MEDICAL PHYSICS

(*Introduction*)

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Medical physics is commonly regarded as a new branch of medicine. The discovery of fundamental physical phenomena, such as the cathode rays, x-rays, radioactive substances, and neutrons, as well as successful applications of earlier discoveries in practical medicine, has fostered the impression that medical physics is an achievement of the twentieth century. That impression is not accurate. The science of physiology, for example, began with Harvey, who was the first to use systematic measurements in biological investigations and the first to attempt to correlate biological phenomena with physical laws. Fundamental knowledge of blood pressure depended on the development of suitable manometers. Many facts about the heart and circulation of blood could not have been learned without the microscope, string galvanometer, stethoscope, and roentgen rays. With the discovery of x-rays electronics entered the service of medicine. This discovery by Röntgen in 1895 and that of radium by the Curies in 1898, together with the subsequent evolution of medical radiology, vividly illustrate the close relationship of physics and medicine. Although recent discoveries and developments have led to an increasing recognition of physics as an essential part of the substructure of medicine, progress in biology and medicine has always been significantly related to advances in physics.[1, 2, 3]

Medical physics interprets living processes by physical laws; it analyzes the effects of physical agents on living tissues. Medical physics provides information concerning the physical theories and principles that apply to various medical procedures and instruments and a working knowledge of their use. Accordingly, the activities of a biophysics department are devoted to using physical phenomena to analyze living processes, as well as to produce methods and tools helpful to the physician in his diagnostic and therapeutic work. Many centers of biophysical research have been created during the last twenty years. The late Dr. George Crile was one of the first to recognize the importance of this research and to be interested in its development.

The utilization of physical principals has led to the development of methods for measuring radium dosages in "gamma roentgens," radioactive phosphorus for the treatment of myelogenous or lymphatic leukemias, artificial radioactive isotopes for tracer studies within the organism, the ultracentrifuge or the Tiselius electrophoretic apparatus for studies of protein fractions, the Wetzel grid for the analysis of factors

influencing the growth of children, methods defining the limitations of tests for defective color vision, the electroencephalograph, the electrocardiograph, and the audiometer.

The average physician, however, still looks askance at the attempts of experimental or mathematical physicists to adapt their working methods to his everyday medical procedures. He finds it difficult to understand the value of physics in medicine and therefore does not assign the same importance to physics that he does to chemistry. One reason for this attitude is inherent in the literature on medical physics. Research reports on the subject are scattered throughout the literature of physics, chemistry, physiology, and medicine. At present no medium easily accessible to physicians and surgeons exists for publication of articles that deal exclusively with medical physics. In recent years attempts have been made to concentrate such publications in special journals or sections of journals and in books on biophysics, but these have usually dealt with limited aspects of medical physics. There has been a definite need for a collection of widely diverse information on medical physics in a form useful both to practitioners of medicine and to biophysicists.

The field of radiology was one of the first to be interpreted from the biophysical viewpoint.[4, 5] More recently the whole field of medical physics has been approached in the same manner. Through the combined efforts of 250 collaborators the principal applications of physics to medicine have been assembled in one text.[6] The material presented in this book shows that medical physics has become an essential part of the substructure of medicine, and that it performs a function similar to that of medical chemistry.

In subsequent issues we shall endeaver to acquaint the general practitioner with specific and practical applications of physics to medicine.

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