50 YEARS OF CURRENT SCIENCE—GLEANINGS

THE NEED FOR BIOPHYSICAL RESEARCH†

THE main trend of scientific research in the present century has been the progressive intermingling of various branches, which were formerly considered as independent. Thus, physical chemistry and mathematical physics were the earliest to be recognized as distinct fields of study, while biochemistry has now been in existence for a considerable period as a separate discipline. But the application of physical and mathematical methods on a large scale to biological problems is a recent development, resulting in the emergence of 'biophysics' and 'biometry'. It is obvious that major developments are likely to occur in these comparatively virgin fields, which serve as common grounds for different well-established disciplines.

In the past, a few biologists have been interested in the physical aspects of their subject, and physicists have applied their methods to the study of living organisms. Unfortunately, however, there has been no uniformity in the approach to biophysics, nor even a clear conception of its scope and potentialities. The problems concerning the development of biophysics as a separate field of endeavour have been ably treated in an article by R. W. Stacey and his views have been discussed by a number of workers in another issue of *Science.**

The term 'biophysics' may be used to cover broadly three types of studies: the physics of biological systems, the biological effects of physical agents and the use of physical methods in the study of biological problems. It is thus clear that biophysics covers a very large domain of knowledge, and that no logical and well-defined demarcation can be laid down between it on the one hand and the allied branches of physics and biology on the other. But there is no doubt that there exists at present a large area of no-man's-land between physics and biology, which would yield interesting results on exploration. For instance, there is an impressive volume of work waiting to be done on living matter at the microscopic, sub-microscopic and molecular levels. The worker interested in this phase would study tissue ultrastructure with the aid of physical instruments like the X-ray camera, the centrifuge and the electron-microscope. He would investigate the various properties of protoplasm like viscosity, elasticity, optical activity and so on. The thermodynamics of living matter constitute another fundamental field of research, rich in exciting biophysical problems. Spectrophotometric analysis of biological materials may constitute a real contribution to our knowledge of the molecular patterns in the protoplasm and to an understanding of the real nature of life. The measurement of bioelectric phenomena may lead to a proper understanding of neural and mental processes.

Man now travels faster and farther, higher in the air and deeper in the ocean, than ever before. He is exposed to new physical influences by virtue of the invention of new weapons and machines. We must learn the effects of these physical agents on living matter and the biophysicist has a large part to play in such studies. The rapid advances in nuclear physics have led to new and important aspects of biophysical research, such as the tracer isotope techniques and the effects of nuclear radiations on living matter. Again, physical instrumentation forms a major portion of the projected activity of the biophysicist.

Perhaps the reason why many of these subjects have not been investigated in detail in the past is that one needs a background both of biology and physics for a proper appreciation of the problems. Whether we like it or not, there is a difference in the approaches of physicists and biologists in tackling their problems, and it is difficult for one trained in only one of these disciplines to acquire the way of thinking of the other. There is obviously therefore, a need for the development of a special curriculum for training students who wish to take up biophysical research.

Researches in biophysics have been going on in other countries mostly through collaboration between workers in the two fields to which it is related. In some, as in France, regular courses of study are available in the subject. It is time that we in India too considered the possibility of affording courses, at the post-graduate level, to those who wish to take up research in this fascinating field. As a first step, summer courses may be given in the premier laboratories, to acquaint the biologists with the physical techniques that could be profitably used in their studies as also to familiarise the physicists with the basic concepts and ideas behind biological research. Workers in our country could expect to make significant contributions to this field, for it is still in the exploratory stage and not much spadework needs to be done in catching up with workers elsewhere as far as technique is concerned.

Let us therefore earnestly hope that active collaboration between workers in physics, chemistry and biology will soon be forthcoming from our universities and research institutions, to enable us to contribute our share to the field of biophysical research.

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* "The Status and Development of Biophysics," *Science*, 1951, **113**, 169, 617.

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