when "slow readers" can complete such information before the speaker is well started.

Audiences suffer, also, from speakers who discredit themselves by their slovenly pronunciation of basic scientific terms; *e.g.*, expuriment for experiment, chimistry for chemistry, bacterawlgy for bacteriology and vaurus for virus.

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QUOTATIONS

"TO DO SOMETHING FOR THE WELFARE OF MANKIND"[1]

IN these dark days when the world is at war, when democracy is at bay, when no great acumen is required to perceive that a world revolution is in progress—a deep-seated battle between many varying ideologies with no clearly discernible final result—the place, the purposes, the value of the philanthropic foundation may easily come in question. Governments are expending astronomical sums and gigantic efforts for purposes of destruction; of what importance under such circumstances is the welfare of mankind? What values can the few millions of any foundation directed toward such an objective conserve for a future social fabric the pattern of which can be dimly seen, if at all, by the wisest of men?

Is it mere futility to expend money to increase knowledge; to improve the practice of medicine through education and research; to carry out experimental efforts for the improvement of methods for the advance of public health, in days when human life and health are necessarily subject to the needs of war; to devote funds to the improvement of hospital facilities and management; to grant fellowships to brilliant young men that they may be trained for the advance of scientific knowledge; even to attempt to relieve in some slight degree the starvation and misery brought about by the present world upheaval?

The Commonwealth Fund does not believe that such effort is futile. On the contrary, it is the belief of the fund that these undertakings are more important today than ever before. Knowledge and brains still have no substitute. No matter what the future may have in store, knowledge must be conserved and developed, brains must be trained and given opportunity. Not forever will force reign, not always will the organization of society—or its disorganization—preclude the benefits to mankind of scientific discovery, of knowledge, intelligence and understanding. Whatever philanthropic foundations can contribute to the forging of implements for a better day will not be lost. In many conversations during the past two years with able and intelligent leaders in various fields, the outstanding thought has in no instance been one of despair or futility, but rather courage and determination in the belief that now more than ever it is of first importance that the development of potentials for a better and happier world be continued. A few mad men may have seized upon the advances of science for their own destructive ends. But they will pass from the scene. Human living will be reorganized—progress may have been halted; it has not ceased.

Thus it is the duty and the privilege of foundations to "carry on" and to "carry through" to a brighter day. The thought can scarcely be better expressed than in the words of Mr. George W. Gray in the concluding sentences of his tribute to the work of Wickliffe Rose, "Education on an International Scale":

> . . . eclipse is not obliteration. The sun is blackly obscured but it will shine again. Hope feeds on the integrity of law both cosmic and moral. . . . No star is ever lost.

BARRY C. SMITH

[1] Introduction to the twenty-third annual report of the Commonwealth Fund.

SCIENTIFIC BOOKS

RADIATION THERAPY

The Biologic Fundamentals of Radiation Therapy. By FRIEDRICH ELLINGER. Preface by MAURICE LENZ. English translation by REUBEN GROSS. New York: Elsevier Publishing Company, Inc. $5.00.

THE biological action of radiation from x-ray and radium varies according to the conditions of application. With x-ray the primary effect is wholly due to the light of short wave-lengths emitted from the anticathode under the impact of the electron beam. These light rays then set free electrons when they are absorbed. With radium, while the alpha rays are usually removed by screening, beta rays are left unless the filter is heavy. Roentgen rays and gamma rays from radiation do not differ except in wave-length. Hence if the action of radiation is due to electrons no differences in biological effect should be expected from x-ray of different voltages or from radium, provided that the conditions of measurement are strictly comparable. This fact has almost never been considered by students of the problem, and the omission has led to the contradictory statements which still exist in the literature, many of which are quoted by the author. For example, as a proof of the different effects of

