

BME-19 (4)

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# Introduction

## BIOLOGICAL EFFECTS OF NONIONIZING RADIATION

**N**ONIONIZING radiation interacts with biological materials. The question is—what is the nature of this interaction, and does it constitute a hazard? The U.S. Congress believes it does and in 1968 passed Public Law 90-602, "The Radiation Control for Health and Safety Act," to protect the public from unnecessary exposure to harmful radiation emitted from electronic products. The Bureau of Radiological Health of the Department of Health, Education, and Welfare was given the responsibility for establishing an electronic product-control program. In addition, Congress also passed the "Occupational Safety & Health Act of 1970" giving the Labor Department the responsibility for promulgating and enforcing occupational safety and health standards that include the area of nonionizing radiation. These standards are to be developed with help from the Secretary of Health, Education, and Welfare and others such as the American National Standards Institute. How these controls, regulations, and standards are being established is, of course, a matter of great concern and importance.

For example, there is a serious lack of knowledge regarding the biological effects of microwaves. Evidence of this lack of knowledge is seen from the fact that the standards in the U.S.A. and the USSR differ by three orders of magnitude.

At the same time it should be pointed out that in connection with microwaves, there has been and will continue to be significant increases in the use of RF energy. It is presently being used for various forms of communication and radar, with power levels increasing at a rather rapid rate. In addition to communication applications, the use of microwaves in industrial, medical, and consumer areas is on the increase, the most obvious example being the development of the microwave

oven. Another example is a recent suggestion in connection with the development of a nonpolluting source of energy, which involves the use of microwaves for the transmission of large amounts of power, and the subsequent questions regarding potential hazards to man and his environment.

I am sure that the same situation prevails with other forms of nonionizing radiation, such as lasers and ultraviolet. It is, therefore, increasingly important that there be a rational scientific basis for arriving at the values used in the setting of hazard levels and in the regulatory programs. In order to obtain the information required, it is necessary that there be a coordinated program of research devoted toward this end. It is also important that attention be given to both biological and physical measurements and research techniques so that the experiments therefore become meaningful. Unfortunately, to the best of my knowledge there is at present no coordinated program of research directed toward establishing a scientific basis for determining potential hazards of nonionizing radiation.

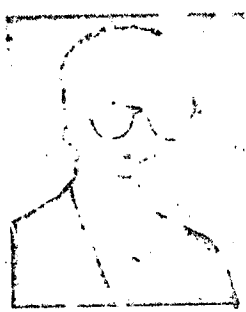
The papers included in this group derive from a program on the Biological Effects of Nonionizing Radiation that was given at the March 1971 IEEE International Convention and Exposition in New York. It was intended to provide general background material in the form of survey papers in this area for the engineer. As such it included an introduction, which discussed the development of Regulating Programs under the Radiation Control for Health and Safety Act of 1968, papers concerned with the details of the interaction of biological materials with microwave, laser, and ultraviolet radiation, and finally, clinical experience in connection with various types of nonionizing radiation.

This series of papers follows the same general outline in that it includes a paper on regulating programs, a paper on microwave radiation and its biological considerations, and finally, a summing up in terms of clinical experience to date.

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Mr. Rosenthal is a member of the American Association for the Advancement of Science, the American Association of University Professors, the International Microwave Power Institute, and Sigma Xi. He is a past Chairman and member of the Administrative Committee of the IEEE Group on Microwave Theory and Techniques and a member of the IEEE Standards Committee. He is presently Chairman of the American National Standards Institute's Sectional Committee C-95 on RF Radiation Hazards.