

of roots of a polynomial in a half plane. The original method of Routh is given in full detail. A somewhat more useful criterion, developed by Lienard and Chipart, is presented; it involves the calculation of fewer determinants than the original Hurwitz technique.

This book cannot be recommended too highly, for it contains material otherwise unavailable in book form. One could wish that material on infinite matrices were included, but this lack does not detract from the stature of Gantmacher's book as an exposition on finite matrices. The translation is a good one, but there are several misprints which are easily spotted.

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Measurement of Subjective Responses:

Quantitative Effects of Drugs. Henry K. Beecher. Oxford University Press, New York, 1959. xvi + 499 pp.

Henry Beecher, well-known research professor of anesthesia at Harvard, has written an important volume, summarizing a vast amount of recently developed information on the subjective responses of various kinds of people to various kinds of drugs. It is interesting that this subject was popular a little more than a century ago; S. F. C. Hahnemann (1755-1843), founder of the medical sect of "homeopathy," systematically tested all kinds of drugs, even in extremely small doses, in order to note their effects on himself. Responses to these tiny doses were largely subjective.

Let me say at once that Beecher's volume is a comprehensive, detailed, systematic, well-written, carefully arranged, and very useful reference work. It is fully documented (1063 references, with full titles and pagination), and it has a helpful index.

The volume is skillfully organized. The first part deals with the measurement of pain: a prototype for the quantitative study of subjective responses. The second part deals with the quantitative study of the effects of drugs on various subjective states.

After an interesting introduction attempting to define pain and its characteristics as a sensation, Beecher goes on to give a systematic critique of methods for measuring pain. An important discussion of placebos and placebo re-

actors follows. It is astonishing what a large number of subjective responses are obtained from the administration of biologically inert chemicals, such as lactose. This simply confirms Hahnemann.

Beecher goes on to consider statistical problems in double-blind testing, pain thresholds, the effects of analgesic agents on pain thresholds, the important matter of drug interactions, synergism and potentiation, factors producing variation in the pain threshold, and action factors of the pain experience.

Beecher concludes that pain cannot be satisfactorily defined. Pain sensations and pain perceptions are identical, representing an indefinite amount of psychic processing. Pain thresholds are not constant, either with respect to individuals or from time-to-time in a given person. Experimentally induced pain and pain resulting from disease differ in their components, and the techniques of producing experimental pain are not fully satisfactory for appraising analgesic agents. There is no dependable relationship between the number of pain spots stimulated, or the degree of their stimulation, and the extent of pain invoked. Analgesic agents appear to exert their effect on the "reaction component" rather than on the "original sensation."

The second part of the volume begins with a discussion of the measurement of "mental clouding" and other subjective effects of morphine. It proceeds to a consideration of sedation and hypnotic states, and then to a review of the effects of anesthetic agents on subjective states. Psychotomimetic drugs, as well as the general subject of euphoria and dysphoria, are surveyed; and then consideration is given to quantifiable expressions of anxiety, with a review of quantitative studies of the effects of narcotics on hunger. Nausea and pruritis are discussed separately. There is consideration of experimental and pathological cough, with regard to subjective and objective components.

Unfortunately, this second part of the book does not include a summarizing chapter. Perhaps Beecher thought that the intelligent reader would go back over the whole effort and attempt to make his own summary. This would not be easy, because such a vast amount of information is explored so thoroughly and so significantly that it really would be a repetitive effort to try to compile a summary. For these same reasons, it is difficult to review the book except in generalizations.

Beecher's effort is provocative, stimulating, and inspiring: its skillful analysis of the various factors concerned in the complicated concept, "pain," is provocative; its suggestions for logical approaches to pain relief are stimulating; and the way in which it has been compiled, written and published is inspiring. This is really a monumental contribution.

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Zulu Journal. Field notes of a naturalist in South Africa. Raymond B. Cowles. University of California Press, Berkeley, 1959. xiv + 269 pp. Illus. \$6.

Each of Raymond Cowles' many fine research papers contains a little extra. Beyond its technical content, each paper brings a smell of the outdoors into modern scientific periodicals, an all-too-rare aroma that comes from a naturalist's broad curiosity about the living animal in its native haunts. *Zulu Journal* is the other side of the coin. In this sensitive, often poetic account of human ecology in Natal Province, Union of South Africa, are intriguing bits of information—adaptations in color matching (including negroid skin and zebra stripes), food webs, and heterothermism. For this reason, the book will give the scientist rewards beyond the pleasure of reading colorful, picture-evoking descriptions of animal and human life on the African veld.

Zulu Journal is not a journal, for it gives no consecutive account of Cowles' field work. Instead, it flits about with the deceiving aimlessness of a butterfly, picking up an anecdote here and there, inspecting an ecological situation briefly, encountering amazing numbers of different animals and sizing up each for its place in the African world. Without effort the reader comes to see through experienced eyes "the mood of the country, its seasons, and the passing years."

