ciencies, especially for lack of iron or phosphate. The book gives a careful review of self-regulating dietary functions as studied in laboratory animals and young children.

The current study deals with 784 children in the Baltimore area, of whom 172, or 22 percent, had a record of pica. The incidence of pica was 27 percent in Negro children and about 17 percent in white children. This was correlated with the incidence of nutritional problems and the percentage of illness and physical defect.

The hypothesis that poor nutrition may be the underlying factor in pica is well documented historically, especially in connection with the Negro slaves in the South, and by experimental and clinical studies. The volume is well arranged, and there is a good index.

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## History and Philosophy of Science

**Edward Palmer, Plant Explorer of the American West.** Rogers McVaugh. University of Oklahoma Press, Norman, 1956. 430 pp. Illus. + plates. $6.

Edward Palmer was one of the great pioneer collectors of a century ago, principally in the Southwest and in Mexico. As an outstanding collector, he was proficient in many fields, "gathering for the museums of the world more than 100,000 specimens of plants and uncounted thousands of archaeological, ethnological, and zoological specimens," corals, amphibians, marine animals, birds, insects, land shells, reptiles, sponges, mammals. A self-trained man, he was given to writing vivid field notes but leaving to his scientifically trained colleagues the responsibility of seeing that the notes got incorporated with the specimens. Human nature being what it is, this seldom happened, and the museums and herbaria of the world contain tens of thousands of Palmer specimens accompanied by only the most fragmentary information.

Nearly 20 years ago, Rogers McVaugh stumbled on an almost complete set of Palmer's field notes, together with many other manuscripts related to his life and travels. The present volume is the result of a devoted winnowing of these materials and of many others, painstakingly assembled from various institutions and individuals. It is essentially a gazetteer of Palmer's travels and collections, written very largely with the needs of present-day taxonomists in mind. Some 229 pages are devoted to a meticulous account, in alphabetical order, of all the localities in which Palmer is known, or supposed, to have done his collecting. As one turns the pages and reads an item here and there, one does not know whether to be more astounded at Palmer's persistence in getting around the world on slender means, at a time when traveling conditions were very primitive, or at McVaugh's persistence in running down and assembling exact information —from ancient and modern maps, from letters, from his own travels, from records in the government files, and from specimens in the herbaria of the world. Take this entry, for instance (and remember there are more than 200 pages of such concentrated, codified, corrected information about the doings of 50 to 100 years ago):

"*Otinapa, Durango,* 24°11′N, 105°W. *1906. July 25–August 5.* on August 7 Palmer wrote from the city of Durango: 'I have today returned to this city from the Hascienda [*sic*] of Otonapa 35 miles n.w. of Durango City . . . at which place spent 12 days.' Nos. 332–465, 546–55, 559, and 560 were collected. The distance from Durango is not far from 35 km. (not 35 miles as stated by Palmer, nor 65 miles as given in the set of the field notes at the Gray Herbarium). The Hacienda of Otinapa is now (1951) nearly abandoned, but it is accessible by a poor road from Otinapa station on the railroad. The site of the old hacienda, about 20 km. north of the railroad, is in a broad cultivated stream bottom, with grasslands and pine forests on the hills above it and some rough broken land in the canyons along the creek."

Preceding this section there is a chronological account of Palmer's life, with particular reference to what he collected, where he collected it, and under what conditions. Following it are five appendixes: a chronology of his plant collections and locations of known sets of field notes; a list of herbaria known to have significant numbers of his plant specimens; his botanical field notes from the Colorado trip of 1861 and the Indian Territory collecting of 1868; and his last will and testament. There is a meticulous list of original source materials and a short and very incomplete index.

But for two things it would be all this and nothing more—a useful technical compendium of the goings and comings of Edward Palmer and the herbarium specimens which resulted therefrom. The first of these things is McVaugh's skill, not only as a finicky and indefatigable cataloger, but as a writer of good, plain, easy-to-read English prose. The other is the man Palmer, himself. The fullness of his own record, now that McVaugh has pointed the way to it, makes it a gold mine of social history. And, in this book, we see the character of the man—able, so taciturn about many things that we have only a sketchy notion of his life in spite of his voluminous record, cross-grained in some relationships yet singularly sweet at times (so that an old Mormon lady now sits down and writes a charmingly detailed account of how he set all the pioneer children in one home to collecting insects).

