since a theory may be built into the concepts we use in the description (in fact, in the very observation) of phenomena, to give up an important scientific law would be to do more than to give up some predictions we had become fond of making; it would be to "let our concepts crumble." Thus it can be that the abandonment of a scientific law may be a *conceptual* impossibility notwithstanding the fact that the law is empirical in the sense of aiding in the derivation of testable predictions. To put it differently, certain scientific laws (for details, see Hanson's chapter on classical particle mechanics) are *not* "empirical" in the sense that no experiment now conceivable (and this is not a "psychological" use of *conceivable*!) could overthrow them, although they are not "definitions," and they are not "a priori" either (since their abandonment *would* be conceivable if an Einstein or a Newton were suddenly to provide us with a whole new way of conceptualizing the phenomena in question). Since I feel strongly that overworking of the "empirical statement-or-else-a-definition" dichotomy is one of the worst faults of conventional philosophy of science, I was extremely happy to see Hanson take this up so thoroughly and so convincingly. Indeed, Hanson shows in detail how the same law may function in one context as a testable generalization, in another as a definition, in another as a conceptually a priori statement, and in yet another as a computing device. (I would only add: one should stress the point that the law does not have different *meanings* because it is employed in so many ways; sentences in a natural language—and not just laws—can quite frequently be used in so many different ways *because* they have a single meaning.)

Among other problems touched on in these chapters are the familiar worries about the "reality of theoretical entities" (what better reason could there be for accepting a system of concepts than that it makes the world intelligible?) and the difficulties that some have felt about the use of exact numbers in theoretical science. The book culminates in a chapter on elementary particle mechanics which shows the power and fertility of Hanson's ideas through their ability to render some of the dark mysteries of quantum mechanics understandable, not in the sense of providing final clarification (that is the goal of the physicist rather than of the philosopher of science) but understandable in the context of the past history of scientific theory-construction, and in the context of a growing research science.

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Plain Talk from a Campus. John A. Perkins. University of Delaware Press, Newark, 1959 (order from University Publishers, New York). x + 195 pp. $4.

Since their average tenure is less than 5 years, many state university presidents are not in office long enough to reflect very much upon their experiences, much less reduce them to book form. John A. Perkins, president of the University of Delaware since 1950, is one of the exceptions. He speaks not only as an experienced educational administrator but also as one who has achieved recognition in the field of public administration. His *Plain Talk from a Campus* is a sharp analysis and a searching commentary on some of the critical problems in contemporary American education.

Part 1 deals with the purposes of education, both higher and secondary. According to the author, colleges and universities confront four main sources of problems: overwhelming increases in enrollment; the extremely divergent preparation of high-school graduates; the tendency of most institutions to "emphasize tradition far more than change"; and the peripheral functions which barnacle the pilings of American education. In view of the fact that higher education enrollments quintupled during the first quarter of the present century and doubled in each subsequent 15-year period, one may wonder how "overwhelming" our problem of sheer numbers is, but there can be no question about the fact that Perkins has come to grips with some of the major educational issues of our time.

In Part 2, his analysis of the problems of financing higher education, particularly on the state level, is very incisive. What he has to say about the shortcomings found almost everywhere in the patterns of state expenditure and taxation makes very understandable the fiscal fumblings of many state legislatures, and one must agree with him that more federal support is inevitable if these mounting difficulties are not overcome. In his opinion, moreover, bringing the Federal Government more largely into the picture implies no new peril.

Perkins' special interest in public administrations is reflected in the third part of the volume. He stresses the role that the colleges and universities ought to play in training students for public service careers, and he urges a wider realization of what Walter Lippmann has called "the public philosophy." A telling contrast of a wryly amusing sort is drawn between American political leadership of the past and present, in a chapter on "Benjamin Franklin and the organization man."

The final section of *Plain Talk from a Campus* is a potpourri, having to do with such miscellaneous topics as the ingredients of effective university administration, research and publishing, the neglected importance of books as media for learning, what a president does and does not include in his annual report, and the need among students for more self-discipline.

All in all, John A. Perkins has given us some plain talk which needs to be heard and heeded within and around all of our campuses.

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Trend and Tradition in the Prehistory of the Eastern United States. Illinois State Museum Scientific Papers, vol. 10. American Anthropological Association Memoir No. 88. Joseph R. Caldwell. Illinois State Museum, Springfield, 1958. xiv + 88 pp. Illus.

This synthesis of the archeology of the eastern United States, originally written as a doctoral dissertation at the University of Chicago, should prove most valuable as a general introduction to the subject. It has the advantage over previous syntheses, such as *Archeology of Eastern United States,* edited by James B. Griffin (University of Chicago Press, 1952), of being a true synthesis and not just a compendium of local sequences. On the other hand, it avoids the disadvantage of *Method and Theory in American Archaeology,* by Gordon R. Willey and Philip Phillips (University of Chicago Press, 1958), in that the synthesis is expressed in narrative fashion and is not compressed into a rigid scheme of developmental stages based primarily upon what happened in nuclear America. The present volume is truer to events in the eastern United States.

The acknowledged weakness of this synthesis is that, for lack of time to cover the literature thoroughly, the author concentrated on the southeastern United States, where he has done most of his own research. On the other hand, the volume does present fresh material on Southeastern archeology, and, if any area is to be emphasized, this is the best, since the most important developments took place here, at least during the later periods. The volume also suffers from a certain vagueness of conceptualization—for example, *trend* and *tradition* are not precisely defined, and neither are most of the actual trends and traditions covered in the monograph.

