has been read; and for such the matter perhaps should end at that point. Such individuals are likely to be temperamentally unfitted to recast and summarize an investigation in a form comprehensible to a public not technically trained. Others find in the effort a self-clarification that brings new vision when they turn again to their own work. Among such are the great expositors of science, successful in instructing others, perhaps because they best succeed in instructing themselves. The dissemination of the results of research, however, is always an exacting business, demanding more than cold rationalistic approach. When most successful, the effort involves something akin to dramatic sense and a literary skill which touch the imagination without doing violence to verities or distorting perspectives, and still leave those instructed with a dominant feeling of the power of reason. He that hath the talent clearly should not hide it; nor is he likely to do so, for he will probably feel the stimulus of a responsive public. The conflicting demands of the public and the laboratory he will somehow adjust, usually, I think, to the benefit of both.

To these general reflections I may add that the Carnegie Institution recognizes its responsibility and continually seeks means by which it may present the results of its work to scientific workers and the public. Its volumes issued through the division of publications and the special publications prepared by some of its departments have prompt and wide distribution. Careful statements of its work are distributed to the press as news releases. An exhibition of its diversified activities, held annually in Washington, and series of lectures by its investigators are other means by which it approaches the public.

We at the observatory share in the responsibility. Each year we care for thousands of visitors at Mount Wilson. We give public addresses; cooperate with the Astronomical Society of the Pacific in providing annual series of popular lectures and general articles for its publications; aid with the news releases issued by the Carnegie Institution, with its yearly exhibition and its own series of lectures. We open our library to students qualified to use it, and, as occasion permits, welcome at the telescope men on fellowships of the National Research Council, the General Education Board, the Commonwealth Fund and other foundations.

Technical results printed in periodicals and books are the source for fellow workers in science and those who prepare texts for instruction; news releases, lectures and popular articles reach the general public; visits to the observatory reveal something of the atmosphere of research not conveyed by printed words. Behind all, however, and giving life to all, is the power of organized effort and the work of earnest men. Herein lies the spring that draws its waters from the heavens and from the earth and all its life. As that flows, so shall the mind of man grow and put forth new fruits and his spirit become fine.

THE STUDY OF THE MIND[1]

By Dr. WILLIAM A. WHITE

ST. ELIZABETH'S HOSPITAL, WASHINGTON, D. C.

I MUST preface the few remarks which it seems to me that an occasion of this sort warrants by expressing my deep sense of appreciation at being elected to membership in this distinguished body. Nothing could be more gratifying than the opportunity of associating myself with you through the medium of this Greek letter society. I naturally feel highly honored that my past performances have been of such a character as to lead you to ask me to join with you, and I assure you that in the future I will consider the honor of this association as a stimulus to work that will continue to command your regard.

In the few minutes at my disposal I feel that the most appropriate thing that I can do is to formulate very briefly what might be called a profession of faith, by which I mean a statement of what I conceive to be the significance of my chosen work both as it appears to me in the present and as I vision it for the future.

In the first place, no adequate understanding of the present status of the study of the human mind can be reached, as indeed might be said of any other scientific subject, without some knowledge of the historical aspects of the subject. And I may remind you in this connection that it is only very recently that the study of the human mind in its various reaches has escaped from the limitations of its associations with philosophy, theology and morals and has finally become, in my opinion, a biological science which undertakes to investigate and explain not only the outwardly observable behavior of living beings but the circumstances in that world within us, which can only be approached by methods of introspection, which are of such apparent significance in connection with our

[1] Address at the annual meeting of the District of Columbia Chapter of the Society of Sigma Xi on April 26.

behavior as to make it seem dependent on our ways of thinking and feeling.

It has been known for many years that the perception of the outer world was more or less modified by the individual, differently in different cases; and the personal equation which was developed as a corrective device for doing away with or at least minimizing the distortion that was inevitable, and which was shown in the different results obtained by different observers in recording the same phenomena, stands as a concrete expression of the realization of this fact. But such variations as one finds in this field of scientific observation, variations which showed up in the reading of scientific instruments, while it is important, is, to put it mildly, of minor significance as compared with the distortions of the universe about us which from our point of view we read into the perceptions of primitive man, of the child, and of the mentally diseased, and which as mass phenomena have invaded civilization from time to time in such expressions, for example, as the belief in witchcraft which swept over Europe, persisted for some hundreds of years, and cost hundreds of thousands if not millions of lives. All these groups of phenomena are manifestations of the distortion of reality as it filters through the individual and is interpreted by him upon the basis of his background of experience, both individually and racially.

The researches within the present century in the field of psychopathology have had as one distinct objective, among others, the correction of these distortions with a realization, quite naturally, of the philosophical implication that after all the universe is for us as we perceive it but with no longer the necessity for being controlled, inhibited and prevented from progress by such a hypothesis; for if this statement of philosophy is accepted at its face value it would mean that progress in the interpretation of the facts of reality was either impossible, or, if not that, at least outside of our control, that nothing we could do would affect the net results one way or the other. Progress voluntarily aspired to by means or methods intelligently addressed to that end would be nothing more nor less than an attempt to accomplish the impossible, but the remarkable fact is that man is able to accomplish the impossible or at least what seems to be the impossible. I might perhaps better say that life in its evolutionary and developmental progress stands out as an example of the accomplishment of the impossible, and man may continue to progress if he has the courage to discard limiting theories and go bravely forward, even though what he seeks may seem to him at the time unattainable.

