the fundamental law of the observation, conscious or even marginal, of relations. This is in reality the golden rule of all learning. Though in special circumstances "partial" and "unspaced" learning may be preferable, in the vast majority of cases the learner cannot fail to secure large economies by attentively observing the relations and interrelations which obtain in the material, of whatever nature it may be, which he wishes to remember.

CHAPTER VII

MENTAL TESTS

THERE is no way in which wastage of energy, either mental or bodily, is so effectually secured as when it is continuous; a perpetual drain, even throughout life, on the resources of the individual. Such a state of affairs may come about when he is put into a situation or employment which is uncongenial and from which he cannot escape. Still more so is it the case when he is positively unfitted for the employment in question. The square peg in the round hole is proverbial. Yet in life there are many square pegs in holes they do not fit, because no one has taken the trouble to measure either the peg or the hole when fitting them together. To a large extent any hole that was handy was good enough for the peg; any peg that offered would do for the hole. The theory—if any theory lay behind it—was that most people can turn their hand to anything; it was only the glaring exceptions that need be excluded from the common supply of labour and the special exigencies of demand. It was not realised that all-round average men and women do not exist; or that individuals by their different individual aptitudes were fitted for different life-tasks. Or, if this was realised, it was in a cast-iron sort of way; and the divisions of the measure applied to the aptitudes were so gross that pegs and holes seldom, unless by mere chance, fitted nicely.

Of recent years, however, psychologists have paid very great attention to the measuring of the various aspects of mind, and to the construction of scales by means of which the mental powers of different individuals may be estimated and compared. This work has been attended with an extraordinary degree of success; and so fruitful has it already proved to be in practice that there is undoubtedly a brilliant future in store for this branch of the science.

"Mental testing," by which the ratings of individuals according to the different mental powers investigated are ascertained, is in reality no altogether new thing. In a gross and clumsy fashion estimates of mental power have been made from the very earliest times. One man is "bright" and another "dull"; one has a good memory, while another has a bad one; this one has exceptional keenness of vision or sharpness of hearing, that one is below the average in one or the other or both. But such estimates are at best rough-and-ready ones, suitable, perhaps, for their original purpose, but possessing little scientific accuracy. They gave impressions rather than exact measures; and impressions which were often misleading.

When psychologists began to aim at greater precision, however, simple tests came to be devised for determining the mental abilities of individuals. It was under the stress of practical needs that systematic scales of measurement came to be invented.

Some twenty-five years ago the educational authorities of Paris entrusted to Alfred Binet the task of attempting to find out the causes of backwardness in many of the schoolchildren of the municipality—

whether, for example, it was due to inattention or carelessness, or resulted from some genuine mental inability to keep pace in class with other children of the same age.

Binet and Simon—who became associated with him in this investigation—thus had to find a measure of the capacity of children, otherwise attentive, careful, and so on, to profit by the teaching which they received; and they cast about for a measure as little artificial as possible.

Now, all measures are to a very large extent arbitrary. To measure any given length, a length is necessary; but it may consist of units of any length you please—an inch, a foot, or a mile. So, to measure a weight, we make use of another weight—a gram, or a pound, or a ton—to balance it.

Obviously, measures of this kind are of no use in dealing with mental powers. We cannot use a foot-rule for "intelligence," or a set of scales and weights for "application." But, by taking sufficiently large numbers of children, we can find out what sort of mental tasks an "average" child of six or nine or twelve years old is capable of performing. And thus we can construct a scale by means of which we are able to measure the mentality ("intelligence") of any given child. No matter what his real (chronological) age may be as counted in years or months, his mental age will be equal to that of the "average" child whose mental tasks he can just perform. In making this scale, educational attainments, or information derived from schooling, were as far as possible left out of account. The tests devised to measure native capacity alone depended mainly—

in so far as they depended on information at all—on the ordinary knowledge which any child would acquire in the experience of everyday life.

The reader will see, from examples of the actual tests given, how they were conceived by their inventors. It will be remembered that the Binet-Simon tests were made for children.

Tests for "average" three-year-old children.

(1) Naming real objects (e.g. hair, nose, eyes).

(2) Memory for sentences up to six syllables, as: "It is cold and snowing." The average three-year-old cannot repeat a sentence of ten syllables, as: "His name is Jack. Oh, what a naughty boy!"

Tests for "average" seven-year-old children:

(1) Memory for five digits, as 4, 1, 0, 5, 3.

(2) Unfinished pictures. The child is shown four outline drawings of heads, lacking eye, mouth, nose, etc.; and is asked, "What is missing in that picture?" The test is passed if three out of four correct answers are given.

Tests for "average" twelve-year-old children.

(1) Memory for seven digits. To pass the test, one out of three trials must be correct.

(2) Problems such as the following:

(1) "Supply the missing word in this: A person who was walking in the woods in the park stopped in fright and ran to the nearest policeman, saying that she had just seen hanging from the branch of a tree a . . . ."

(2) "My neighbour has been having queer visitors: first a doctor, then a lawyer, then a priest. What's happening there?" (To pass, both problems must be solved.)

These tests may look as though they were entirely arbitrary, and even somewhat absurd. But they have been "tried out" on large numbers of children, and have thus been empirically standardised in such a way that the "average" child of any given age can just pass the test for that age. Children who can just pass the test of their real age are "average" children. Those who fail in it are "dull"; while those who pass tests of a higher age are "bright."

But even this is a gross classification. By dividing the mental age as found by the tests by the chronological age it is possible to get a finer measure. This is expressed by the "Intelligence Quotient"—I.Q.—of any given child (or adult) as a percentage. Any I.Q. below 100 indicates dullness in varying degrees; and all grades from the feeble-minded (I.Q. below 70) to very high-grade "intelligence" (the highest I.Q. observed yet is somewhere about 180) are indicated.

"Intelligence" tests like the foregoing involve the use of language, which it is sometimes desirable to eliminate. We cannot test the deaf, or foreigners who do not understand, by linguistic tests. Accordingly "performance tests," as they are called, have been devised, by means of which the "intelligence" of the testee can be measured equally well. Success in these performance tests involves exactly the same mental operations as those brought into play by the tests employing language; so that, whatever "intelligence" may be in itself, the same capacities are measured in the two cases.

The Binet-Simon tests have been revised and standardised several times, notably in America; but

in some one or other of their forms they are currently used for the diagnosis of mentality. Their principal application is found in the weeding out of the sub-normal from normal children in schools, so that they may be placed in special educational institutions; but the I.Q. of any person once found can be taken into account in the problem of individual vocational guidance, since it remains relatively stable up to the full development of mental maturity.[1]

Tests such as the foregoing, however, have the disadvantage of taking up a great deal of time in application. Each testee has to be examined separately by someone skilled in mental testing; and, as a rule, it is only doubtful cases brought forward by the teachers which ever meet the expert.

In certain cases such personal tests are necessary; but it is difficult, if not impossible, to administer them all round. Yet, as we have seen, a definite knowledge of the innate mental capacity of the individual is desirable, if we would fit him into his most advantageous place in life. Accordingly, psychologists have applied themselves to this problem also; and it has been found possible to devise series of tests for "intelligence" which can be applied to large numbers of individuals at the same time. These are known as "Group" tests; and, like those described above, they can be divided into two classes by which literates and illiterates respectively can be tested.

The first use of group tests for "intelligence" on a very large scale was made during the War, when they were employed to rate the mental capacity of recruits in the American Army. No less than nearly a million

[1] Cf. Chapter VIII.

and three-quarters of men were tested by the American psychologists in this way; as many as five hundred being put through the tests at a time.

The results of such wholesale "intelligence" testing were found to be of the highest practical value. Not only were the mentally unfit weeded out altogether, but the kind of employment for which each recruit was best fitted was also indicated. The men were drafted into groups according to their performances in the tests in such a way that individuals of relatively the same degree of "intelligence" could be brought together in the same regiments. Thus the backward and sluggish did not impede the brighter and brainier in their training. And, further, it was possible to select men of high "intelligence" for promotion to the rank of officers, or for special employment according to their several abilities.

The American Army tests—both the "Alpha" for those who could read and the "Beta" for those who could not—proved to be so great a success that the use of testing of a similar kind has come to be largely used in the United States in nearly every sphere of life, and particularly in schools and colleges. But not America only has made use of these methods of rating individuals by mental testing. Large numbers also have been tested for general mental ability in this country; and the results have been uniformly satisfactory and eminently practical. There is little doubt that the use of mental tests will be more and more extended as the immense importance of ascertaining the capacity of individuals for the various avocations of life comes to be realised. Here, if anywhere, will vital economy of a permanent kind come to be secured;

for there is as certainly an abundance of wastage of mental energy in attempting to perform a continuous task above one's power as there us in performing a too-easy one.

The more brilliant child, kept in a school grade too low for his real ability, wastes his time, and even deteriorates in the work he can easily do. The child in a class too advanced for his powers labours uneconomically to keep up with his class-mates. It is only the child whose work is fitted to his ability who truly economises. This is equally true in the school or workshop of life at large. If we can discover the amount of mental power available in each case, we can grade our individuals according to the occupations which require different degrees of mental ability.

All that has been said up to the present in this chapter has to do with the so-called "intelligence," or general mental ability, which the tests are supposed to measure. Nothing has been suggested as to the nature of "intelligence," except in so far as the use of inverted commas is intended to imply that there are large divergencies of opinion among psychologists in its regard. In a book of this kind it is not desirable to enter into a discussion of a matter which is so highly controverted, nor to elaborate what the author believes to be the most exact view. The problem is too abstract, and the evidence in favour of the view in question too involved, to allow of adequate treatment within the scope of a few paragraphs. It will, however, be of interest to indicate the nature of some of the tests employed in group testing, and to summarise the chief elementary mental processes which they are devised to measure.

The first of the American Army ("Alpha") tests is an instructions test. The testee is required to follow the instructions, which are given orally, by marking his booklet as he is bidden. Thus, he is told to make a cross in the first, and a figure 1 in the third, of five little circles printed in a row in his booklet; and so on through a number of similar tasks progressively increasing in difficulty.

A similar test was given in the Civil Service Examinations in this country. The following, which was not given orally, but in printed instructions, is taken from the 1920 Examination:

"Draw a continuous line passing under the first word in the following list, through the second, and over the third, and then repeat the operation when the words in the list are counted from the other end and the instructions *under* and *over* exchange places:

Head Cap Tree Box."

This sort of test involves the understanding of the instructions (the discovery of relations), remembering them, and carrying them out exactly (the finding of correlates, see p. 67).

Another test is that to which allusion has already been made, viz. that of finding analogies. In the "Alpha" series it is made a fool-proof test by limiting the possible responses of the testee to one out of four words given him as possible answers. Only one of these will fit the relation exactly; and the testee must choose that one and no other. In the original form of the test, or "Free Analogies," he may respond with any word whatsoever; and here, of course, ambiguities may arise. This is hardly possible in completing an analogy like the following: "Sailor is to Soldier

as Navy is to. . . ." But it is possible in "4 is to 16 as 5 is to . . ."; for here a right answer might be either 20 or 25.

Examples of the "Alpha" Analogies test are:

"Underline one of the words given in each case as the most correct response:

"Ear is to hear as eye is to—table . . . hand . . . see . . . play.

"Tears are to sorrow as laughter is to—joy . . . smile . . . girls . . . grin."

In this case it is obvious that, beyond the mere understanding of the meanings of the words, what is tested is the ability to perceive the relation between each pair of words given, and to apply it to the third word in such a way that it is seen to hold true also between this and the fourth. This is a further instance of the perceiving of relations and of correlate eduction.

A third test is that known as the "Opposites" test. In the "Alpha" tests it was given with the instruction:

"If two words of a pair mean the same or nearly the same, draw a line under same. If they mean the opposite or nearly the opposite, draw a line under opposite. If you cannot be sure, guess. Two samples are already marked as they should be.

"Samples:

"Good—Bad . . same—opposite.
Little—Small . . same—opposite."

The actual test consists in forty pairs of words becoming progressively more and more difficult, of which the testee has to decide whether their meanings

are the same or opposite. In this test, again, the elementary process involved is the perception of the relations of sameness (similarity) and opposition (dissimilarity) between the meanings of the words.

A further test in the " Alpha " series still again has to do with meanings and relations. In this test the testee is required to construct a meaningful sentence out of the words of a disarranged one, and to state whether it is true or false. Thus, always in increasing difficulty, sentences like the following are given :

" lions—strong—are . . . . . true false.

" not—eat—gunpowder—to—good—is . . . . . true false.

" repeated—call—human—for—courtesies—associations . . . . . true false."

Here again we see that the nature of the process tested consists in setting out the meanings in the form of relations between two terms ; as gunpowder—is not—good to eat ; i.e. " gunpowder " and " good to eat " are extracted from the jumble of words in the mixed sentence as two terms in the relation of incompatibility.

Another of the " Alpha " tests and one that generally proves of far greater difficulty has to do with the relations of numbers. Here is an example :

" Look at each row of numbers below, and on the two dotted lines write the two numbers that should come next.

" 9 1 7 1 5 1 ....
" 15 16 14 17 13 18 ....
" 3 4 6 9 13 18 ...."

In a test like this, the law of the progression of the

numbers must be found before the testee can complete the blanks; and that law can only be discovered by an inspection and comparison of pairs of relations. Thus, in the first example, the regularly decreasing proportions of 9, 7, and 5 to 1 are enough to indicate the law, and so provide the wanted relation by means of which the series may be continued according to the instructions. The relation between 9 and 1 is to the relation between 7 and 1 as that between 7 and 1 is to that between 5 and 1. They are similar relations; and the testee, having once grasped the similarity, can apply it to the term 5 to 1 with the resultant evocation of the correlate 3 to 1.

In the second example there is a double-patterned progression which can be grasped in a similar way and the blanks completed by 12 and 19.

The comprehension of the law in the third case is shown by the completion of the blanks with 24 and 31.

The ability to perceive such relations, simple or complex, together with the ability to apply them to new terms, is what the test measures.

Finally, we may consider another test which has been used in group testing for "intelligence"—that, namely, of "Absurdities." These involve the detection of relations which are incompatible. They were already used in the Binet Individual Tests for the tenth year of mental age. We find there, for example, "One day a man fell on his head off a bicycle and was instantly killed. He was taken to hospital and they say he will never get better." Apparently, at the twelfth year easy tests of this kind are always successfully passed. But they can be made so difficult that only a certain percentage of adults are able to pass

them. Thus, for instance, tests like the following were correctly done by less than 20 per cent. of adults.

"A man who bought a dog that had been advertised complained to the seller that the dog's legs were too short. The seller replied: 'They are long enough to reach the ground, aren't they? What more do you want?'"

"The horse obeys his master because his eyes magnify, so that his master seems to the horse to be much larger than the horse himself." In these "absurdities" the testee is required not only to recognise that they are absurd, but also to give the reason why.

To some people tests of this kind seem to make the whole practice of mental testing a rather silly game, quite unworthy of serious attention and of little use for estimating "intelligence." But, in principle, Absurdities tests, like any others used, can be reduced to the understanding of the meanings of the words and the grasping of the relations between them. Thus only can the "absurd" word or clause be seen to be irreconcilable with the rest of the sentence. It is like seeing that the substitution of an upside-down nose for the normal kind in the drawing of a human face, or replacing it with some other grotesque feature, is absurd.

Testing for general "intelligence" by linguistic methods is thus seen to be testing for mental ability of some kind, whether this be a single power entering into all kinds of performances, or a group of such powers more or less extended. As a matter of fact, one of the earliest conceptions of it—at any rate in connection with mental testing—was of a group of

such powers which was supposed to consist of Comprehension, Invention, Direction, and Censorship, whatever these rather vague terms may have signified. But more fruitful, at any rate for theory, is the conception of a general mental energy which is relatively constant for any given individual, yet which varies from one individual to another in the difference of amount or level to which it rises.

The tests evidently measure *something* which to a larger or lesser extent is involved in all mental performances that call for memory, understanding or insight, capacity to perceive relations between things, and to evolve further thoughts of things to which these relations may apply. In testing over all sorts of special ways in which these mental processes may be involved—as, for example, in seeing, hearing, tasting, and so on; in perceiving relations between weights lifted, and length of lines or angles seen or actively drawn; in remembering different kinds of material; in arithmetical or logical or musical skill, and the like —this *something* can be evaluated. For it is reasonable to hold that all the special aptitudes cancel each other out, if each is independent of the other, and a sufficiently large number of them is taken.

Whatever "intelligence," or general mental ability, may be in itself, we know what it is in its manifestations. We know, moreover, that it is an endowment which makes for efficiency in life. In popular terms, it may well be no more than capacity to learn, or to profit by experience, or to adapt oneself to novel situations. But these aptitudes are obviously of the greatest importance for practical affairs; and he who has a large endowment of them is fitted to succeed.

For certain avocations in life a high degree of this "intelligence" is absolutely necessary; and no one could hope to succeed in them without it. For others less is necessary. There are many occupations which can perfectly well be carried out with only a moderate degree of it. There are some, indeed, in which even the feeble-minded can excel. There is thus no reason why an "unintelligent" man should fail, provided he selects a life-task in keeping with his powers. Wastage is only inevitable when there are misfits; when an "intelligent" is put to a task demanding too little, or an "unintelligent" to a task demanding too much. In this matter, true economy consists in adapting mental capacity to the requirements of trade or profession; and waste of life-energy—not only for the moment, but even throughout the whole term of one's working life—is brought about by blunting fine instruments upon coarse tasks and attempting to use rough tools for delicate work.

It is difficult, and even perhaps impossible, for the individual who already finds himself settled in his life-work to make any change in his calling which will better accord with his native ability than the one in which he is placed; though in some cases even this will be found to be quite possible. Thus for the majority economy of this kind may be impracticable; and they must just go on earning their livelihood and aiming at their ideals as best they may. But it is high time that the consciousness of the community should become awake to the appalling wastage that is going on, and take means to remedy it. "Slow rises worth by poverty depressed."

In some measure this is already being done by

teachers and others who are interested in the after-welfare of the children committed to their charge. If the general public has not, many teachers have a proper appreciation of the value of mental tests. Psychological clinics and institutes—unfortunately to a very limited extent up to the present—also meet the need; and all the schemes of vocational guidance are heavily tribute to estimates of general mental ability. As we shall see in a subsequent chapter, special abilities are also of prime importance in the selection of any particular calling, as well as in the choosing of any individual for any particular kind of job. But general ability counts for so much, and the means of estimating it are so applicable and certain in their results, that with increasing knowledge of Psychology it becomes increasingly criminal to neglect it.

The hit-or-miss methods that we employ are wasteful in the extreme. Here is a lad or girl leaving school and embarking upon the affairs of life. Here happens to be an opening. Let him apply for it. Here is a man out of work. He has been a clerk or a coal-heaver. And here is a labour exchange with a number of vacancies for employees. Fit them as best can be, according to past employment and records of a necessarily vague and chancy value.

If every child of school-leaving age, and every man or woman seeking work, had a rating card at least for general mental ability, there would be some chance of securing economy both individual and public; for in the aggregate the individual economies in life-energy must tell weightily in the general interest.

That such a putting of scientific method into general practice might work out in limiting the scope

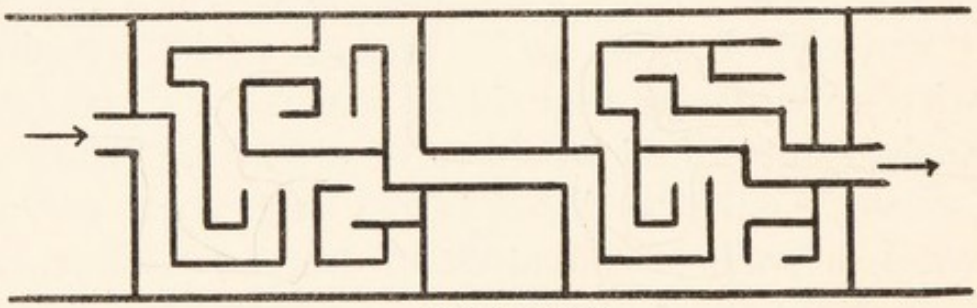
of action of any given individual to a few possible directions is no sound argument against it. For that individual's own interests are best secured by guiding him into a path that he can tread with ease, economy, and personal profit. Should his desires outpace his capacity, in no case could he honestly indulge in them. Such indulgence would always be at the expense of someone else. And should his capacity prove, after all, greater than the use to which it was put, there is far more chance that he could break the bounds of circumstance than that, having been rated too highly, he should be able to keep pace with his work.

These reflections are obviously concerned with the social aspect of economy in life-energy; but they have a no less obvious bearing upon individual economy as well. It is only by recognising that the two aspects of the question are not mutually incompatible, but complementary, that either will be secured. The individual has, no doubt, obligations towards the society of which he is a member, as well as rights in his own regard. But no less has the social organism duties towards its individual members. And the principal duty of all would seem to be that each one of them should be incorporated into itself to the greatest advantage and profit of everyone concerned. The promotion of life-economy for each is in reality secured by the advantage of all.

Little has been said as to the performance tests by which illiterates, and others who cannot for any reason do themselves justice in tests like those of the "Alpha" American Army test, are rated for "intelligence." The "Beta" tests, however, when examined with a view to discovering the basic mental

processes involved in their successful performance, show themselves to be modelled upon exactly the same plan, and in fact to measure precisely the same processes. In these tests, for instance, the testees had to trace their way with a pencil through simple mazes, to analyse the number of cubes shown in a printed perspective of cubes, to repeat patterns made up of simple figures, to substitute symbols which were given in a key for numbers, to compare pairs of numbers as to likeness or unlikeness, to supply features missing from pictures of familiar objects, to build up squares out of sections into which they had been cut, and the like. None of these performances can be successfully carried out unless the testee can grasp meanings, seize upon relations, and apply them to the matter in hand. In principle the " Beta " tests are exactly the same as the " Alpha."

Examples of some of these performance tests are given in the accompanying illustrations.

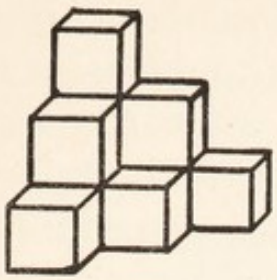


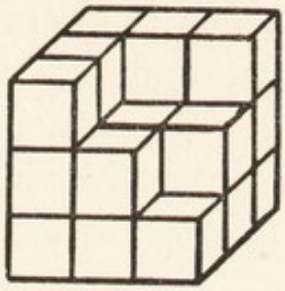
MAZE TEST.[1]

The testee is required to trace the shortest way through the maze.

All the tests without exception are " speed " tests. A strictly limited time is allowed for their performance.

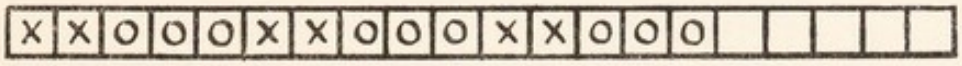
[1] I am indebted to the courtesy of Messrs. Henry Holt of New York and Messrs. Sidgwick & Jackson of London, for permission to use this and the following five illustrations from *Mental Tests in the American Army*, by Yoakum and Yerkes.

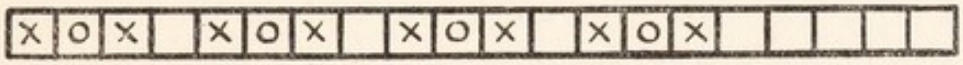




CUBE ANALYSIS TEST.

The testee is required to count the number of cubes in each case, and enter it in the squares shown below.





X–O SERIES TEST.

The testee is required to complete the patterns by filling in the blank squares.

62	62
59	56
327	327
249	249
1536	1536
3745	3745
45010	45001
62019	62019

NUMBER-CHECKING TEST.

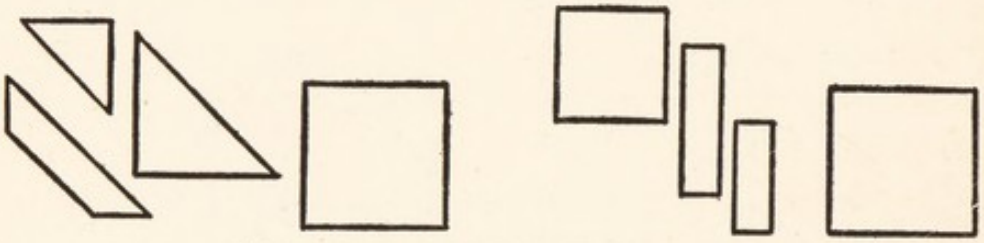
The testee is required to mark with a cross each pair of numbers which are the same.

To succeed in them the testee must show himself to be alert, and the mental process must move both quickly and accurately. These, after all, are only the ordinary requirements of success in using one's mind in every-day life. The whole procedure of the

PICTORIAL COMPLETION TEST.
The testee is required to supply the missing features.

tests, though apparently highly artificial, is in fact much more closely like that of the conditions of ordinary life than is commonly realised.

While an accurate measure of the general mental ability of any individual is a most desirable pre-



GEOMETRICAL CONSTRUCTION TEST.
The testee is required to draw lines in the squares on the right to show how they could be built up from the sections.

requisite for the selection of a calling which will be economical for him, there are special abilities or aptitudes also no less important to be considered. Poets, it is said, are born, not made; and popular usage allows us to speak of born musicians, mathematicians, statesmen, orators, and the like. There would seem to be no doubt that, either by a natural

bent or by an early acquired interest, different individuals do show aptitudes for different kinds of work. It would be a sheer waste not to make use of such aptitudes where it is possible to do so. With the possible exception of musicians (for music seems to be a very specialised and independent aptitude), most of the born great men combine in their greatness a considerable number of elementary aptitudes; and it is upon the combination of these that their conspicuous success to a large extent depends. Some method of testing should, accordingly, be employed to discover the presence of these elementary abilities. And in this matter of special as opposed to general mental ability very little is at present exactly known.

