LISTENERS to previous talks in this series may have been surprised at the variety of directions in which the psychologist is asking questions, and trying to answer them by experiment. This variety is, of course, much greater than it has been possible for the other speakers to compass. Some observers of the current picture, indeed, find it difficult to discern any firm, clear lines of development at all. So I want to devote this final talk to prospects in experimental psychology. Or, rather more precisely, I shall consider some present features which suggest possibilities for the future progress of this science.

One thing that often brings about movement in a science is the intrusion of some novel factor—some fresh demand or new interest—from outside. Psychology at the moment is almost embarrassed by the variety of external influences which bear upon it. There is, for instance, the somewhat paradoxical circumstance that the more human beings employ ingenious mechanical contrivances to mediate between themselves and the outside world, the more important it become to know precisely the capacities and limitations of human function. The telephone and radar, machine tools and guided missiles, do not, as is
sometimes supposed, tend to replace the 'human factor'. They only enable men to exercise powers which the unassisted eye and brain and hand already possess—although often with greater effect, ease, speed or precision, more remotely, or in more varied or extreme conditions. But the effective design of such devices demands closer understanding of human functions than was ever needed to exploit the skills of the unencumbered human body.

So arise a series of problems which are being widely studied to-day, and which offer good opportunity for the experimental psychology of the future. Many of them possess an interest which goes beyond the merely technical scope of what has been called 'human engineering'. Attention has got drawn to things hitherto neglected or taken for granted, and novel approaches to fundamental questions have emerged. The study of language, for instance, has been in some sort revolutionized by the modern theory of communication, which in turn originated in the demand for a cheaper and better telephone service. It seems not impossible that the resulting ideas and methods may find much wider application in psychological research—in relation to memory and to thinking for example. Again, the craftsman using hand tools is his own master, and hardly prompts investigation of his skill. But the man who operates a machine, such as an aeroplane, must do so in such a way that the effects and timing of his acts match appropriately the working of the machine. For this reason much attention has recently been paid, especially by Bartlett and his associates, to processes intervening between the signals from the environment which impinge upon the human operator,
and the muscular acts by which he reacts back upon it. Such mutual interplay between incoming stimulus, inner intention or requirement, and outgoing adjustive act is certainly a fundamental feature of behaviour generally. There is some hope that principles which have been found applicable in the narrow field of machine operation may prove helpful in larger and more enlivening connections.

Examples of the stimulating impact of mechanical invention upon our interest in the human organism could be multiplied almost indefinitely. But I would like to give one more in rather greater detail. Landing an aircraft can be a tricky business—and the trickier the faster the aircraft is going. Among many things required of the pilot is the visual appreciation of the position and orientation, relative to him, of the surface of the earth. Moreover, this must be done from a viewpoint different from any commonly used on terra firma. And a notable feature of the situation is the rapid change of perspective forms, owing to the movement of the aircraft. Now, until the demands of pilot-training and accident-reduction had focused attention upon this instance of 'real-life' visual function, attempts to understand the '3-D' aspects of our visual experience had been very largely based on laboratory experiments. Though numerous and excellent, these explored a range of conditions more limited than that encountered outside. Because of the convincing magic of the stereoscope, theory leaned heavily upon the disparity between the images in the two eyes as the chief basis of visual distance appreciation. The needs of military aviation, however, led Gibson, in America, to abandon the laboratory for the outside world of sun and shadow,
earth and sky. And so he came to study a number of factors hitherto neglected. For instance, when we look at an obliquely presented surface like the ground, which possesses surface-texture, or any regular pattern, it affords visual stimuli which are characteristic of its inclination to the line of sight. The pattern, or texture, is bunched up in the distance, and opens out near to the observer. Gibson refers to its ‘texture-gradient’ and was able to show that this feature, which is available even in monocular vision, plays an immediate and important part in localizing and orientating surfaces and objects for us. A second important factor, for the moving observer, is the characteristic sequence of perspective presentations of familiar forms and objects. These changing presentations are usually not perceived as distortions of the shapes of objects, which on the contrary tend to remain constant in appearance in spite of the changing point of view. They are interpreted as movement of the observer relative to a fixed environment, and allow him to appreciate his changing position and orientation relative to it. Gibson’s work affords no more than a starting point for detailed experiment, and his conclusions are by no means universally accepted. But it marks an escape from the tyranny of the stereoscope in the study of visual space perception, and exemplifies a freshness of spirit which has yet to appear in some other branches of psychology. Much the same might be said of the fascinating work of Adelbert Ames and his associates, in America, and of Michotte, in Belgium, who have explored other parts of the same field with similar freedom from the dead hand of their predecessors’ achievements. Indeed, it looks as if the study of visual perception, spurred by
the novel demands of contemporary life, is likely to move into a new phase, in which some of the general characteristics of our visual experience, such as the sense of 'reality' it brings, may be elucidated. If so, some light may be thrown upon those curious, elusive, modifications which occur in states such as fatigue, neurosis, and in some toxic conditions.

An increasingly close concern with developments in the physiology of the nervous system, and with findings in clinical neurology and neuro-surgery, provides another new and fruitful impulse to the experimental psychologist. Until quite recently, neither side could make much contribution to the other. The physiologist and the neurologist were chiefly engaged, so far as any detailed interpretation was concerned, with functions of the nervous system at a level which seemed unworthy of many psychologists' interest. So little was understood of the functions of the brain that the physiologist or the clinician who had to talk about psychological matters like perception, language, memory and temperament, and their disorders, was bound to use rough and ready terms which offered little scope for the more detailed and sophisticated approach of the psychologist. But this state of affairs is rapidly passing. The working and organization of the brain itself are being effectively studied by physiologists, who find themselves in some connections increasingly forced to frame their experiments and discuss their results in terms akin to those used by psychologists. Conversely, the directions in which the psychologist can go his own sweet way, in ignorance or neglect of physiological findings, are getting distinctly fewer. Again, the neuro-surgeon can now operate with a refinement which encourages much
closer psychological study of disorders which may be alleviated, or occasioned, by surgical procedures.