different voltages, the writer quotes from a table by Reissner and Wintz showing that the reddening of the skin giving the so-called erythema dose varies greatly with the filtration of the x-ray. Such an erythema may be produced by 450 r with unfiltered radiation while filtered radiation of higher voltages requires 700 r to give the same reddening of the skin. This, now known to be incorrect, is the type of much early work. The later quotations are from, for example, Stone (*Radiology,* 30: 88, 1938), who states that 25 per cent. more r measured in air can be given of roentgen ray at 1,000 KV than at 200 KV. Both statements are perfectly correct reports of experimental observations, but for instance taking Stone's figures, the back-scatter from the deeper tissues against the skin is 35 per cent. of the impinging dose with 200 KV x-ray, whereas it is only 3 per cent. with million volt x-ray. Hence the difference in effect is easily explainable, for with higher voltage the skin received about 25 per cent. less than with the lower. On the other hand, with Drosophila eggs suspended on thin gauze so that there is no back-scatter, Wood, Exner and Packard have shown that exactly the same doses are needed to kill these eggs with x-ray generated at 10 KV and with all intermediate voltages up to 1,000 KV. On the other hand, the practitioner of roentgen therapy is much more interested in Stone's report than in the results of the Drosophila eggs, for he is desirous of avoiding an erythema, and the higher the voltage, the less likely is an erythema to appear. Many of the older observations which Ellinger quotes were made with different exposure portals and show variations which are also entirely due to differences in scattering, not to some hypothetical differences in the effects of different wave-lengths of radiation. Ellinger quotes Sir Thomas Lewis to the effect that erythema of the skin produced by roentgen rays is due to the liberation of histamine-like bodies. But on the next page, he offers several criticisms of this theory which show that perhaps we still are unaware of the exact process. The effects observed certainly can not be correlated with damage to the cell ferments. Recent studies of the clinical course of erythemas have shown that there are great variations in the periodicity and types, and it is probable that the process is much more complicated than Lewis has suggested. It is interesting in this connection to recall an observation published years ago that the effect of extreme heat and cold gives rise to lesions of the tissues and of the vascular system nearly identical with those produced by x-ray and radium.

The writer turns after these general discussions of effects observed on the skin to the changes which are produced by the radiation of various organs. Present interest is for the moment centered upon the effects of radiation upon the male and female sex organs and the possible late damage to the offspring. It is very doubtful that the ordinary radiographic exposures used in studying the position of the fetus in the uterus before delivery have any notable effect, although heavy therapeutic radiation has occasionally been noted in human beings to induce extensive lesions in the child. Most of these examples have been drawn from patients who have been rayed for cure of fibromyomata of the uterus and are pregnant at the same time. It is unlikely that a viable child can be obtained with a fibromyoma of any size, but it is wise in general to make a preliminary Aschheim-Zondek test for pregnancy and to empty the uterus surgically before beginning x-ray treatment. A good many surgeons would recommend a hysterectomy under these circumstances in place of irradiation. From all these facts it is evident that temporary sterilization should not be done and if there is any reason for interference with possible future pregnancy, total sterilization should be accomplished either by x-ray or by surgery. Geneticists are agreed that it is doubtful that any notable effects will be discovered in the first generation of offspring after moderate radiation of the gonads, but point out that the second generation of animals shows radiation damage. They also are not in agreement that the moderate quantities of radiation used in diagnosis will cause serious lesions in the second generation; some doubt even the effects of large doses, and point out that inasmuch as most of such heavy doses to the genitals are given for carcinoma of the uterus or tumors of the testicle, the patient is sterilized anyway. It is well, therefore, to wait before making statements concerning irradiation damage until actual observations can be made upon human offspring. The first generation children of rayed individuals are now being married, and within the next twenty years it should be possible to get some useful statistics on this important question.

The author then proceeds to a survey of the effects of radiation upon the various types of malignant tumors, and discusses, in a general way, the application of the fundamental principles on which such treatment is based. Some of the opinions quoted concerning the influence of hormones upon radio-sensitivity are obviously without much scientific foundation, and the writer is a little uncritical in certain fields. For example, it is now certain that preoperative radiation of carcinoma of the breast is of no value, and post-operative radiation of the ovaries is of little therapeutic importance in restraining the growth of a cancer of other organs.