Of all plant labels, Palmer's are certainly the ones most worth saving. He may not have known how to spell or to punctuate, but he had a remarkable eye for essentials and a gift for pithy phrases. They are more than just scientifically accurate; they are the raw material of poetry. Here are some examples, with the original spelling and punctuation:

"309 edges of woods and parias yellow as soon as the sun is hot the petals curl under June 26 boiling spring Chickasaw nation."

"198 Pigg weed old road sides old fields and wood openings all over the country May 28."

"430 white mottled purple sage cented a decotion is made of this plant and used in feavers it is also used to wash the skin to cool it June 26 moist spots in wood and by raveins boiling spring to Rileys Mill."

"477. fox grape on gravelly wooded hills and raveins often but very short wood pendant to ground and unsupported by trees of a very agreeable foxy taste pulp thick rather tough makes fine preserves . . ."

Palmer's personality obviously fascinated McVaugh, who goes out of his way to describe Palmer's unsuccessful attempts to bottle *pulque* and *aguamiel* commercially, and to comment grimly on his calmly collecting ethnological material in an Apache village immediately after it had been wiped out in a punitive expedition. He was, says McVaugh, "a man who could neither express himself clearly nor spell his words consistently, but who corresponded regularly on an equal basis with the leading scientists of his day. He performed prodigious feats in accumulating, packing, and safeguarding collections of all kinds of fragile materials and he prepared copious data sheets to accompany the specimens, yet he rarely succeeded in keeping his records free from errors and hardly ever managed to distribute his specimens with the data he provided. He was small and frail and passed hardly a year without some incapacitating accident or illness, but when he was seventy-five years old he was still able to take in stride a week's trip on horse back in the rough mountains of western Durango. . . . The impulse that took him back to the field again and again must have been not a liking for collecting itself but little more than a liking for travel and for strange places, a feeling that by his work he was contributing to science, and a willingness to accept commissions to collect certain classes of materials in return for the opportunity to go out again."

The book is attractively printed and put together. It is ingeniously arranged for ease of consultation by taxonomists. The ethnologist, the social historian, the general student of the Southwest will find the index maddeningly inadequate. *Aguamiel,* for instance, does not appear at all in the index, and the reference to cactus candy is hidden (to all but the initiated) under *Opuntia.* However, the book is such a rich mine of all kinds of information that a first-class index would have been just one more major project.

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**Philosophy of Science.** Gustav Bergmann. University of Wisconsin Press, Madison, 1957. 181 pp. $4.75.

Originally planned as the foundation section of a volume on the philosophy of psychology, *Philosophy of Science* focuses on those ideas considered by the author to be indispensable for logical analysis of the behavioral sciences. Despite this orientation, the book will be of interest to philosophers generally and to philosophically minded scientists in other domains, for, aside from analyses of physical concepts by way of paradigm, Gustav Bergmann provides an introduction to notions such as "deduction," "existence," "definition," and "number"; recurrent remarks on philosophic analysis by means of schematic representation in "improved" languages; and a general discussion of description and explanation in science.

Of special significance in connection with the latter topics is the author's fruitful characterization of types of scientific law, including what are called "process," "cross-sectional," "equilibrium," "developmental," "statistical," "historical," and "composition" laws. The subject of composition laws introduces Bergmann's illuminating analyses of a whole cluster of problems, which have figured importantly in psychology and the social sciences, concerning *Gestalt,* holism, emergence, and reduction. Not the least valuable feature of these analyses is the pinpointing of ambiguities in key terms such as *whole* and *additive*—ambiguities crucial to their philosophic use by some writers.

