

of the 16th and 20th centuries . . . DR. ALLAN A. MACRAE

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The Rise of Evolution

Concluding Lecture

THE HUMAN BRAIN

We marvel at the accomplishments of man in making computers with tens of thousands of electronic switches that are able to perform enormous calculations at lightning speed. Yet the greatest computer that has yet been invented is insignificant indeed compared to the complexity of the human brain. In the brain there are hundreds of millions of cells, every one of which has direct contact with at least ten thousand others. This is hard to imagine. Some idea of the mechanism involved can be secured from the results of microscopic research on the neurons, or nerve cells, of which the brain and the rest of the nervous system is composed. Although these cells are so small that no one of them by itself can be seen by the human eye, many of them have protrusions extending from the cell body to a distance of two to four feet. These protrusions, called axons, are very long but extremely thin. Shorter protrusions branching out like trees are called dendrites. It is by this complex system of axons and dendrites that interrelationship is provided between the multitudes of distinct nerve cells.

By observing individuals who have suffered brain injuries, and by other methods, it has been possible to determine the parts of the brain that are responsible for various activities. Certain portions of it receive impressions of touch, others of sight, others of sound, others of taste. Still others start the impulses that result in motions of the hands or of the feet.

EYE AND BRAIN

The activity of the brain in seeing is most interesting. The lens causes a picture of what is in front of each of the two eyes to appear on the retina, reversed and inverted, so that, for example, what is above and to the right appears in the lower left portion of each retina. This excites the nerve endings of the retina, and the nerves from the right side of each eye carry the impulses to an area on the right side of the brain, those from the left side of each to an area on the left side of the brain. Thus certain cells in the right side of the brain are affected

by what is visible at a person's left, while certain cells on the left side of the brain are affected by what is visible at his right. Other nerves connect these two areas, and the two pictures are so combined that one has an impression of a single picture in front of him appearing in three dimensions.

A frequent admonition for a ball player, as he comes up to bat, is: "Be sure to keep your eye on the ball." Why should this be important? If you were to tell him that the ball would come, say, exactly two feet and three-quarters inches in front of him, at a height of exactly three feet and two inches, this would not enable him to cause a certain exact spot on the bat to hit an exact spot on the ball. It would only confuse him. Yet the brain receives impressions from the eye, also from the sense of equilibrium given by the three canals in each ear, also from the various muscles giving information as to the exact way he stands and the exact way in which the bat will move forward as he moves his arms in a certain way. All of this is worked out by the brain at lightning speed, so that a well-practiced player will hit the ball exactly as he desires, provided he keeps his eye on the ball. In this and many other situations one can observe the remarkable efficiency and intricacy of the human brain.

Truly the human body is an amazing mechanism, in which hundreds of complicated chemical processes are constantly being carried on. Its trillions of cells are of many different types, yet with great similarities among them. The vast majority of these cells contain within them all the information involved in every aspect of the body, so that one cell from the gonads is sufficient in combination with one from the other sex, to produce a body that will itself contain trillions of cells reproducing in a new combination the qualities and characteristics of the parents. The human spirit has indeed received a marvelous mechanism through which to express itself. To believe that this remarkable organism, working together in such amazing fashion, has come into existence entirely through a fortuitous set of circumstances, having developed by hit-and-miss from a very simple beginning, would require the utmost credulity.