The mind of man has in the present century come into its own for the first time as a worthy subject of scientific study and investigation; and if some of the investigations and some of the studies made appear to lead to rather unacceptable results, or results which do not seem to measure up to the requirements of the standards which have been attained in other scientific disciplines, it is, in my opinion, only because we are dealing with an infinitely complex group of problems and we are only beginning to attempt to deal with them in a scientific manner, free from prejudice, superstition and the like; and the important thing is not so much the accomplishment in a specific instance as the fact that sincere efforts are being made by an ever-increasing body of enthusiastic students. Even though I indicate the situation in these rather discouraging words, still enough has been accomplished to act as a sufficient stimulus for the high adventure of further discoveries, because of the tremendous importance and significance of this field as already disclosed. For example, we are beginning to feel very definitely—some of us at least—that the phenomena at what I call the psychological level of functioning of the living being, while to be sure they are intangible, imponderable and invisible, are nevertheless somehow to be related in our thinking to the manifestations of energy with which we are more familiar in the physical world. The psyche is being considered as an organ the function of which, expressed in its most generic form, is the equalizing of stresses and the releasing of tensions, with the necessary tendency to bring to pass a state of equilibrium—not a static equilibrium but a dynamic equilibrium. And as we undertake to evaluate various states of mind we can not escape from the necessity of measuring them over against the stimuli which have released them and forming some sort of judgment as to the quantitative relations between the two. We see, for example, such quantitative relations, although to be sure we have no means of measuring them with accuracy, between the depth of grief of an individual over the loss by death of a beloved friend or relative and the importance and significance of that friend or relative in the life of the survivor. We see very definite quantitative relations between the feeling of guilt and the nature of the act which has excited it; and when we realize in such instances as this latter, for example, that such a reaction is based upon an inner standard against which the individual measures his conduct, and that that inner standard is received from the cultural environment in which the individual was raised and becomes such a standard by being built into the psyche, you will perhaps understand what I mean when I say that I believe in the last analysis that the psyche may be considered as an environmental inclusion in a sense not dissimilar from that in which the blood is con-

sidered to have been originally the environmental inclusion of a droplet of sea-water, which subsequently became the circulating medium for the transportation of various substances from one part of the body to another.

If such an hypothesis, or perhaps it might better be called a speculation, should ultimately prove out, it would then mean what again we already have definite hints of: that the laws which govern in the physical world and with which we are to a certain extent familiar would be determined to govern in this apparently more tenuous and immaterial world, the world within. We would find that the relation between stimuli and mental states, as already indicated, was a quantitative one; for example, the relation between a frustration and a compensation. We would see analogies with scientific laws with which we are already familiar, and to which we would become progressively less able to remain blind.

If all the above things represent a fair statement of how we may consider mental events in their relation to other events in the cosmos, then it can be further understood how significant this particular class of events has become for an adequate understanding of the most important aspects in which we relate ourselves to our environment, namely, those inter-personal relations which have to do with our contacts with other human beings and upon the nature of which it may easily be said depends the whole future course of civilization. Civilization is a matter of the psychology of the peoples functioning at a social level of integration, and no adequate understanding of the forces that are involved can be had unless this fact is appreciated, and we can not expect to guide these forces into constructive channels unless we have this information.

While it is true that this program contemplates a procedure which looks a little as if man had the problem on his hands of raising himself by his own boot-straps, nevertheless, as I have said, this impossible performance is just precisely what he has proved himself in the past capable of doing. And so it would seem that the reception of psychology into the realm of the biological sciences, the appreciation of man from this point of view functioning as a social unit, and the attempt to fathom the intricacies of the human psyche by the development of methods of research in this field, are worthy, significant and important developments in the world of science which need to be aided, abetted and encouraged by all those who in their own particular fields may have reached a higher degree of perfection both in the observation, description and interpretation of their facts, and in the development of ways and means for their uncovering.

In any case, however, we will continue our search in the regions of the unknown and our efforts to find explanations where at present none exist; and we hope that if from time to time we make mistakes and come to conclusions that are unwarranted by the facts, that we are sufficiently loyal to the tenets of scientific methodology to be the first to welcome the criticism that will disclose our shortcomings, while in the meantime we shall, on the other hand, be able to receive contributions from other sources without exhibiting those prejudices that unfortunately too frequently mar the course of scientific progress. In this respect we trust that we may profit by our own disclosures, although we feel the burden of those human weaknesses that are common to us all; and so in attaining to recognition in the general body of the sciences we make our entrance in the hope that we may be received as one of you, earnestly working to throw light where there is now darkness.

OBITUARY

HERMAN CARL RAMSPERGER

THROUGH the death of Dr. Ramsperger on July 13 we have lost an outstanding American contributor to chemistry.

He was born in Salt Lake City, July 19, 1896, and obtained his education at the Utah Agricultural College and at the University of California, where he received the degree of doctor of philosophy in 1925. Since that time he has held positions as instructor at California, National Research Fellow at Stanford and at the California Institute of Technology, and as assistant professor of organic chemistry at the California Institute.

His main work was in the field of chemical kinetics where he made contributions of permanent importance to science. Through his work on the rate of decomposition of azomethane, we were provided for the first time with a satisfactory study of homogeneous unimolecular gas reaction whose specific rate falls off with decreasing pressure. This result was crucial in showing the effect of molecular collisions in leading to the chemical activation of molecules, and provided the experimental basis for the theoretical developments of Rice and Ramsperger, of Kassel and others which give a quantitative account of the dependence of reaction rate on pressure. The work on azomethane was followed by the determination of other unimolecular rates so that the whole field has been left in a satisfactory state.

In addition to his work in chemical kinetics, Dr.