tom-level members of our own society and culture. . . . Yet each study appears to be the repetition of a principle akin to the one that when a bulldozer meets the soil that nature has been depositing for ages, the bulldozer always and promptly wins" ("What ethnography is," vol. 47, No. 2, University of California Publications in American Archaeology and Ethnology, University of California Press, Berkeley, 1957). Hughes illustrates the last 15 years of this bulldozing operation, and in his final chapter, "The broken tribe," offers a suitable obituary.

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La Culture des Tissus Végétaux. Techniques et réalisations. R. J. Gautheret. Masson, Paris, 1959. iv + 884 pp. Illus. F. 10,500.

For 30 years I have been a friend and a friendly rival of the author whose work is under consideration. Under these circumstances, a completely objective treatment of the work is scarcely possible, and it is with much hesitation that I have accepted the task assigned to me.

This book is not a handbook. It is an encyclopedia. In its six sections—"Techniques"; "Morphogenesis"; "Polarity and induction"; "Physiology"; "Cultivation of isolated cells"; and "Pathology"—Gautheret brings together in one volume much of the important work on the in vitro cultivation of plant tissues, up to 1958. These sections are all treated in detail, with a wealth of illustrations and specific citations. All represent fields in which the author or his students have made important contributions. With its bibliography of 986 titles, this will be an indispensable reference for all workers in the field for many years to come. It stands as a monument to Gautheret's leadership.

Perhaps the strongest parts of the book are the sections on morphogenesis and polarity, in which are found imaginative and exhaustive analyses of tissue relations, both in primary explants and in established strains; of the effects of the various growth substances; and of the differences between species, between types of organs serving as sources of explants, and between materials associated in different ways. This is the type of work in which the author is most at home, and it is excellent.

Yet, having given this praise, I must confess to an uneasy feeling that the treatment is so personal that the book lacks much of the objectivity one expects in a general treatise. True, the author warns us when he says, in his introduction to chapter 1: "We do not propose to describe all the techniques employed in the cultivation of plant tissues but to emphasize the procedures used in our own laboratory or developed by our pupils" (page 10). These limitations extend to much more than technique; they permeate the entire work.

Nowhere is there a clear definition of what is or is not to be considered a "plant tissue culture." There is no historical section which might serve to place this question in perspective. Nor does the treatment itself help. Cultures of roots, stem tips, embryos, pollen-mother-cells, and other organized materials are brought in only when they have served as sources of disorganized masses. This results in the omission of much that has contributed to the development of the field.

On the other hand, large parts of the sections on morphogenesis, polarity, physiology, and pathology deal with phenomena which can only be effectively studied in primary explants, masses which may or may not give rise to permanent cell cultures but which often produce roots and stem tips and are capable of serving as sources of complete plants—that is, as cuttings. Inclusion of such materials expands the term "tissue culture" far beyond that usually accepted. The feeling emerges that to Gautheret a "tissue culture" is anything studied in his laboratory, and that anything studied elsewhere is important only so far as it supplements his own work.

This chauvinism crops out repeatedly. Gautheret attributes the "establishment" of tissue culture to Alexis Carrel (page 733), an idea which would certainly be opposed by the proponents of Ross Harrison. He describes and illustrates (page 283, Fig. 143), as if it were an original discovery (1934), the disorganization of cultivated root tips as a result of injury, ignoring Chamber's earlier description (1925) and my discussion and illustration of the same phenomenon (1932), although he cites both of these papers elsewhere. He states that Heller's nutrient is "of almost universal use" (page 15); this may be true for France, but it is certainly not true for many laboratories in America, Asia, and Europe (elsewhere than in France). This is a French work, a Parisian one, but not a well balanced international one.

There are some curious statements. Gautheret says that dry sterilization of glassware should be avoided since it renders the surfaces alkaline (page 82); this is certainly untrue of clean Pyrex, which is used extensively elsewhere. He says, "Petri dishes must not be used for subcultures" (page 63), although such use is quite extensive. He says that aluminum foil should never be used for capping tubes (page 64); this method is widely approved. On the other hand, none of the watch-glass methods are described, nor is the method of cultivation in pharmaceutical bottles of various sorts, developed, especially in Riker's laboratory, because of its cheapness. The only shake-culture method described is the relatively complicated one introduced by Steward; the simpler ones of Riker and of Nickell are ignored.

