MAGNETISM

Modern Magnetism. By L. F. BATES. ix + 340 pp. Cambridge: at The University Press. New York: The Macmillan Company. 1939. $4.50.

IN many universities, the study of the magnetic properties of matter is not strongly emphasized, and the study of the experimental work in this field is almost totally neglected. This volume by Professor Bates, of the University College, Nottingham, is particularly welcome to both the student and the teacher for its presentation of much material which is unavailable except in the original publications. Although written primarily from the experimental point of view, the underlying theory is not neglected, and the work is by no means a mere compilation of observations. Proceeding from definitions of elementary quantities with no attempt to discuss the subtleties here involved, a rapid survey is made of atomic structure in terms of the vector model, and of the elementary theories of susceptibility. This is followed by descriptions of the methods of magnetic measurements and a review of the results of susceptibility measurements on isotropic and crystalline material. The measured susceptibilities are tabulated together with the electronic structures of the elements. It is unfortunate that references to the sources of the quoted values are not given. The chapters on atomic beams and nuclear spins and magnetic moments are interesting, particularly in view of the fundamental theoretical significance of the results. After a description of the several gyromagnetic effects, the volume closes with three chapters which summarize the experimental results involving the complicated phenomena of the behavior of the ferromagnetic domains, the energy changes and magnetostriction. In view of the enormous complexity and our lack of complete understanding of these phenomena, this portion of the volume is as well organized and digested as is possible without adding considerably to the length and detracting from the book's usefulness. The volume has both name and subject indices and a particularly complete table of contents, making it possible to locate any subject with ease.

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RADIOACTIVITY

A Manual of Radioactivity. By GEORGE HEVESY and F. A. PANETH. Second edition, xvi + 306 pp., translated by Robert W. Lawson. Oxford University Press. 1938. $5.50.

ALTHOUGH this is designated as the second edition, it is in reality the fourth, since extensive revision was done each time the volume was translated into English. The merit of this excellent text-book has been much enhanced by the inclusion of the recent rapid advances in the field, and a revision of the older material in conformance with modern concepts. Chapters have been much enlarged or new chapters added which deal with positrons and neutrons, artificial radioactivity, the transmutation of the elements, the use of radioactive materials as indicators and so forth; and an appendix describing the cyclotron has been added. The volume suffers, as did indeed the former editions, from attempting to cover so large an amount of material in a relatively short space. But this ambitious program is precisely what renders the work most useful. Besides the physical aspects of radioactivity, its relations to the fields of chemistry, geology and even biology are outlined, and these relationships form a structure which it is possible to embellish with all the details and elaborations which the lecturer cares to add. Sufficient references to other works and to original papers are provided. The work of the translator has been well done. As a whole, the volume is a worthwhile addition to any library.

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SPECIAL ARTICLES

THE PATHOGENIC ACTION OF PHYMATOTRICHUM OMNIVORUM

CYTOLOGICAL studies[1] of cotton roots attacked by *Phymatotrichum omnivorum* (Shear) Duggar have presented indirect evidence of the importance of chemical action in the process of parasitism by this fungus. The data from cytological preparations were not accompanied, however, by experimental evidence of the type so well known for various fungi that cause rotting of plant tissues.[2] Henderson[3] has described toxic action on cotton seedlings by thermostable substances in filtrates from cultures of the fungus on liquid media. She found that the decreased pathogenicity resulting from continued culture on artificial media tends to be regained after growth upon a suitable living host. In the present work pure cultures of the fungus have been maintained in successive

[1] G. M. Watkins, *Amer. Jour. Bot.*, 25: 118–124, 1938; *Phytopath.*, 28: 195–202, 1938.

[2] Summary by W. Brown, *Bot. Rev.*, 2: 236–281, 1936.