In the sphere of Industrial Psychology, as we have seen, considerable advances have been made in this direction; and methods of investigating abilities or aptitudes for trades, rather than for professions, have been devised. But the problem is not confined by any means to industry. It is an entirely general one. Accordingly, despite our lack of detailed knowledge, we shall say a word here upon the question of special aptitudes and the manner of discovering them in a general way, and reserve the consideration of vocational guidance and selection for the next chapter.

At the outset we must take warning from the conclusions established in general Psychology that special aptitudes are very narrowly limited in scope. It does not follow that because a person excels in the performance of some particular mental operation he will necessarily be good in some other, even in an apparently closely allied one. Nor does it follow, if we consider

capacity rather than aptitude—capacity being what the individual can do after having been trained—that we can predict success in what looks to be a very similar performance because of success in some other. The nature of any kind of mental work involved either in a trade or profession, accordingly, has to be very carefully analysed in order to find out what particular elementary mental processes are mostly required in it; and the individual has to be tested precisely for his ability to carry out the operations in which those processes are involved.

We saw in Chapter III how motion-study can result in the elimination of useless movements in the performance of work needing muscular dexterity; but that not everyone can profit by the "best way." It is quite possible to arrange tests for such physical dexterity as is required. The neatness and speed of the various elementary movements entering into any given piece of work can be estimated. Thus a means is at hand of finding out who can profit by the adoption of the "best way" in any industry. It is clear, moreover, that quickness of perception and emotional stability, as well as muscular co-ordination, are necessary endowments for the successful performance of certain tasks. These are purely mental endowments; but, as we shall see, tests have been devised for them.

Again, in some occupations the tendency to the repetition of a certain mental process or physical action ("Perseveration") is an advantage; in others it is a hindrance. In the flow of thought which marks the true orator, for example, the obsession of the mind by a stereotyped word or idea through-

out the discourse would mar the grace of his diction. Most of us, especially when fatigued, are liable to such effects of perseveration. We find ourselves using the same word again and again in speaking or writing. And we are all familiar with the "tune that rings in our ears," the "movements" we feel after a steamship voyage, or the monotonous thud of the wheels when a long train journey is over.

Some individuals are far more liable to this than others; and, whether perseveration be a general character of all mental process (which is more than probable) or extends only to certain kinds of operations, they can be tested for it with comparative ease.

The tendency towards repetition of mental processes and of movements is useful in employments of a routine nature, where the same action is performed over and over again; but it is clearly an impediment to good work where quick adaptation to a call for new movements is required. In this connection we might contrast the sluggish mind which can quite well succeed in a monotonous task—even though the actual muscular movements be rapid in the extreme—with that of a dexterous fencer parrying the quick thrusts of his adversary's foil.

Such instances are samples of the kind of distinctions which have to be drawn between individuals in estimating their abilities for the different callings in life. Individual differences in special aptitudes are no less important than differences in general "intelligence" in attempting to avoid misfits. Indeed, it has recently been stated[1] that every man

[1] By Spearman; Brit. Assoc., 1925.

and woman, with regard to such specific aptitudes, tends to be a genius in some directions and an idiot in others. Cases illustrative of this statement are not far to seek. There is the natural musical genius, for instance, who is a fool in the every-day affairs of life, or the (literally) semi-idiot who displays a phenomenal memory for certain classes of facts, or is able to manipulate numbers and dates with amazing exactness.

As has been said, the vast field of psychological investigation has hardly yet begun to be explored in all these directions. In actual practice, however, when a rating of any particular person for his suitability for a given employment has to be made, he is tested for general mental ability. Health, physical strength, education and the like are taken into account. He is then examined for such special aptitudes as sensory acuity, rote memory, speed of muscular reaction, adaptability, and so on. Many of the tests used will reveal ability—or the lack of it—which is required in more than one specialised walk in life. And still greater specialisation can be reached by further still more specialised tests. Thus what has already been scientifically established goes a long way to help him in the selection of a trade or profession in which he has every likelihood of success ; and at the same time to guide the employer in the choice of suitable candidates for any given employment.

It must not be thought, however, in dealing thus abstractly with the psychological factor of special abilities, that other and no less psychological elements in the problem of adapting individuals to their work are lost sight of.

The individual in search of a suitable calling is not merely a bundle of abilities for this or that kind of employment, but a *person* in the fullest sense of the word. In estimating his mental make-up with a view to vocational guidance, all the factors of his personality should be taken into account, and not merely his cognitive powers or executive aptitudes. His hopes and desires, his interests and emotions, his resolution and doggedness in sticking to things once undertaken—in a word, his balance, his whole temperament and character—have to be reckoned with. Even factors like those of his home, family history, and general social environment should not be left out of account, any more than the geographical distribution of supply and demand of special kinds of employment and special kinds of ability with which he will find himself in competition.

To make even any tentative estimate of all these factors is indeed a formidable task for the psychologist. Notwithstanding, however, his confessed ignorance in detail of much that is relevant, he is none the less better equipped for dealing with it than those who rely on the " chuck-and-chance-it " methods that are still in use.

To consider the principal topic of this chapter alone, he is, as we have seen, able to gauge " intelligence." By this means he can determine in general whether a lad or girl leaving school is likely to do better in the higher professional and administrative ranks, in the lower professional and executive employments, in the clerical and highly skilled callings, in the merely skilled and mechanically executive jobs, or finally in the ranks of unskilled labour. Having determined

this, he can predict the relative chances of success for any candidate for an occupation which depends mainly upon his head or his hands. Further, for certain classes of employment—especially of the industrial kind—he has certain ready-made tests to apply. Beyond this, he has to rely upon an intensive case-study of the individuals in question.

But these last belong more properly to problems of vocational selection; and accordingly will be treated in the next chapter.

CHAPTER VIII

VOCATIONAL GUIDANCE AND SELECTION

THE "intelligence" tests considered in the previous chapter do not measure any one particular and isolated capacity, which may be developed and improved by practice, but measure only the general mental ability of the testee. As we have seen, this native ability is an essential factor in all mental performances; without its possession, at least to some extent, no achievement whatever is possible. For some kinds of work a high degree of endowment is necessary. No one could hope to succeed conspicuously in the learned professions, for example, who was not well endowed with "intelligence." But, on the other hand, a very moderate degree is sufficient for certain other kinds of work. There are tasks, such as basket-making, or weaving, and the like which even the moderately feeble-minded can perfectly well perform.

The possession of great general mental ability, however, is of itself no guarantee of success in any given walk of life. Quite apart from other factors—such as emotionality, will-power, character, and that elusive quality called "personality," which make for success in any given calling—there are special factors which enter into the mental make-up by which the individual is suited for one kind of work rather than another.

If we knew the limits of the amount of "intelli-

gence" required for each kind of occupation—the limit falling below which the individual was bound to fail in it, and the upper limit rising beyond which he would be likely to become dissatisfied with it—other things being equal, we could, theoretically, prophesy his success or failure from the score he makes in the tests. Practically, however, we are only justified in regarding these limits from the point of view not of success but of failure. In the case of "intelligence" tests, just as in the case of any others which only measure one mental factor in the abstract, we cannot say more than that a high score is one of the requisites for success; but it is not the only one. Other things being equal, the individual who scores high in *any* test has a greater chance of succeeding in an employment requiring the possession of the ability tested than one who scores low. But, while we cannot safely prophesy success, we can certainly predict failure for any testee who fails to reach the lower limit; and, at least with regard to certain tests, we must consider also the possibility of failure for one who scores too high.

This consideration should be borne in mind throughout the present chapter, which has to do with special tests of vocational aptitudes. These special tests are used as supplementary to interviews in the selection of suitable applicants for the various trades and employments; as well as in advising individuals with regard to the choice of a vocation which will be suitable for them.

With vocational selection, which is in the main confined to trade and industry, we shall only have to do indirectly. It may be looked on as the converse of vocational guidance. The same factors enter into

both. The employer selects his men on the basis of their abilities or capacities to do the work for which he pays them. The man looking for employment selects his work, trade or profession, if he thinks about it at all, on a precisely similar basis. He believes that he has the aptitudes necessary for the work upon which he wishes to embark. The vocational counsellor, broadly acquainted with all the requirements of the different occupations, and skilled in assessing individual physical and mental traits, advises and guides by fitting the individual aptitudes to the vocational requirements. Whereas the employment manager has the advantage of the manufacturing concern or shop at heart, and can sometimes afford to risk wrong decisions in hiring his employees, neither the candidate for employment nor his adviser can take any risks when risks can be avoided. Here the individual himself and his life-economy are at stake. Within certain limits, employees in any business concern will "average up" so that its general economy is secured even at the risk of some mistakes in selection. No individual can "average" with himself; and any real individual economy must be a personal one.

This means no more than that the adaptation of the worker to the work is of great—and becomes increasingly of greater—importance, especially for the worker. The employer of labour wants suitable hands, and employs what he considers to be the best available. The labourer in any sphere whatever wants the best results, for himself, of his labour. Both are out for economy. But there is not—or, at any rate, there need not be—any incompatibility between the ends they each have in view. On the whole, the real

advantage of the employer depends upon that of the employee.

Conditions of life, however, have become so much more complicated and specialised with the differentiation of work that the choice of an employment or profession becomes increasingly more difficult, since the differentiation of specialised work has necessarily resulted in the differentiation of the highly specialised worker. The choice of a vocation has always been a serious matter; and these conditions have not tended to make it an easier one. Nevertheless, as a rule, and in a rough sort of way, the boy or girl leaving school, or the adult in search of employment, knows more or less what sort of work he wishes to undertake. He is influenced in his inclination towards some one or other particular profession or trade, and makes what we may call a preliminary selection of his own, on account of a variety of factors. The kind of work with which he is more or less familiar—that done by his parents or friends, for example—the existence of special kinds of employment near his home, his own particular interests, and the like, to a very large extent determine his choice. And, in the main, his own choice will probably be a fairly good one. Provided his inclination is based on any real knowledge of the occupation in question, it is likely enough to be justified in the event. Such knowledge can be picked up by personal experience of the work to be done, by the observation of others who are doing it, or by accurate information as to its possibilities and demands.

Very many occupations require a fairly similar mental equipment, within the range of which any

one of them can be successfully undertaken; and this makes it possible that the choice of one of them, even when its conditions are not fully known, will not be a bad one. But all occupations are certainly not in this case; and there is always the other possibility of becoming a "misfit." Personal inclination, especially if based on some sort of knowledge, may prove to be the best of all guides. But not every one is likely to have such an acquaintance with the conditions of the occupations available—still less an exact estimate of his own powers—as to make his personal inclination infallible.

The aim of vocational guidance is to help the individual to make his selection, as far as possible, on thoroughly scientific grounds. It must be confessed at the outset, however, that this aim has not yet been achieved. Vocational guidance is still in its infancy, and to a large extent necessarily empiric. It is an art rather than a science; and like other arts—the practice of medicine, for example—it has to make use of such scientific principles as are already established, and patiently carry out research towards the establishing of further ones. Its aim is to fit, not so much the workman to his work, as the person to a necessary part of his environment. And both person and environment are extremely complicated things.

Theoretically, it should be possible to obtain in detail a series of necessary qualifications, aptitude by aptitude, for any special kind of employment. Theoretically also, it should be possible to devise tests for each aptitude separately, so that any individual could be rated accordingly. If we knew

exactly the list of requirements, mental and physical, for every kind of occupation, and if we could assess individuals for these, we should be able to draw up a vocational "profile" for each vocation; and, by testing the individual for each necessary quality, we should be able to obtain an individual "profile" which could be compared with these until a more or less exact "fit" was obtained. In practice, however, we are not in a position to do this. No such vocational "profiles" are in existence; and tests for individuals according to all the capacities involved in different sorts of occupations have not yet been devised.

Within broad limits nevertheless, as we have seen, trades and professions overlap as far as the aptitudes required by them are taken into account. Thus, while it may be—and probably always will remain—impossible to advise on the basis of tests alone as to any particular calling which an individual should follow, to some extent even by tests it is quite possible to rule out a group or groups of trades and professions as unsuitable, and therefore uneconomical for any given individual, and to make a list of those in which he may have a tolerable chance of success.

But with regard to these latter not only "intelligence" and special aptitudes must be taken into account, but temperamental, emotional, and will qualities also. And exact tests for these are conspicuously lacking. This means that the vocational adviser must be a man of broad outlook and sympathy as well as possessing a detailed knowledge of the work he has to do.

His qualifications, in common with those of the

vocational selecter, are twofold. He must know the nature of the work about which he is going to advise; and he must know how to appraise individuals. But, in his case, he is not limited to one special kind of employment; he must have information about all. He has to advise as to individual fitness for vocations. In this way only can he help to effect any economy in the life-energy of the individual who is about to take up an employment. If he cannot secure this end, his claim to advise has no justification in fact.

Accordingly, he will have to possess a wide and detailed knowledge as to the physical and mental qualities demanded of workers in the various trades and professions. He should know as much about the occupational requirements of these as about the characters of the individuals whom he undertakes to counsel and guide.

On very broad lines, it is not difficult to indicate the sort of occupational knowledge he should possess. He must have a wide acquaintance with the actual conditions of the labour market, as well as be able to forecast its probable conditions with regard to supply and demand in the future. Other things being equal, it would obviously be unwise to advise a young man to take a situation in an overcrowded employment, or to spend a number of years in college preparing himself for a profession in which too many will be practising when he comes to qualify. Actual labour supply and demand is not difficult to ascertain. Future conditions such as will probably obtain in professions like medicine or law are at least to some extent predictable before-hand from the number of

students entering colleges and hospitals over a given number of years. Permanence of employment, either in industrial or professional occupations, is an important factor closely connected with the fore-going. Once embarked upon a skilled career, it is generally difficult, if not impossible, to change it for another. Scales of payment, or fees likely to be gained in any work, are of obvious importance; but not less so are the non-pecuniary advantages and disadvantages attaching to it. Mere financial gain is not always a substitute for loss in other directions. True economy must always be a matter of adjustment. The general opinion of those who are engaged in any profession or trade should therefore also be taken into account; their likes and dislikes with regard to it; what attracts them to it or repels them. The adviser should be able to set before the individuals consulting him all the pros and cons of any employment considered.

On the other hand, the mental and physical qualities required of anyone who is to undertake a life-calling with a chance of success, and not only the character of the employment, have to be taken into account, in his own interests. The vocational guide must have the individual "profile" always in mind; and this he will construct, partially by tests where these are available, but mainly by the interview.

The "interview" is a means of attempting to make an exact and deliberate estimate of people. Estimates, or judgments, of our fellows all of us are making continually in every-day life. All our behaviour in their regard depends upon such judgments, which are generally never formulated and are reached unconsciously, as a rule upon the most insufficient

evidence. Such spontaneous judgments, however, are necessary conditions of modern life, in which we may be called upon every day to do business with a number of people who are strangers to us. The man who is quick and accurate in summing up their moral and intellectual qualities is at an advantage compared with one who is not.

Casual and haphazard estimates of this sort, though we continually act upon them, are not the kind upon which we should rely when selecting employees for a job or candidates for an official post. First impressions mean much, for they have the field in the absence of competing ones ; and the " law of primacy " obtains here as elsewhere in Psychology. Even in the interview these first impressions count ; and the vocational guide, as well as the selecter, must make allowance for them, and discount them.

Deliberate estimates made in the interview, however, differ from these intuitive estimates. The interviewer definitely intends to assess the various traits of character of the person he is interviewing, one by one, on all the available evidence ; and of this evidence his own personal impression is only one factor. He has the previous record of the applicant, the opinions of others as shown by testimonials as to his character and ability, his own letters of application (at any rate in the case of applicants for posts), to help him. Further, he has the evidence of performance in tests, either of specific inborn capacity, or of ability, on which to form his matured judgment.

The estimate of the vocational guide is a deliberate one, based on all such available evidence. Nevertheless, as in the case of the employer or the board of

selection, he gives great weight to the interview. We may well enquire why this is so, since he can obtain exact evidence of the possession of the special knowledge required for any employment from examinations passed, of mental and manual skill from "performance" tests, and of general ability from "intelligence" tests. Furthermore, the confidential testimonial will give him as good evidence as is available with regard to the moral character of the individual whom he is assessing, this moral character being taken to include both emotional and will qualities.

Much experimental work has been done to determine precisely what *is* estimated in the interview; and the most satisfactory conclusion is that it is "those numerous elements"—of character—"which cannot be expressed in terms of examination value and concerning which the evidence of the testimonials is so unreliable." In other words, the interviewer appraises those subtle qualities which go to the making of what is called "personality."

The author of the research[1] from which the above quotation is taken lays down several conditions by the observance of which alone a satisfactory conclusion can be come to in an interview. The first is that the mark given for it should be the mean of the marks of several interviewers working independently. In other words, the joint conclusion of a board is more trustworthy than that of an individual. This is no doubt true; but it is often impracticable. The vocational guide works by himself. Provided he avoids the pitfalls of his work, and does not claim infallibility, he is not likely to make bad mistakes. In any case, he

[1] Magson, *How we Judge Intelligence*.

will point out the chances of failure rather than success; and help the person concerned to make up his own mind rather than attempt to make it up for him.

The second condition is that the interviewers should be trained for the work, skilled in introspection, and fully aware of the possibilities of error due to confluence. This condition, though it is the matured conclusion of a scientific research, is almost a truism. The vocational guide, like the physician, has to diagnose his cases; but his diagnosis has to do with far more complicated details than those of disease alone. He has to take the whole personality into account. And in this his judgment is as likely to be biassed by elements of his own psychology as of the psychology of the person he interviews. Thus he may be led astray by his own "conditioned reactions." It is well known that we tend to associate together physical and mental impressions which we have experienced. The appearance, for example, of a person whom we dislike on account of his meanness becomes for us part of that general whole which the person in question means to us; so that, when we see him, we see him as a mean man. This is our reaction to his appearance. And the law of suggestion by similarity brings it about that, when we see someone similar to him, we tend to see this person also as mean. There are innumerable cases of the operation of this law in every-day life. We meet people, and like or dislike them; we sum them up in respect of one or other mental quality, and pass judgment upon them, because of our previous experience of other people. Such "conditioned reactions" are built up in us from our earliest infancy.

It has been proved that a young child who would pet an animal without any sign of fear, would cry and avoid it after it had been shown while a loud noise was made behind the child. The child was instinctively afraid of the noise, not of the animal; but subsequent to its unpleasant experience, both animal and noise became one whole, and formed one situation for it.

The vocational guide must be on his guard against all such influences of his own psychology as may bias his judgment. On the other hand, he must judge the psychology of the person he interviews on its own merit, from such indications as the interview may afford. He will have evidence, from the general appearance of his client, of neatness, orderliness, and the like. A man's clothes may indicate vanity, or carelessness, as well as his manner. Indeed, very many of his habits will show themselves, in one way or another, during the interview. But the vocational guide will estimate them with caution, remembering that there is no good evidence—popular opinion to the contrary—for supposing that, because a man shows a habit in one direction, he will have the same habit in another. Neatness in personal appearance does not necessarily mean neatness in mind nor, for the matter of that, in work. A slovenly manner does not always indicate all-round slovenliness. Indeed, the evidence goes to show the contrary, just as the evidence shows that habit or training in one kind of mental work—logic, for example—does not ensure that the trained logician is also good at mathematics. Very closely allied performances, however, probably do " go together " ; so that deftness of manipulation

of one kind of object may be taken as some indication of deftness of manipulation all round.

The vocational guide, like anyone else, relies mainly on the impressions made upon him in the interview; and the chief source of these impressions is the behaviour of the person interviewed—his manner, speech, vivacity, and the like. It has been shown conclusively [1] that judgments made of "intelligence" on interviews are untrustworthy; though anyone who makes an estimate on this quality or any other as a rule is quite certain that he is right. The only safe thing upon which to judge is "personality." And, with respect to this, there are dangers in the way of making a just judgment which can best, if not alone, be avoided by the possession by the interviewer of certain personal qualities. The individual interviewed, especially if he is an applicant for a post, may be nervous or shy, and show himself to the worst advantage possible. His very anxiety to acquit himself well may easily make him appear in the worst possible light. This is not so likely to happen in the case of one seeking vocational guidance, since the conditions of the interview here are not the same as in the case of the employment manager. On the other hand, he may have a permanent tendency to anger or bad temper, which comes out under questioning. The conditions of the interview should be as nearly as possible like those of actual life, so that all such points can be noted. A testy, irritable, bad-tempered man will not easily get on with his fellows in any work where co-operation is necessary any more than an inordinately shy or timid one will. There are many professions,

[1] By Magson, *loc. cit.*

as well as trades, closed to people who have not the requisite temperament.

To understand and appreciate such gross differences and nuances of character the vocational adviser must have the qualities of patience, kindness, and sympathy himself. He must be able to read himself into the mind of the person he sets out to advise. These are innate rather than acquired qualities; and to this extent the vocational guide, like the poet, is born and not made. But these necessary innate qualities do not absolve him from acquiring also the necessary knowledge, both of trade and professional requirements, as well as the deep significance of the psychological factors which make for success or failure in the different walks of life. In this he is like the people whom he undertakes to guide. Success is not spelt by the possession of any one necessary qualification, though failure is. He must have all the qualities to be a successful adviser.

While we have sketched in some of the main features of the interview from the point of view of the vocational guide, these also will be of use to, and will suggest others to, those who wish to know what he assesses in order to attempt to assess it for themselves. Though, no doubt, they cannot estimate their own personalities entirely impartially, they will at least realise where they may fail to come up to certain standards. And, if they realise this, they can set about remedying the defects as far as it lies within their power. It may be impossible to raise the level of their native "intelligence" or to alter their temperament in any radical way; but so much is due to training and habit, not merely in matters like manual

dexterity and special mental performances, but, as we shall see, in those as well of emotionality and will that great economy can certainly be effected here at the expense of a little understanding and organised personal effort.

It has already been noted that tests are useful to supplement the interview, not to take the place of it. There are no tests of personality. We have also seen that tests of inborn capacity, of which the "intelligence" tests are a good instance, are to be distinguished from those of ability by which a measure is given of acquired knowledge or skill. The rating of an individual according to his "intelligence" is a fairly simple matter; since tests for this have been already carefully worked out and standardised; and tests for educational ability of any kind can easily be given in the form of ordinary examinations. Similarly, tests for any kind of acquired skill can be given by making the testee actually carry out the operation which he is supposed to be able to perform. Practical trade and professional tests of this kind have been in use for centuries, the testee being required to produce an actual sample of his work.

In estimating the capacity rather than the ability, however, of anyone who has not already learned to do the work in question, another form of testing must be employed. The requisite physical and mental qualities for the employment must be assessed separately. When these have been ascertained by an analysis of the employment, separate tests will be used for each, and the testee rated accordingly.

As has been said, complete analyses of the different professions and vocations have not yet been made,

nor do we possess a set of vocational profiles. Nevertheless, samples of the way in which such analyses are made, and of the tests by which the corresponding capacities are estimated, will show in principle what is involved. We may consider several examples from trades and professions.

Leaving out of detailed consideration such obvious requirements as health, physical strength, and endurance (the latter two of which may be tested), what are the principal special requirements of, say, a telephone operator? These may be summarised as acuity of hearing, clearness of enunciation, peripheral vision, memory for numbers, speed of associating, mental alertness, manual dexterity and speed, spatial discrimination, and the like; besides such character-qualities as patience, lack of irritability, emotional stability, capacity for sustained attention in monotonous work, and freedom from notable fluctuations in it.

The lack of one or more of these qualities makes for inefficiency, and frequent annoyance and waste both of time and energy on the part of the subscribers. It is evident that in many exchanges applicants have been selected without due attention having been paid to them. But it is from the point of view of the operator, rather than that of the subscriber, that we must consider the case.

General health can only be properly reported on by the physician; but, while it is usually a pre-requisite for any sort of occupation, it may be noted in parenthesis that the lack of it is not a bar to all sorts of occupations. There are chronic diseases and predispositions which unfit people for certain kinds of

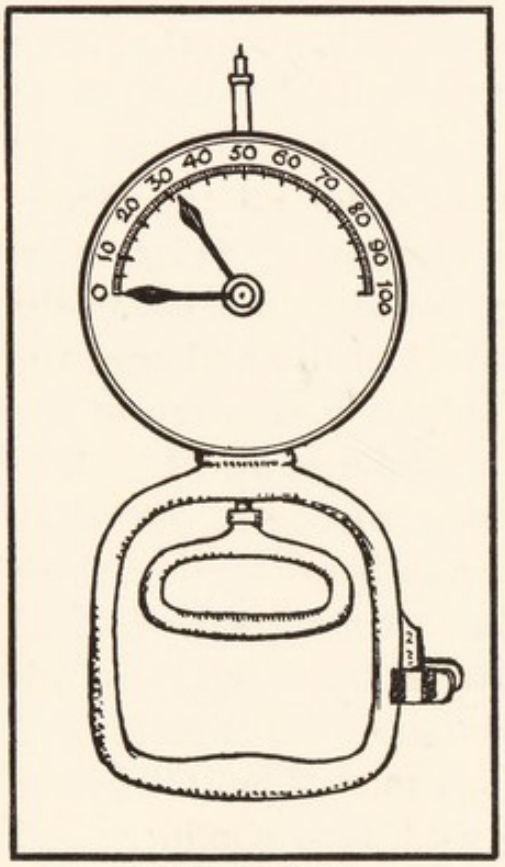
work, but do not preclude them from all. And a like statement may be made with regard to specific bodily defects.

Physical strength is estimated by testing one muscle only, as far as possible, in each test, and using a number of tests for different muscles in different parts of the body. The conditions in which the tests are applied should not vary from one testee to another. Accordingly the tests should be entirely mechanical, the testee pulling against a spring balance suitably arranged to measure the pull of each muscle tested; and the factor of leverage being equalised for all the testees by suitable adjustment of the apparatus. It has been found that there is a very high correlation between the record "pull" of a comparatively small number of the larger muscles and the total muscular strength of the testees. Consequently, a practical test can be given easily and quickly. In testing strength, however, allowance has to be made for a number of factors which influence the apparent results. Among such mental factors are the will of the testee to do his best, his spirit of emulation, general emotional mood, and special momentary emotion. A man "pulls" better when he tries, strives for a record, feels confident and elated, is excited or angry.

