briefly reviewed. Unlike previous writers on this subject (including the reviewer), Dr. Dorsey does not base his discussion on the published definitive values given by the various observers. Instead, he points out that "the published definitive values, with their accompanying limits of uncertainty, are not experimental data, but merely the author's inferences from such data. Inferences are always subject to question; they may be criticized, reexamined and review at any time. When uncritically accepted, they form an exceedingly weak foundation for a revolutionary suggestion; in fact, the suggestion then rests solely on authority." Furthermore, the suggestion of a secular variation "cannot be satisfactorily attacked by merely pointing out that only slight changes in the admitted uncertainties of the measurements will render the suggestion unnecessary, especially if those changes must exhibit some kind of regularity. The most that can be accomplished by such criticism is to show the weakness of the foundation on which the suggestion rests, to show that the suggestion is unproven; whereas the critic presumably wishes to show that there is no basis at all for the suggestion."

Hence, Dr. Dorsey has undertaken to examine carefully the details of the work behind the published definitive values in order to independently appraise the objective value of the work in each case. His detailed discussion of the different investigations is prefaced by eight pages of remarks concerning the theory of errors, the method of least squares, averaging and absolute physical measurements. The treatment is original and stimulating and could very well be required reading for all who are concerned with precision measurements. In two valuable appendixes, Dr. Dorsey discusses (1) the experimental methods for determining the velocity of light and (2) motion maintained by periodic impulses.

All direct measurements of the velocity of light (denoted by V, instead of the customary c) are considered, with the exception of the work by Young and Forbes. The pioneer determinations by Fizeau and by Foucault are discussed briefly, but are not used to test the constancy of the velocity of light, owing to their great uncertainty. Cornu's work is very thoroughly discussed (22 pages) and a revised definitive value is calculated. Errors are found in the reductions of Perrotin and Prim, and Dorsey recomputes their value with corrected equations. Newcomb's work is shown to be affected by systematic errors of unknown sign and magnitude. Michelson's various determinations receive the most exhaustive (27 pages) and critical treatment of all. His reports are strongly criticized:

> Not one of his reports contains sufficient detailed information to enable a reader to form an independent and objective evaluation of the result. Whatever value he may attach to it is purely subjective, resting solely on his confidence in Michelson. . . . When details are given, they have to do with the simplest of measurements, those open to the least question. Of the more recondite measurements, those involving real difficulty and where mistaken procedures would not be especially surprising, little or nothing is said. . . . In none of his reports on the velocity of light prior to 1935 does one find any indication of a thorough experimental study of his apparatus and procedures.

The recent work by Karolus and Mittelstaedt, Anderson and Hüttel is perhaps too briefly presented, and without detailed criticism. The important question of the correction for "group velocity" is not satisfactorily handled, and it is to be hoped that Dr. Dorsey and others will look into this further.

Dr. Dorsey concludes that all determinations made prior to 1928 are of historical interest only, and bases his best value (299,773 km./sec.) on the mean of the Kerr cell determinations and the Michelson, Pease and Pearson determination. The actual uncertainty of this result (called the "dubiety") is thought to be perhaps as much as, but probably less than ±10 km./sec. Finally, it is concluded that "the data give no indication of any secular change in the velocity of light."

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THE LIFE HISTORY OF AN AMERICAN NATURALIST

The Life History of an American Naturalist. By FRANCIS B. SUMNER. vii + 298 pp. The Jaques Cattell Press, 1945. $3.00.

THE author, whose death closely followed the publication of this book, stated that his aim in writing his autobiography was a desire to bring to as wide a circle of readers as possible some of his long-cherished ideas relative to present-day beliefs and behavior. To this end he has analyzed his own personality and remembered experiences with the same impartiality that has characterized his scientific investigations, and these have been widely acclaimed by biologists. In fact, he has been inclined to overemphasize his supposed inadequacies with a frankness that he thought necessary for strict honesty. Most of the twenty-four chapters are written in narrative form and all of them with an unusual degree of literary excellence. They portray the development of the child into the mature man of science, with an analysis of the influences, hereditary and environmental, which may have guided this development along the course which was followed.