In his introduction to the chapter on cultivation of single cells (page 722), Gautheret seems to have missed completely the real significance of Haberlant's reason for suggesting the cultivation of plant cells (1902). And because of the resulting limited concept of the objectives of single-cell cultures, he misunderstands (pages 727–28) the nature and significance of Steward and Schantz's observations on the organization from disaggregated cells, first of cell masses and then of roots and stems; these observations, by the way, were made many years before, though under less well controlled conditions, by both Nobécourt and Levine.

The proof reading is generally excellent, but there are several curious slips. On page 774, in discussing Braun's tobacco teratoma studies, the word *feuilles* is used twice where I am sure *tiges* is meant. On page 278 *Iris* should be *onion.* And on page 290 (the caption for Fig. 146, last line) *bas* should evidently be *haut.*

One of the sections which most raised my hackles was the discussion of growth regulators (page 653). Here the author says: "Since the first attempts of Robbins and of White with yeast extract, the study of the activity of natural products has made little progress. . . . Attempts to extract active components contained in such products have failed. . . . These investigations have led to a situation comparable to that of the

attempts to isolate the trephones for animal tissue cultures. Instead of leading to definite substances these studies have only established the fact that animal cells require many materials involving complex synergies. The future will tell if the same is true for plant cells." In my judgment this statement is untrue for either plant or animal cells. It seems to ignore all the work carried out between 1922 and 1940 by Robbins, Bonner, and White in which, beginning with yeast extract, there were established fully defined nutrients that are used today in dozens of laboratories for the cultivation of a very wide variety of plant tissues. And it ignores the parallel studies made between 1940 and 1958 by which Fischer, White, Morgan, and Parker; Earle and his colleagues; and Waymouth arrived at equally effective defined nutrients for animal cells. Carrel's "trephones" have been relegated to the limbo of "phlogiston," but Gautheret seems to be unaware of that fact.

The bibliography, in spite of its length, is also incomplete.

All of these biases makes one wonder a bit about the depth of the work. Massive it is. It will be very useful. But it is a highly personal work, and the reader should be warned that he will not always find therein completeness or objectivity.

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Advances in Organic Chemistry. Methods and results. vol. 2. Ralph A. Raphael, Edward C. Taylor, Hans Wynberg, Eds. Interscience, New York, 1960. vii + 503 pp. Illus. $15.

This is the second volume in a series aimed at giving organic chemists critical evaluations of the newest methods and ideas in organic chemistry; it so admirably fulfills this purpose that, in most cases, the experimenter can go directly from the book to the laboratory when application of one of the new techniques fits his problem. Internationally known chemists discuss and evaluate the following topics: the uses in synthesis of alkenylmagnesium halides (H. Normant); dialkoxy dihydrofurans and diacyloxy dihydrofurans (N. Elming); ethynyl- and thioethers (J. F. Arens); ketene (R. W. Lacey); nuclear magnetic resonance in structure determination (H. Conroy); hydrogenation-dehydrogenation reactions, including enzyme systems (L. M. Jackman); ultraviolet photochemistry (P. de Mayo); and the chemistry of muscarine (C. H. Engster).

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Middle American Anthropology. vols. 1 and 2. Special symposium of the American Anthropological Association. Social Science Monographs 5 and 10. Assembled by Gordon Willey, Evon Z. Vogt, and Angel Palerm. Social Science Section, Pan American Union, Washington, D.C., vol. 1, 1958; vol. 2, 1960. 60 pp. and 73 pp.

These monographs offer a collection of papers and comments concerning an appraisal of anthropological research that has been carried on in Middle America for the past 50 years. The topics were selected by Willey and Vogt, and in the introduction they say that "the authors of the principal essays were asked to make a survey of the past, an evaluation of the present, and speculation for the future."

Contents of volume 1 are "Middle American archaeology since 1906" by A. V. Kidder, with discussions by Robert Wauchope and George W. Brainerd; "Regional sequences in Mesoamerica and their relationships" by Gordon F. Ekholm, with discussions by Edwin M. Shook and R. S. MacNeish; "Studies on Middle American art" by Tatiana Proskouriakoff, with discussions by Robert L. Rands, George Kubler, and Herbert J. Spinden; and "Research in Maya hieroglyphic writing" by J. E. S. Thompson, with discussions by Linton Satterthwaits, Jr., and E. Wyllys Andrews, IV.