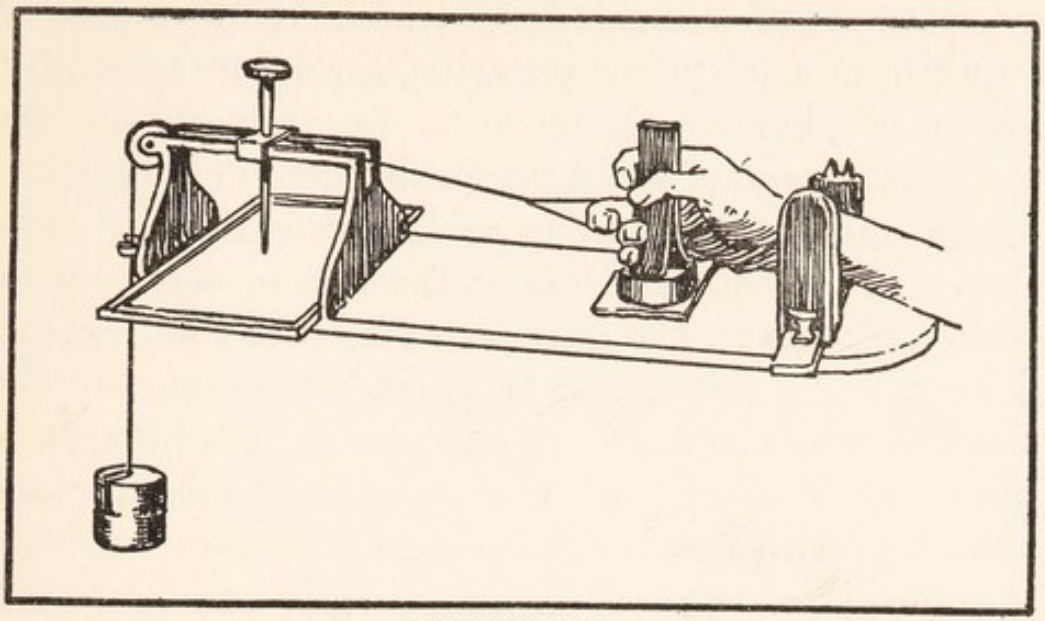
Endurance of muscular capacity as well as of determination to carry on is tested by means of the dynamometer or ergograph (pp. 144, 145); and the fact that these two factors enter into the test lays it open to criticism. The converse of endurance is fatigue; and fatigue, as we have seen, is not a simple but a complex effect of work. Moreover, both the dynamometer, which measures the strength of the hand grip, and the

ergograph, which registers the strength of pull of a finger, involve single groups of muscles, from the records of which it is not always safe to conclude as to the general endurance or fatigability of the individual tested.

Auditory acuity or sensitivity to faint sounds is commonly tested by measuring the distance at which the tick of a watch can be heard. But this is a bad method, since the ticking of watches varies from one to the other in intensity, and since the ticking of the same watch varies in different rooms and even in different parts of the same room, as well as according to the way it is held in the hand. Politzer's acoumeter is often used in the laboratory in place of the watch. It is an instrument in which a small metal hammer is made to fall through a short distance upon a metal bar; and acuity is measured according to its distance from the testee when the sound is heard. It has the disadvantages of the watch especially when used in an enclosed space. A more accurate instrument has been devised by Seashore which eliminates these defects, since the sound is regulated by an electric current which varies in intensity, and is carried to the testee

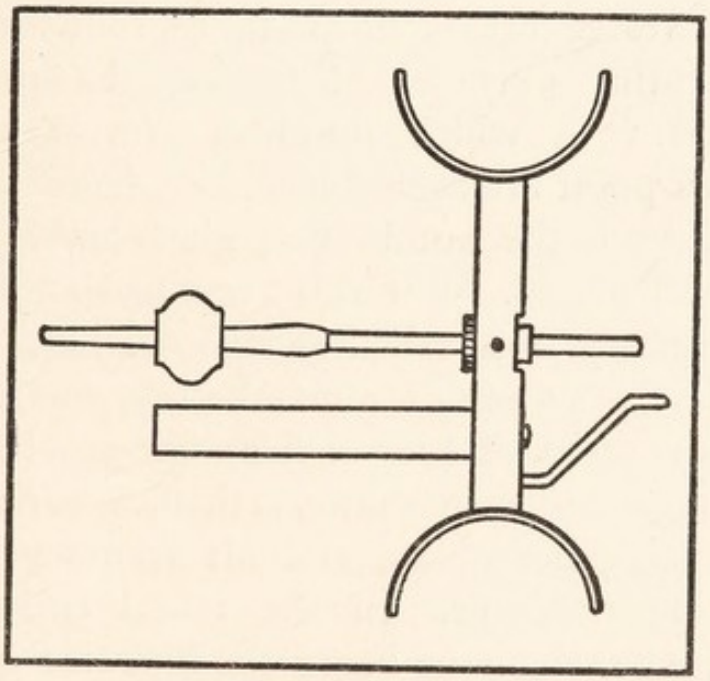


DYNAMOMETER.



ERGOGRAPH.

by means of a telephone receiver. The measurement is made in terms of the resistance of the current, and



POLIZTER'S ACOUMETER.

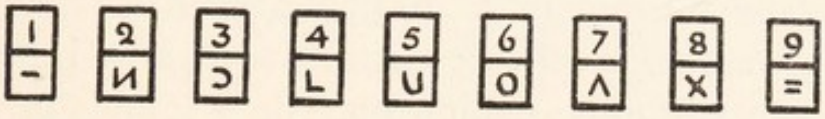
is an absolute one—i.e. the faintest sound heard. But it can also be used to determine the least difference which can be detected between two sounds.

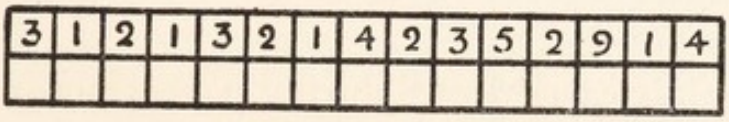
Clearness of enunciation, which is obviously a requisite in a telephone operator, can be measured by means of phonograph records. In ordinary life we can to some extent make up for defects in enunciation by unconscious lip-reading or interpretation by context. This is not possible at the end of a telephone wire. Moreover, the instrument itself to some extent denatures the voice; and the sounds of certain letters are difficult to transmit. The testee records his speech phonographically; and the record is subsequently compared with a clear one.

Immediate memory for numbers is usually tested under absolutely standard conditions. The digits are presented at equal intervals of time, with clear articulation and entire absence of rhythm. Starting with a four-digits number, the length is increased until the testee breaks down in reproduction. For more scientific purposes of finding the amount of correctness with which numbers greater than the breakdown-point are reproduced, the degree of correlation between the numbers as given and as remembered is calculated. But this accuracy is not practically necessary for telephonists. Rather, what is needed is the power of remembering, one after the other, short series of four or five digit numbers, given without regard to even tempo, articulation, or rhythm. The testee replies orally, and his accuracy is scored by the experimenter. In the actual conditions of operating the telephone board the operator is engaged in "doing several things at once." Accordingly, the test is best given with distracting conditions, such as spot-dotting or card-sorting. The annoying frequency with which wrong numbers are actually put

through in practice might be obviated if some such test were given; though it must be remembered that there are other sources of wrong numbers than bad immediate memory. Manual dexterity or spatial discrimination may be to blame for the plugs being put into the wrong connections.

When a number is called, a connection has to be made between two points, those, namely, of the incoming and the outgoing wires. This requires a quick association between the number wanted and its place on the board, together with very considerable





SUBSTITUTION TEST.
The testee is required to enter the symbols under their corresponding numbers.

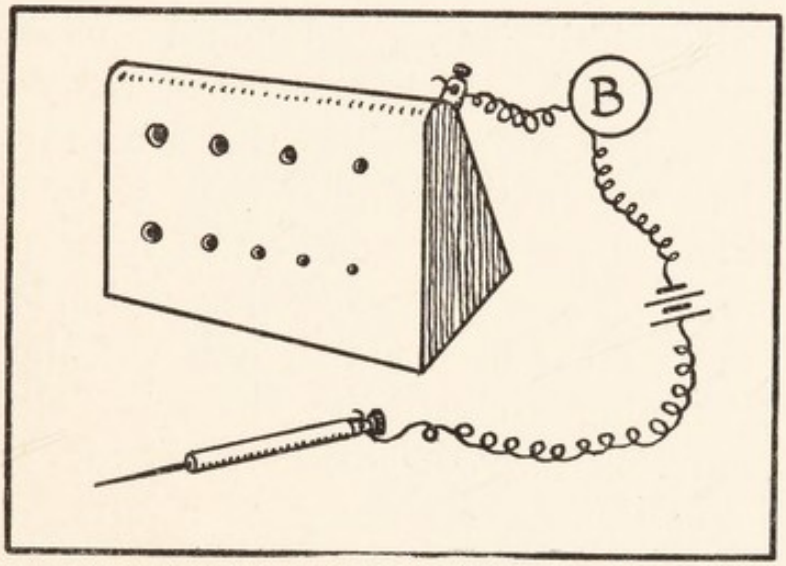
flexibility between the different numbers and places under the control of the operator. Telephone operators, no doubt, are trained; but their native capacity in associative speed can be tested before training. As a sample of a test devised to measure the quickness with which associations are formed by repetition, though it was not planned for telephonists and perhaps could not best be used in this connection, we may take Dearborn's Substitution test (above). In this the testee is required to substitute arbitrary symbols for numbers as quickly as possible. Numbers and symbols lie before him in pairs as he works; and his success is estimated by the time he takes to perform

the test, his accuracy, his final knowledge of the symbols and his gain in the last, as compared with his speed in the first part of the test.

Alertness, generally, is measured by the speed of reaction time, the testee being required to react, by pressing a key which breaks an electric circuit, to a stimulus which is presented to him at the moment when the circuit is made. The making and breaking of the circuit is registered in thousandths of a second by means of an electrically controlled clock. It has been found that, when the testee pays attention to the movement he has to make in pressing the key, his reaction is quicker than it is when he is attending to the stimulus—which may be a sound, or light, or touch, etc. But there are also individual differences in the speed of these reaction times (which are not the same for different senses); and, when the experiment is carried out during a protracted period, we can obtain some indication also of the capacity for sustained attention, and of the amount of fluctuation in attention, of the subject tested. It is clear that the "sensorial" reactions, as they are called—those, namely, in which the testee reacts only when the stimulus is clearly perceived—are more important in the case of the telephone operator than the "muscular" ones.

Connections on the board have to be made quickly and accurately. This requires motor control, dexterity and speed, for each of which numerous tests have been devised. Steadiness of control is measured by an instrument which consists of a metal plate connected in series with a metal pointer and an electric marker, which traces a line on a smoked

paper fixed to a revolving drum. The plate is pierced by nine holes of different diameter; and the testee is required to place the stylus in each hole without touching the metal of the plate; or, to hold it steadily in the hole without making contact. Each contact made is registered on the drum-paper; and, when allowance is made for disturbing factors, the testee is rated according to the number of the contacts made. This test measures the control of



STEADINESS TESTER.

The stylus is held in each of the holes of the metal plate in turn. Contact between needle and plate actuates the Sounder, B, or is recorded on the smoked paper of a kymograph drum.

movement in accurate aiming and in preventing unwanted movements.

More suitable as a measure of precision of motor control is the aiming test, in which the testee has to hit a mark with a pencil. He stands before a target on which are marked ten crosses, swings his whole arm upwards, and strikes at each to the beat of a metronome. In all, three targets are used and thirty shots recorded; and it has been found that, although

the error in any one stroke may be considerable, the average of the thirty shots is relatively constant for each testee. This average is worked out by measuring the errors made in each stroke and calculating the mean or standard deviation. As a test of capacity, there is the danger of improvement by practice as the experiment is being performed. But, for practical purposes, this danger is reduced to a minimum by scattering the crosses irregularly over the target.

Manual dexterity and speed may be measured by the accuracy with which the testee removes rings from one upright rod on which they are arranged and places them on another similar rod; or by changing the position of pegs from one set of holes to others in a board. These are exceedingly simple operations; but, as has been noted, it is the aim in any kind of testing to estimate the most elementary factors entering into the capacity tested. And the tests in question have given good results. Akin to these and to the aiming test is the spot-dotting test invented by McDougall. In this the testee is required to make a spot with a pencil in the centres of a number of small circles. The circles are printed in varying positions on a strip of paper which passes at a uniform speed behind an aperture in the exposure apparatus, so that only about an inch of the strip is seen at once. Speed and accuracy are measured by the deviations of the spots made from the centres of the circles.

Spatial discrimination is a matter both of vision and of muscular "feel." We judge distances by sight and by the amount of effort put forth to reach a given point. Tests accordingly will fall into two

groups, as power to estimate length of lines and differences in angles by the eye, or by the amount of effort to move the hand from wherever it may be to the place to which it has to carry the plug. To a large extent, with practice both judgment and movement become habitual and automatic. But if the basis is not there originally, no amount of practice will make up for it. The individual without the capacity will never learn. Visual discrimination of space is tested either by making judgments as to the equality or inequality of lines shown to the testee, or by requiring him to make one line equal to another. And similar tests are given with regard to angles. The apparatus generally used is a black velvet-covered board with adjustable white threads, which can be lengthened or shortened either by the tester or the testee. The results of a number of judgments (or of adjustments) are treated by the usual statistical methods, and the testee rated accordingly. Muscular space-discrimination is estimated in much the same way. The testee either makes a movement in a given direction or submits to one passively, and then attempts to make a movement of similar direction and distance, without any guidance from his sense of sight. His errors are noted and the results calculated. There are great individual differences in the estimation of distance and direction both by the eye and by muscular "feel," some people succeeding in the tests very much better than others. In actual practice, however, the telephone operator does not merely judge distance by the eye, or by the effort he makes in reaching out his hand and arm, separately. He sees the caller's lamp glow, often by peripheral

vision, plugs in the subscriber and takes the number. He then makes the connection. Practice sets up a co-ordination between eye and hand movements. Accordingly, after practice, his ability could be tested on an actual board. But this would be of the nature of a "trade test."

A capacity test, however, could be devised by a simple combination of the two tests outlined, the testee being required to react to a small number of suddenly appearing visual stimuli by making movements in various directions and of different extents. Even a slight modification of the reaction-time test given above, which is commonly used in psychological laboratories, would measure these capacities, and at the same time show the effect of practice. Instead of being required to react quickly to a single stimulus by pressing upon a key, the testee has to react to several stimuli by pressing upon a different key for each. A five-finger set of keys is used; and he is instructed to press with the thumb when he sees a red light, with the index finger for a green, the middle finger for a white, and so on. Electrical circuits are used; and his speed and accuracy of direction are registered on a smoked drum.

With a slight further complication, this test may also be employed for obtaining some measure of the testee's emotional stability. A loud buzzer or horn may be sounded during the course of the test, and any disturbances either of speed or accuracy of reaction resulting from the unexpected noise may be observed on the records.

Capacity for sustained attention is best tested in some performance similar to that which will be

required later on. Among the common forms of this test, however, are the cancellation test and that of spot-dotting. The latter has already been described. The former in principle consists in crossing out letters in a printed sheet of capitals irregularly arranged, but spaced close together. The testee is rated for speed or accuracy, or for both combined. His score is taken at short intervals; and the data are plotted on a curve which shows the effect of "warming up" to the task, variations in output due to waning attention and fatigue, spurts, fluctuation of attention, etc. The effects of practice must be allowed for; and, indeed, the data can only be interpreted by the skilled investigator.

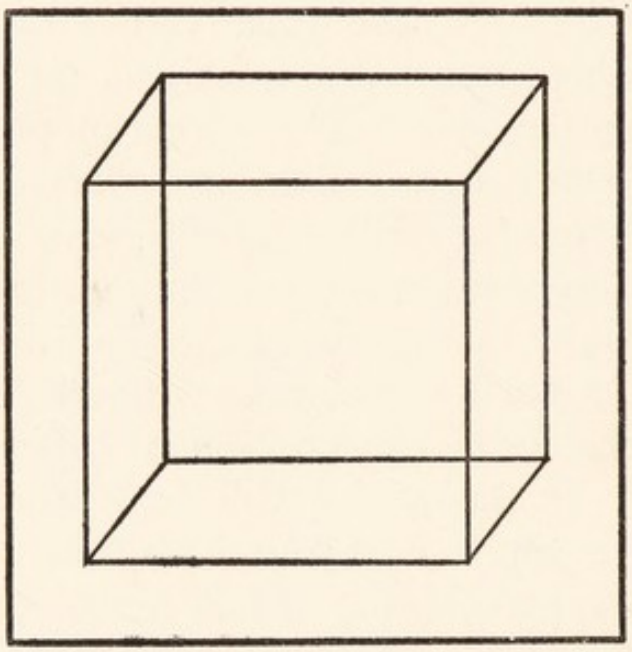
Fluctuation of attention may be measured in other ways, as by the rate of appearance and disappearance of a faint visual or auditory stimulus, or by the apparent change in the position of "reversible perspectives." If the reader will look steadily at the diagram given on the next page, he will see that the face of the cube apparently nearer him seems to recede and give place to that which occupied the rear position.

Further observations on emotional and will qualities will be made in the chapters having to do with Will and Emotions.

I have made this summary, which is by no means complete, in order to show how the requirements of an employment may be analysed and an individual's capacities tested in accordance with those requirements. It seemed better to do this than to take odd tests at random which might suit now this, now that, occupation. It must be remembered, however, that the description of the tests is the briefest possible

and in no sense exhaustive. For complete description, analysis, methods of giving and scoring the tests, and the like, the reader is referred to the manuals and text-books on the subject.

It is much more difficult to say what special aptitudes are required for success in any given liberal profession than in any given trade or skilled employment. What is it that makes for success in law, in



REVERSIBLE PERSPECTIVE.

medicine, in engineering, in politics, for example? There are certain mental qualities which are obviously a *sine qua non* for any one of such professions. No one can hope to succeed in any one of them who has not a considerable dosage of "intelligence." This, as we have seen, may be measured by tests; or we may take the school-record as an indication of its possession. "Personality," too, evidently counts for an enormous amount; but we have no means of estimating exactly the group of elusive qualities

which constitute personality. For any summing up on this head we must depend, in practice, on the interview and on the judgments of those who know the individual well. And this is so in regard to all the character qualities. In the present state of our knowledge we have no exact way of measuring them.

But there are certain qualities, for which we can test, which are among the requirements at least of certain professions. For instance, over and above his knowledge and skill acquired in lecture-hall and dissecting-room, the successful surgeon must possess manipulative deftness, steadiness of motor control, mental alertness, the power of concentrated and sustained attention, constructive imagination, quickness of judgment and decision, and the like. He must not easily be emotionally disturbed nor, having once made up his mind on a course of action, should he be liable to the influence of suggestion.

The architect, engineer, and designer require a considerable degree of constructive or creative "imagination," mostly of a visual kind. This power, as we have seen, is exemplified in the discovery of new correlates (p. 67), and seems to be a native endowment of certain individuals which is incapable of improvement by training. Moreover, in professions such as these, arithmetical capacity of the higher kind is a necessary requisite.

Most of the tests for the mental and physical qualities named in these professional instances have already been described in our analysis of the qualities required by telephone operators. There are several remaining, however, which may briefly be indicated here.

Quickness of judgment may be measured by a modification of the American Army "Alpha"[1] "Best Answer" test. This is in reality a group test of "intelligence"; but it involves judgment, and can be given individually so that the exact time of the reaction is taken. Two samples may be given.

"If you are caught in a shower and have no umbrella, you should—

"(*a*) take shelter till the shower passes;
"(*b*) run all the way home;
"(*c*) ask a policeman to lend you an umbrella;
"(*d*) borrow money to buy a mackintosh."

"If you are in front of a runaway horse, you should—

"(*a*) run as hard as you can straight in front of it;
"(*b*) jump aside;
"(*c*) seize its bridle and stop it;
"(*d*) call to someone to save you."

A better test, not yet standardised however, would be to present two alternatives for choice in an exposition apparatus and measure the time taken to make the choice between them *for a really good reason.* This would measure both the quickness of judgment and the decision. Unfortunately, though several methods have been suggested, there is no good way in which the determination to carry out the decision taken can be measured.

Tests for suggestibility are of two kinds—impersonal, i.e. without prestige, and personal, depending largely upon the impression made by the person who administers them. Among the former class is the test

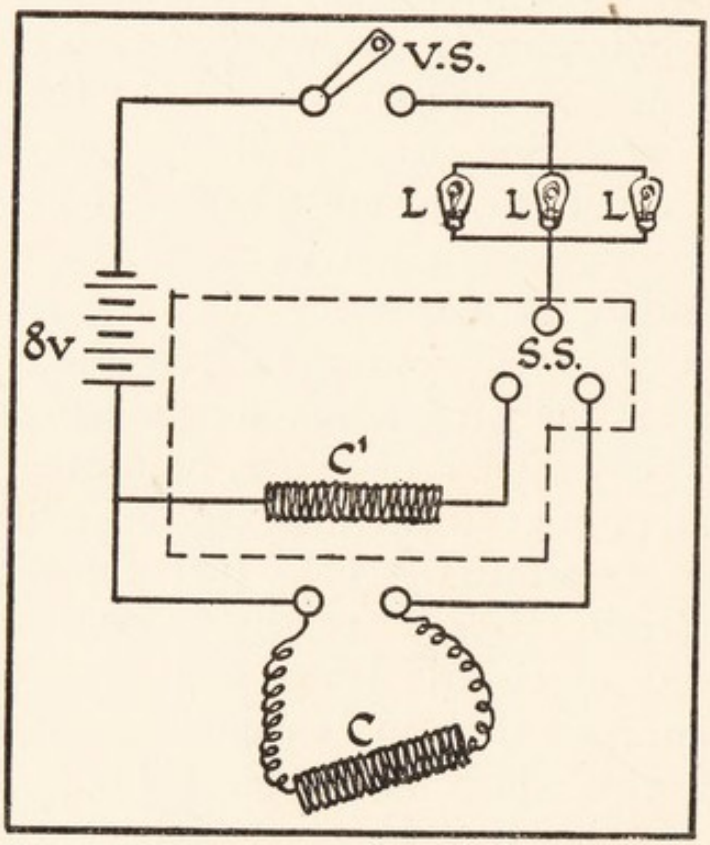
[1] Cf. Ballard, *Group Tests of Intelligence.* I am indebted to the courtesy of Dr. P. B. Ballard for permission to use the above and several other of his tests as illustrations.

of suggestibility by progressive weights. Fifteen weights, exactly alike in appearance, and conspicuously numbered from 1 to 15 are used. All, except the first four, weigh 100 grams, the first, second, third, and fourth weighing 20, 40, 60, and 80 grams respectively. The testee is instructed to lift the weights in order, and to say whether each succeeding weight is heavier, lighter or equal to the one immediately preceding it. In lifting the first few weights a tendency is set up to expect the succeeding ones to be progressively heavier; and the amount of this suggestion, as influencing the judgment of the testee, can be roughly estimated from the number of weights, after the fifth, which are pronounced to be heavier. They should, of course, be judged as equal.

Personal prestige suggestion can be estimated by the illusion of warmth test, or by that of hand paralysis. The "warmth tester" consists essentially in an arrangement of electric lamps and wires controlled by a prominent switch and seemingly connected with a coil of wire which the testee holds in his hand (p. 158). The experimenter explains that when a current flows through the lamps and coil the latter will become heated so that it can be felt; and the testee is instructed to say "now" and drop the coil as soon as he feels the warmth. As a matter of fact, the coil is not in circuit with the lamps and no current passes through it unless an invisible switch is used. This switch is never used unless the testee fails to react after a minute to the illusory "warmth." The experimenter, after the signal "ready," impressively switches on the lamps, at the same time starting a stop-watch, which he stops as soon as the testee reacts.

A number of trials is made; and the testee is rated according to the number of times he reports warmth when there is none, and the time taken in each trial.

Hand paralysis is a less scientific method, since many factors which are uncontrollable enter into it. The



ARRANGEMENT OF APPARATUS FOR TESTING SUGGESTIBILITY BY THE ILLUSION OF WARMTH (RESISTANCE-WIRE METHOD)

None of the apparatus enclosed in the dotted line is seen by the testee.

C, Coil of heating wire held by testee.
C1, Compensating coil through which current flows when not heating C.
L, L, L, Electric Lamps.
S. S, Secret Switch, two way to C or C1.
V.S, Visible Switch.
8V, Accumulators.

experimenter holds out his hand in the clear view of the testee, instructing him to look steadily at it and at the same time to hold out his own hand in the same way. He is told to pay attention only to the feelings he experiences in his own hand, and not to take his

eyes from that of the experimenter. Gradually the experimenter makes his hand more and more rigid, at the same time saying, " You can feel a tingling in your fingers. Now they are becoming stiff. They are getting stiffer and stiffer. Now they are quite stiff and rigid. You cannot close your hand at all. Try. You cannot close it." The time required for the suggestion is recorded with a stop-watch, together with the degree of rigidity (of which only a rough estimate can be made) produced by the suggestion. It ranges from *nil* to complete inability to move the hand. For any diagnostic purposes this test should be used with the greatest caution and the result should only be evaluated by a skilled psychologist. It is a test which can be given collectively as well as individually ; and the writer has seen as many as 20 per cent. of a class of thirty absolutely incapable of closing their hands until counter-suggestions were given. As will be evident to the reader, the " hand paralysis " is a suggestibility test into which prestige enters in a marked degree. It has been found to afford useful indications of susceptibility to hypnotic suggestion.

Power of creative " imagination " can be tested in several ways. Among the most usual tests are those of the interpretation of ink blots, of sectional cubes, and the like. In the " ink-blot " test (p. 160) a series of twenty standardised blots is shown to the testee with the instruction that he is to record how many " things " he can see in each blot. Everyone knows how pictures can be " seen " in the clouds, fire, and the like. The number of interpretations made of the blots, together with the time taken, is used as a measure of the inventive " imagination " of the testee.

