

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 techniques. 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 technique 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-

gebra by one of the leading American experts, gives an authoritative account of linear associative algebras which have been the center of interest in algebra for over sixty years. The book is the first in English to utilize fully the new methods introduced by Emmy Noether and her pupils to refine and extend the theory. The preliminary knowledge necessary for its understanding may be found in the Survey reviewed above, or in the author's own text, "Modern Higher Algebra."

The book begins by giving in less than fifty pages all the classical structure theorems. The remaining three quarters of the book are devoted to the numerous new results obtained in the last fifteen years due in the main to Emmy Noether, Richard Brauer, Hasse and Albert himself. Particularly noteworthy are the

chapters on the representation theory expounding the methods Albert developed in the theory of Riemann matrices and on the structure of rational division algebras where Albert has been able to avoid the complicated arithmetic of integral sets of an algebra. A final chapter, in which numerous unsolved problems are stated, and an excellent bibliography of the recent literature enhance the value of the book for the student.

The book is written with great clarity and precision and more than fulfils the author's stated purpose in the introduction: to provide "a text on the theory of linear associative algebras . . . (and) a source book for young algebraists." No mathematician at all interested in algebra can afford to miss it.

MORGAN WARD

SPECIAL ARTICLES

A NOTE ON THE HYGROSCOPIC PROPERTIES OF CLOTHING IN RELATION TO HUMAN HEAT LOSS

QUITE recently we have noted in studies of heat loss from clothed subjects that the thermal effect of moisture changes in clothing can be of large order in relation to human heat production. Such effects may produce confusing results in studies of heat loss under conditions of widely different relative humidity. In changing a clothed subject from a low to a high relative humidity at the same temperature, the effect appears as a plus error in the subject's heat balance. In short, the subject appears to produce more heat than can be accounted for by his metabolic rate. This process is the reverse of evaporation and is due to the absorption of moisture by the clothing with a resulting evolution of heat. In the reverse change, loss of moisture from clothing produces a greater cooling than can be accounted for by the temperature of the environment. Both efforts are transient, and disappear under conditions of equilibrium.

Loss or gain in textile weights due to hygroscopic properties has received extensive study from the standpoint of the industries concerned. The relative humidity of the ambient air has been considered as the critical factor involved and standard regain tables are available which give the weight of moisture picked up (or regained) by 100 parts of a given dry material at equilibrium in an atmosphere of a given relative humidity. These tables show that between 30° and 100° F. air temperature has a minor effect on the ultimate state of equilibrium. In industry attention is given to moisture regain because of its technical importance in spinning and its bearing on true weight of yarn sold or received.

This factor has importance at present because of

the interest of physiologists, biophysicists and engineers in developing highly efficient garments for human protection under extraordinary conditions of climatic exposure. In attempting to deal with this problem in our own laboratory we have found no satisfactory references reporting the time curves of these adjustments in textile moisture content. This is the important factor, since it is obvious that the evolution of 100 calories of heat in a garment over a period of 48 hours is of little practical consequence. On the other hand, if a considerable fraction of this heat is released, under certain conditions, over a period of one, two or three hours, the practical effect may be considerable.

For the benefit of others who are concerned with this field, we are reproducing data which will be of assistance in roughly estimating the order of this effect in time. The results apply to a man's woollen garment weighing 1.86 kilos when dry at 70° F.

A temperature and humidity controlled room was available for this study. A Sauter balance of 20 kilo capacity and sensitive to 50 milligrams was used. The garment was originally allowed to come to equilibrium at 70° F and 25 per cent. relative humidity. It was then weighed and packed in an air-tight metal container, while the temperature and relative humidity were being adjusted to a new level. The garment was then unpacked and hung on the balance. Weight gain or loss was recorded continuously at set intervals until full equilibrium was reached (Curve 1). This procedure was repeated, using a new temperature and relative humidity setting for the last half of the operation. The garment was tested over a temperature range from 45° to 90° F. At each temperature a high and low relative humidity was established (77 per cent. and 30 per cent. approximately). The re-