Of intense interest are the author's accounts of his early struggles in his chosen career, hampered as he

was by ill health, of his efforts to obtain definite proofs in his baffling scientific investigations, particularly those pertaining to natural selection and evolution, and of the persistence which eventually led to success. The narratives are enlivened by many amusing episodes and abound in clever and humorous expressions. The story of his ill-fated expedition to the Egyptian Sudan is as thrilling as almost any work of fiction.

As a general rule each chapter concludes with a brief discussion of the sociological aspects of the subject under consideration. The concluding chapters on the real value of science, man versus nature, the vivisection bogey and the philosophy of the booster are sound and forceful. The final comments on religious beliefs are the result of the author's honest conviction, although many will differ from his conclusions.

WESLEY R. COE

THE ASPERGILLI

Manual of the Aspergilli. By CHARLES THOM and KENNETH P. RAPER. 373 pp. Baltimore: Williams and Wilkins. 1945. $7.00.

THIS manual in general follows the plan or system of treatment found in a former work, "The *Aspergilli,*" by Thom and Church. While all the best features of that work have been preserved and added to in this book, it is in no sense merely a second edition or revision. It is an entirely new book written to include new knowledge acquired by the authors and others during the past twenty years. The subject-matter has been treated from a more modern viewpoint without abandoning such principles and conclusions as were strongly supported in the former work, and which have been found to be fundamentally sound.

It is gratifying to see that the authors have continued to maintain that the generic name *Aspergillus* should apply not only to the conidial stage but also to the ascosporic stage. The genus *Aspergillus* is here to stay, regardless of rules of nomenclature. "It is better," the authors say, "to forget *Eurotium* along with technicalities."

In Chapter 3, "Morphology and Description," as in the former work, the characters of the colony are discussed under such headings as (1) color, including the range of color extending through a group, color of conidial wall, chromogenesis or substratum coloration; (2) morphology of the head, foot-cells, stalk, vesicle, sterigmata and conidium formation. These features are more fully discussed and illustrated than formerly, so that a student understands what must first be known in order to identify a species correctly from the conidial stage alone. A comparatively small number of species develop ascocarps. These structures, including the "Hülle cells" and sclerotia, are briefly discussed. Sexual reproduction is strictly on the basis of homothallism. No heterothallic species are known so that variation as it occurs in nature and in culture can not be attributed to +/− relations. A variant is in general applied here to a strain which is not stable. It has arisen through gradual change from a well-defined strain. A mutant, on the other hand, they define as a strain whose source is known and has arisen from sharp breaks in culture. It is a gene mutation, and one which retains its distinguishing features in culture. Examples of natural and induced mutants are cited, though the authors do not pretend to distinguish absolutely an induced mutant from an induced variation.

Aspergillus has long been one of the classics for purposes of text-book illustration of the life history of an ascomycete. The authors could have, without detracting from the usefulness of the book, included a more extended discussion of sexual reproduction along with illustrations of cytological features showing nuclear conditions in various structures and nuclear behavior leading up to ascus formation. The importance of heterocaryosis in the fungi is coming to be recognized so that a more extended discussion of this feature along with its many implications as determining colony characteristics would have been welcomed.

Chapter 4 on cultivation and examination has been considerably extended, now covering eighteen pages instead of eight. Nine excellent formulae are now recommended for culturing *Aspergillus.* Only one formula of the four originally suggested is retained. This is Czapek's Solution Agar. The special virtues of each type of medium are indicated. The pros and cons of "single spore" method of culture are interesting and instructive. The method has its place, but it can not be recommended as a way of preserving the whole morphology of a species. Transfer of masses of conidia is the best safeguard for this purpose. To this statement one could agree without giving up the idea that perhaps even then the whole morphology of a species would be difficult to corral in one culture. We are hearing much these days about the best way to maintain cultures of *Penicillium notatum* so as to insure the maximum production of penicillin.

The taxonomy of both of these genera demands the exercise of the most scrupulous care to preserve the purity of cultures. Chapter 5 on this subject has been enlarged to cover this subject more completely. The lyophile form of preservation of cultures for future use is described in some detail, but the authors point out that, while the feasibility of this method has not been fully proved, their results are encouraging. Various common sources of contamination are