The "sectional-cube" test is, perhaps, a more scientific one. The testee is told to think of a cube, painted red. He is then told to "imagine" that the cube is sawn through by three equidistant vertical and three horizontal cuts; and he is required to say how many of the resultant small cubes have paint upon them (1) on one face, (2) on two faces, (3) on three faces. A similar test is the following. "Imagine a square. Draw an imaginary line from the middle of the right to the middle of the left side. Draw

INK BLOT TEST.

imaginary diagonals of the original square. Into how many parts is the square divided?"

As a matter of fact, it is not necessary to have the power of *visual* imagination to perform these tests successfully. Certainly, however, a power of some kind is evaluated which is a requisite for certain kinds of work. It may be suggested that the power of educing correlates (p. 67) is the power in question, whether enforced by visual imagery or not.

As has already been indicated, no pretence is made in this chapter to give a complete account of trade

and professional tests, or to suggest a number of vocational "profiles." The several examples considered, and the tests outlined in connection with them, however, will serve to show what has been —and what can be—done in the way of discovering special aptitudes required in different kinds of work. The progress of vocational analysis and of the devising of tests, if slow, is a steady one. There is already a considerable number of proved tests available for use by the vocational adviser; but whole batteries of tests are still wanted.

While the point of view here is exactly the same as that taken throughout this book—that, namely, of economy—it seemed best to present the matter in the form adopted. The chapter is not written as a guide for vocational counsellors; but the work of the vocational adviser is outlined with a view to showing how economies may be effected. Nothing that is likely to be of help to the individual choosing his life-work is of so little moment that we can afford to neglect it. And vocational guidance has already proved its worth in this respect.

It need scarcely be emphasised again that the wastage or economy involved in fitting the peg to the hole is both social and individual, as well as continuous.

CHAPTER IX

EMOTIONAL WASTAGE

MALADJUSTMENTS in life, as we have seen, are a lasting source of wastage. Graver still, however, are the emotional wastages they almost inevitably bring in their train. The misfit, whether placed too high or too low for his capacities, is apt to be dissatisfied with his work and with himself. The work is continually irksome and irritating to him. His relations with his fellows become strained. Seeds of discontent are planted; and their growth entails an ever-growing drainage of energy.

But there are many other sources of emotional wastage than that due to maladjustment in trade or profession. Emotions may arise in connection with all sorts of objects and persons, and in all sorts of conditions. Normally, an emotion may be taken to reinforce action; and therefore, though the output of energy may be greater when the action takes place under the stress of emotion, there can be no question of waste when the action is a useful or desirable one. It is when the action is undesirable or harmful, or when it cannot develop to its normal issue, that the emotion itself is a wasteful drain upon us. And this is frequently so in the conditions of life in which we are placed. The crude emotions of fear and anger, for example, which had a large part to play in more primitive conditions, and made both for the preservation of the individual and the develop-

ment of the race, are more often than not a hindrance rather than a help to progress at present. And reflection will show that the arousal of any emotion, in circumstances other than those which call for it, must be undesirable.

Modern psychological theory, based upon the observation of a large number of facts both in normal and pathological cases, insists upon the great importance of a study of the instincts in man in order that we should understand his emotional feelings and his actions. Though overlaid and obscured by intelligence, in the sense of ordering and planning, the view taken is that the springs of all his action are to be found in instinct. Time was when the study of the instincts was wholly neglected, on the ground, mainly, that these were native provisions of Providence for the guidance of the activities of the so-called "lower" animals; whereas in man this blind guide was replaced by his nobler faculty of intellect. Not by instinct, but by intellect alone were human actions regulated.

It has come to be generally realised, however, that man is as much driven by his instincts as any other creature; and that the function of intelligence—by which he was to be distinguished from the brutes—is to serve him in the following up of his instinctive needs. Intellect thus comes to be looked upon as an instrument or tool to be used in the shaping of his life, the rough materials of which are given to him in the shape of natural wants and desires.

In the simplest imaginable conditions of life we should seek for food when we were hungry, but at no other time; we should make no intelligent plans for

future provision, even of the most primitive kind. So we should strike our enemies, but only when we were angry with them; and seek a mate only under the urge of the sex-impulse. Such actions would be clear and unmistakable, unambiguously derived from the impulses. But in the more complex conditions of highly organised society many of these primitive impulses are apt to be lost sight of in the intricate machinery that has been devised for their satisfaction. All the resources of intelligence have been tapped to build up complicated systems of future supplies, of production and distribution, which involve all sorts of work other than creating them, in order to meet instinctive hunger wants, clothing wants, and the like. In the same way, the highly intelligent and technical art of warfare has been developed from the cruder primitive methods of enforcing the communal will to self-assertion; or—better example still—disputes are settled in courts of law rather than by fisticuffs; while elaborate systems of tribal tabus, customs, and legal enactments have been evolved to foster and to curb the sex-instincts of the individual in the interests of the community as a whole as well as in his own. A similar statement might be made with regard to any one of the appetites and instincts of man. Intelligence is an instrument to be used in securing the satisfaction of all of them, and—since clearly they cannot all be operative at once, or in the same degree—in setting them over and against each other in the harmonious balance which we call Character.

We saw in Chapter V that mental energy is used—wasted or economised—in the processes we list under

the head of knowing; though it was there suggested that this energy might in reality be attributed to conation, or will. However this may be, it is certain that mental as well as physical energy is involved in instinctive action, especially when this is developed to the point of being strongly emotional. In general, such action exhibits the conational aspect most strikingly. The creature driven by instinct *tries*, and if necessary tries again and again. But emotion makes the trying all the harder.

If we consider the working out to its end of any instinctive impulse, this will be abundantly evident. Examples are to be found throughout the range of animal life: migratory fishes covering great distances and forcing their way against innumerable obstacles to their spawning-places; spiders working tirelessly at their webs; squirrels laying by their stores; beavers building their dams. Fully developed instincts in their least ambiguous form of expression, however, are to be found in the insect world; and we may take a classical instance from Comparative Psychology for examination. This is the behaviour of the solitary wasp.

These creatures, when about to deposit their eggs, prepare a hole or nest in the ground or in a wall, and then go in search of prey, which they paralyse or kill by stinging. This they bring back to the nest as food for their future larval offspring. The habitual prey of one species of these wasps is a grasshopper. On its return with its capture, the wasp leaves the grasshopper outside but near by the nest, which it itself enters, as though to examine and finally approve of it. It then proceeds to drag the

grasshopper in with its jaws, lays it in place, deposits its egg upon it, and closes up the opening of the nest—this whole cycle of action being normally an invariable one.

One of the earliest modern observers of insect life, however, interfered with this normal sequence of actions. He removed the grasshopper to a short distance from the opening of the nest while the wasp was still within it. The insect emerged from the hole, searched for its grasshopper and brought it back, and entered the nest again leaving the prey outside exactly as before. Again the grasshopper was moved, and again the wasp acted in precisely the same way. This behaviour on the part of the wasp was repeated *forty times in all* on the persistent removal of the grasshopper; until, finally this was removed altogether. Thereupon the wasp closed the nest without more ado, leaving its egg to hatch out into a larva for which no food had been provided. In this instance the driving power of the instinct is clear. Over and over again the insect strives to carry out the prompting of its thwarted impulse. All its energies are bent to this end. And that it is not an intelligently conceived and planned course of action that it follows out is obvious when we remember that the wasp has no previous experience of what it is doing, nor of the end to which its instinctive activities lead.

Similarly in ourselves, in whom instinctive activity is so overlaid by the intelligent prevision of ends and the planning of means towards securing them, the energetic drive of the whole process is derived from the original instinctive tendencies.

Consider in this connection the case, at first sight most unpromising for the view in question, of the man who apparently holds all his natural instincts at bay, thwarts them continually and suppresses them, in order to attain some real or fancied goal which he may know he may never reach during his lifetime. He stakes his all here, in order that he may secure a reward hereafter. He has, we shall suppose, summed up the temporal losses and gains inevitable to his conduct; and decided to deny himself and follow an ideal which he must judge to be both worth while and practicable. That ideal becomes his guiding principle. It determines his whole conduct throughout a long course of years, at the expense of all other expressions of himself. Instances of this are common —the "crank" with an idea, the monk with an ideal, the fakir. Discipline, hardship, starvation—the negation of every natural craving seems to be involved. Surely, if anywhere, intelligence—as shown by the cold-blooded adoption of a far-off and intellectual ideal—as *against* instinct is at work here. The "higher" strives against the "lower" nature and triumphs. The ideal vanquishes the passions.

But the case is not quite so simple as this. It has to be shown that the intellectual ideal is substituted for the passion; that it is not an end towards which the passion itself may work. For this is not evident. It would seem rather that the ideal is an intellectualised goal quite in keeping with the natural goal of the instinct towards which the creature strives with all the energy of his instinctive being. One instinctive drive may become predominant at the expense of others; and its energy used to other ends (within the

possible ends determined by the instinct) than those we may suppose to be primarily intended by Nature. The miser, for example, sinks all his energies in the business of hoarding gold. But gold is certainly not the natural *object* of the instinct of hoarding. The monk may lay all the springs of action tribute to his instinct of ultimate self-fulfilment by asceticism. And this is clearly a form of the self-assertive or self-regarding tendency. The balance of the other connate tendencies, when one thus becomes supreme, is secured not by their suppression, but by a sublimation in which their energy is drained away from their primitive channels of expression into those of the dominant tendency, no matter to what object or ideal end this has become affixed.

It was at one time more or less commonly held that the emotions, or feelings of pleasure and pain, considered abstractly, determined the behaviour of all sentient creatures. Men sought the pleasant and avoided the unpleasant. This doctrine of "Hedonism" very early in the history of thought rose to the eminence of becoming the basis of the system of ethics of the same name, as well as being a psychological explanation of conduct. The algebraic sum of pleasures and pains was accepted as a sufficient account of the whole matter.

But evidently Hedonism can give no full account of all the facts. Problematical pleasures, even if believed to be illimitable, cannot be set over against actual ones, especially when neither the one nor the other is actually experienced, but only forms the subject-matter of a judgment of value. We certainly do often judge, and prefer one course of action to

another; we even often take account in such judgments of the pleasure or pain entailed by the actions between which we choose. But the driving power is not the choice, nor the values discussed while we are deliberating. It is the instinctive conation of the individual towards connately determined general goals; within each of which there may be a wide variety of individual determinations.

An almost exact parallel to this is to be found in laboratory experiments on Choice, to be considered in the next chapter. When a person sets out to choose between two alternatives for some good reason, the whole process of becoming aware of the alternatives, consideration of their values and weighing of the motives for choice of one rather than the other, and actual determination of the alternative chosen, usually goes on in a quite effortless manner under the influence of the previous general determination to choose. The choice once made, action with regard to the chosen alternative follows; but this action does not derive its drive from the choice itself. The choice is the condition only of the release of energy provided by the determination to choose and to act. This may or may not be accompanied by emotion. We must, accordingly, turn from the emotional to the conational aspect of instinct to find any really satisfactory explanation of the way in which we, in common with the other animals, behave.

Nevertheless, emotions do arise in connection with our relation to objects, persons, and situations. There is no doubt about our fear, or grief, or rage, however we may find these states to be related to other mental processes. There is no doubt about the energy

used up when we experience them. Accordingly, from the point of view we are taking in this book, emotion is of enormous importance. Indeed, the emotional drains upon our energy are the most considerable of all; economy here is of the greatest possible moment.

Emotions are currently held by psychologists to be a phase in the development of instinctive tendencies. Thus we are *afraid* when, in the presence of an object or situation which threatens us, we have the impulse to run away, or hide, or stand stock-still so as to avoid being seen. Similarly, we are *angry* or *lustful* when we are face to face with an enemy towards whom we experience a tendency to assert ourselves, or a possible mate whom we wish to make our own. Every instinctive tendency can thus be paralleled by an appropriate emotion, which obtains a greater or less possession of us while the instinctive drive urges.

But the emotion proper develops mainly in those cases in which we cannot satisfy the instinct by the action to which it prompts. We are afraid, angry, or lustful when we cannot rid ourselves of the objects of our fear or anger, or possess ourselves of the objects of our lust. It is the thwarting of the instinct when it arises which brings about the greatest emotional feeling. Our fear is strongest when we cannot deal successfully with the situation which arouses it. We are incapacitated and helpless—therefore we fear. We have not yet destroyed our adversary or dominated the circumstances which thwart us; we are therefore angry—and of all anger, brooding anger is the worst. Such emotions may therefore be looked upon as coming from the frustration of instinctive impulses rather

than as accompanying their satisfaction; since, when satisfied, the emotion dies out. When the impulse arises and attains its normal satisfaction, we cannot so much speak of emotion as of simple pleasure. Whatever goes well with us is pleasant.

But such single great impulses as we have considered, which give rise to primitive emotions, are not perhaps so usual experiences as we might expect. Complex emotions like gratitude, scorn, loathing, or envy; sentiments such as revenge, jealousy, or reproach; are more commonly experienced by us perhaps than pure disgust, or love, or anger, or fear, though these primitive feelings certainly enter into them.

Moreover, these complex emotions and sentiments are apt to be relatively permanent, and so to constitute emotional moods; whereas the pure emotions tend to be transient and only called up by relatively unusual objects or situations. Nevertheless, all the emotions in question can be analysed into their original simple components. Gratitude, for example, includes love and self-abasement; scorn connotes both disgust and anger; jealousy is a compound of love and hate and fear. They have their roots in the same instinctive tendencies. Accordingly, whatever causes of drainage of energy may operate in them may be studied—and can most easily be studied—in an examination of the pure emotions.

In this chapter we have taken anger, fear, and lust to be typical of these. When any one of such strong emotions arises, there is an enormous amount of energy expended, both bodily and mental. Indeed, the emotion itself as a conscious event is largely the result of the bodily commotion which is brought about

by the working of the instinct to which it belongs. Thus, on the physical side, in rage or fear, a large number of cranial and sympathetic nerves, not usually strongly stimulated together, is thrown into action. Many changes take place in the glandular secretions of the body ; tears in grief, sweat in anger, for example. More important still is the action of the ductless suprarenal glands. Normally, these secrete a product which has to do with maintaining the muscle-tone of the body. When we are excited by an emotional stimulus such as anger, however, they pour a far greater amount of adrenalin into the blood-stream, which, among other things, has the effect of increasing the circulation and causing the liver to throw a large amount of sugar into the system. In this way the muscles are provided both with the fuel and the oxygen required by them in order to put forth the greater energy called for by the situation. The rate of breathing, as well as the heart-beat, is changed ; and the process of digestion—the churning movements of the stomach and intestine, as well as the secretion of gastric juice—is suspended.

All these and many other bodily changes which also take place have great biological utility. They serve to fit the organism for the effectual carrying out of the instinctive impulse—in fear, for example, for flight ; in anger for combat. This they do by releasing the stores of physical energy required in the emergency.

But they also have their mental counterpart in the emotion itself. Whatever view we take as to the relation between mind and body, these physiological changes mean that the feeling we have of our bodies

and their parts, vague though it may be, is profoundly modified. Whether this is the result of the emotion or, as is often maintained, its cause, does not much matter in this connection. In any case, the object of the emotion is first of all present in our minds; we have the tendency to act in some way with regard to it; and we feel afraid of it, or enraged with it, or the like.

On the mental side also energy is expended. We have seen in Chapter V that the amount of cognitive mental energy tends to be constant in output. We can only grasp a certain limited number of things at one time; we are only able to perform a limited number of intelligence tests accurately in, say, the allotted two minutes. And it need not be supposed that the source of this sort of energy is overdrained even in great emotional stress, or that there is any increase in output. Rather, it flows in a limited channel; and conceivably may be held to wear the bed of that channel, or, if we prefer the simile of "engines," to overwork the engine in which it is concentrated. The object of the emotion holds the centre of consciousness to the exclusion of all others.

But cognitive energy is not the only energy of the mind. There is conative energy also to be considered. Common experience tells us that there are degrees of trying; and that conative effort, by leaving us tired mentally, does drain away energy. And laboratory experiments on sustained attention on any kind of mental work bear this out.

Moreover, if emotions reinforce instinctive action and increase conation, there will be a drainage of energy roughly proportional to the strength of the

emotion when we are under its influence; and this may be called emotional even if in reality it is conation that is principally concerned.

But the emotion itself, especially if it be due to frustrated instinctive impulse, may have a direct drainage effect of its own upon mental energy, just as it has upon physical. Some of the most enervating emotions of all are those in which we can *do* nothing, and indeed try to do nothing. The impulse is simply baulked; there seems to be no conative effort whatever; yet our energy is sapped and drained away to no effect. Even the emotions we have been considering—though their bodily counterpart, by releasing stores of physical energy, fits us for coping with the situation—are excessively wearing to us. And this is especially true when, as is usually the case in present social conditions, there is no immediate possibility of satisfying the instinct by prompt action. We cannot always run away from fearful objects, or avoid unpleasant and embarrassing situations; nor can we always satisfy insults or innuendoes by knocking down their authors. Though we can appreciate the biological utility of the bodily reaction, social conventions make it useless in practice. At the close of a bout of rage or fear—and especially of quite impotent rage or fear—we find ourselves thoroughly unstrung. We are drained of energy; tired out both physically and mentally; incapable of further effort.

Quite apart from the fact that any strong emotion while it lasts seriously interferes with any kind of mental or manual work, it is plain that such an emotional drain of energy as this is a serious matter. Emotions are always costly, even when they are useful. When they

are useless they are an extravagance. And more costly extravagances still are the prolonged complex emotions—such as resentment, envy, or jealousy—which continually drain energy away without being of any effectual or practical utility to us.

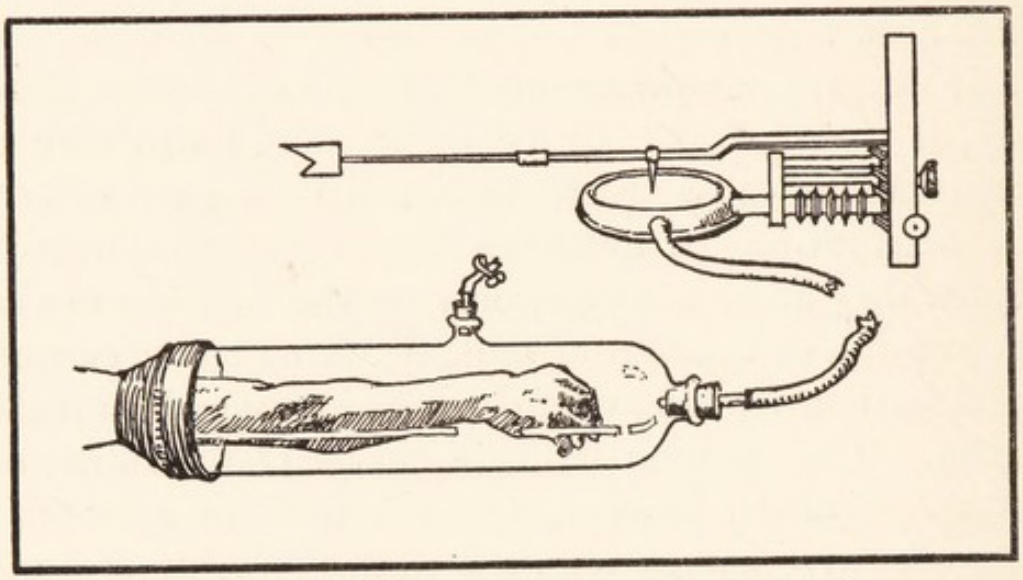
How may such emotional wastage—for it evidently is a waste of energy since it is unprofitable—be prevented? How can we avoid being angry, afraid, and the like; or escape being consumed by such slow-burning passions as those which have just been instanced?

If we are temperamentally emotional—that is to say, if the normal body balance referred to above is habitually or easily upset—there is little hope of success in attempting to influence our emotions directly. Since they arise, however, only on the occasion of the perception or thought of some definite object, person, or situation, we can avoid the occasions which provoke them. The emotion is like a charge of dynamite, or of slow-ignition powder, which is fired by a match; the cognitive energy required to fire it being of weak intensity, while the energy thus released may be enormous. We can turn our minds elsewhere; and so, by draining our normal cognitive energy into other channels, leave none available to set the emotion going.

When this is not easily possible because the emotion is already stirred up, we can sometimes use the energy already liberated by the coming into play of one instinct in the service of another. Just as fear may suddenly be transformed into anger, or even into pity, by slight differences in our attitude towards its object; so, by considerations with regard to the object or to

ourselves, we may transform one emotion into another. We may thus sometimes secure the energy of a useless or harmful passion in the service of a useful and beneficial one. In this way the mind, by reason of the thoughts it harbours, largely moulds and shapes its own emotions. More than this, it actually modifies the involuntary bodily changes which constitute the emotion on its physical side.

This may seem to be an extravagant statement to



PLETHYSMOGRAPH AND RECORDING TAMBOUR.

make; yet it can be substantiated. When we are occupied with an idea of an action—of lifting the hand which is passively lying upon the table, for example—the actual tendency to lift it can be felt in the hand. If, pursing the lips into the form of an O, we think the word "mammon," we can feel the tensions of the muscles involved in actually saying "mammon." Both these examples have to do with voluntary changes brought about in the body. We can lift our hand or say "mammon" if we will. In auto-suggestion as advocated by Coué,

the frequent contemplation or forcible keeping before the mind of an idea, such as that of health, has its effect. This fact lies at the root of all so-called faith-cures, Christian Science, and the like.

Of still greater effect are ideas of this sort when implanted from without, as in hypnosis; in which suggestions that blisters will be formed on the skin, or the rate of heart-beat altered, or the peristaltic action of the intestine accelerated, actually bring about these effects.

In laboratory conditions also merely by thinking of pleasant or unpleasant things one can bring about changes in the volume of a limb, or in the electrical state of the body. It is known that certain colours, odours, sounds, have a stimulating effect upon the mind, while others depress us. Some are exciting, others calming. When perceived, they have a parallel effect upon the body as well; and the changes wrought by them on the bodily processes can be measured by appropriate instruments. Thus the records of the physical changes can be interpreted in the light of our conscious experiences as reported in introspections. In this way, for example, the volume of the arm increases—as can be demonstrated by the plethysmograph—when a stimulating red or orange light is shown to the individual being tested, whereas it decreases under the influence of blue light. Similarly, the sphygmomanometer shows increase and decrease in blood pressure, the sphygmograph alterations in pulse beat, and the psycho-galvanometer changes in the electrical condition of the body, under the influence of emotional stimulation. The mere sight or threat of a pin-prick is sufficient to cause a rapid

decrease of the electrical resistance of the skin, which is accompanied by many other physiological changes. Similar phenomena are observed to take place also when we merely allow our minds to dwell on thoughts of emotional situations; so that indirectly, and by way of memories, anticipations, or even mere representations of pleasant things, a large number of the bodily factors entering into the undesirable emotional states can be altered. If you want to be cheerful and care-free, *think* of cheerful and stimulating things; take up a cheerful, care-free attitude; since there is evidence that, by taking thought, we can mould our own emotions.

If it is sometimes difficult—though, in the light of the foregoing, it is seen certainly not to be impossible—to modify and suppress undesirable emotions with their consequent drain of mental energy in the way suggested, we can secure a similar result by means of a more roundabout method.

As has been shown, emotions consist largely in the physical changes brought about by the presence of emotional objects and situations. If we cannot easily alter these in our thought, we can, at least in part, directly modify some of the bodily tensions which enter into the complex of the emotion, and thereby also indirectly modify other physical factors of the emotional state. It is quite possible, for example, to change a depressed emotional state into one of elation by merely altering the general posture of the body. A slouched, depressed, spiritless attitude goes with mental depression, worry, or anxiety. If anyone suffering such an emotion will take the trouble to brace up and hold himself erect, fill his lungs and

breathe to his full capacity, take a brisk walk, and the like, he will find that, by altering his bodily condition, he has been able to alter his emotional mood also. He becomes cheerful and confident. He sees the world with other eyes. Ordinary breathing or calisthenic exercises have a similar effect; and the cycle of influence so set up between mind and body progressively dispels the energy-wasting emotion, to replace it with an energy-saving one. That is why sports and games[1] which brace and tone the muscles, secure the oxygenation of the blood and bodily tissues, and provide at the same time new thoughts which force one out of the habitual groove, are so beneficial from the emotional point of view.

What has been said applies both to the crisis of emotion which suddenly flares up and to those emotional states which are deep-rooted and persistent. In these latter we often seem literally incapable of turning our minds towards other things. We brood too deeply on the cause of the emotion or on ourselves to be able to think of anything else. In such a case the simplest practical remedy is the indirect one of seeking to produce the bodily expression of that emotion with which we wish to replace the one which is wasting our energy.

As we shall see in the following chapter, however, we need not entirely rely on an immediate remedy to be applied in each case. It is possible, at least to a large extent, to find a constant remedy—or rather a prophylactic—for costly emotions. We can, if we will, train ourselves to be optimists. Failing that, we can habituate ourselves in the performance

[1] Cf. Chapter XIII.

of some useful work which will employ all our available cognitive energy in such a way that the object arousing the emotion cannot be contemplated at all; and in consequence the emotion itself cannot develop.

At the beginning of the chapter we spoke of the emotional wastage caused by uncongenial occupations. To some extent even this can be minimised by making use of the suggestions already given. But it is more particularly with regard to one's personal relations with other people that emotional drains on energy are most disastrous. Apart from anger with its allied states, or fear, which rarely is developed to any great extent in ordinary social conditions, those that make the most wasteful demands upon our energy are certainly worry, anxiety, solicitude—to name but three of a group that could easily be extended indefinitely. There is also the devastating emotion which one experiences when being drained of force by what has been very aptly called a "costly" person. All of us know the kind of person meant; the man or woman who "gets on our nerves"; the bore, the blood-sucker, the vampire. There is no one who at some time has not experienced this—the helpless sufferance of some individual who drains us white of energy.

