proved, because what we have in this work is a series of verbal descriptions of placement on several variables, not precise measurement. But these are tasks that are made more apparent and can more readily be begun because of this thoughtful study.

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Personality and Sensory Intake

Individuality in Pain and Suffering. ASENATH PETRIE. University of Chicago Press, Chicago, Ill., 1967. 171 pp., illus. $5.

This book fails to redeem its promise. The author, a British psychologist who has worked in both London and Boston, has studied individual differences in response to pain. In this book she reports that tolerance of pain can be predicted from performance in non-pain-producing situations. She postulates a central regulation of perceptual experience, including pain, that operates by augmenting or reducing sensory intake. The predictor task involves kinesthetic aftereffects: if one rubs one's fingers along the edges of a 2½-inch block for about 60 seconds and then is asked to judge the width of a 1½-inch block, judgments will differ from those in which there was no prior finger stimulation. The author reports that some subjects respond to the stimulation by increasing their judgments over the base line (no stimulation) and others by diminishing their judgments. The former subjects she calls "augmenters," the latter "reducers." There are, of course, "moderates" who show no consistent over- or underestimation with respect to their own baselines.

Using performance on this kinesthetic aftereffect task as the criterion, Petrie discovered that augmenters had a lower tolerance for pain than did reducers, when pain tolerance is measured by the Hardy-Wolff-Goodell dolorimeter. Provoked by this finding are several fascinating hunches and leads for further research. For example, the author reports that a case of painless peptic ulcer was a reducer; that augmenters tend to have high scores on the hypochondriasis scale of the Minnesota Multiphasic Personality Inventory, an indication that they are hyperaware of their bodies; that reducers tolerate sensory-isolation experiences poorly and seem to prefer pain experiences to being alone. Thus certain personality characteristics which control the intake and processing of perceptual data affect a host of sensory experiences.

So far the promise, for most of this experimental work was reported at various times in the past, beginning in 1958. In these early reports, the data were considered as preliminary results, and one could therefore overlook the fact that the principal experiment linking perceptual style and pain included only seven augmenters and six reducers; that the sensory-isolation experiment included only nine subjects, with four least tolerant and five most tolerant of the isolation; and that the extensions to other perceptual experiences were anecdotal.

In this book the author mentions no replications of those experiments. Such replication would be crucial for bolstering the certitude with which one can regard these results, for the early experimental work is marred by a number of serious methodological faults which can be minimized in a first exploratory effort, but not in a definitive survey of the work after so many years. For example, there is some evidence that men and women respond to the kinesthetic-aftereffects task differently; yet the experimental groups include disparate numbers of men and women, so that in the results the possible contribution of sex to the variance is confounded with the central regulatory function being studied. Another serious fault concerns the criterion score, which is a computed difference between a base-line score and a post-stimulation score; there is evidence that a relationship exists between these two scores, yet no effort is made either to control for base-line levels by covariance or regression techniques or to measure the exact contribution to the criterion score of the base-line measurement. There are, furthermore, no studies reporting the consistency over time of a person's position as an augmenter or a reducer. One also searches in vain for a discussion of how the author understands the kinesthetic aftereffect or of how she reconciles her view of this phenomenon with those of others who, like Koehler and Wallach and Klein and Krech, also used this task and speculated about it.

There is a potentially exciting finding with reference to schizophrenia, in which most schizophrenic subjects are classified as reducers. But we discover that the testing techniques used with the schizophrenic subjects are different from the standard techniques used with the matched control group. And there are no data on whether the schizophrenic patients were on drugs. Here again, the experiment was performed on a small number of patients (17) and no replication with refined techniques is reported. Inasmuch as only a small section of the book concerns pain, the title misleads those who would look to it for a systematic investigation of individual responses to pain.

Even with these exasperating faults, this book cannot simply be dismissed. The clinical insights are intriguing, sometimes even brilliant; they generally make good sense. The promise of those insights obliges the author to have refined her techniques, replicated her results, expanded her sample groups, and pinned down the generality of the kinesthetic aftereffect. She has not met those obligations. The appearance of the book may stimulate others to perform with the required rigor the definitive search for individuality in the regulation of sensory input.

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Phytochemistry

Terpenoids in Plants. Proceedings of a Phytochemical Group symposium, Aberystwyth, Wales, April 1966. J. B. PRIDHAM, Ed. Academic Press, New York, 1967. 269 pp., illus. $12.50.

For countless centuries the terpenoids have provided man with some of the most pleasing and satisfying scents and tastes encountered in this world. Yet despite their ubiquity and general usefulness, little investigation of these materials was made until Otto Wallach entered the field in 1879. Until Wallach's death terpenoid chemistry seemed to flourish, but then a period of relative inactivity set in. Investigations of terpenoids became so limited that such barren suggestions as that terpenes were "waste products of plant metabolism" were advanced. It seems strange that there was such a lag in the investigation of these compounds, for in what other field of chemistry can one encounter dozens of structural isomers of a single, simple empirical formula, a prodigious facility to undergo cyclization and novel rearrangements, and even a bright blue hydrocarbon?