From such sources will doubtless come advance in our grasp of the mechanisms of particular functions like language, perception and skill. But of equal interest, perhaps, are prospects for the experimental psychologist which have to do with more general aspects of behaviour. Some people, for instance, show predominant variety and even inconsequence in their reactions. Others are steady and consistent, while others again are marked by heavy compulsion and incapacity to alter their behaviour even when circumstances urgently demand that they should. We all recognize that from time to time we fall into one or other extreme, very often, as it seems, when tired, or anxious, or slightly ill. Normally, a balance is struck which is more or less well suited to the needs of everyday life. But certainly one of these tendencies—that to repeat compulsively acts which fail to conform to the immediate demands of the situation, is a most interesting special kind of behaviour, which should repay experimental study. An extreme example is afforded by the ineradicable and endlessly repeated ritual act of the victim of obsessional neurosis. In such a case the interpretation of his behaviour is often sought in terms of unresolved infantile anxieties. Certainly no evidence as to how such a condition grew up could fail to be of interest. On the other hand, it is also interesting that the condition may sometimes be dramatically relieved—though not, perhaps, wholly eradicated—by surgical interference with the frontal lobes of the brain. For this suggests that, however it arose, its maintenance is dependent upon fairly specific cerebral mechanisms.
PROSPECTS OF EXPERIMENTAL PSYCHOLOGY

Something of the background to compulsive activity of this kind may, perhaps, be learnt from the experiments of Liddell, Maier, Massermann and others on the so-called experimental neurosis in animals. By subjecting an animal such as a cat, a sheep or a pig, to a conflicting situation in which the road to gratification of an appetite unavoidably brings discomfort or pain, a condition can be induced which is in many respects reminiscent of acute anxiety neurosis. Once established, it is very intractable, being impervious to the common influences which build up and break down ordinary habits, such as training, reward and punishment. Such ‘neurotic’ animals have a strong tendency to compulsive, unadaptive behaviour. When placed in the experimental apparatus, they adopt stereotyped and sometimes bizarre postures, and seem unable to profit by any fresh means made available to them either to satisfy the appetite, or to avoid the unpleasantness. Mr. Watson, in a previous talk, spoke of the establishment of perceptual discrimination in rats by means of the jumping-stand technique. In such an experiment we can make the discrimination impossible for the rat to learn, by making random the rewards and punishments between the patterns. If the animal is now gently, but it has to be literally, pushed into responding, it persists in performing one act to the exclusion of the other. Usually it chooses one of the two doors to jump to, irrespective of which pattern is displayed there, and regardless of the fact that it is being punished in half the trials. If reward were now always placed behind the other door it would never find it out. There is much scope for further experiment on animals along these lines. Is, for instance, the
repetition a consequence of an inability to change, or vice versa?

A similar disadvantageous inflexibility afflicts most of us from time to time. In spite of our best efforts to do something fresh we repeat compulsively and with maddening precision, the same false act in making a skilled movement, or make the same mistake in carrying out a prescribed sequence of acts. Much more exaggerated forms of the same disability may be seen in many patients with cerebral disorders, in some neurotic sufferers, and in the aged. The tendency is often the more marked the more difficult the task, and an instructive, if humiliating, inquiry could be made about the part it plays in our everyday thinking: which is by no means outside the scope of experiment. A technique recently devised by Whitfield might very well be applied to it. This is a kind of game in which the player has to place a number of different pieces in their right places on a marked board. At the outset, of course, he is merely guessing. But after each attempt he is told which pieces have been correctly placed, and so has definite data on which to base his next attempt. Now the chances of getting any given number of pieces right at any given attempt in the series, and the most favourable series of moves, can be calculated on the assumption that full use is made of the data. By recording the actual moves one can discover how far the player is persisting in errors, whether of memory or inference, which he could have avoided. Whitfield, in fact, noted instances of fixated behaviour in his experiments, and variations of this kind of study might usefully explore the whole question of repeated error, in pathological as well as in normal cases.
This problem of the nature and role of *stereotypy* as opposed to *variety* in behaviour is just one instance out of many where experimental study looks at present promising. I chose it because it exemplifies some points of wider significance. First, there is the possibility of specific investigations, in which experiment can be made to interlock with experiment, and to interact with coherent theory. Secondly, there is a hint of physiological relationships not too remotely in the background, and the suggestion that work upon animals is not entirely beside the point. Thirdly, the phenomena in question exhibit continuity as between the normal and the pathological. Lastly, a number of separate studies can be provisionally related, in terms of a general theme which seems to run through a good deal of human experience and behaviour.

Patience and boldness directed along lines such as these could lead psychology to a not undistinguished future among the experimental sciences. But a good many people may be inclined to ask whether anything is likely to emerge which really furthers our understanding of human nature. This depends, I think, on the sense in which we seek understanding. Does science ever bring enlightenment in the way we expect and sometimes rather querulously demand? A large part of its findings are assimilated, applied, and taken for granted. They do more to alter behaviour—to replace one set of habits by another—than to enlarge understanding. In this respect experimental psychology may eventually have repercussions as profound as experimental physics has had. If so, they are likely to evoke a similar mixture of approval and disapproval—of hopes and fears. But for the rest, on the face of it, it
looks as though the chief outcome of science is to produce bigger and better puzzles. Perhaps one day psychology may even aspire to this.

REFERENCES


FURTHER READING