For all these there is a sovereign specific, if those already suggested as able to transform them into self-elation, complacency, tranquillity, and the like, should prove to be impracticable. It is relaxation. What is aimed at, of course, is relief of mental tension, relaxation of the keyed-up state which the emotion signifies. But, as we have seen, in all the emotional

states of every kind expressive bodily attitudes are involved; and these contribute to the emotional strain. Indeed, all mental activity is accompanied by physical activity; and, as far as we know, is incapable of taking place without it. In the emotions, muscles, both of the voluntary and the involuntary type, glands, and nerves are brought into play in a prominent fashion which is not habitual to us. Just as by altering the general posture of the body we may change one emotional state into another, so by relaxing it altogether we may relieve or abolish it. Relaxation of this kind is not so much a physical as a mental performance. In the first place, it has its origin in an act of the will. Further, we must know how to relax; we must be able to *feel* the tension and relaxation, not only in the larger muscles but in the small ones also. Most of us, without much practice, are able to pick up the feelings of strain and contraction from the great muscles of the legs, arms, or trunk; but very few can appreciate similar feelings coming from the eyes and organs of speech. Yet, as we shall see, for full relaxation even these small muscles must be relaxed as well as the great ones; and it is only by learning to recognise the feelings and progressively to modify them that we can reach the point of complete relaxation. This is not so easy a matter as one might suppose.

Nevertheless, though we do not attend to them as a rule, we do experience similar relaxations of the muscles frequently. When we lie in bed waiting to go to sleep—in which state relaxation progressively increases—little by little the muscles slacken their tension as the body takes the position of complete

repose. The difference between this and the state of tension is easily recognised by comparing it with the feeling of the first " stretch " when we awake. When we are going to sleep, languor creeps, as we say, into our limbs ; we may even lose consciousness of them, though we are not yet fully asleep, for we go on thinking. Our mind is active, though our body, so we think, is at rest. But the body is not at rest yet. We have not reached the point at which " sleep that knits up the ravell'd sleave of care, . . . balm of hurt minds, great nature's second course," has come to us. Especially is this so when we think of emotionally exciting things—projects we have in mind, recent emotional experiences, or the like. So long as our thoughts " touch " the emotions, their stores of energy are tapped ; and " free energy " is incompatible with the relative inactivity, the physical and mental rest of sleep.

Active thought, then, is what we must attempt to rid ourselves of in composing ourselves to sleep, as well as in relaxation.

We have seen that, though we may treat of mental and bodily energy in abstraction separately, mental activity cannot go on in the absence of physical activity. All the evidence we possess is against such a possibility. Accordingly, while we are thinking, and thereby using mental energy, we have to look for its bodily accompaniment if, by influencing this, we would minimise or suppress our thought.

Now, it is agreed that thought is in a very peculiar way connected with processes going on in the central nervous system. No one knows, and probably no one ever will know, what that connection is. There

is some evidence that we can to some extent directly induce sleep, as we can bring about waking, by willing —a power observed more in certain people than in others. But in practice it is often found that the will to sleep, especially when we are emotionally stirred, has precisely the opposite effect, and effectually wakes us up. Accordingly, for practical purposes, we should look to other bodily concomitants of thoughts than the brain processes with which we believe them to be in close connection. And these we find to be the same as those involved in the deep relaxation which reduces mental tension and puts an end to emotional expenditure.

While we are thinking, we are at least also seeing and talking; not, of course, observing external things or speaking aloud, but seeing "with the mind's eye," talking in "inner speech," and the like. This does not mean that thought consists in "imagery," or even that continuous imagery is necessary for continuous thought; but that trains of thought do not begin or continue without imagery of some kind. And, when images are experienced, there is evidence to show that the sense organs connected with the kind of imagery in question—especially visual and motor-speech—are active. Thus the muscles of the eyes and those of the larynx are *not* relaxed while we "see" or "talk," even, as we suppose, mentally[1] only.

[1] This is almost certainly true in the case of dreams also. The observation and study of "normal" dreams, and experimental work done in artificially inducing them, show that the dream has as its occasion or cause an internal activity of the receptor organs themselves, or slight external stimulations which affect them. Thus,

Recent experimental work[1] has shown that it is possible to train a person to relax completely, not only the greater muscles but those of the eyes, larynx, etc., as well; and that, when so relaxed, the mental state is one of complete relaxation, like that of the body. In this state the mind is at rest, even if the person is not asleep. Emotional strain is abolished, and mental as well as physical drainage of energy prevented.

Indeed, though actual demonstration of the possibility of such relaxation has only recently been furnished, it has long been known that even a less thorough-going procedure has similar effects. The hypnotist teaches his patients to relax as a preliminary to inducing the state of hypnosis. The analyst uses a similar device. And many eminent physicians have used and use physical relaxation as a means of securing

Bergson holds that what he terms (visual) " phosphenes " and internal auditory sensations are largely responsible for our dreaming. If, when fully awake, we close our eyes and attentively regard what then occurs in our visual field, most of us will be able to detect spots or patches of colour, coming and going, changing in hue and form, sometimes patternless, sometimes most beautifully and intricately patterned. This is often especially noticeable just as we are on the point of falling asleep; and, in this case, the " phosphenes " have been called " hypnagogic images." In this latter connection trained introspection yields the feeling of slight muscular contractions also over and above the visual imagery; and it is reasonable to extend the whole mental state, of which the imagery forms but a part, beyond the waking into the sleeping stage. Thus also Cubberley has found by means of experiment that small patches of plaster affixed to—or oil rubbed into the skin of—hands or feet (" tensors " and " detensors") regularly produce dreams of certain types, in which kinæsthetic images *certainly*, and probably actual kinæsthetic sensations, are experienced. Cf. also p. 226.

[1] Jacobson, " Progressive Relaxation," *Am. J. Psy.*, 1925.

tranquillity of mind. Apart from drugs, which may be employed to reduce emotional excitement, relaxation is an entirely natural, practical, and wholesome method of arresting drains on our mental energy. The bore and the vampire make no impression on us when we are relaxed. The slow-burning fires of the persistent passions can be extinguished by physical and mental limpness; and the sudden onslaught even of a great emotion can in the same way be parried and overcome.

CHAPTER X

WILL WASTAGE

In this chapter—which of necessity differs from others in the book in its method of treatment—we reach some of the most difficult and obscure problems of Psychology; those, namely, which have to do with human will, with regard to which hardly a beginning of scientific work has yet been made.

Throughout the history of thought, speculation as to the nature of the will has had a foremost place in all the great systems of philosophy, mainly because of the need of finding some basis for moral theory. And the current popular beliefs in its regard to-day are deeply coloured by these speculations of the past; though they are no doubt grounded on some fact of personal experience for each one of us also.

Despite our acceptance of the scientific axioms of determinism, the conservation of energy, and the like, most of us believe, as we commonly say, that we "have" a will, that it is "free," and that it is a faculty which sets itself in action and directs most of the other powers of our minds and bodies. In this popular view the will becomes an energy or force which can itself be utilised or squandered; and economy or wastage of the energy of the mental or physical powers directed by it must also be credited or debited to its account.

It is true that we are forced to set limits to the sphere of action of the will by the recognition of powers

which are not subject to our voluntary control. While we can with some success, for example, will to attend to a dull lesson we are learning, we can scarcely help attending to a violent stimulus which breaks in upon our mind. In like manner, we can will to close our hand or move our limbs, and execute the action; but we cannot directly by mere willing contract the smooth muscles of the arteries or intestinal canal.

Popular beliefs like these, though they may, with others, in the long run be justified, are not scientifically established. We have, as we shall see, no evidence that the will is a thing, or that it is (or has) energy. No measure has ever been made of the strength of will-acts, nor of any energy expended in willing. There is no satisfactory objective test of will as there is of "intelligence"; and in the present state of laboratory technique we can only fall back upon the use of estimates[1] in order to determine whether any given individual has a strong will or a weak one, a determined or a vacillating character, and the like.

Nevertheless, a few first steps have been taken in the scientific study of the will; and, as far as our point of view—that of waste or economy—is concerned, there is a certain amount of established knowledge available.

In making use of such knowledge, however, we shall have to disabuse ourselves of all popular philosophical prejudice—such as, for example, the "having" of a will which is "free." These are not questions for science, though they may be problems for philosophy. Moreover, it is inevitable, in the present state of our knowledge, that a certain amount of speculative theory

[1] Cf. Chapter VIII, p. 134.

should still be interwoven with ascertained fact. Though the observed facts themselves may be indisputable, there is considerable variety in their interpretation. We must adopt some principle, however, in interpreting the facts; and our principle shall be: to introduce nothing into theory that can be left out of it; to interpret fact by fact, rather than by speculation, where this can be done; and to confine ourselves to the aspect of energy-saving, which alone is the aim of this book.

In the first place, then, we must determine what we mean by will. Popularly, this is often supposed to be, and generally spoken of as if it were, an entity, or thing, in its own right. If such an entity exists, it should be discoverable in one or other, or in all, of those mental acts which are always attributed to the will; as, for example, acts of trying, endeavouring, deciding, resolving, choosing, and the like. But a very large number of experiments with regard to the control of experience by trying to control it, the breaking of more or less fixed mental habits by resolving to break them, choosing between alternatives, and the like, has been carried out; and in none of these has anything akin to a substantive will ever been discovered in introspection. When we try to perform a difficult task, such as holding one aspect of a reversible perspective[1] steadily before our mind, or working out a mathematical problem, we find that, at any rate to some extent, we can usually succeed in doing so. But introspection reveals no entity "will" in this, any more than it is to be found in ordinary acts of concentrated attention. At most what is discovered is

[1] Cf. p. 154.

a " consciousness of act," or " consciousness of action." This is an experience absolutely distinct from the consciousness of effort which has its physical origin in muscular strains in different parts of the body, and especially in the sense-organ actually involved in attending. But it is not for that an experience of will as a thing in its own right.

This " consciousness of action," as it has been called, is not, as a matter of fact, however, an abstract, isolated, and self-subsistent entity, as the term might seem to imply. Action is always a property of some thing that acts. And systematic introspection reveals to us that what we really experience when we *will* is invariably a being which acts in some one or other manner. This active being which is experienced, and which—though it does not arise *from* experience—may be held largely to determine the whole of our experience, is the Ego, or Self. It is the *same* being which is experienced when we, as percipients, perceive or, as judges, judge : the *same* being which is experienced when we passively " enjoy " a state of pleasure or unpleasure. It is a unitary and unique Self which feels, and knows, and wills ; not a collection of beings, one of which feels, another knows, and a third wills. Indeed, the fallacy of looking upon the will as a substantive thing is apparent when we reflect that while we may (improperly) speak of the intellect as understanding, or the will as willing, just as we speak of the eye or ear as seeing or hearing, we have no word whatever for any thing other than the Self as feeling.

Careful laboratory experiments, carried out with regard to trying, determining, resolving, choosing, and the like, have done no more, as far as this par-

ticular point is concerned, than establish the unsophisticated common sense of the man who says "*I* will, or choose; *I* determine, or try." To say this is to state what appears to be an indisputable fact. To go further, and assert that "I *have* a will," or "My will *does* this or that," is philosophical sophistication.

We may, therefore, take the will to mean the Self in action in certain ways—those kinds of action, namely, which we group together when we talk of resolving, determining, choosing, and the like. And in that sense we shall use the term in this chapter.

But if the will is in reality the Self, if acts of will are experienced as action, is there not an expenditure of energy involved in willing? Undoubtedly, when we will, there appears to be a flow of energy; but introspection shows that this is rather by way of a simple release of conative energy than an actual expenditure of energy in the exercise of the will itself.

Let us take a now classical experiment, many times repeated in various forms, to exemplify this. A testee is given a simple task to perform—to press one key with his right hand, say, when a red light is shown to him, and another with his left hand when a green light appears. In accepting the task, he resolves (and this is clearly an act of will) to do this. After the first few experiments have been performed, it is found that he presses the keys correctly though no willing is further involved in the performance, and the nature of the task, even, is no longer consciously in his mind. Whatever the intervention of the Self in his original resolve to react with his right hand for red and with his left hand for green may have been, it has released

energy which continues to flow in the appropriate mental, nervous, and muscular channels concerned in carrying out the movements of pressing the several keys.

Make the task a more difficult one. It is known that by frequent repetitions of meaningless syllables in pairs, these tend so to become related one to another that, on presentation of the first member of a pair, there is an inevitable tendency to remember the second one. The more repetitions, the stronger does the tendency become. In a series of experiments originally planned to measure the strength of the will, the testees were made to learn meaningless syllables of this kind a very great number of times, so that the tendency would be a very strong one indeed. Then they were told that the first syllables of the pairs would be presented to them ; but they were instructed to react by finding a rhyme to each, and not with the syllable which had been associated with it in the process of learning. It was hoped in this way to measure the strength of the resolve to rhyme against the number of repetitions of the syllables which had created the associative tendency pitted against it.

There has been considerable criticism of these experiments as a reliable measure of strength of will ; but " very strong " resolves to rhyme were certainly reported as having taken place when the instructions were given—*before* the syllables to be rhymed were presented. The subsequent rhyming, without any further intervention of will, evidently is to be attributed to such resolves. Acceptance of the instruction " to rhyme " set up what is known as a " determining tendency," or mental set, to rhyme, just as the instruc-

tion referred to in the previous paragraph set up a tendency to react with right or left hand to the coloured lights shown. If anything was measured in these experiments, it was the " determining tendency " against the force of association between the syllables, and not the strength of the resolve to rhyme which was taken beforehand. And perhaps even this was not " measured."

Increase still more the difficulty of the task. It is well known that after we have looked at a bright light for a short time we tend to " see " it even when it has ceased to act upon our eyes. Let the reader stare for a moment at an incandescent lamp, and then close his eyes. He will see the filament, first in its true colour, and then, intermittently, in its complementary and a number of other hues. Experiments have been carried out in which each eye was stimulated by an exactly equal amount of illumination for exactly the same time ; but with this difference, that the stimulus for the right eye was a bar of light sloping inwards and downwards from right to left, while that of the left eye sloped inwards and downwards from left to right. The testee, of course, could not tell from which eye the after-sensation was coming, except in so far as he knew that the inner left-hand slope belonged to the left, and the inner right-hand slope to the right eye. What the person tested " saw " while the light was falling on his two eyes was a V. What he experienced afterwards, when the light was turned off, were intermittent after-sensations which might be a complete V (when both eyes were involved), or the left or right arms of the V, according as the left or right eye only was affected.

The absolute durations of these after-sensations could easily be recorded by electrical contacts in circuit with pointers which traced their time-intervals on a smoked drum.

In this experiment the testees were told to record their after-sensations in two different conditions: first, when these occurred freely (i.e. when no attempt was made by the testees to influence them); and secondly, when an attempt was made "to have and to hold" the left arm, the V, or the right arm alone. It was found that the resolve "to have and to hold" (clearly a will-act) exercised a marked effect on the duration of that after-sensation for which control was desired, its relative duration with respect to that of the others being considerably lengthened.

In these experiments—apart from the fact that they showed that by willing we can to some extent control the course of experience—introspection gave clear evidence that two factors of special importance were involved in control. There were the usual strong feelings of muscular effort; and there was the consciousness of action mentioned above. The felt muscular effort is always referred to that aspect of ourselves which we call our body; while the distinctly introspectible consciousness of Self as active is, more properly, attributed to the aspect we call mind. It is clear that energy is expended in any muscular action; its amount can be measured in terms of the fuel used up, or of work done. But it is by no means so clear that what we have called Self-activity in willing is also measurable, or indeed calls for energy of any kind. In any case no direct measure has ever been attempted; though in experimental work on conation testees exceptionally

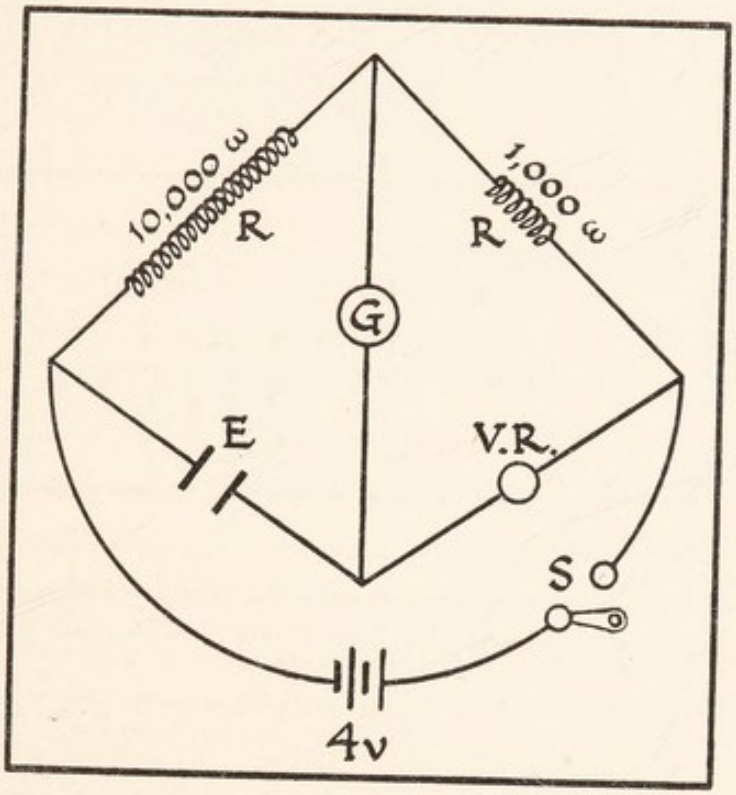
good in introspection were able to report the experience of a greater or less amount of "something," taking one such experience as an absolute amount and comparing it with another. This method of comparison, of course, lies at the foundation of all measuring; but, since there is no possibility of finding units in the standard by which we measure in this case, no exact results in the scientific sense can be expected. This "something" which was experienced as greater or less, however, was recognised as belonging to the group of conational or volitional phenomena. In subsequent paragraphs we shall bring forward evidence to show that it is conation rather than volition or will.

Attempts have been made to get some more or less exact measure of this Self-activity, whatever it may be, indirectly; by measuring, namely, bodily changes which constantly occur parallel to changes occurring in it. Whereas we can find no physical standard divided into units by which we may measure mental events, the body is susceptible of being measured in a great variety of ways. Among other things, as we have seen, we can record the volume, and the changes in volume, of a limb, or the electrical resistance of the skin. And on the assumption that changes in these, or any like measurable physical phenomena, run parallel to changes in the amount of what we have called Self-activity, we can get some measure of the latter by measuring the former.

Of the different indirect measures of this kind, the psycho-galvanic index (psycho-galvanic phenomenon) appears to be one of the finest and most practicable (see diagrams, pp. 195, 196).

It has long been known that certain mental events

are accompanied by changes of an electrical nature in the body, which can readily be measured. Several forms of apparatus have been devised for recording these changes. In principle, they all consist of a galvanometer in direct or secondary circuit with the person to be tested, in such a way that any electrical



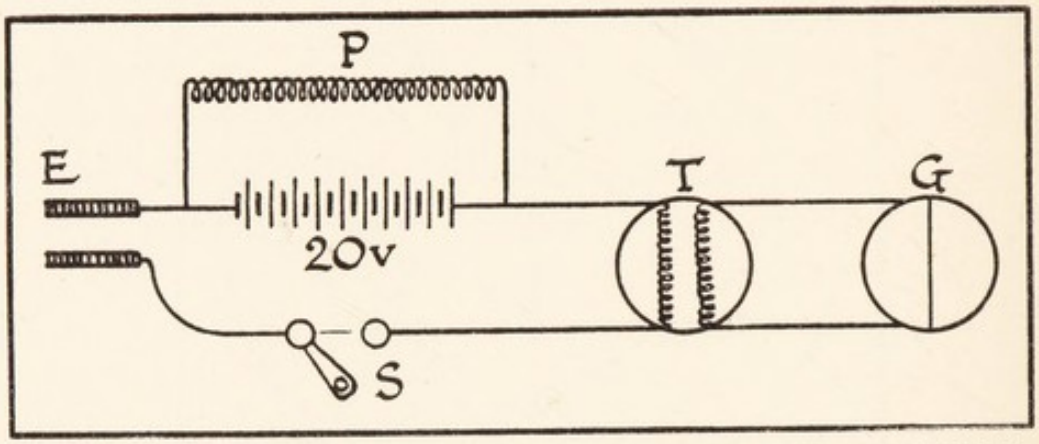
ARRANGEMENT OF APPARATUS FOR PSYCHOGALVANIC REACTIONS (GALVANOGRAMS).

E, Electrodes fixed to palm and back of hand.
G, Moving coil Galvanometer.
R, R, V.R, Fixed and Variable resistances of Bridge.
S, Switch.
4V, 4-volt Accumulator.

change (body current, resistance, etc.) occurring in him will cause a movement of deflection of the galvanometer needle. A small mirror affixed to the needle reflects a beam of light upon a moving strip of photographic paper; and, as the needle swings, this traces a line of light upon it. Thus every alteration in the

level of the curve is due to electrical changes in the testee.

The kind of mental events with which the deflections in the galvanometer curve are associated are commonly held to be emotions; and the amount of deflection has been taken as the measure of the emotion experienced. "Nocive" stimuli, for example, such as a pistol-shot, a pinprick, or the mere threat of a pinprick, and the like, were originally observed to produce



ARRANGEMENT OF APPARATUS FOR PSYCHOGALVANIC REACTIONS (TACHOGRAMS).

E, Electrodes fixed to palm and back of hand.
G, Special sensitive and quick-period Galvanometer.
P, Potentiometer.
S, Switch.
T, Transformer.
20V, Accumulators.

such deflections. In a similar way, decreases in resistance were sometimes found to occur with mere thoughts of emotional situations. As a matter of fact, they have since been found to "go with" increase in any kind of mental activity. Any pronounced act of attention—counting aloud, working out logical or mathematical problems "in one's head"—is capable of producing these deflections; and the greater the difficulty of the mental task performed, the greater,

roughly speaking, is the accompanying drop in resistance.

Theoretically, some degree of emotional feeling is always present in our minds; practically, however, many thousands of galvanic reactions have been recorded in which the testee was unable to discover any trace whatever of an emotional state; and, contrariwise, emotions have been experienced with no corresponding galvanic deflection.

We must clearly, therefore, look elsewhere than to emotional experience exclusively for an explanation of the phenomenon; though, at the same time, we must hold that emotional situations do frequently account for it. There is, however, no contradiction in this. We have seen [1] that emotions are intimately connected with instincts. Indeed, they are to be considered as an aspect, or part, of an instinct, of which a no less integral and important part or aspect is the conative drive or impulse towards action together with the ensuing action itself. If emotion arises, it apparently serves to increase the energy of the impulse; and we have suggested that it arises principally, at any rate, when the impulse is checked or impeded.

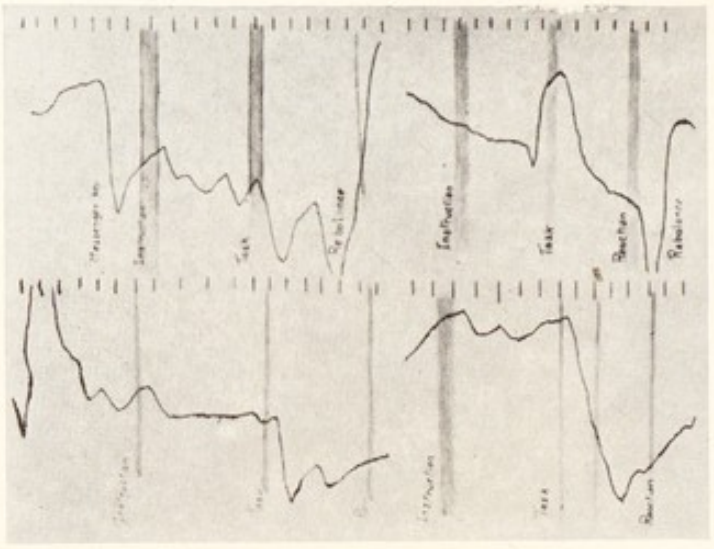
The decrease in skin resistance registered by the galvanometer is accordingly to be considered as due to the conative, rather than the emotional, state of mind, and as measuring, at least to some extent, the amount of conation. And this is in no way inconsistent with the evidence that emotional states may produce it, since the arising of an emotion may be taken as a sign that conation has increased. When threatened by a pin-prick, or burning match, for

[1] Chapter IX.

example, there *may* be emotion ; but there is certainly a strong impulse to withdraw from it.

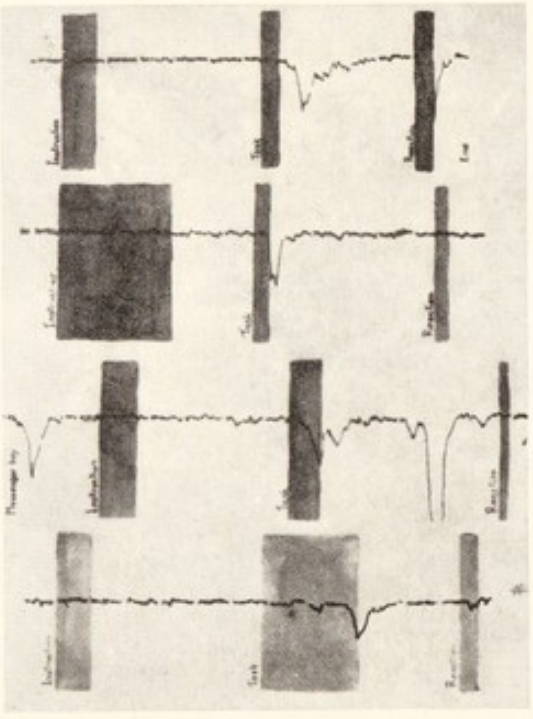
But a more convincing argument, at any rate for the present writer, is to be found in direct introspective experience. Very early in a long series of experiments on different mental processes—character qualities, judgment, strength of will, control of after-sensations, choice, and the like—it was found possible to compare, as has been said, one state of Self-activity with another mentally, and to say whether the latter was greater, less, or roughly equal to the former. The testee reported such comparisons in his introspections; and when the photographic paper was subsequently developed it was found that the recorded deflections agreed extraordinarily well with the reports. Whatever mental states he was actually comparing as greater or less did in point of fact largely accord with greater or less diminution in his skin resistance. The important point to determine was : What were the states so compared ? After much tentative description of the experience in question, the term " alertness " was found to characterise it best, as signifying the transition from a state of relative passivity to an active one. This alertness (the " consciousness of action " of previous observers) was clearly distinguishable from the sense of effort, of which we have already spoken as a mass of feeling of muscular origin. It was in no sense emotional, though it might be accompanied by emotion. And it was clearly recognised as of a conative, or striving, character. It was the Self as alert that was described.