In the past decade improved analyti-

cal and preparative techniques have brought about a considerable revival of terpenoid research. This book documents much of this progress. It presents the views of 12 investigators who have a broad and varied interest in the field. A chapter of particular interest to me was one that dealt with the biological significance of terpenes in plants. Although no biochemical function of monoterpenes in plants is yet known, much is known about the functions of the higher terpenoids. Here the author was able to bring to the reader the manifold fashions in which terpenes interact with their biochemical environment. From gibberellins to sterols to carotenoids, the author traces their function and form.

Considerable emphasis is placed on terpenoid biosynthesis. Material is presented on specifically labeled substrates, biosynthesis of monoterpenes, terpenoid quinones, and prenols (polyisoprenoid alcohols). A chapter on structural determinations of carotenoids points up the role of modern analytical instruments in this complex field and reveals the great progress made since the introduction of such techniques as nuclear-magnetic-resonance spectroscopy. J. S. E. Holker's chapter on conformational analysis presents one of the clearest expositions of this subject that I have encountered.

Most certainly any volume with 12 authors has inherent disadvantages, from discontinuities in style to presentation of too specialized a view of a particular area of study. *Terpenoids in Plants* suffers from these to some extent, but offers in compensation an excellent overall review of the many facets of a complex and fascinating subject.

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Petrography

Electron Micrographs of Limestones and Their Nannofossils. ALFRED G. FISCHER, SUSUMU HONJO, and ROBERT E. GARRISON. Princeton University Press, Princeton, N.J., 1967. 157 pp., illus. Cloth, $6.75; paper, $3.25. Monographs in Geology and Paleontology, No. 1.

As its name implies, this first volume of the new series Monographs in Geology and Paleontology is an annotated collection of electron photomicrographs of representative limestones and their included minerals and microfossils. Fischer, Honjo, and Garrison present a survey of the microstructure of fine-grained limestones from many geologic environments ranging in age from Cambrian to Recent. These authors are well known for their work in this relatively new area of geologic research, and this book is a careful selection of some of their best published and unpublished photographs.

In addition to a discussion of the mineral grains, the overall limestone fabrics encountered, and the fossils in phyletic order, a thorough and clear treatment of the techniques of the replica method that are necessary for the proper interpretation of the resulting electron micrographs is given. The chief value of this book will be its usefulness to the carbonate petrographer faced with the task of unraveling the history of fine-grained limestones. Here is a reference book of electron micrographs valuable for comparative purposes. The value could have been substantially increased, however, by the use of more than one replica technique on several of the samples and by inclusion of some of the photomicrographs from other workers in the field.

Apart from some text references which were omitted from the remarkably up-to-date bibliography and a misplaced figure legend, the text is quite free of errors of production. Although many readers may take exception to some of the interpretations of the more than 80 beautifully reproduced plates, few can quarrel with the reasonable price of this book, which will undoubtedly find its way to the reference shelves of all serious students of fine-grained carbonate rocks.

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Semiconductors: Lines of Inquiry

The Physics of Semiconductors. Proceedings of an international conference, Kyoto, Japan, Sept. 1966, sponsored by the International Union of Pure and Applied Physics. TOSHINOSUKE MUTO, Ed. Physical Society of Japan, Tokyo, 1967. 794 pp., illus. $32.

The conference of which this volume forms the report was the eighth in an international series dating back to 1952. The proceedings were issued, readably and cleanly presented, clearly printed on good paper and well bound, a short three months after the conference was held. This efficiency and good judgment were typical of the conference, which in setting, organization, and presentation has had no superior among its predecessors and which will set a very difficult aiming mark for its successors.

The organizing committee made a severe choice from the submitted material, confining their selection to topics they considered suitable for 1966. To my mind they showed good taste—the older lines of research were solidly represented, while newer investigations which may be expected to be productive in the future, but which marked something of a departure from tradition, were introduced on the international scene. Thus in the former category we find reports of competing methods of calculating theoretically the band structure of diamond-family semiconductors, considered alongside optical measurements which in principle determine the structure above the lowest band edges but which in practice seem to be full of problems of interpretation; we find ever more complex experiments and detailed interpretation of optical experiments at intense magnetic fields; we find a session on the fundamental mechanisms of radiative recombination with or without the interaction of complex defects, very little on laser action (but apparently a deliberate omission of extensive reporting on semiconductor lasers); we find that the hydrogenic impurities still provide experiments and theoretical problems, but that the deeper impurity states have usually not found better than the most phenomenological cataloguing of their energies; we find that transport effects, and especially the oscillatory low-temperature effects, are providing basic data on the less well-understood materials; and we find a great interest in hot electrons and current instabilities such as the Gunn effect.

In the second category I found impressive the very interesting papers on electron-phonon interaction, especially those on interactions leading to sound amplification. A long session was devoted to magnetoplasma and magnetoacoustic phenomena, and it seems certain there will be more to come. There