

"Hemichordata *must* be removed from Chordata and made an independent phylum of invertebrates"; "The concept Gephyrea *must* be obliterated from zoology"; "Ctenophora are a sharply delimited group with definite characteristics that entitle them to separate phyletic rank. It is even not at all settled that they have originated from Cnidaria"; "The Entoprocta are maintained as a phylum distinct from the Ectoprocta".

The volume reaches the high standard of all McGraw-Hill publications. Its cost in Britain is certainly very high, but its value as a compilation of up-to-date knowledge is undoubted. All zoologists will wish Dr. Hyman renewed health so that she may complete the great task she has set herself, and will look forward to the next volume, which is to deal with the Mollusca.

N. B. EALES

## MODERN THEORY OF THE INTEGRAL

An Introduction to the Theory of Integration

By Prof. Adriaan C. Zaanen. Pp. ix+254. (Amsterdam: North-Holland Publishing Company; New York: Interscience Publishers, Inc., 1958.) 50s.

PROF. ZAAZEN'S reason for adding to the considerable number of books surveying the field of modern integration, from the classical Lebesgue theory to the developments of Radon's extension of this theory to abstract spaces, is that such accounts generally rely either on the approach through measure theory or on the concept of the linear functional; he wishes the young analyst to be familiar with both procedures. Thus after a brief preliminary section on set theory, he defines measure over a semi-ring and builds up a more general measure by an extension procedure; then Stone's method of defining the Daniell integral as the extension of a linear functional over the class of step functions is seen to be practically a special case of the extension procedure for measure. The author gives plenty of illustrations, particularly helpful in showing how the older theory fits into the more modern, so that, for example, the extension procedure applied to the Riemann integral yields the Lebesgue integral. Fubini's theorem on the reduction of a multiple integral to repeated integrations is carefully studied, as is the tedious but important Radon-Nikodym theorem, which may be regarded as a very high-level version of the change of variable in an integral. Later chapters give some applications, such as unitary transformations in Hilbert space, and ergodic theory. Measure over a Boolean algebra is excluded, but Carathéodory's book is available; and integration over a locally compact space and the related Haar measure are omitted, since an account of the relevant topology would have substantially increased the size of the volume.

The exposition is clear and precise, provided the reader pays unremitting attention, and provided he does not neglect the exercises, an integral part of the text. "The student who omits them is like the man who, when attending an excellent dinner, wants to race through the main courses only, and (under the misapprehension that it is merely the nourishing value that counts) refuses to touch the wines and little delicacies which are offered him"; and the author is offering Montrachet, not Coca-Cola.

## INTERNATIONAL CYTOLOGY

International Review of Cytology, Vol. 7

Edited by Prof. G. H. Bourne and Prof. J. F. Danielli. Pp. x+684. (New York: Academic Press, Inc., 1958.) 16 dollars.

THIS volume, issued under the auspices of the International Society for Cell Biology, is probably the most valuable and interesting of the series, of which it is the seventh. Among the well-known contributors are Don W. Fawcett, Françoise Haguenu, Johannes Rhodin, F. G. Spear and Paul Weiss. The articles by Spear on the biological effects of radiation and by Ilse Lasnitzki on carcinogens, hormones and vitamins in organ cultures are topical in view of widespread interest on the effects of atomic tests, and of cigarette smoking. Spear gives a comprehensive historical review on radiation physics, the general response of living tissues to radiation and radiation chemistry, and has cleared the ground for a new approach to this field. He quotes J. A. V. Butler: "We are at the moment in the position of a man who tries to elucidate the mechanism of a telephone exchange by throwing bricks into it and observing some of the results". Naturally, Spear's section on the possibilities of chemical protection against radiation effects is of considerable interest. A number of chemical and physical agents are claimed to have such protective action in certain cases. He lists cysteine, glutathione, BAL, thiourea, glucose and ethanol. The intimate cytological results of radiation could not be examined more than cursorily by Spear. Many years ago M. J. D. White discovered as a by-product of his work on the effects of X-rays on the maturation phase of locusts that in many cases the single sperm 'middle-piece' became double, triple or even quadruple. Recent work at the Argonne National Laboratory, by Tahmision's group, working under the auspices of the U.S. Atomic Energy Commission, has shown that the insect 'middle-piece' arises from a number of separate bodies which normally fuse to form the 'neck body'; radiation prevents their fusion, but does not prevent their growth. Further work along these lines with electron microscopy should be fruitful.

Ilse Lasnitzki, using the watch-glass plasma-extract clot technique of Fell and Robison, has investigated the effect of carcinogenic hydrocarbons on human foetal lung, and mouse prostate, the influence of sex hormones on embryonic development of sex organs, and the changes produced by vitamin A. Lasnitzki provides some remarkable photomicrographs of the effects of 3,4-benzopyrene from cigarette smoke, on the bronchiolar epithelium. Carcinogenic hydrocarbons and sex hormones stimulate cell division in basal cells of skin and vagina, and thus induce abnormally high proliferation.

The section by Françoise Haguenu, a distinguished member of the French School of electron microscopy, goes into the question of ergastoplasm or endoplasmic reticulum. The name ergastoplasm was coined by Garnier (1897, 1899) for the *Nebenkerne* in gland cells. His work was amplified by other members of the Nancy School of Histology, such as Prenant and Bouin. Copies of their figures occur in many of the major works on histology. Happily, Haguenu also mentions the contributions of the Japanese cytologist Sakae Saguchi in this connexion. Electron microscopists entered the field, and by about 1947 really good electron micrographs