

"IF I WERE A GRADUATE TODAY"

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In the last 10 to 20 years there has been enormous progress in the understanding of the simpler aspects of brain structure and function. This basic work has been on the properties of the unit structures of the nervous system, the nerve cells, on the modes of communication over nerve cells by propagated impulses and between them at the functional contacts or synapses and on the simplest functional patterns of nerve cell organization. It provides a sound foundation for further progress; and, thanks to the great power of the new microtechniques, its success has been beyond the most sanguine hopes of a few years ago. Yet all this progress serves but to give an immensely wider and deeper vision of the fantastic problems that lie ahead. We can now be confident that the almost infinite complexity and variety of the neuronal networks that could be formed by the ten thousand million nerve cells of the cerebral cortex endows it with potentialities adequate for any achievement, even for that displayed in the performance of the highest intelligence. I have hopes, too, that we are on the threshold of understanding the basic principles responsible for the laying down of memory traces, which we may envisage as being due to an enduring enhancement of synaptic efficacy with usage. In this way a neuronal pathway that is activated by a particular sensory input will, as a

consequence of repeated activation, achieve a kind of stabilization by means of the enhanced synaptic functions of its neuronal linkages, and so be available for recall in memory when there is an appropriate input into its circuitry.

If the value of research is to be measured in relation to its intrinsic importance to man, then brain research must rank as incomparably more important than space research, which commands a very much greater financial support. No doubt much of this inflated support is forthcoming because of its real or imagined value for military strategy and political status. I don't care much about the lavish expenditure of money on space research. What I do care about is that it is attracting such a large proportion of the highly intelligent young scientists. This is a real tragedy, and I hope it will be possible to limit its impact. For example, I think it is urgently necessary to oppose the emotional attraction of space research by the development of a counter attraction in the greatest of all intellectual adventures, the attempt by man to understand the working of his own brain.

As I have mentioned above, great progress has been made in our attempts to understand the mode of operation of the simplest levels of brain action with the secure foundation provided by the study of the properties of the units of the nervous system, the nerve cells, and of the functional linkages between them, the synapses. Moreover, we now have considerable insight into the organization of the simplest patterns of neuronal linkages. What is now needed is the concentrated efforts of the highest intellects in such diverse fields as mathematics, physics, communication theory, chemistry and molecular biology, in order to transform the present level of investigation into fields as yet unknown. One can envisage that it will be necessary to have revolutionary developments in both the experimental and theoretical methods of probing into this vast field.

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