It remained undecided, however, as to whether this experience could truly be called volition (will) or not.



EXAMPLES OF GALVANOGRAM.

The decrease in resistance is measured by the linear amount of the deflection.



EXAMPLES OF TACHOGRAM.

The rate of change in resistance is measured by the area of the deflections.[1]

[1] The Galvanogram and Tachogram deflections shown in the illustrations were simultaneously recorded, one from the left hand, the other from the right.

Indeed, in this first series of experiments, which was on choice, what was reported by the testee as alertness or consciousness of action in choosing between alternatives seemed to be the release of conative energy and no true volition at all; since in this series, as subsequently in others, the same experience was reported and was accompanied by deflections in circumstances in which there could be no question of will at all. The volition in choice is the adopting by the Self of a motive for the selection of one of the alternatives; and there is no evidence that this makes demands on mental energy nor that it is indicated by any psychogalvanic deflection.

In order to determine this point, a further set of experiments was carried out in which decisions and resolves (clearly will-acts) were separated in time from their fulfilment. The testee, for example, would decide to carry out some more or less difficult mental task as soon as it was given to him. The carrying out of the task certainly required mental effort and trying (conation); but apparently the resolve to carry it out needed none. Even most "energetic" decisions, resolutions, and the like, demanded no more mental effort than that required to attend to what was being done. If there were any real drainage of energy connected with them, it certainly was not greater than that which occurs in ordinary acts of attention.

Galvanometer curves were regularly recorded throughout these experiments; and it was found that the deflections were almost invariably greater when the tasks were actually being performed than when the acts of will were made. In many cases no deflections whatever occurred at the moment of decision or resolve

to do the tasks; but, varying in amount with the difficulty of the tasks, decreases in body resistance were recorded while they were being carried out.

On the very reasonable assumption that these decreases in resistance are an indication of the expenditure of mental energy, going with increase in alertness, it seems clear that trying to perform any mental operation uses up energy, while actual willing does not. And this is in accordance with the introspective reports of the testees. No matter whether we call our will-acts—resolves, decisions, and the like—strong or weak, intense or feeble, true volitions seem to require no expenditure of mental energy. If there appears sometimes to be such an expenditure when we will, this is due to the fact that we are at the same time attending or trying to attend; it is due to simultaneous conation. What we experience as mental—as distinguishable from physical—effort, and what is indirectly recorded by the galvanometer, is mental performance or trying. The will-act itself is effortless and demands no energy.

This conclusion will appear to some people to be a startling one. To make it clear, consider what happens in an indubitable will-act—that, for example, of choice. As the choices made in laboratory experiments are the exact parallels of the choices of every-day life, any simple act of choice will serve for analysis.

Suppose we have to choose at dinner between thick soup and clear. What happens? The resolve to take soup at all is the equivalent of the acceptance, in the laboratory, of the instruction to choose. It requires no effort, no energy, other than that necessary to attend to what we are doing. The waiter then presents the alternatives: "Thick or clear, sir?" Nor-

mally, we may make up our minds in an instant and be unable to observe any mental process at all, so quick, so predetermined, so habitual, may the choice be. But let us be fastidious here and deliberate, weigh one against the other the merits of the soups, as we so often weigh the alternative values to us of different courses of action. At once conative energy is called into play. The basic instinctive tendency or appetite for food is drawn upon. The two alternatives "thick" and "clear" have to be held determinately before the mind. We cannot choose for any good or reasonable motive until we know clearly what they are. And the mere trying to know them, to hold them steadily in consciousness, requires energy.

This last fact comes out in a startling way in work done with nonsense words to which a meaning is being associated by the process of learning them together with pictures or diagrams which, when learnt, they are to signify. Trying to get their meaning clear before they have been thoroughly learned is a hard task, and entails a very considerable drain of mental energy. It is accompanied by marked psycho-galvanic deflections. Similarly, recalling the full meaning conveyed to us by the words "thick" and "clear" makes certain demands on us, more or less, according to the amount of reproductive force required.

The next step consists in motivation; and here, again, energy is called for, especially in the case in which the motives for or against each alternative are more or less evenly balanced. As far as motives alone are concerned, were they absolutely equal we should be in the position of Buridan's Ass, starving midway between the bundles of hay which equally attracted

him. Choices between alternatives where the motives are equally balanced are difficult. If we must choose when both the soups are equally delicious, or both equally nasty, we shall have to discover some way of altering, or adding to, the values of the several motives until one of them reaches the critical point for choice. One soup, for instance, may be more wholesome than the other. When the critical point is reached, the actual choice takes place without further ado or expenditure of energy. But the search for fresh motives, the strengthening and weakening of motives already present, the weighing of motives by throwing the Self, as it were, into the scale with them, all demand conative energy, and often to a very high degree.

As a matter of fact, all motives for choice, before they actually become capable of moving us to any course of action, exist in the form of values. Objects and actions possess a value in relation to ourselves ; and we come to our choices with a scale of values already created by our past experience. These values correspond to our instinctive needs and to the acquired wants which are built up upon them.

Value thus ultimately consists in the relation of anything whatever to a native instinct, or to one of its acquired derivatives, as satisfying to it. And, since our values are constructed in a scale, it is their relative worth one to another, rather than any absolute worth, which in the end enters into the motive. When we are hungry, any food has value ; but some foods have more attraction than others. We shall be determined in our choice of thick soup or clear by the relative value which, by our acceptance of it, becomes a sufficient motive.

This is less evident, perhaps, in actual life than in the experiments carried out in the laboratory. Here we can create a relative scale of values, or worthwhileness, of a series of colours, tastes, or odours, by comparing them and listing them in an order of preference. In most choices made between the items in any such list, the event shows that it is the relative position of any given alternative in the list with regard to any other that determines the choice. This, however, does not invariably hold good ; for other conditions, extraneous to the nature of the scheme of value on which the list was made, may play their part also. The value " wholesome " may override that of " nastiness " in the case of the soup.

The last phase in the act of choice is the fixation of one of the alternatives to the exclusion of the other ; and this phase is reached as soon as the motive for it reaches its critical point. Here again we may frequently be aware introspectively of Self-activity ; and usually this phase of the choice has been assigned in a very intimate way to the operation of will. It is here, if anywhere, that the " fiat " occurs. Is it not the actual point at which we *choose* ? And is not energy expended here ? There are reasons to suppose the contrary.

In the first place, in repeated acts of choice, the choice in the end becomes absolutely automatic, just as the pressure on the appropriate key in the experiments considered above. The whole process from beginning to end unrolls itself under the influence of the initial resolve to choose which began it ; and there is no further intervention of the will whatever.

Moreover, in those choices in which the will does

intervene—by way of strengthening motives, terminating the suspense of a long reaction, or the like—the consideration already advanced again holds good. A simultaneous conation—a trying, striving, or doing—accompanies the will-act ; and this is both what is experienced, and registered by the galvanometer. The " fiat " itself is effortless.

An illustration may help to make the point still more clear. Nothing of the nature of the human will, involving as it often does the acceptance here and now of far remote ends to be pursued, ideals to be realised through striving, and the like, can be credited to other animals than man. Yet in them we find instances of the most amazing striving towards instinctively determined goals. In them, too, we find the psycho-galvanic phenomenon. The sustained conation of the flight of migrating birds, driving them relentlessly on over their course of thousands of miles, sometimes to utter exhaustion and even to death, can be paralleled by the relentless pursuit of a chosen end, an adopted ideal, which we sometimes find in man. But the effort is not in the willing itself ; it is in the carrying out of the willed action. The expenditure of energy, which may be both enormous and continuous, is in the execution of our plans, not in our contrivance of them. Will is not action, but the Self-initiation of action, whether physical or mental. To this extent the study of the will is necessary for any fruitful economy of energy that lies within our power. The problem of the education of the will for the sake of economy is the problem of providing suitable values for the conduct of life ; values to which we assent voluntarily and effortlessly. And, in this sense,

volition may be said to be knowledge. Economy in the further striving initiated by the will-act may be secured by finding a "best way,"[1] by systematic training in forcing ourselves to perform with patience even trivial and in themselves quite unimportant actions, by creating habits of action by repetition.

But we ourselves as wills—whether determined or free—can only be understood in terms of motives ; for we do not act *in vacuo*. Ultimately, therefore, we are understood in terms of values, since every motive is a value that has come to be identified with Self. In the following chapter we shall consider the notion of value as related to the training of the will on economical lines.

[1] Cf. p. 23.

CHAPTER XI

IDEALS, WILL AND CHARACTER

If, as we have considered in the previous chapter, will is an effortless Self-activity in the acts of which, as such, no energy whatever is expended, it is none the less often a controlling factor in the release of energy. If I will to think out a problem mentally, and do so, I expend mental energy. If I will to raise my hand, and execute the motion, physical energy is expended as well. The executive powers which are under our voluntary control use up physical and mental force; though "the reserve of energy which gives efficacy to the will lies below the conscious limen."

Accordingly, if we would economise such vital energies as lie within our power, we must consider how we should best act in voluntarily releasing them. This problem in reality is not one for experimental psychology, since it is a problem of values, and therefore is related to the whole philosophical scheme of life. It is a metaphysical problem, and thereby transcends any one particular science.

None the less, if we accept—as in point of fact each one of us does accept, no matter how crudely—a system of values, we can make some scientific study of the way in which any one of these comes to be adopted as a motive for action; and we can also see

how every will-act tends in the long run to become habitual.

We have already considered the fact that a value only exists in relation to a desire or a need; and ultimately can be explained only in relation to instinctive needs, to which all our personally acquired desires are reducible. We can thus conceive objectively the relation which constitutes a value as holding good in the case of any well-marked animal instinct. Though the animal, driven by the instinct, cannot realise it, we can, for example, appreciate a value attaching to the peculiar egg-laying activities of the yucca moth or the solitary wasp. And it is because we can conceive the relation of value, and do ourselves experience purpose in connection with that relation, that we read purpose into the behaviour of these creatures, or, for the matter of that, into Nature as a whole. Because of our experience of purpose in purposive behaviour of our own, we are able to discern purposeful laws in Nature.

Nevertheless, while we can detect the objective relation of value in such clear-cut instinctive actions as those of the moth or wasp, most of us can very seldom give any really intelligible account of the values we ourselves adopt as motives for our own voluntary action. The reason of this is that the instincts in man are not so sharply defined and invariably determined with regard to their objects as they are in the case of other animals. There is a very great elasticity in their application, because of the process in which the connate end of a human instinct comes to be supplanted by any one of a large number of substituted ends which are ideally represented in

thought. Thus a man may act for motives of patriotism, or honour, or duty, and the like, because of his fundamental instinct of self-assertion. Since he is no isolated unit, but a member of a social organisation, this instinct becomes determined to the sentiment of patriotism, say, by some sort of ideal evaluation of patriotism as in reality satisfying the Self-regarding sentiment. All this implies an intelligent elaboration of values within the scope of the instinct over and above the mere instinctive drive itself. It implies also deliberation, or the weighing one against the other of the values so elaborated.

The wasp and the moth neither elaborate nor deliberate. At the appropriate time the complicated action of egg-laying is simply carried out; no more being necessary for its instinctive accomplishment than the objective conditions—the presence of the flowering yucca, suitable soil for the nest and possible prey, and the like—over which these insects have no effective practical control.

But it is precisely because, for us, several values within the scope of each need or desire may be possible, and may be ideally represented as satisfying it, that we are able to suspend instinctive action while we seek to understand the values fully, and weigh one against the other the relative advantages of each in regard to ourselves. For, as we have seen, it is in relation to Self only that anything has any consciously apprehended value at all. Moreover, to some extent at least, we are able to control our environment, not only in the following up of any given course of action that has been determined upon, but also in ideal representation beforehand. These facts undoubtedly

complicate the abstract consideration of any several values which happen to be in presence at any moment; but, in actual life, such complications exist and have to be reckoned with.

In the suspension of the instinctive action which itself immediately liberates energy, the obviously effective factor is the apprehension of several values which are more or less equally balanced. But the really important matter for economy is the thorough understanding of the values as motives for the different courses of action considered. In other words, values have to be accurately determined. Though we may possess some roughly accepted system of them, it is not, as a rule, always one that makes for economy in actual practice. The values of the vast majority of people, it may safely be said, are immediate ones—if they are not actually no more than instinctive. Living from hand to mouth, as it were, and wastefully, they adopt as motives those values which can be realised at once. Whereas in truth the economical way of living is to secure our motives for our every action from a scale of values which are subordinated one to another. And such a subordination can only come from an intellectual appreciation of their *relative* worth. To this end all the values must be arranged in a hierarchy under one supreme value in relation to which each finds its appropriate place. Thus, when any one of them comes to be accepted as a motive for action, in any given circumstances, it will be a motive by which we *ought to be* moved. This ought, however, is in effect no moral ought, though ultimately it will no doubt come to be related to a moral standard. A motive is never a motive in the

abstract. It is always someone's motive; and every value that is made a motive is always so made according to someone's standard.

But to state this is to state the objective aspect, in terms of value, of what in reality is, on its subjective side, a hierarchy of native and acquired tendencies to action—wants or desires of the Self, or person. The many springs of action within us, which are the expression of our many-sided nature, are not all capable of simultaneous functioning. Just as we cannot at the same time flex and extend our arm, so we cannot, for example, fight and run away at the same time, nor simultaneously in all respects be patriots and Self-seekers.

Accordingly, the instinctive drives or impulses must be pitted one against the other in some way; and an economical balance is only to be secured by a more or less stable equilibrium, in which that one only is released for action which—in accordance with our value-estimates—we wish to release. Such an equilibrium of instinctive energy can be to a very large extent secured and controlled by the will; and this, we have already seen, is not a separate entity, but the personal Self. What is secured in this way is no more than Self-command, or Self-control.

Now, the Self, or person, is moved to assent in choice, or to any other act of will, by a motive—indeed by the strongest motive. But the motive in question is always that value which the Self, as such, accepts. Any other sort of motive is involuntary. The adoption of any value as a motive, then, is what principally has to be explained. And—though there are undoubtedly exceptions, if the question is considered thus in the

abstract—it may be said that that value is always accepted as motive which best accords with the sum-total of dispositions, native and acquired, which are organised or integrated in Character.[1]

Accordingly, if we are to attempt to secure any economy of the physical or mental energy unloosed by will, we must know upon what plan character should be built up, as well as how to set about its building. This we can only know by possessing ourselves of an adequate system of values; and by securing at any moment that one value which is most economical as a motive for our action.

The training of the will accordingly becomes the training of character on the lines of value. It becomes

[1] The view of Character as an integration of native and acquired tendencies under the presidency of the will is one which has led to much confusion. Because we consider tendencies and dispositions in the abstract, give them names, and speak of them *as if* they were substantial and independent realities, we tend to think of them as existing as such; forgetting that we are dealing with them analytically and abstractly only for purposes of exposition. Such tendencies, etc., do not *exist* in the abstract, but concretely and as the expressions of an individual entity or nature. The observed behaviour of a man—which is the way that his tendencies, in some manner related or subordinated one to the other, manifest themselves to us—in reality betrays a *person*. But the person himself is not merely an integrated system of isolated tendencies (taking these in the widest sense possible). Personal unity is not the result of a sum of independent acts or possibilities of action. The acts and capacities, on the contrary, are the acts and capacities of the individual person himself. And Character is the mark, or set of marks, by which we know him. Personality—an abstract term—is often confused with Character; but, while Character *may* be looked upon as the relatively permanent integration of all the tendencies of an individual, the Person himself may not, and still less may his Personality.

Self-training in the light of values. Thus, as far as a plan of life which will secure economy is concerned, the important matter is to arrange all the relevant values in a hierarchical order.

The building up of such a system of values is the task, not of the will, but of intelligence. It is only because we appraise one in relation to the others that there can be any system or hierarchy at all; since, as we have seen, it is the relation of one to the other that constitutes the scale; and relations are only apparent to intelligence.[1]

It may seem to be a waste of energy or, what is the same thing, a waste of time to take the trouble to work out a scale of values for ourselves. But this is not so. It is no more a waste than the trouble and time involved in testing for vocational aptitudes is a waste considered in relation to the total amount of energy-saving it may ensure.

As a matter of fact and of common experience, human life is so complicated in itself and in its setting that it is quite impossible for any individual to satisfy all his desires by realising all his values. Human abilities are so numerous that we cannot allow them all entire freedom of action. The opportunities for converting values into motives are too varied to permit of the simultaneous, or even the successive, conversion of them all.

Moreover, all values are not equally worth while as satisfying our needs or wants; and we require a criterion of their worthwhileness. The touchstone of value is not mere pleasure, even if immediately attainable; for experience makes it abundantly clear

[1] Cf. Chapter V.

that pleasure aimed at as a thing worthwhile in itself invariably defeats our end to attain it. Some other criterion of worthwhileness is necessary; and this is to be found only in the accomplishment of the action in which we identify ourselves with the value by pursuing it and making it our own. Any substantial or lasting happiness is entirely dependent upon achievement of this kind. Accordingly, some sort of a hierarchy *must* be established, if we would not continually have a conflict—and a consequent appalling wastage of energy—within ourselves.

But our values, on the one hand, and our desires, on the other, are themselves of two orders. There are values of the sensory order, which depend upon the condition of the organism. In this sense, food, or drink, or a mate, are values in respect of the cravings of hunger, or thirst, or sex. These are inborn. But there are also values of an intellectual order which are personal and acquired; and the desires corresponding to them are both modifiable by training and controllable.

Of the two classes of values, corresponding to sensory and intellectual needs and wants, the intellectualised values seem to be the higher; and of them all the highest appears to be satisfaction in the attainment of a completely unified character. But this, as we have seen, can only be realised by the organisation of all the tendencies which together go to make up character. Organisation, however, cannot be secured by merely setting one thing beside another. Unification can only be brought about by subordinating one to another. Our plan of life, therefore, should have Self-realisation standing in the first place, as the ultimate end to be

attained. It will relate all other tendencies to this aim. It will be regulated by that most fundamental of all the sentiments—Self-regard. It will draw its energy from that strongest of all the instincts—Self-assertion.

These statements may seem to be false and even cynical; but they are neither false nor cynical. They are not false; since the only practicable plan of life must take human nature as it finds it, and build up from the strongest and most enduring foundations. Nor are they cynical; for it is not the actual Self, in process of realisation, that is proposed as a goal, but the ideally represented and "perfect" Self—the fully realised Self as presented in thought—towards which our striving ought to be directed. *This* Self may be considered from many aspects. For the moralist, it will be the morally ideal Self; for the æsthete, it will be beauty; and for the metaphysician, reality. But at this point all the value aspects break down and coalesce.

No one of the instinctive springs of action will be left out of the foundation of the completely organised character; but we shall be able to manage the impulses arising from them and the desires connected with these impulses in the strength of the supreme desire reaching out towards the ideal Self.

If this is the end proposed, it must be clearly held before our spiritual vision. All the means which might help towards that end must also clearly be conceived, as well as those which hinder its fulfilment. Whatever impulses to action or thought then may arise on the sensory or the conceptual plane, we ourselves as will can only regulate them by reference to value. Thus, in order to attain the end proposed, it is reason-

able to use Self-restraint in many directions; it is necessary to hold many impulses in check; and to divert many acquired, and even native, tendencies into fresh channels.

It is in this that character-training consists; and here a real call for effort is made. Having constructed an ideal plan of life by relating all our other values under the supreme value of full Self-realisation, we find it difficult to act up to it. It may be that it is easy enough to make, and to understand, the plan itself; for that is merely a matter of intelligence and judgment. It may be easy to assent to it, or to adopt it. The difficulty lies not in this, but in carrying the plan out, in living it. And this is so because of the strength of the impulses which militate against it—impulses arising from undisciplined desires and from native propensities which have not been properly organised within us.

Here, apart from keeping the ideal goal steadily before us, there is only one way of securing our aim. Like every other mental process, impulses may be disciplined and desires trained. Mental consistency or habit, as well as bodily, may be secured by exercise; and unwanted desires weakened by the cultivation and strengthening of opposing ones, by the draining away of their energy into the service of desires which we wish to cultivate. Constancy of will, in matters even of the greatest moment in life, may be attained by practising Self-control and Self-denial in little things. We may become "will-skilled" by exercise.

A similar process may be instanced in the acquisition of any skilled psycho-physical habit, as, for example, typewriting or piano-playing. At the first stage the

learner explores the keys and finds their relations one to another slowly and tentatively. It is a new pastime, and interesting. But as the novelty wears, and he still has to continue learning, effort is required to keep him to his task. In this stage, very considerable energy may be released. He knits his brows, strikes the keys with quite unnecessary force, spells out the names of the notes or letters, and clearly expends great mental and physical energy. But this second stage gives place to a third when the habit is acquired; and the playing or writing then runs smoothly and—unless for some other reason impeded—with little or no effort at all.

This process is exactly parallel with one which is to be observed in the laboratory, when acts which were originally will-acts are seen to become habitual—to lose their character of true volitions—by repetition; so that in the end we come to act in a certain way without further thought or willing.[1] In this sense "training of the will" is a possibility; though in reality the phrase means disciplining our tendencies by means of repeated acts performed under the influence of resolve, or decision, to carry them out.

In all this process of habituation, however, if we would the more easily ensure success, there are several conditions to be observed.

In the first place, a definite purpose is absolutely necessary. This can only properly be secured by a thorough understanding of the plan of life which we frame for ourselves, and a realisation of the essential relativity of all the values contained in it with regard to its supreme value. The choices of the laboratory

[1] Cf. p. 203.

are all conditioned in this way by that "value" which is constituted by the nature of the experiment in progress, and the "leading" desire to perform it according to the instruction given.

Secondly, that value in the strength of which all the others have their (relative) meaning must be one which is apprehended as in reality attainable. A chimerical goal, an impracticable course of action, cannot appeal to us in such a way as to hold us in spite of the urge of any strong impulse that may arise against it. We may hitch our waggon to a star; but we cannot long keep up a pursuit of comets.

And here, again, experimental work shows us how, despite the strongest resolutions to perform a given task, a testee constantly "gives up" in all those circumstances in which he feels that the task is not forthwith about to be realised.

In strict relation to the realisation of the proposed goal as attainable is the further character that it must not be too far distant from our grasp. Our highest ideal values sometimes fail to be accepted by us as motives for our action, or having been accepted fail to remain effectual motives for us, not because they are in themselves impossible of achievement—we may be certain that they are—but because they are so far removed as to require a long and persistent course of action to achieve them. We have, in such a case, a distrust of ourselves. Shall we—we ask—in such an arduous pursuit, be able to succeed? Will our star shine always, or will it suffer an eclipse while we are painfully treading the long path that separates us from it? *Can we succeed?*

To counter this—which is a counsel of imperfection

to ourselves—we have only to set before us intermediate goals to be conquered one by one on our progress towards the final goal of all. "Nothing succeeds like success"; and as we pass one sign-post after another, distrust in ourselves gives place to confidence. "If we have come so far, why not further?" The athlete does not hope to win his palms at once. Rather, he trains, with discipline and self-denial, to fit himself for final victory. But relative success is a condition of his persistent training; and, without it, he will not continue to put forth all his effort.

So also in laboratory experiments it has been proved that a knowledge of success achieved in any task has helped to spur the testee on to further endeavour. If the plotted curve of work he has already done be shown to him, it always acts as an incentive to a greater increase of output. When he knows he is doing well, he will do better.

Finally, the accepted value-goal must be in fact *one's very own.* In other words, no matter what other personal instinctive drive is harnessed in its service—the spirit of emulation or competition, the urge of acquisitiveness, or the drive of sex—identification of the Self with end or goal must be secured. That is to say, as we have already seen, the value must become a real, actual motive, by becoming linked with the Self-regarding sentiment and thus rooted in the instinct of Self-assertion.

What the precise plan of life to be adopted should be, how its values are to be subordinated one to another, it is not within the province of Psychology to enquire; and, moreover, from the point of view taken throughout

this book, it is a matter of indifference. But, once a plan is in fact adopted—and some such plan, vague and unsatisfactory as it may be, in point of fact always is adopted—economy of energy can only be secured by disciplining oneself according to that plan ; so that it may come to be carried out, or lived, as smoothly and as effortlessly as is the action of the will itself. Under the influence of that action, whatever tendencies are exercised will become habitual, and thereby second nature. Accordingly, if by " nature " we understand the ground or source of all the activities of any being, second nature will be the ground or source of those same activities as modified by exercise and fixed in habits. Thus habit is crystallised freedom.

And this is what we know as Character, the mark or seal of a trained, and by training vigorous, nature—or, better, the expression of a Person in the process of Self-training, Self-expansion and Self-development.

CHAPTER XII

DISTURBANCE AND SUBLIMATION

In the previous chapter we considered the way in which Character comes to be formed and consolidated by a double process of integration and training of our connate and acquired tendencies under the influence of will tending towards a consciously presented and accepted goal. We saw also how difficulties may arise in the following out of our plan of life once it has been adopted. Impulses inconsistent with it, arising from undisciplined tendencies, have to be overcome. Energy has to be diverted into channels in which it will help rather than hinder us. In all this, economy consists essentially in securing unity of character.