[3] L. Henderson, *Amer. Jour. Bot.*, 24: 547–552, 1937.

transfers on roots of living cotton seedlings. When a fragment of infected root was placed against the root of a healthy seedling, it usually caused within a few hours a shrinking and discoloring of adjacent host tissues. This was followed by the formation of an encircling and penetrating hyphal weft, which produced within two or three weeks a thoroughly soft decay of the cortex along the entire root system. The immediately destructive action observed in such cases, occurring before penetration had been accomplished, suggested that a transfer of tissue-destroying substances from rotted to healthy roots had taken place, and led the writers to test the action of hyphal exudates apart from the fungus. It was found that small pieces of decayed roots, when squeezed with forceps, generally yield one or two drops of clear, amber-colored liquid. In one series of tests this fluid was applied directly, in the form of drops, to the surfaces of normal cotton seedling roots; in a parallel series healthy roots were treated with drops of liquid expressed from decayed roots which had been subjected to the temperature of boiling water for one hour. Similar tests were made for the action of liquid pressed from germinating sclerotia which had been formed on nutrient agar without access to host tissue. Special care was taken to avoid mechanical injury to the healthy roots and to maintain aseptic conditions throughout all experiments.

Liquid from unheated, decayed roots was usually absorbed into healthy roots in 4 or 5 hours, and frequently imparted a moist, water-soaked appearance to the tissue at the points of application. After 24 hours the tissue thus affected had begun to shrink and turn yellow or light-brown, forming sunken necrotic areas which resembled the lesions caused by the fungus on roots of young cotton seedlings. In most cases the shrinkage progressed around the root and extended somewhat longitudinally until the root appeared to be girdled or ringed almost to the central cylinder. After three or more days a number of small lateral roots began to break through the necrotic cortex, which suggests that the tissue destruction did not extend beyond the endodermis. Stained sections of roots fixed in different stages of cortical necrosis show a gradual disorganization of protoplasts, followed by swelling and distortion of cell walls from the epidermis inward. Finally the epidermis and cortex collapse into a deeply staining, disorganized mass, which shrinks toward the endodermis. Simultaneously, abundant cell division in the pericycle initiates the formation of lateral roots.

Cotton roots treated with liquid expressed from heated decayed roots reacted in a different manner; the liquid was not absorbed as readily, and usually only a slightly discolored spot resulted. No considerable shrinkage or disruption of tissue continuity was observed, although sections of the treated roots show that toxic effects had been exerted on protoplasts near the places of application. The experiments with unheated and heated liquid from germinating sclerotia gave results closely parallel to those described above.

Attempts to recover the fungus by placing on nutrient agar various samples of roots to which unheated fluid had been applied failed, and sections of such roots show no mycelium. Both of these circumstances tend to indicate that viable hyphae are rarely, if ever, transferred with the expressed drops of liquid, and that the induced lesions resulted from the activity of fungous secretions. The consideration that the lesions might have been brought about by possible toxic products of the chemical breakdown of host tissues is minimized by the fact that similar lesions resulted from the application of unheated liquid from germinating sclerotia. The demonstration of chemical action as an important factor in the pathogenic mechanism of *P. omnivorum* is of interest in connection with biochemical studies of the basis of resistance in certain plants to the root rot caused by this fungus.[4,5]

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URINE CHLORIDE CONCENTRATION IN PATIENTS WITH CUSHING'S SYNDROME

McQUARRIE, JOHNSON and Ziegler[1] and Anderson, Haymaker and Joseph[2, 3] recently reported changes in the serum electrolyte pattern and urinary excretion of sodium and potassium in patients with Cushing's syndrome that were in most respects diametrically opposite to those in patients with Addison's disease. These findings, together with the observation[2] that extracts of the blood of such patients prolonged the lives of adrenalectomized rats, suggested that Cushing's syndrome may be dependent upon or associated with a state of hypercorticoadrenalism.[1, 2]

Cutler, Power and Wilder[4] have demonstrated that under standardized conditions of low sodium and chloride and high potassium intake the presence of supernormal concentrations of sodium or chloride in the urine is suggestive of a state of adrenal cortical insufficiency. Theoretically, the opposite condition should obtain in hypercorticoadrenal states under conditions of high sodium and chloride intake. The fol-

[4] G. A. Greathouse, *Phytopath.*, 28: 592–593, 1938; *Amer. Jour. Bot.*, 25: 743–748, 1938.

[5] The senior writer's share of this work was done during his tenure of a National Research Fellowship in Botany, 1938–39.

[1] I. McQuarrie, R. M. Johnson and M. R. Ziegler, *Endocrinol.*, 21: 762, 1937.

[2] E. Anderson, W. Haymaker and M. Joseph, *Endocrinol.*, 23: 398, 1938.

[3] E. Anderson and W. Haymaker, *Proc. Soc. Exper. Biol. and Med.*, 38: 610, 1938.