The Importance of Biological Research

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Many like to think all human knowledge as one great field with its subdivisions developed more for convenience of study than because they are essentially different. In any case, none of us would deny the fact that the sciences are closely correlated and that they frequently overlap. It used to be that subject matter and methods separated them, but now neither is more than partially true. It is, however, convenient to think of physics as a study of energy, chemistry a study of matter, biology a study of life, and so on, but this is not a perfect separation, and when it comes to methods there are other difficulties. A biologist and a chemist for instance, might work in the same laboratory, use the same materials and methods, and reach the same results. Yet one might be considered a biologist and the other a chemist; one would be interested in the results as related to chemical problems and the other in its relation to life; in other words, the main difference would be in the point of view.

In much of modern biology it is often important and frequently necessary to use the findings and methods of mathematics, physics, or chemistry in solving its problems, but there is some danger of loosing sight of the main theme: the comprehension of life in all its manifestations. Useful as are the methods and materials of other sciences, there is much left over that cannot be explained by any one or all of them combined. Even when chemistry or some other subject seems to solve the whole problem in biology, there is much left untouched when life itself is not considered.

Important as are the discoveries and development in this atomic age, we must not loose sight of the fundamental value of biological research for humanity. We are now giving more money and attention to atomic and allied research than to the solution of biological problems which are more directly related to life and human organisms. This may be understood and partly forgiven because of the pressure of war fears and the necessary protective measures. Unfortunate also, has been the great urge to enter into a type of research which is so well advertised and supported.

One of the reasons that biological sciences have been slighted is due to the mistaken idea that these areas are less difficult and less worthy of the highest efforts of the best minds.

It is true that there are many fields of biology which require less preparation to enter than is the case with some of the other sciences, but in the long run all great questions are equally difficult to answer. It does not matter much what area one enters, the ultimate problems are there. As David Starr Jordan once said many years ago, "All the easy things have been done."

The old conception of pure science as being entirely apart from any application to human use seems rather absurd to us now for there have been so many discoveries which seemed totally outside of any direct value to man that have proved to be of the utmost importance in applied science. We now recognize more than ever before that practically every research in pure science will sooner or later be valuable for man.

However, it is well to keep to the ideals of pure science. When doing research in this field it may be fatal to an investigation if applications be constantly sought, for this might lead to neglect of the apparently unimportant but really valuable principles or explanations. There should always be investigators in every science who are interested only in principles and are always ready to follow where facts may lead without being sidetracked by some possible practical application. We need to encourage many in the pure sciences; applied research will then develop naturally.

The central problem of biology is a better comprehension of protoplasm and the nature of life. There are numerous aspects and phases; there is possible an almost unending source of information. Almost every branch of biology has its contribution towards a better understanding of this most important phenomenon of the world in its value for us.

The nature of the living substance or protoplasm has been approached in many ways. In

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recent years chemistry and physics have given us clearer conceptions than we ever had, but still much eludes us. The study of hormones, vitamins, and other products of the cells instead of solving all problems have brought forth still others. The study of heredity, both cellular and external, has profoundly affected man and given him a better knowledge of all living things, often greatly to his social and economic advantage. The better knowledge of physiology and disease has greatly lengthened man's life and eased his pain. Disease after disease has been brought under control and more are being investigated. Perhaps cancer, heart diseases, and other modern killers might more quickly be reduced or eliminated if a fraction of the money spent on armaments, military preparations, and nuclear research could be applied to man's immediate benefit.

We do have a war on right now, not only against disease but against insects. It has been suggested by entomologists that it is still an open question whether man will succeed against the insects with their wonderful powers of reproduction and their great adaptability. It has also been said that man could not continue to live on this earth more than three years if the insects did not war upon themselves.

There are so many pressing problems in the field of biology that it would take pages to merely enumerate them. Some that have been prominent have been concerned with heredity and development, the nervous system and its sense organs, disease and immunity. There is also the growing interest in resources for the future. Can we continue to produce plants and animals by the wasteful methods we have been using? How long can this continue? How long before our natural resources will be exhausted especially with the undreamed of increases in world population?

Such questions and many more are being considered with now and then some considerable hope of satisfactory answers; for example, the artificial manufacture of chlorophyll. If this can be accomplished, then green plants, the basis of life on earth, can have a substitute of far-reaching importance. Some also hope that nuclear energy may in time be used directly by the human body.

Some of the recent aids to the understanding of living things, and their activities have come through the study of viruses. Long before their identities were known, these were said to cause some of our most terrible diseases —hydrophobia, smallpox, yellow fever, polio, and many others. By the use of modern methods, including the electron microscope, these were identified, but whether they were chemical or living bodies is still in some doubt. They sometimes appear in crystalline form and do not reproduce outside living cells, which may suggest a lower organization than that of protoplasm, but they appear highly complex although very small as compared with bacteria. In some cases, at least, they possess an outer layer of protein material and an inner part of nucleic acid and suggest something like a living substance. In many ways the most interesting are the bacteriophages which attack bacteria. They were first known in 1915 but better understood when the electron microscope came to be used in 1938. They appear to be little balls with a short stem or tube on each one; the outer parts are protein, the ball contains nucleic acid which is injected into the bacterium by means of the hollow stem or tube. Nucleic acids, similar to those of the chromosomes, change the activity of the cell attacked, causing the heredity substance, chromatin, which is similar to that injected, to alter its activities and aid in the production of other compounds or viruses like those which had penetrated the living organism. In this peculiar way reproduction of the virus is accomplished with the destruction of the bacterium, something like hereditary substance having entered the cell and changed its whole metabolism.

By careful study of this strange activity, there may be valuable information obtained about the nature of chromatin and its part in the transmission of hereditary characteristics.

Enthusiastic students of the viruses have said that this line of inquiry is more important to man than all the atomic energy projects which engage the attention of so many scientists today. These biologists have said that virus study is leading us towards an understanding of functions and activities of living substance, of life itself. Such researches would also bring about the banishment of the terrible virus diseases and furnish more accurate knowledge for the control of human and animal inheritance.

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