All that has been said, however, had reference to the "normal" mind—the hypothetical *mens sana in corpore sano*—to which our actual minds tend only more or less to approximate. Such difficulties as we may meet with, accordingly, in the training of our Characters will differ greatly from individual to individual; though, within the range of what we may agree to call "normality," they may all be looked upon as being within our power of control. They are disturbances rather than uncontrollable impulses.

Beyond the region of normality, however, and infinitesimally shading off from it on either side, lies the region of the abnormal. And here impulses may be, and often are, absolutely uncontrollable. Here, too, the impulses show themselves in strange

and unusual forms—unreasoning and seemingly unaccountable fears, compulsive actions, functional paralyses, contractures, and the like.

It is not the purpose of this book to include a chapter on systematic Psycho-pathology, or to make any detailed study of the abnormal mind for its own sake. No clinical case-histories will be given. Readers who are interested in these matters can be referred to the already vast and continually growing literature on the subject, which is the result of an immense amount of pains-taking study and investigation of such case-histories. While not, in the strict meaning of the term, experimental, all this work has been carried out upon empiric lines ; and we can have every confidence in the accuracy of the reports, and in the care with which inferences have been drawn from them.

Of recent years enormous advances have been made in these branches of Psychology as applied to medical practice, which throw a very considerable light upon the normal functioning of the human mind. And numbers of theoretical conclusions of great importance which seem to be generally accepted have emerged. While there may still be considerable disagreement as to details in the theories, in their main outlines they appear to be well established. Several of these theoretical conclusions have a direct bearing upon our problem ; and we shall accordingly make use of them in the present chapter as supplementing what has gone before.

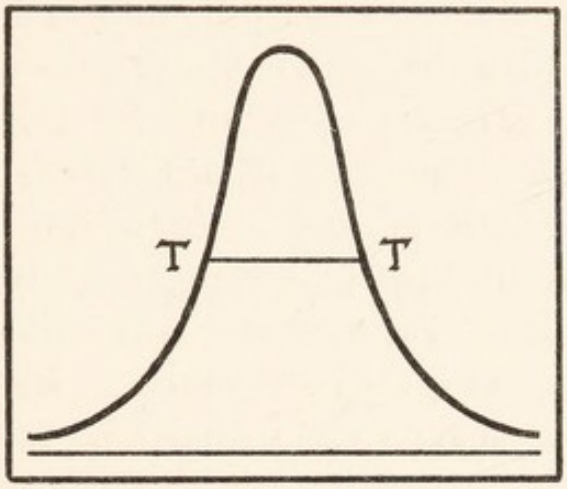
A fundamental conception which the study of the abnormal mind has emphasised is that of the "unconscious." To be sure, pure Psychology, and philosophical speculation upon the facts of consciousness,

had long before reached the notion of an unconscious mind. The ordinary facts of memory, among others, were enough to raise the problem; and many other facts—such as the power to awake at a predetermined time, the action of certain kinds of subliminal stimuli in determining simultaneous conscious contrast, and the like—pointed to a solution of it. A curious experiment illustrative of the action of one subliminal stimulus upon another is the following. One side of the testee's tongue is painted with a solution of sugar that is just too weak to be sensed as sweet. He has no consciousness of the sweetness. The other side is then painted with a salt solution which, likewise, is too weak to be apprehended. The result is the emergence in awareness of the sensation of sweetness.

Moreover, the characters of the field of consciousness as a whole with regard to the clearness of its contents —its shading off gradually from a central area of maximal awareness, through areas of less and less awareness, to the margin at which the contents have a minimal degree of clearness—permitted the theoretical extension of the field to a region in which, by reason of lack of intensity or determinateness, there is no clearness at all. Keeping in mind its non-spatial character, and the fact that any diagram can only be employed in its regard by a rather far-fetched analogy, consciousness could thus come to be represented by a bell-shaped curve. In this the apex would stand for the point of greatest clearness, or field of attention. As the curve descends and widens it would represent the waning clearness and the growing number of the contents until the threshold of consciousness (T—T) is reached. In theory, the curve

can be extended indefinitely; and there is no reason why we should not so extend it so as to include an immense number of possible contents capable of rising to that degree of intensity required for them to cross the threshold.

While pure Psychology, then, already had a doctrine of the subconscious or unconscious, the observations



SCHEMATIC REPRESENTATION OF MIND

T—T, Threshold of consciousness; above which mental contents increase in clearness as they are nearer to the apex of the curve. The area below T—T represents the unconscious.

of Psycho-pathology stressed it. Such facts as those of the post-hypnotic carrying out of orders given in hypnosis, the recall of lost memories by suggestion, automatic writing, and the like, were brought forward in its support. Something other than conscious perceptions, thoughts, and desires could and did have an influence both upon consciousness and upon behaviour. In post-hypnotic phenomena, for example, the idea of an action to be performed at some fixed time, or upon the giving of a signal, worked itself out in fact. The hypnotised subject was told, for instance, that, when awakened, he would take off his

coat as soon as he saw the hypnotist rub his hands together; or that he would sit down and write a note to So-and-so at eleven o'clock precisely on the following day. And the event showed that, while the subject was entirely unconscious of the order given and of the mechanism involved in its subsequent fulfilment, upon the signal or at the time fixed an impulse to carry out the suggestion arose in his mind. If asked *why* he acted as he did, he usually gave some more or less plausible reason quite unconnected with the real one. He removed his coat because he was too warm, in order to brush it, or for some like purpose. He wrote the note because it came into his mind to do so, because he had something to say to So-and-so, and so on. He "rationalised," in other words, his post-hypnotic compulsive impulse; and frequently gave the most absurd rationalisations imaginable.

But the impulse, all unconscious though it may be until the predetermined moment for its release, is nevertheless effective. Accordingly, one comes to look upon it as in some way embodied in an unconsciousness; ready, so to say, to become active as soon as the appropriate occasion arises. "The unconscious is a psychological hypothesis postulated in order to explain the facts of consciousness and subconsciousness in purely mental terms. This hypothesis is necessary if Psychology is to be an explanatory science." The science of Psychology is *obliged* to enlarge its boundaries in order to give any adequate explanation of its observed facts.

Formerly hypnosis was largely employed with considerable success in the treatment of a number of psycho-neurotic conditions; and it is still a "method"

of Psychotherapy, though to a large extent it is now used in connection with other methods—such as analysis—which at present enjoy a greater vogue.

In a sense, Psycho-analysis, though it is an entirely different method of procedure, grew out of hypnosis. It was found that memories of past events which had been entirely forgotten, but nevertheless had a profound bearing upon the symptoms of the patient, could be recovered in the hypnotic state; and, in probing for the origins of psycho-neurotic disturbance, use was made of hypnosis to reveal them. The method was based on the assumption that the pathological source of the trouble having been ascertained, steps could be taken to deal with it. Hypnosis was a way of reaching the individual case-history of the patient.

But it was found that these memories could be recovered by other means than hypnosis (which was not in all cases practicable); and that the realisation, on the part of the patient, of his morbid state *as related to* the previous experiences which had caused it brought about of itself its amelioration or cure.

The other means than hypnosis for the recovering of lost memories consist in systematic analysis of the mental associations which obtain between the present thoughts of the patient and those that have been forgotten. And these analyses are carried out on the assumption that all mental experience, whether forgotten or not, is bound together by associative links; and that all present experience is conditioned by the past. In the associations obtaining between experiences the affective element is usually held to play an extremely important part.

Thus, to take a typical example which has always held a prominent place in psycho-analytic literature, present dreams are looked upon as caused, or at least influenced, by repressed desires—desires which may have had their origin in the remote infantile past of the patient. In the same way, the reaction words given by the testee in " free association " tests (p. 75), either on account of their meaning, or their frequent repetition, or the length of their reaction times, are taken to be indicative of the old repressed memories which are at the root of the neurosis. It has been held, also, that the psycho-galvanic phenomenon (p. 194) which may accompany the words given in such a test is a reliable " complex indicator."

This summary is perhaps too brief for a full understanding of the matter. Let us confine ourselves to dreams. It is obvious that much of that of which we dream comes from quite recent experiences. The clothing of our dreams, if the expression may be used, consists largely, though not of necessity exclusively, of the events of the day or so before the dream occurs. And the occasion of the dream itself may easily—at least very often—be traceable to some external or internal bodily stimulus which acts upon us during sleep. A great number of observations on dreams has definitely established this fact; and experimental work, carried out in the main with touch-stimuli, has corroborated it.

The dream, then, may be considered to be a false perception, the material of which, apart from the sensory stimulus giving rise to it, is borrowed from the more or less immediate past.

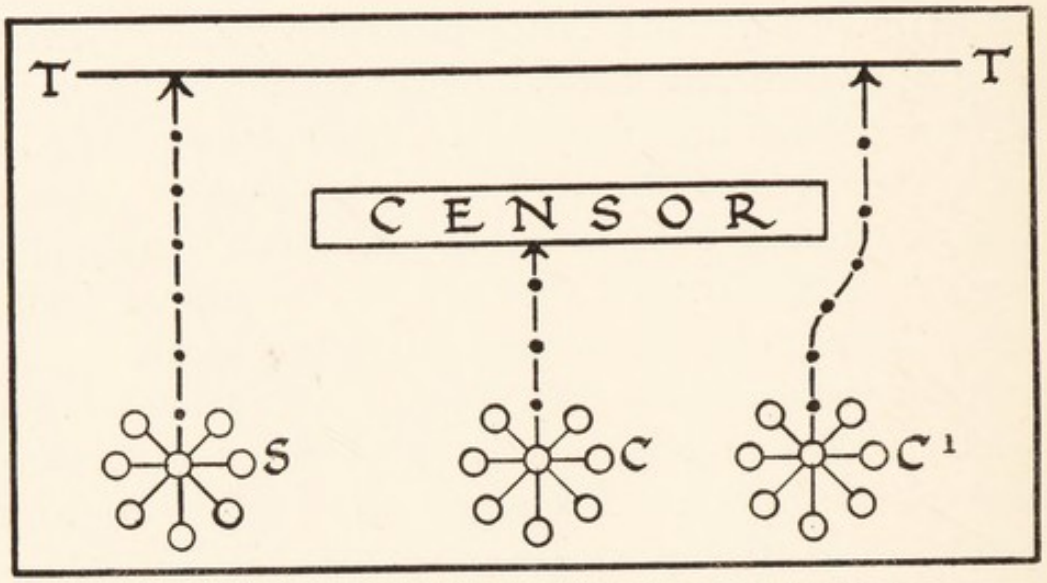
But the *motif* of the dream, it is held, comes from an

unconscious desire—a repressed wish, connected with an instinct—which is prevented from coming clearly and without disguise into consciousness because of a system of repressing tendencies exercising a "censorship" over it.

Censorship is thus usually conceived as a mechanism of suppression brought about by influences of a social or moral order with which the unconscious wish cannot be harmonised. The latter can only manifest itself in sleep, when the critical power of the mind is in abeyance—and then only in a disguised form; or in such waking-slips in word or behaviour as cannot easily be traced to it as to their source. It may also betray itself, as we have seen, in abnormal fears, compulsions, and other physical disturbances.

A somewhat similar distortion of perception to that which occurs in dreams can be observed in experimental conditions. If a single word is shown to a testee in a tachistoscope—say, for 1/10 second—he will ordinarily be able to read it and understand its meaning. But if, just before its exposition, some other word is spoken in his hearing, the meaning of this may have a profound influence on the way he sees and understands the other. Or if, again, his thought is exercised in some one direction, the chances are that he will see the word exposed as one relevant to the circle in which his thought is moving at the moment. Thus, if four names of flowers—let us say—are tachistoscopically exhibited to him, and a fifth word—PAWKY—is shown, he will in the great majority of cases read this and understand it to be PANSY. Indeed, the familiar fact that we see and read aright words misprinted in a text is due to a similar mental mechanism.

The " repressed " tendencies of Psycho-pathology, normally kept beneath the threshold of consciousness by a " censor " which only permits them to rise above it, as in dreams, in a distorted, condensed, or symbolic form, are known as " complexes," and are usually considered to be past experiences which possessed and still possess a highly emotional value. They are,



SCHEMATIC REPRESENTATION OF THE UNCONSCIOUS

T-T, Threshold of consciousness.
S, Sentiment.
C, Complex prevented from entering Consciousness by Censor.
C1, Complex evading Censor.

further, considered to be energetic in character, striving to manifest themselves to consciousness, despite the repressive working of the censorship.

The whole picture painted of these psycho-pathological cases is a highly dramatised one, in which the mind is represented as a sort of theatre or stage where these hypostatised entities—complex, censor, threshold, and the like—have their several parts to play in a kind of puppet-show of opposing forces. But, in reality, as we have seen, no such dramatic staging

of entities really occurs. The complex is a personal tendency, radically connected with a thwarted instinct; the censor is the character as far as this is integrated apart from the complex in question; the threshold is, as in pure Psychology, that degree of energy which is necessary for us to become aware of any mental item or event.

Nevertheless, though the dramatic presentation of the theory may be inacceptable, it does not follow that the theory itself is false. And, as a matter of fact, the great number of cures obtained by the use of psycho-analytic treatment—the removal of repression, the recall and living over again of the emotional incident or incidents at the root of the disease, the solution of the internal conflict by an understanding of what it in reality consists—point to the fact that, in some sense, repression, conflict, and complex are very real mental processes indeed. Moreover, in these psycho-pathological cases, they are energy-sapping in the extreme. They may all readily be understood in the light of what has already been said in connection with emotions, instinctive and acquired (conative) tendencies and will.

Clearly, in all such abnormal morbid conditions, when personal control is impossible, there is only one course to be followed. There is little or no hope that the individual suffering from one of the psychoneuroses can successfully deal with his own case. He cannot secure economy by curing himself of his disability; but he should promptly seek the advice and treatment of a competent psychotherapist.

All abnormalities, however, such as those we have been considering, are in reality no more than morbid

exaggerations of quite normal mental processes. All of us experience inner conflicts of one kind or another, whether fully or only partially conscious. If we do not all suffer from complexes, all of us have sentiments or emotionally charged memories which, if they are unpleasant, most of us do not wish to recall—even if we are able to do so. All of us have censors, in the shape of accepted traditions, social, moral, or religious, which have been forced upon us, as a rule in very early childhood, by the sheer pressure of our environment. Even such morbid mechanisms as the Œdipus or Electra complex have their normal counterparts in the ordinary attitudes which a child spontaneously adopts towards his father and mother.

Accordingly, since they have proved themselves to be successful, we may consider the methods of Psychotherapy, practised with regard to morbid cases, as applicable also in principle to "normal" people; and as practicable, at least to a considerable extent, without external assistance. These methods, it will be remembered, are aimed at removing repressions, resolving inner conflicts, breaking up complexes which are unconscious, and so bringing the individual into real harmony with himself. But, as considered in the present connection, they will have to do with what we have called ordinary disturbances, which need not be unconscious at all, rather than with pathological conditions.

The principal methods of Psychotherapy consist in catharsis (which may be called the abreaction, or purgative, cure); sublimation (substitution, or diversion, cure); and re-education (self-knowledge, or autognostic, cure). We should not, however, conceive

of these in practice as sharply distinct methods and incompatible one with another, but as largely overlapping and mutually adjuvant. Nor should they be looked upon as exclusive of other methods, such as suggestion (which, in its present application, becomes auto-suggestion), or the ordinary "facing up to" difficulties and meeting them squarely from the intellectual point of view.

Catharsis consists essentially in purging the mind of the morbid complex which is at the root of the disorder; and such purging is brought about by the discovery for himself, on the part of the patient, of the submerged, emotionally charged memory or memories which constitute the complex. In psychoanalysis the patient is led on from one idea to another by way of their associations, with the help of the skilled analyst, until he comes at length to a knowledge of the original experience—up to this point repressed or forgotten—which caused the mental wound or trauma. This experience he then lives over again with an accompanying discharge of pent-up emotional energy which effectuates his cure. The process is known as abreaction.

In "normal" people we need not look for deeply suppressed complexes of this kind, which require a course of analysis, extending perhaps over months and even years, for discovery. The sentiments and old emotional experiences and desires running counter to their accepted traditions, even if forgotten, lie near the surface, and can more easily be recalled. Indeed, many of them come quite clearly to awareness when what is called an examination of conscience is made. In such an examination one is really making a

confession to oneself; and the practice of auricular confession—which certainly is of the greatest help in the solution of one's inner conflicts—is one in which every use of this principle of catharsis is made. Indeed, auricular confession, not only of what one is easily able to remember, but of what is forgotten under repression also, is actually made to the physician in the course of psycho-analysis. The mere recital of what, in the one case, may be called sin, and, in the other, wishes, rooted in instincts, of which the personal consciousness disapproves, is in fact an essential part of the cure. The felt contrition of the penitent is the analogue of the emotional abreaction of the patient.

Nevertheless, short of actual confession, either to a fellow-man or to a Deity from whom he believes he obtains pardon, the mere emotional manifestation to himself, in the light of his own ideals, of one's real desires as disapproved by his social or ethical conscience is enough to meet the disturbances which ordinarily arise, and to resolve the ordinary conflicts of every-day life.

In catharsis generally, then, pent-up emotional energy is released, and works itself away in a greater or less emotional discharge.

Sublimation, on the other hand, is a process in which excess of energy properly belonging to an instinctive disposition is drained away from its connate, and in the circumstances undesirable, outlet to some other socially more beneficial one, either within the scope of the instinct or outside it. Thus, for example, the urge to anger with those who oppose his will of the man of irascible temperament may be diverted to the conquest of difficulties in the arduous pursuit of

some goal that will be of service to his fellows. Thus, the drive of sex may be—and, in circumstances in which it cannot find its connate sexual outlet, generally is—employed in other directions. Social conditions are not always such that this instinct can have free release in its normal channels. The disharmonies between the time of its arousal and the possibility of its satisfaction are notorious.

As a matter of fact, substituted ends are frequently found to have replaced the connate end of the sex-impulse even before it has come to maturity. Interest in other matters—in sport and games, for example, or in the activities of social organisations such as Indian Bands or Boy Scouts—has already provided channels in which vital energy can flow freely and worn them deep; and sex-energy may be drained into these channels also as it begins to be liberated. More than this, as infancy and adolescence pass, the sex-impulses may be diverted to other ends than the crudely physical one within the sphere of the sex-instinct itself. Thus, respect and reverence for others, and especially for members of the opposite sex, sympathy, consideration, loyalty, chivalry, and the like, may become direct sublimations of sex within its own ambit. Its energy may be drained in these directions by the formation of such moral sentiments. It may be sublimated in the creative, or executive, achievements of art, literature, music; in social and philanthropic work, in philosophical study, in religion.

All these things, far indeed removed as they may seem at first sight to be from the sexual instinct, are supra-sensual fruit which this far-branching root may bear.

The knowledge that such a transformation is possible in the case of instinctive activity enables the " normal " individual to set about the management of his impulses and desires with a strong and justifiable hope of success in resolving his disturbances. Not only can he pass these in review before his mind as in catharsis; he can divert his energy and set about the creation of sentiments also in which it is capable of being fully employed to advantage.

Re-education as a psycho-therapeutic method consists in the discovery of the past and present mental state of the patient by letting him simply talk fully about himself, his conscious disturbances and conflicts, his hopes and aspirations together with the obstacles he meets with in pursuing them, his emotional experiences, and the like. The physician's task is to listen and to help by assisting the patient to understand himself, to recognise and realise the occasions of his maladjustments, and to relate together as cause and effect his sentiments and general views of life with his illness. As will appear, this method is a kind of surface analysis, which may, when necessary, be supplemented by deeper probing. It reveals the patient to himself. And in the process, aided to see and formulate for himself rather than taught by the physician, he comes to frame what we have seen to be of such great importance, a general scheme or plan of life. He comes to appreciate real values and so to form effective sentiments.

Here again, when the case is not one for the psycho-therapist, the person suffering from disturbance can largely aid himself. He has only seriously and honestly to examine his own mental condition, and to compare it

with what he will realise it ought to be. This is tantamount to saying that he already has, or easily can shape for himself, a general philosophy of life. But it need not mean that his philosophy is of a very high order, or profound. A common-sense philosophy is all that is required of him, without metaphysical subtleties or greatly elaborated distinctions. And in most cases, indeed, that is all he could expect to find were he to put himself into the hands of the most competent physician.

As we have seen, these principal methods of Psychotherapy mutually overlap, and are in no way inconsistent with the use of other methods also. Indeed, in the carrying out of any one of them it would be difficult to avoid the use of suggestion on the part of the physician. Such is his prestige [1] in the mind of the patient that, practically speaking, hetero-suggestion must always accompany whatever method he employs; no matter how much in theory psychoanalysts may reject the statement that it enters into their procedure.

Other schools of Psychotherapy, however, frankly make use of suggestion, either in the hypnotic, hypnoidal, or waking state; and it is found that these suggestions, concerned with the mental health of the patient in general, or the particular complexes which are the cause of his morbid symptoms, largely, and often completely and permanently, effect his cure.

There can, of course, be no question of prestige suggestion when a person who is not suffering from unmanageable complexes attempts to deal with his own case. He is dealing then with what we have called disturbances of the nature of which he is well

[1] Cf. p. 157.

aware, rather than with complexes; and he may employ auto-suggestion to counteract them.

Auto-suggestion and hetero-suggestion in common may be taken fundamentally to consist in the acceptance of an idea without any logical reasons why it should be accepted. In this the two processes are identical. The difference lies in the fact that in hetero-suggestion the idea is implanted from without, whereas in auto-suggestion it comes from within—the idea itself arising involuntarily in the mind of the subject, or being voluntarily impressed upon it by himself.

The theory has been advanced that such "suggested" ideas work only in the imagination and *against* the will: "When the will and the imagination are in conflict, the imagination always wins" is a familiar, if a fallacious, catchword. But it is a fact that the will to succeed, or at least a fixed belief in success—not a mere wish, or velleity, accompanied by thoughts of possible failure—is a necessary condition of auto-suggestion. In a sense, as we shall see, the belief may be pitted against the conscious will and carry the day; but it is not for that an imagination that is involved; it is an active tendency.

In this way are the so-called "faith-cures" brought about by auto-suggestion based upon a firm belief that a cure is possible, and will certainly be wrought by fervent prayer, by such curious practices as "absent treatment," or by a piously convinced pilgrimage to a wonder-working shrine. Similar curative practices have been observed from remote antiquity in the form of charms, spells, and holy places; and there can be no doubt but that in many cases these have aided the

process of auto-suggestion by supplying powerful and cumulative prestige suggestions as well.

Belief, accordingly, or a firm conviction of success, is an absolutely necessary element in auto-suggestion. There is little use in taking up the mental attitude "I will try to do it, but there is little likelihood that I shall succeed"; for the implied—and usually very real—anxiety with regard to the result of the trying will probably, if not certainly, defeat our own efforts. Who has not experienced the intolerable state of waiting for sleep that will not come? The more we *try* to sleep, the more wakeful do we find ourselves; for trying always spells the possibility of failure. The more we imagine sleep, the less drowsy do we become, unless the effortless will[1] whole-heartedly embraces the idea. The one attitude to take up that has the smallest chance of success is the calm, untroubled "I shall do it," no matter what the "it" may be. That is the attitude of a fully actualised will confident and certain of success. The idea we suggest to ourselves is, then, one which we, as will, feel we can carry out, and will to do so, without anxiety or thought of possible failure.

It may be asked, if this is so, why should ideas which have no logical ground work in suggestion rather than those which are logical? In point of fact, this is not the case. Ideas, logically acceptable and accepted, work just as well as illogical ones. The only difference lies in the fact that the illogical ideas—such as that we should become well when we are sick, or overcome our disturbances, when there is no logical reason why either event should happen other than our belief

[1] P. 200.

and willing—are accepted in suggestion, while we may not be able to accept them otherwise. But there is a logic even in this; for that "other than our belief and willing" is a caveat that shows a sufficient ground for our acceptance of the ideas in question. There is such a thing as the will to health, just as there is the will to overcome difficulties. In hetero-suggestion, especially when given in the condition of hypnosis, belief is strong and has no competitors in presence. In such a state the most illogical ideas may frequently be accepted and acted upon. In auto-suggestion the acceptance of the idea mainly depends upon belief in oneself.

Another question, closely related to the foregoing, equally demands an answer. How is it possible that auto-suggestions should ever result, as they sometimes do, in ill-health or maladjustments? Why should we believe, and how can we will, that we should be ill rather than well; or incapable of dealing adequately with our disturbances or difficulties?

A general answer to this question is to be found in the way in which the emotions work; and this is especially true with regard to the emotions of fear, and lack of confidence in oneself, or negative Self-feeling. We distrust ourselves as wills capable of withstanding instinctive impulses arising from within us or influences playing upon us from without. We have no faith in ourselves; and we are afraid. If not actually morbid, we are in a quasi-morbid state of conflict. We do not consciously desire illness or maladjustment. Nevertheless, just as in the truly pathological cases the illness or the maladjustment may be the expressions of unconscious wishes—to

gain a little sympathy, to punish ourselves for harbouring the unconscious wish itself, or to inflict punishment upon the friends who are so cruel to us—so in the case of the lighter disturbances there may be some wish not fully realised lying at their root. To whatever cause the disturbance may be traceable, it may easily become aggravated by dwelling upon the idea in connection with which it arose; and it may be minimised or removed by accepting and dwelling upon the contrary idea. For no belief can gain a foothold within our minds unaccompanied by some idea; and no act of will is possible without some sort of belief. Here, again, it is not the bare idea that brings about the effect of overcoming disturbance. It is the idea accepted and believed, coupled with the Self-assertive "I really and truly will."

The last method to be examined, which, in one way or other, is implied in all the rest, is "facing up to" difficulties and dealing with them on the intellectual plane. The psycho-neurotic is unable so to adjust himself that this is possible. He needs the care and skill of the psychotherapist in order to adjust himself to reality. But the nearer the individual approaches to the normal, the more possible it becomes for him to relate himself to all the circumstances of life. He will make allowance for the influence of the unconscious upon his conscious mind. He will understand the nature of the instincts in all their crudity, and know that they may be made to subserve his conscious ends by substitution and sublimation. He will realise the inner nature of his conflicts and the causes of his disturbances. In other words, he will come to learn what he himself is, what are his strong points as well

as his weak ones. Self-knowledge of this deeper kind will lead him to a practical philosophy of life, on which he will construct a plan of living which is economically worthwhile, which can in fact be lived. And he will put into effect the methods outlined above in translating his plan into actual life itself.