The author sees three major trends in the prehistory of the eastern United

States. The first, culminating in late Archaic time at the beginning of the first millenium B.C., was marked by increasingly efficient adaptation to the forest conditions peculiar to the area. In the second, spanning the period from 1000 B.C. almost to A.D. 1000, "we find reared upon this economic foundation an era of regional differentiation and stylistic change." The third trend was towards closer relationships with Mesoamerica—"progressive drawing together with the Nuclear American civilization" (pages vii–viii). This seems a reasonable way to characterize what happened in the area.

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Elementary Practical Organic Chemistry. Part 1, *Small Scale Preparations*; part 2, *Qualitative Organic Analysis*; part 3, *Quantitative Organic Analysis*. Arthur I. Vogel. Longmans, Green, New York, 1958. xxviii + 890 pp. Illus. $9.75.

This new edition of *Vogel* differs from the 1948 edition chiefly in three respects: (i) the material dealing with the reactions and characterization of organic compounds and the tables of physical constants of the various classes of compounds and of their derivatives have been removed from the portion of the text dealing with preparative methods and added to the section on qualitative organic analysis, which now occupies 296 pages; (ii) an entirely new section (196 pages) has been added, on the quantitative estimation of nitrogen, halogen, and sulfur, of the common functional groups, and of a few specific compounds; (iii) there is a marked decrease in the number of compounds for which preparative procedures are given.

In Part 1, "Small Scale Preparations," the number of preparations given (approximately 150) is about 35 percent of the number in the 1948 edition. This reduction results not only from the addition of the new section on quantitative analysis but also from the fact that there are now fewer pages in part 1 and that the page-size has been reduced, the amount of text being about 75 percent of that in the 1948 edition. However, 150 is still a much larger number of preparations than one finds in most texts published in the United States. Moreover, there is a broader coverage of the theory of physical methods and experimental techniques.

Numerous changes have been made in the procedures given for preparing certain compounds, and new types of reactions, such as reductions with lithium aluminum hydride and sodium borohydride, have been added. On the other hand, the elimination of such a large number of preparations has necessarily meant a loss of useful types, and not everyone will be satisfied with the choice of those retained.

The author emphasizes the change to smaller-sized runs; the amounts used appear to be from one-fourth to one-tenth of those used in procedures given in the 1948 edition. However, the quantities of starting materials, which vary from a few grams to 25 grams and usually amount to around 15 grams, are comparable to the quantities usually used in laboratory courses in the United States. More sizes and types of glassware are used in the procedures given than are usually supplied for average-sized classes in the United States.

The organization of part 2, on qualitative analysis, is not the best possible. The familiar system developed at the University of Illinois is used, but the two chapters titled "Reactions of organic compounds" and "Class reactions" cover much the same material. Similar or identical procedures may be found in the two chapters, some tests are given in one chapter and some in the other, and directions for preparing derivatives are found in both, along with qualitative tests for functional groups. The inclusion of separate discussions for aliphatic functional groups and aromatic functional groups leads to much duplication and to many unnecessary cross references.

Part 3 describes, for the most part, standard procedures for the determination of functional groups. In fact, all three parts (which, incidentally, may be purchased separately) are very similar to texts published in the United States that cover the same areas.

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Dangerous Marine Animals. Bruce W. Halstead. Cornell Maritime Press, Cambridge, Md., 1959. vi + 146 pp. Illus. $4.

Although this volume contains a remarkable amount of information about the kinds of marine animals that are dangerous to man (dangerous when touched or eaten or when overtly aggressive), we are assured that this book is the nonspecialist's version of a more exhaustive book still in preparation.

With the growing use of diving equipment, doctors especially will find this a valuable reference book, for the author (a physician) has taken pains to discuss the medical aspects of all sorts of marine accidents, ranging from jellyfish stings and poisoning from shellfish to sea-snake bites. An amazing variety of animals are in some way dangerous to man, but so little is known of many of them, or even of the nature of the injuries they cause, that many of the recommended treatments are empirical guesses. If one is bitten by a sea snake, it is essential that the snake be brought along to the hospital to make sure it is harmless. Much evidently remains to be learned, especially about the nature of fishes that are poisonous to eat, before the resources of the "silent world" can fulfill the expectations of some hopeful people. In the meantime, a book such as this is an essential beginning.

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The Perpetual Forest. W. B. Collins. Lippincott, Philadelphia, 1959. $4.50.

W. B. Collins, who is deputy chief conservator of forests in Ghana, has managed to capture on paper much of the drama of life, death, and renewal in the African tropical forest. Any naturalist who has spent years of his life in the equatorial forest has felt the silent force, the rich complexity and ecological integration, of this most interesting of our terrestrial communities. Without saying so, Collins conveys by an array of facts the impression that the forest itself is a living, pulsating organism.

The author describes the conditions for the existence of a rain forest; he starts with the organisms in the soil, then discusses the succession from the relatively simple pioneer stage of the mangrove swamp to the complex, varied, climax forest. Today this self-sufficient world is being assaulted by man, and the destruction of the closed forest may be accomplished within the century. Collins describes the step-by-step process by which this occurs—the destruction of the forest cover and, finally, of the land, much as it occurred in North America. But water and wind act with cataclysmic force in the tropics.

The original shifting cultivation of the native garden was not destructive because these cultivated areas, abandoned after two years, were regenerated in another ten. But, as population increases, the rest periods become too short and new forest openings are burned out constantly. Once cleared of forest, the ground, laid bare to the searing sun, ceases to function as it did before it was denuded. First, the breakdown of humus is accelerated, then soil organisms are killed. Wind erosion follows. Rains may come, but there is no organic material