In a short chapter on the effects of corpuscular radiation from radioactive substances the writer quotes the studies of Zadek to the effect that the substances which he injected intravenously in the treatment of leukemias were dangerous to life and not very

effective. Ellinger properly refuses to commit himself on the therapeutic value of short-lived synthetic radioactive substances, expressing the opinion that while they are of immense importance in experimental physiology as tracers of various elements in the course of metabolism, their therapeutic value is still unproved. He also holds a very conservative attitude toward the use of neutrons until further information is available.

The subject of the effect of light, especially ultraviolet, upon the general health and in the therapy of disease is very thoroughly presented with interesting observations on photopigmentation drawn from the author's own investigations which tend to show that the presence of pigment alone is not necessarily protective. Photodynamic sensitization is reviewed, and the author makes the interesting statement that in xeroderma pigmentosa, usually assumed to be a light-sensitivity disease, the victim does not always show high light sensitivity and that the actual cause of the disease is still unknown.

In the fifth section the writer again reviews in considerable detail the theoretical notions in regard to the action of radiation which have already been discussed in the opening chapters. The modern literature on the subject is pretty well summarized, but he gets into difficulties in trying to reconcile some of the older work by Glocker and others with that of more recent observers, and the chief value of the discussion lies in showing that to many of these matters we do not as yet know the answer. He then turns to a study of the time factor in radiation and again finds it difficult to reconcile contradictory statements.

The book closes with an admirable bibliography of 1,100 numbers. Most of the references are correct. Only a few typographical errors are noted. There are also excellent author and subject indices. The volume offers a useful survey of a subject about which it is impossible to be dogmatic because of the huge gaps in our knowledge, not only of the underlying biological phenomena, but of the most suitable practical technics. Complete reversal in methods of treatment has taken place since radium and x-ray began to be used widely in the therapy of various diseases, especially cancer, and further advances depend largely upon the slow method of statistical investigation of large numbers of treated patients. Animal experiments have been of value chiefly as showing many of the fundamental laws which govern the action of radiation, but have not been of much use in deciding a host of practical questions which arise daily in the treatment of human cancer. More and more it is becoming evident as experience accumulates that there is no universally applicable technic for the treatment of the large number of diseases in which short wavelength radiation has in some hands proved of great value. The problem is one of practical therapy, not of biological theories.

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MODERN ALGEBRA

A Survey of Modern Algebra. By GARRETT BIRKHOFF and SAUNDERS MAC LANE. 450 pp. New York: Macmillan. 1941. $3.75.

THE rejuvenation of algebra by the systematic use of the postulational method and the ideas and point of view of abstract group theory has been one of the crowning achievements of twentieth century mathematics. Although many of the basic results stem back to Kronecker, Dedekind and Steinitz, the present-day subject is largely the creation of the great woman mathematician, Emmy Noether. "Modern Algebra," by one of her pupils, B. L. van der Waerden, will always remain the classical account of the subject as she conceived it.

Although two or three books on the new algebra have already appeared in English, the present volume appears to the reviewer to be the best all-round introduction to the subject, unique in its clarity, balance, generality and inclusiveness. The size and plan of the book preclude a comprehensive treatment of any one topic; in compensation, the authors are able to say something about nearly every important topic, and they usually succeed in saying the really important things. In addition the book is enlivened by striking applications of modern algebra to other branches of science and made eminently teachable by the inclusion of numerous excellent problems and exercises.

The power of the postulational method is emphasized from the onset by developing the properties of the integers, rationals, real and complex numbers along with the elements of ring theory and field theory from well-chosen postulates. There follow chapters on elementary group theory, vector spaces, linear groups, ideal theory, algebraic numbers, Galois theory and other topics. The geometrical treatment of matrices as linear operators over a vector space is a judicious innovation. The authors even find space for the fundamental ideas of lattice theory, a vigorously growing branch of algebra particularly cultivated by American mathematicians.

In conclusion, the book is emphatically recommended either as a text, an introduction to the literature or a bird's-eye view of one of the great branches of modern mathematics.

MORGAN WARD

Structure of Algebras. By A. A. ALBERT. 210 pp. New York: Colloquium Publications of the American Mathematical Society. 1939.

THIS book, written primarily for specialists in al-