In chapter after chapter, Cowles tips his hand to reveal what is coming in the final one. To him it is evident from the rapid changes of the past 50 years in the land of his birth that "Against the deadliest weapons of man, fecundity and agriculture, scarcely anything but weeds or parasites can survive for many more decades." The final chapter, starkly titled "Man," still comes

as a surprise containing surprises, for it presents such a logical, forceful analysis of the outcome for other animals of the human population explosion around the world. He argues, on the one hand, for a few natives and man-set fires in wildlife reserves—to continue the evolutionary pressure to which wildlife and the vegetation have become adapted. On the other, he clearly wonders how a sanctuary, even as large as Kruger National Park (the size of Massachusetts or New Jersey), can be meaningful as an island of wilderness if there is no genetic interchange with kindred animals and plants from beyond its boundaries. How can the enclosed creatures continue their evolution in an unchanged direction, if they are confined in this way?

That Cowles' last visit to Natal was in 1953 does not date his book. We tramped over many of the same hillsides during July and August of 1959, and found the deterioration of the soil, the problems of management, the tensions between people over the future, all just a little more acute and desperate than is told in *Zulu Journal*. To Cowles' credit, he has underplayed the political background of the South African scene and focused more attention on the world-wide problems—the survival of wild animals, native plants, and primitive people in the face of unchecked increases in human population.

The book should be read carefully by all who are concerned with man's future—even his near future.

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Human Nutrition and Dietetics. Sir Stanley Davidson, A. P. Meiklejohn, and R. Passmore. William and Wilkins, Baltimore, Md., 1959. xii + 844 pp. Illus. \$15.

Three Edinburgh men—Sir Stanley Davidson (professor of medicine), A. P. Meiklejohn (lecturer in nutrition), and R. Passmore (reader in physiology)—have banded together to produce the best textbook on nutrition presently available to the graduate student, the scientist, or the internist. The combination of their talents is unusual. Davidson, an excellent clinician, has made distinguished contributions to a number of fields in medical investigation. Meiklejohn, well known in this country as

a clinician, has had extensive practical experience as consultant in nutrition for the United Nations Relief and Rehabilitation Administration. Passmore, a man with wide interests in the physiology of nutrition, served for many years in the Indian Medical Service, in particular at Coonoor.

This large volume (844 pp) is divided into six main sections: Physiology, Foods, Primary Nutritional Diseases, Nutritional Aspects and Dietetic Treatment of General Diseases, Public Health, and Diet and Physiological Stress. The first part deals with the more classical aspects of the biochemistry and physiology of nutrition, including the mechanism by which food intake is regulated. The references and illustrations are judiciously chosen, and in every respect the book meets the highest requirements for scholarship. That it does so without being unusually wordy is particularly well illustrated by chapter 7, "Alcohol," which in the space of only 2½ pages (five bibliographical references) manages to give a superb summary of present knowledge of the place of alcohol in nutrition.

My only reservation about the first part is that the authors could have provided a better discussion of the basis on which various sets of requirements or recommended allowances have been established.

The second part is particularly useful. It deals with the various types of foods into which, ultimately, nutrition is translated. There is a useful section on preserving, cooking, and wastage, as well as a section on food poisons.

The section on subnutrition and starvation, as well as that on obesity, could usefully have been amplified. These topics are dealt with in a fairly cursory manner and, particularly obesity, without too much originality. This is all the more surprising because few people in the world have had as much extensive firsthand experience with the problem of subnutrition as Meiklejohn and Passmore, and, for that matter, few people have written as well on the subject as Passmore. It is to be hoped that in the second edition this important subject will be discussed more fully. Similarly, obesity is a field to which both Passmore and Meiklejohn have contributed and continue to contribute. The emphasis placed on this subject in the teaching of present day nutrition should entitle it to a somewhat more detailed presentation than is accorded it in *Human Nutrition and Dietetics*.

The sections on nutritional deficiencies are good, and they are particularly well illustrated. Section 4, Nutritional Aspects and Dietetic Treatment of General Diseases, is excellent, though it may, perhaps, reflect British practices too much for literal application to American hospitals and institutions.

Part 5, on public health nutrition, is excellent; it includes a wise appraisal of the social as well as the technical factors to be taken into account when dealing with the nutritional practices of populations.

A final (and very brief) part deals with diet and physical stress. The description of the management of children's diets could have been somewhat more detailed, and the common criteria for evaluating the adequacy of diet for growth could have been discussed at somewhat greater length. Other chapters in this section, dealing with athletics, effects of climate, expeditions and emergency rations, are consistent with the excellent quality of the book.

The existence of this book will make it much easier for anyone teaching nutrition to advanced students to organize a course based on readily available references. It should make it even more difficult to justify the omission of a course in human nutrition in the training of medical students.

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Covered Wagon Geologist. Charles Newton Gould. University of Oklahoma Press, Norman, 1959. xiii + 282 pp. Illus. + maps. \$4.

This is the autobiography of a pioneer geologist who worked in Oklahoma and the surrounding areas. His professional activities covered the 60 years prior to his death in 1946, and one of his early field vehicles was a covered wagon, though he did not make any transcontinental trips in it.

If you are a geologist working in the mid-continent area, you will probably want to read this book at one sitting. If you are a geologist working elsewhere, you should have it in your library because it is rich in allusions to the development of our present knowledge of the fundamental geology of Gould's sphere of interest, much of which was developed by Gould himself in his various posts. He was a teacher who initiated the geology curriculum at the