Volume 2 contains the following papers: "The subsistence problem in Mesoamerican history" by Homer Aschmann, with discussion by Evon Z. Vogt; "Middle American linguistics: 1955" by Norman A. McQuown, with discussions by Morris Swadesh and J. Alden Mason; "Middle American ethnography" by Pedro Carrasco, with discussions by Arden R. King and O. G. Simmons; "Applied anthropology in Mexico" by Alfonso Caso and Gonzalo Aguirre Beltran, with discussions by Benjamin D. Paul and Allan R. Holmberg; and "Theory in Middle American ethnology" by John Gillin, with discussion by O. G. Simmons.

New Books

Mathematics, Physical Sciences, and Engineering

The Arithmetic of Computers. An introduction to binary and octal mathematics. Norman A. Crowder. Doubleday, Garden City, N.Y., 1960. 480 pp. $3.95.

Annual Reports on the Progress of Chemistry, 1959. vol. 66. Chemical Society, London, 1960. 482 pp. £2.

Boundary Layer Theory. Hermann Schlichting. Translated by J. Kestin. McGraw-Hill, New York, ed. 4, 1960. 667 pp. Illus. $16.50.

The Chemistry of Yttrium and Scandium. R. C. Vickery. Pergamon, New York, 1960. 130 pp. Illus. $6.50.

Digital Applications of Magnetic Devices. Albert J. Meyerhoff, Ed. Wiley, New York, 1960. 623 pp. Illus. $14.

Foundations of Electrodynamics. Parry Moon and Domina Eberle Spencer. Van Nostrand, Princeton, N.J., 1960. 321 pp. Illus. $9.75.

From Dualism to Unity in Quantum Physics. Alfred Lande. Cambridge Univ. Press, New York, 1960. 130 pp. Illus. $3.75.

Frequency Power Formulas. Paul Penfield, Jr. Technology Press and Wiley, New York, 1960. 176 pp. $4.

Geology of India and Burma. M. S. Krishnan. Higginbothams, Madras 2, India, 1960. 618 pp. Illus. Rs. 22.50.

Initiation à la mecanique quantique. Librairie Hachette, Paris, 1960. 336 pp. Illus.

Kernenergie—Technik. Einfuhrung in die Physik und Technik der Kernenergie—Erzeugung. Verlag Moderne Industrie, Munchen 23, Germany, 1960. 300 pp. DM. 36.

Lectures on Fluid Mechanics. Sidney Goldstein. Interscience, New York, 1960. 325 pp. Illus. $6.60.

Linear Circuits. pt. 1, *Time-Domain Analysis*; pt. 2, *Frequency-Domain Analysis*. Ronald E. Scott. Addison-Wesley, Reading, Mass., 1960. 928 pp. Illus. $6.75 each.

Markov Learning Models for Multiperson Interactions. Patrick Suppes and Richard C. Atkinson. Stanford Univ. Press, Stanford, Calif., 1960. 308 pp. Illus. $8.25.

The Mathematics of Radiative Transfer. I. W. Busbridge. Cambridge Univ. Press, New York, 1960. 155 pp. $5.

Physics of Precipitation. Proceedings of the Cloud Physics Conference, Woods Hole, Mass., 3–5 June 1959. Geophysical Monograph No. 5. Helmut Weickmann, Ed. American Geophysical Union, Washington, D.C., 1960. 447 pp. Illus. $12.50.

Precis de physique theorique moderne. Physique classique et relativiste et theorie classique des champs. vols. 1 and 2. Theo Kahan. Presses Universitaires de France, Paris, 1960. 687 pp. Illus.

Progress in Inorganic Chemistry. vol. 2. F. Albert Cotton, Ed. Interscience, New York, 1960. 409 pp. Illus. $10.50.

Tables for Petroleum Gas/Oxygen Flames. Combustion products and thermodynamic properties. I. I. Berenblut and Anne B. Downes. Oxford Univ. Press, New York, 1960. 111 pp. $4.80.