Rather disconcerting is Bergmann's omission of adequate citation to related literature, and even more so are his occasional controversial comments on authors whose views are neither quoted nor specifically cited, notably John Dewey. But most disturbing to me are the flat judgments thrown out offhandedly on difficult issues. Thus, to take two examples, we are told (page 40) that "the ideal language, by the way, is 'phenomenalistic'" and (page 87) that, while there has been "a good deal of talk, in the nether regions of the intellectual universe" to the effect that recent physics has given up Newtonian mechanism and determinism, "it is worth mentioning . . . that these views are also thoroughly mistaken." This last is doubly disturbing when we learn (page 124) that quantum phenomena "form an area of relative chance," and that our idea of the physical universe, though deterministic, is not mechanistic, as Newton's was, in one sense clearly specified in the text.

Bergmann's logical framework is not nearly so subtle as some of his analyses of physical and psychological issues. Readers will find it impossible to tell, from his treatment alone, how controversial his logical-descriptive and analytic-synthetic dichotomies have become in recent discussions. Nor does Bergmann, in the face of a history of critical treatments, qualify his pronouncement of the existence of simple and complex properties and relations named by descriptive words—an affirmation which, incidentally, seems to conflict with the extensionality he appears to espouse (page 55). And, in place of various philosophic methods suitable for a variety of purposes, he frankly searches for an "ideal language" in which *everything* can be stated and *all* philosophic problems can be analyzed. Despite these strictures on his general framework, it must be said that his specific analyses of explanation, law, and holism stand pretty much on their own feet and are, moreover, enlightening and suggestive. It is to be hoped that they will be widely and seriously studied.

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**A History of Technology.** vol. II. *The Mediterranean Civilizations and the Middle Ages.* Charles Singer *et al.* Clarendon Press, Oxford, 1957. 802 pp. Illus. $26.90.

It is with great pleasure that we receive this, the second of five projected volumes of essays on the history of technology, all written by experts and admirably edited by competent historians. As the world speeds on at an ever more dizzying pace toward apparent total reliance on technologic man, interest inevitably grows in answers to the question: How has it all come about? Whence has come our technocentric predicament? It is obvious that we are here, but how and why? It is curiously significant that historians are at last seriously taking stock of certain anachronistic elements within their own pursuit. Social and economic history has always sought a prop—if oftentimes a shaky one—in the material factors of history. But even today there is, as yet, no fully professional discipline which can be called "history of technology." When one realizes that, except for sporadic scholarly adventures in narrow byways (as well as misadventures on the textbook level), no competent history of technology has existed in the English language, is it not clear that the present monumental effort is epoch-making? In this sense, the present undertaking appears to be a sort of belated historian's anabasis into the obvious. Let us hope that it will spur on still others, especially here in America, to develop the history of technology with a degree of energy comparable to that now expended on other historical disciplines.

Volume I of *A History of Technology* [*Science* **121**, 549 (1955)] related a history of the period from earliest antiquity through the fall of the pre-Greek "Ancient Empires." This history, of necessity, relied almost exclusively on evidence unearthed by archeologic excavation. This of course is the result, in part, of the fact that many pre-Greek literatures are lost and hence unknown to us. In addition, perhaps because of the randomness of archeologic finds, what fragments we do possess from such literatures are mainly nontechnical. Hence, artifacts provide the soundest clues about the nature and sources of the substances employed in pre-Greek technology, and tools, especially, point to the techniques themselves.

The present volume deals with classical and postclassical civilizations of the Mediterranean and of areas to the north, through approximately 22 centuries. Although archeology remains vital for an understanding of this period, literary evidence constantly increases until, by the end of the 15th century, the historian's problem is decidedly one of selecting representative documents from a vast array of possibilities. The editors carefully point out that the problem of selection will become increasingly acute as the project moves nearer to our own times. The tempo must increase. If volume I registers *andante,* then volume II is a movement in *andantino.* Inevitably, succeeding volumes will reach *allegretto* and *allegro.*

It is impossible, in such a brief review, to do more than outline the contents of 800 pages of detailed history. The general plan of volume I has been only slightly modified in volume II. After a brief but useful set of "Historical notes," by A. R. Hall, there are five basic subdivisions, which divide the concept of technology as logically as it can be done.