CHAPTER XIII

GAMES AND PLAY

In several connections throughout the course of this book we have had occasion to notice in passing the importance of play and games in our mental life. It will be convenient to bring together in a single short chapter the main psychological views and principles with regard to this subject in so far as it may be related to our problem of securing economy in mental and physical energy.

As a matter of fact, all play involves expenditure of energy. Mental activity always, and generally bodily activity also, is used up in playing. The kittens and the baby considered in a former chapter play spontaneously until they become tired and fall asleep. But, as we have seen, expenditure of itself does not of necessity spell wastage. Indeed, the greatest possible output of energy, provided the goal is worth while and can be attained, may in the long run prove to be the greatest of economies. And play is no exception to this rule. Its goal, whether we are aware of it at the time or not, is generally a worthwhile one both from the psychological and from the more general biological point of view as well.

Play may be said to consist in any form of activity which is pursued entirely for its own sake; not, as in the case of work, with a motive other than itself, or any further end in view. This is a general definition of play in its subjective aspect, without reference to

the nature of any kind of change which may be brought about in the player, or in his environment, by the activity in question. Thus, what is often looked upon objectively as work may in point of fact be play, and *vice versa*, if the agent's aims are considered. Looked upon biologically, we find a purposeful character in all such activity; but there need be no conscious purpose in it whatever. The very little child and the very young animal play aimlessly in their grasping, clutching, squirming, kicking movements. Later come more complicated actions, dropping and picking up, and the like; and, later still, yet more intricate ones, as in the manipulation of toys. But in all this ever-increasing complexity of activity there is no real indication of purposive action for the sake of further ends.

Nevertheless, as a matter of fact, while they are playing the child and the animal are, as we have already seen, actually learning. They are co-ordinating muscular actions, and relating the movements of their limbs and hands with their visual, auditory, and other impressions. The child very early learns thus how to grasp and to hold things. He finds out how to carry them to his mouth and to explore them after the manner of babies. In his aimless cooing and babbling he is laying the foundations of his future articulate speech. In all this process he is acquiring both knowledge and skill. The kitten or puppy in play is likewise in the kindergarten of Nature, building up related impressions and dexterities which will be of service to it later on in the pursuit of ends that will not be merely playful.

There are several theories as to the meaning of

play ; of which the first—that it is a general aimless activity due to a surplus amount of energy—seems to be borne out in the kind of play-behaviour we have just been considering. The earliest play of all would seem in the main to be due to surplus energy finding release in this way.

But a second theory also appears to be borne out—that, namely, in which play is said to consist in the exercise of instinctive activities which is biologically useful in the acquisition of different kinds of skill. There would seem to be little doubt that the hereditary psycho-physical mechanisms of all the instincts, both in the higher mammals and in man at any rate, are thus exercised in playful activity ; though the play is not at the time the result of any specific drive or impulse of any particular instinct. It seems thus to be clear, for example, that instinctive mechanisms, such as those of fighting and hunting in cats and dogs, are developed and exercised while the instinct itself is yet in abeyance. Puppies do not actually bite, kittens do not really drive home their claws, in play ; nor are they really angry with one another. When the moment of biting and clawing in earnest comes—when anger supervenes—the play is over. The human baby, similarly, has no instinct to escape by hiding aroused in the game of peek-a-boo played with its mother ; nor are his movements of withdrawal caused by fear. When he becomes afraid, the game is at an end. Thus the psycho-physical mechanisms in and through which the instincts work are co-ordinated and exercised ; but the truly instinctive urges seem entirely to be lacking or to be sublimated.

A third theory as to the meaning of play makes it

a form of recreation. This is in no way inconsistent with the two views already considered; and particularly, as we shall see, does it hold good with respect to the play of adults. The truth of the matter would seem to be that each of these theories of play emphasises a fact of common observation; but that the separate principles upon each of which an attempt has been made to explain play in general must be considered as combined in differing proportions according to the different forms of play to be explained. We may, accordingly, accept the view of the biological utility, or "practice value," of play, and at the same time account for it in fact by pointing to a fund of surplus energy upon which it draws. And, accepting this, and interpreting biological utility on a wider basis than that of practice, to include recreation, we may discern in the play, games, and sports of adults especially an energy-saving device of Nature of the greatest practical importance. We shall thus be able to link up with the theories of play already instanced the exceedingly important view that play-behaviour is the characteristic behaviour of a creature in a joyful mood. For play is always joyful.

All this agrees very well with what, as we have already seen, are general psychological principles. The total output of mental energy tends to be a constant. It must find its outlet in some way or another. Fatigue and boredom follow its continuous flow through one and the same channel. Add to this that physical energy also needs to find release. We may dam it back, as it were, for a time and let it accumulate; but in the end it escapes in some direction. The energetic puppy, if alone, will contentedly

worry at a rag or shoe; or, if confined without a plaything in a small space, he will show his restlessness in random, aimless movements. The child—or, for the matter of that, the adult—growing weary of some monotonous task, will yawn and stretch his limbs. He will swing his legs to and fro and fidget on his chair. Thus he drains away some at least of his surplus energy until his work is done, and he can allow it full release. Even the child at table will ask if he may be " put down " as soon as he has finished his meal, so that he may relieve the irksomeness of sitting still—even to eat—by playing and romping.

Play is thus seen to be a sort of natural safety-valve which functions in the first instance before the actual business of work in life begins, as well as in the intervals of work later on. It has an immense part in the initiation of all our learning. It is a " joyous " way of acquiring the most fundamental forms of knowledge, and the most necessary mental and bodily habits, of all that we ever can acquire. Moreover, though it certainly uses up energy, it is in reality at least a relative form of relaxation or recreation. In it we are not anxiously directing, or forcing our energy towards some ulterior end which may be difficult of achievement. Its own end in itself, it can at any moment be given over when for any reason we wish to stop playing. Nothing is lost if, when we choose, work or rest takes its place; since, as an end in itself, it is always reached. And, further, since it is always a successful activity, a functional pleasure is always attained by it. We like to play.

This is true, at least to a large extent, even in consciously and deliberately planned play in which

we seek to acquire skill; though here an element of work may be involved in it as well. When an adult practises golfing strokes, or a fisherman accurate long-distance casting, in a sense he is working to attain an end other than the actual thought and movement in which he is then occupied. But there is certainly an element of play in such practice as well. Some activity for its own sake enters into it. Some presumably surplus energy is used up. Some part of the psycho-physical mechanism belonging to an instinctive disposition is exercised. And certainly pleasure is attained. Moreover, the energy that is expended in any kind of play is released spontaneously. The actual carrying out of the play may indeed involve effort and striving; the release of energy does not. While, as we shall see, there are often distinctly beneficial results gained from the expenditure of bodily energy in playing of the kind in which great effort is required, the best conditions for mental recreation are then also frequently attained.

In Chapter IV we saw that rest-pauses interposed between longer periods of work tend to increase the total output without making any greater demand upon the worker. We saw, too, that working-day hours can often be shortened with advantage both to the employer and the employees. And it was also pointed out that even a simple change of posture during the intervals of heavy or sustained manual work tended to raise the amount of output during the working periods. In these rest-pauses, however, though the body may be (it certainly need not be) relatively inactive, the activity of the mind has not ceased. Depleted bodily energy may be replaced, or

even stored up, at such times. The mental output tends to be the same during work or during rest. Nevertheless we still effect a mental saving in play. What happens in this case is that the energy is no longer being drained in channels which have become worn and fatigued. The output is for the moment switched away from the limited number of mental engines which have been working for the furtherance of a definite and restricted task. Our activity then becomes assimilated to the playful. It deploys in various directions, working in fresh engines for no other sake than its own.

A somewhat similar effect is to be remarked with regard to rest-pauses in memorising, which we considered on p. 94. If we turn at once from learning one set of nonsense syllables by heart to the learning of another set, the process known as retro-active inhibition is aroused; and we find that we retain and are able to recall only a less percentage of the syllables of the first list than we should otherwise have been able to do. Doubtless the rest-pause here has had to do with the consolidation of what has been already stored in our (unconscious) retentiveness. But it clearly also has to do with a kind of purely mental play as well. The working of the retentive engine has been facilitated by use; but the engine has not been overstrained. Energy has been diverted from it in time; and, since it is no longer working, we are "playing." The facts observed as to the advantage of the "spacing out" of repetitions have a similar explanation. The foregoing are only a few examples of a number of observations which might well further illustrate the point.

The present use of the word "play," however, may seem to go beyond all reasonable bounds. Still, we find a quite similar usage in such current expressions as the "play of ideas," the "play of fancy," and the like. The man or woman who is indulging in day-dreams is playing. Our Castles in Spain are playthings, whose only danger is to be confused with, or to replace, reality. More than this, if play be indeed activity for its own sake, some of the highest achievements of the human mind have been, and are, essentially playful; and even Heaven itself will be a place to play in.

Playful activity, thus seen in its typical form in the behaviour of young animals and children (in whose case the surplus-energy explanation of it may be stressed), tends later on to become organised, as far as human beings are concerned, in games and sports. In this process of organisation the different instincts come to be more directly and intimately implicated in it; and at this stage the practice explanation is to be emphasised. We can see this to be the case when the child begins to play with toys, or play *things*; and still more as he joins in social games with play *mates*. The many careful studies which have been made of the play of children show that each phase of child development has its characteristic forms of game, and that the child passing through each phase shows a decided liking for certain kinds of play. The toy makes a direct appeal to some one or other of the instincts. Playing with toys, like the golf or fishing of the adult, is a sort of half-way house between pure play, in the sense defined, on the one hand, and real work on the other. The child manipulates, exploits, its

toys. The little girl " mothers " her doll. The little boy builds houses with his blocks or, later, arrays his soldiers in battle order. He and she alike " live themselves " by empathy into their playthings. Even adult work is pressed into the service of children's play; as when the child lays a table with its little cups and platters, or sweeps the floor with miniature brushes and brooms.

To be sure, the play-world of the little child is not at all the real world of the adult. The two worlds cannot properly be compared. But the child's world is a no less serious world and compelling for all that. The stick held between his legs is a *real* " hobby "-horse, the unsightly bundle of rags she nurses is a *real* baby, while the children are playing with them. There is nothing incongruous in the fact that the child *sees* them thus in play; even if, at the next moment, the stick or rags may be thrown aside, having lost all their meaning. It is the meaning that counts, in play as in work; and the play-meaning of any toy in its actual setting is far more fluid, far less fixed, than the hard and stubborn workaday meaning of the world which experience has forced upon the adult. These meanings of the toys are tributary to the different instincts.

All this is true also with regard to the social, or group, games of children and adolescents which come to be developed later on. In these the instincts are drawn upon in turn. Curiosity, pugnacity, constructiveness, destructiveness, hoarding, are shown even in the solitary kinds of play. Not only crude instincts, but the higher sentiments also, are manifested in the group games. Here we can see the mastery-instinct,

or its converse the submissive, shown in the imposition of leadership. We find the instinct of gregariousness exemplified; but we also find that *esprit de corps*, loyalty, and "playing the game"—which are sentiments—become developed. Even sex, despite possible immaturity at the time, shows its promptings in the early social games in which the opposite sexes are playing; and round it, as an instinctive nucleus, sentiments of courtesy, respect, chivalry, and the like become crystallised. More than this, and from our point of view exceedingly important, is the fact that in these group games real Self-control comes to be acquired, and mastery over the cruder emotional impulses achieved. The sentiment of "playing fair," not only with one's own side but with the opponents also, takes the place of the earlier "playing false" and cheating, and of the quite natural outbursts of anger and jealousy which one so often observes. The spirit of team-work develops as the individual player identifies himself with his side. And, in the end, the very instinct of Self-assertion, while it still remains active, comes to work for the common, rather than for the purely personal, end. The game may, indeed, be lost; but the good-humoured satisfaction of playing it remains. Self-mastery and Self-control thus learned under the influence of "playing the game" are immensely valuable principles of economy which may be drawn upon throughout life; and they are exercised —or may be exercised and strengthened—in every subsequent group or social game that is played.

Moreover, what has been said is further true with regard to all the forms of dramatic play also, in which imitation has so large an influence. These

dramatic plays, of which so many have become fixed in the traditional group games, often appear quite spontaneously, at least in embryonic shape, in the play-life of most children. And the spirit of make-believe, or "let's pretend," so strong in them, outlives the periods of childhood and adolescence. Many grown-up people frequently display it.

There is, moreover—though this is rather a digression from the main exposition of this chapter—a principle of psychology in virtue of which we tend not only to play ourselves, but to enjoy the play of others also. Thus sympathy, by reason of which we feel with others and share their emotions, may be said to be at the basis of all our appreciation of dramatic art, and to explain our enjoyment in it. Even our enjoyment of tragedy may be accounted for in this way; provided we realise that here the emotions portrayed are not real but simulated. The tragedies of real life are quite other than the tragedies of literature or the stage. In no sense are these ever looked upon as plays. We do not enjoy them; where possible, on the contrary, we avoid them. Their demands upon our sympathetic energy are too great, and defeat all purpose of economy. In simulated tragedy the milder stirring of the emotions is said to be cathartic.

A cruder form of this same principle at work is to be seen in the sympathetic behaviour of the crowd assisting at a football match or race-meeting. Vicarious enjoyment of playing, in adults at any rate, seems to satisfy a need in bringing about some kind of emotional discharge. While the child must act himself, the adult is content to look on. But he is not merely a passive spectator; he looks on actively, with

incipient movements similar to those of the players, and more or less fully roused emotions in keeping with the game, or with the comedy or tragedy being enacted.

What we have seen above to hold good essentially in the case of childish and adolescent play can be said to hold good in general with regard to the play-activities of adults also. But here the recreational explanation of playing is to be underlined, rather than that of surplus energy or of the exercise of instinctive dispositions for the sake of their practice. To be sure, surplus bodily energy may be drained away, and instinctive dispositions may function—though generally in an attenuated and sublimated form—in adult play. But recreation holds the first place in explanation here ; and in this connection the term is to be taken in its literal sense. In his round of golf the sedentary student or the office worker re-creates himself from the point of view both of body and of mind. He is in a new atmosphere, a fresh environment, where instead of books or ledgers there are trees and grass and clouds. His thoughts, instead of running in the habitual fixed grooves, find new and varied objects of contemplation. His interest, great though it may have been in his work, is centred on a new achievement. He brings muscles generally unused into action ; and in his exercise fills his lungs with pure air and oxygenates his blood, thus stimulating secretion and eliminating waste products. There is a similar re-creation in tennis, cricket, the dance, and all like games and pastimes in which change both of scene and of activity is brought about. In games and sports such as these which entail physical action,

though energy is expended at the time, and usefully, great economies are effected in the long run. This we have already anticipated to some extent in the chapter on emotional wastage. Mere change of posture is capable of changing an asthenic or wearing emotion into a sthenic, cheerful one; and bodily movement greatly helps in bringing about the change. Muscles are exercised and glands are brought into function, which is as necessary for the mind as for the body; for the player is not a mere collection of glands and muscles and the like, but an organised individual, of whom the mind is a chief aspect or part.

Physical exercise in games and sports, then, works in this way; while the game or sport itself, considered as the modified expression of one or of several instincts, provides direct incentives for the stimulation of the pleasurable emotions. And of themselves these are always healthy and re-creative. Especially is this so in relation to that most fundamental of all the instincts, Self-assertion, which is brought into function in most —if not, indeed, in all—adult games. For all such games—even to that of solitaire or patience which one plays with oneself—seem to contain a strong competitive factor. In patience one plays against oneself, or against chance; just as the athlete may run or jump in order to beat his own record.

If there should be an accumulation of surplus energy of any kind to be got rid of, it is drained away in physical play; and, in any case, sports and games secure that the flow of nervous energy is directed through other neural engines than those habitually in use during work. Thus these latter necessarily are rested. Indeed, it may be hazarded that the

mental level of play in general, being more directly primitive than that of work, indicates that the lower neural centres are primarily involved rather than the higher ones. When energy is being drained through these lower centres, the higher centres are being rested and re-created.

But these physical kinds of adult play are not exhaustive. At the other end of the scale there are forms of play in which the activity of the mind is far more prominent than that of the body. Typical examples are a game of chess or of cards. In so far as any such game is played for its own sake it fulfils all the conditions of play; and from the point of view of economy in mental energy, such pastimes may be considered as attenuated examples of the physical games themselves.

Sedentary games such as those instanced may thus all be said to be symbolic. The chessmen or the cards are representative of armies which the players are leading to combat according to more or less fixed tactical and strategic rules conventionally accepted. The game is more intellectualised and less a direct expression of the combative instinct than that of the childish "Red Indian bands" which play at raiding each other's territory, making conquests and taking captives.

But such games depend for their interest upon exactly the same instinctive dispositions as the other social games to which reference has been made; though, from the bodily point of view, they are obviously relaxations. In them muscular exercise is reduced to a minimum. Nevertheless, drawing as they do upon the same dispositions, the same qualities

of emotion are excited and the same conative tendencies allowed their scope. If not other than the habitually exercised groups of muscles, other mental engines than those usually running in the service of work are put into commission. Primitive interests are directly drawn upon, though in a sublimated and highly intellectualised form. And, quite apart from the social atmosphere in which games of this kind are commonly played, at once both stimulating and restful, the game itself makes for that re-creation which leaves the mind fresh and invigorated for more serious business.

No matter in what proportion the mental principles underlying the various theories of play be combined in any given instance, all play in its proper distribution with regard to work makes for economy and for efficiency in life. If nothing else, free-running energy gives habituated mental mechanisms relief; and the satisfaction of ends achieved—as they must be achieved in so far as the activity is in reality a playful one, if they are ends in themselves—invariably ensures pleasure.

We achieve with ease what we really enjoy; and save ourselves in the achievement.

APPENDIX

PSYCHO-PHYSICAL THEORIES

THREE principal theories as to the relation between Mind and Body have been advanced by psychologists as fitting, and explaining, all the facts observable.

The first is that known as the theory of Psycho-physical Interaction ; in which the Mind and the Body—or Soul and Body, if you will—are presented as two separate things or entities which are capable of acting and reacting one upon the other. Thus the Body, as a physical being in a physical world, is conceived of as obeying the laws of physical nature, acting and acted upon by the other bodies which all together with it go to make up that world. It is subject to the laws of physics, such as gravity, and so falls if it is unsupported ; to the laws of mechanics, as exemplified in the movements of the limbs, which can be treated as levers ; to the laws of chemistry, since within it chemical elements combine and separate according to their natures ; to the laws of physiology, as in the contraction of the muscles, circulation of the blood, and the like. There is no need to prolong a list, which might be almost indefinitely drawn out, to show in what way the Body forms one unit of that collection of physical objects which we call Nature.

But, over and above all this, over and above all the relations of which the Body, or a part of it, is one term and other bodies the others—which relations are expressed in the laws of physical science—there is another relation between the Body and the conscious Mind of the individual of whom it is the Body. The precise nature of the relation in question is a mystery. It is unlike the notions we frame with regard to the relations

we conceive to hold good in the material world. But it is none the less conceived as being in some way a causal relation, in which either term, Body or Mind, may be the cause of some effect that is brought about in the other. It is true that we have no way of knowing precisely how a nervous change in the Body, such as that which takes place when the nerve-endings in the retina of the eye, say, are stimulated, ultimately becomes translated into conscious seeing, or causes the vision of external objects. In the same way we cannot tell exactly in what way a conscious wish to lift a weight from the ground causes the contraction of the muscles of limbs and torso by means of which the weight is actually lifted. We certainly do not know ; and we are no nearer now to an explanation as to *how* consciousness arises as a consequence of nervous processes, or *how* our willing acts upon the Body, and through it upon other objects, than we were when the problem was first raised. It is unlikely that an explanation of this point will ever be forthcoming.

But most of us would without hesitation assert that we know by experience and common sense that consciousness is caused by events which do occur in the Body, and that some at least of the changes which take place in the Body are the effects of mental activity. This theory of the relation of Mind and Body is the one held by the vast majority of people. Despite the difficulties that may be urged against it, it has always occupied the foremost place among the conclusions of philosophers and psychologists ; and the most representative students of the science subscribe to it to-day. Moreover, apart from theory, everyone behaves, in actual life, *as if* it were true.

A second theory of the relation that holds between Mind and Body which has won a number of adherents is that known as Psycho-physical Parallelism. There are two forms of this theory. In the first, the Mind and the Body are again conceived of as distinct things ; but in this case neither of them

exerts any real causal influence upon the other. Each has its own succession of events; those of the Body taking place in accordance with natural physical laws, while those of the Mind succeed one another according to mental ones. But the two series of events, the mental on the one hand, and the bodily on the other, take place in exact parallel. For every bodily change there is also a mental one, not caused by, but merely running side by side with it. This theory has been illustrated in a variety of ways, of which the best, perhaps, is the analogy of the two clocks. Mind and Body are represented as two time-pieces, perfectly synchronised, which tick and ring the hours as one. Neither has the slightest influence upon the other; yet so perfectly are they attuned that nothing happens in the one but the other, in its appropriate way, records it also.

A second form of this theory presents the two series of causation—the continuous chain of bodily processes on the one hand, and the succession of mental states on the other—as phenomena revealing in two ways one underlying real causal sequence. In this view, there are not in reality two distinct things, the Body and the Mind, to be considered, but one individual only, in causal relation with other (metaphysical) individuals and things. And the changes which take place in this individual are registered not only as physical happenings, but as mental events as well. Analogies are usually misleading devices to secure clearness of thought; but if we allow that of the two synchronised clocks to help us to grasp the previously sketched form of the theory, we might use here the simile of a single clock with two dials. Neither dial influences the other. Both are worked by means of the same mechanism; and both register, each in its own way, mental or physical, the one set of continuous changes that takes place in the works. This form of the theory is known as Psycho-physical Monism. It is a metaphysical theory, in the sense that the individual thus held to manifest itself in two different sets of phenomena

is held not to be empirically known, but only known by inference from the phenomena which it displays.

Akin to this theory in appearance, though sharply to be distinguished from it, is that of Epiphenomenalism. Here the mental series is presented as a sort of by-product of the physical. There is no causality between one mental event and the succeeding one ; nor does the mental play the part of cause to any physical event. The mental occurrences simply follow one another according to the sequence of physical occurrences taking place in the Body. These latter, as observed, are the phenomena of the processes of material causality and change. The former are not true phenomena at all, but " epi-phenomena " ; and they indicate no causality other than the material.

These are the principal theories that have been advanced relative to the connection of Mind and Body. They have here been sketched in with the greatest brevity in order that we should have some notion of the way in which we are to conceive wastage of energy in regard to the economising of life. For, clearly, it is in the expenditure of the energy of a cause that wastage, in the sense in which we have used the term, is to be discovered.

In the first two theories—those, namely, of Interaction and Psycho-physical Parallelism in both its forms—mental causality plays a large part. In Interaction the Mind is presented as a cause bringing about effects not only in itself, but in the Body as well ; and in this theory the Body also is similarly conceived as a cause acting upon the Mind. In the first form of Parallelism, prior states of the Mind are looked upon as causes of subsequent ones ; and similarly bodily changes are conceived of as causes and effects within the physical world. In its second form, it is true that the real causal series is held to lie beneath, or behind, both the mental and the bodily manifestations. But in all these cases real causality—that is, constant relations of antecedence and consequence with quantitative equivalence—is, or certainly may be, asserted. A difficulty is

sometimes urged against this statement as applying to the case of Interaction. It is said that mental causation would conflict with the scientific law of the conservation of energy, especially as this is generalised in the statement that "the sum-total of energy in the universe always remains the same." But this is not so. Apart from the fact that the question of the conservation of energy is a philosophical and not a strictly scientific one, the very notions of energy, cause, and the like are derived from our own experience of ourselves as energising. We have *no* insight with regard to any real energy or causality as obtaining in the world as we know it. We interpret the phenomena of that world as energetic or as causal because of our immediate insight into our own energy and causality. And we cannot stretch our interpretation so far as to contradict the very foundation upon which it is based.

It is only in the case of Epiphenomenalism that there is any real difficulty. Here the relation of antecedence and consequence, with quantitative equivalence between cause and effect, does not obviously hold good in the case of the mental series. But this is because, having hypostatised the abstract notions of cause, energy, and the like, which we have concretely observed with insight in our own activities and nowhere else, we apply them to the interpretation of what we call physical phenomena—forgetting that these, in so far as they are phenomena at all (that is, so far as they are known), are themselves mental.

For such reasons as these, this last theory of Epiphenomenalism is generally criticised and rejected by psychologists as absolutely inadequate to explain the facts.

What most interests us here, however, from the point of view we have taken in this book, is the notion of quantitative equivalence between cause and effect which enters into the scientific conception of causality; for it is precisely at this point that light is thrown upon the problem of economy or wastage of life-energy. Whichever of the psycho-physical

theories we adopt, we must conceive of energy as something capable of doing work, or bringing about results. This, too, is an abstraction. It is the agent in reality, not his energy, that works. If we are interactionists or parallelists of the first kind, we shall have two distinct kinds of energy to consider, the mental and the bodily. If, on the other hand, we adopt the view of monism, there will be only one energy to deal with—that, namely, of the underlying real individual. But this unique energy will be seen to be equivalent to two, since the individual in question is not merely a physical, but also a conscious one. Indeed, he is primarily a conscious, and only secondarily a physical, individual. It is only in the epiphenomenalist view that a single and irreducible energy is asserted which leaves Mind altogether out of account in its conceptions of energy and causation. Accordingly, since there is no direct evidence to recommend, but much to lead us to reject, the last-named theory, we find it convenient to take up the position adopted in the text (p. 16).

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