

Dalhousie Medical Journal

"The building of a perfect body crowned by a perfect brain, is at once the greatest earthly problem and grandest hope of the race." - Dio Lewis

PSYCHOCYBERNETICS & THE CONSCIOUS STATE

Marvin Reinberg 68

Not long ago nearly everyone subscribed to the concept of brain mind dichotomy. According to this concept, even the most complete and detailed understanding of the physical structure and operation of the brain could never suffice to explain mental activity. The mind was considered to be something nonphysical, outside the realm of the natural sciences; it was believed to make use of the brain as the agent of some of its activities but was thought to possess properties and powers that could never be interpreted on the basis of any conceivable organization of cells and tissues.

In recent years the dualistic brain mind concept has steadily lost ground to the mechanistic point of view. The development of machines capable of performing thought like processes has aided this trend. Throughout the years, medical research workers have learned that whatever their philosophy, they make consistent progress in learning how living organisms operate by assuming that they are subject to the physical laws of nature and by painstakingly applying the technique of scientific investigation. As a result the history of medical research largely consists in repetitions of a single theme; the removal of one after another of the organs of the body from the realm of the physical unknowable and unexplainable to which all living processes were once assigned. In former times the idea that the heart is no more than a complicated pump which would one day be replaceable by a man-made device during a lengthy surgical operation would have seemed as shocking to most people as the modern discoveries that the brain, too, operates in accordance with the physical laws of nature.

Most impressive of all, are the observations that reveal the physical basis of the "higher processes" of emotion and intelligence. The discovery of pleasure and punishment centers in the brain-discrete, localized, stable aggregations of neurons in which an electric current means a sense of well-being, hunger, sexual gratification, rage, terror or pain - made difficult for those whose thinking emphasized the dichotomy of the brain and the mind. This difficulty was further increased by the evidence for the controlling effect on personality of the integrity of the neuronal connections to the frontal lobes as well as by the clear relationship established by Penfield between stimulating cortical currents and the "mental" processes of speech and memory, and evidence for the automatic machine-like nature of some of the learning processes has further aggravated the plight of the brain mind dualist.

Nowadays it is commonplace to emphasize the analogy between the human brain and electronic digital computers. The secret of the power of modern computers resides in the discovery that extraordinarily complex operations can be broken down into steps that can be handled by very simple processing elements. In mathematical calculations, any operation that the mathematician has invented can be broken down into such elemental steps and caused to control the generation of the voltages representing output numbers. And in logic problems, the computer can deduce new conclusions from given propositions by the application of the rules of logic which can be broken down into the same simple processing steps as those used in mathematical computations. This would also appear to be a valid description of the essence of brain function.

However, as we move up the scale of intellectual complexity beyond the kinds of phenomena that we arbitrarily categorize as "automatic learning" we come face to face with a formidable philosophical problem - the sense of consciousness.

This subject is awkward and embarrassing to a mechanist. It is important at this stage to consider what is meant by consciousness. Consciousness is a state - a relative state - that cannot exist without a subject.

The state of consciousness has two evident components, awareness and reactivity. I am aware that I am conscious and you assume that I am by the appropriateness of my reactions. In common with so many attributes of neuronal function it, therefore, has a motor

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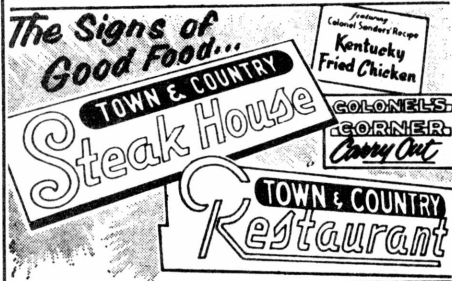
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and sensory component. There are variations in the form of consciousness as in sleeping and waking, sleeping being a state of lowered reactivity and selective awareness and there are also variations in the level of consciousness which is a relative, not an absolute state. As a rule when consciousness is disordered awareness and reactivity are diminished in like degree to establish the hierarchy of coma which passes through light and deep confusion, semicoma, to deep coma. Sometimes reactivity may be diminished alone or principally, in pure forms causing the condition of akinesia with mutism which is physiologically the same as what the psychiatrist calls stupor. In this state recall may be lost though in it awareness can persist unaltered.

In previous times, as mentioned earlier, many physicians spoke as though a patient could lose consciousness without a loss of use of some parts of the nervous system; or if they admitted that there was loss of use of nervous arrangements along with loss of consciousness, the inference from the statement of that admission often was that the nervous arrangements affected did not represent parts of the body but are centres having nothing to do but to "play upon" the lower centres. Morphologically they were spoken of as part of the body, but physiologically they were spoken of as if they were distinct from it as the most psychological of psychologists suppose mind to be independent of organization. In other words consciousness was not a function of the higher centres; it was simply concomitant with their functioning.

Present scientific advances have led to a remarkably rapid increase in the knowledge of the way the reticular formation of the brain stem with its cephalic extension affects a person's consciousness—work beginning with Herrick's comparative anatomy, Hess and Ronson's observations on sleep states and Bremer's observations of the effect of section of the brain stem on reactivity. It is since the systematic researches of Mogoun and his colleagues that the past decade has been a dramatic convergence of interest on the subject and the growth of a convincing body of knowledge. This integrating device in the brain stem confers on the organism a flexibility of attention and response closely related to changes in internal and external environment. It modifies the state of consciousness.

One may conclude from the above that the state of consciousness is a purely physical phenomenon and that eventually we may be able to explain volition, ideation, reasoning and emotion on the basis of definite anatomical configurations. Suppose we now carry this blending of the physical and biological a step further. Consider the following line of speculation; it is now known that there is no essential difference between living and non-living matter. Living matter has or has almost been synthesized in the laboratory out of inert ingredients, the statement depending upon just where the line is drawn in the very fuzzy region that separates life from non-life. Rapid progress is also being made in breaking the genetic code; it is no longer purely science fiction to speculate that one day man may be able to synthesize the chromosomic content of the cell nuclei and, by providing a suitable growth environment thereby "build" living organisms of considerable complexity. Now if the resulting animal is similar to a naturally created higher animal will it be conscious? It would be hard to doubt that it will. What then if a creature of similar behavior and intelligence were to be fabricated from components of quite a different kind - with a nervous system and brain based on electronic components instead of neurones, for example? Would it too possess consciousness and the subjective feelings that go along with it? For all we know today, surely this has to be considered to be a possibility. And how about existing electronic digital computers? Is it possible that somewhere among their wires and transistors, there already stirs the dim glimmering of the same kind of awareness that has become, for man, his most personal and precious possession? Fantastic? Perhaps.

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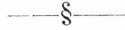
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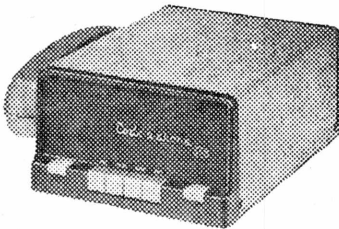
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