tion after the war, and the plan of giving credit for the intensive war courses toward a degree in engineering should be adopted. On the other hand, it is reasonably certain that the character of the men who complete the new engineering courses will be excellent, and the colleges should insist upon this high standard of scholarship and character after the war.—*The Electrical World.*

SCIENTIFIC BOOKS

Annals of the Astronomical Observatory of Harvard College. Vol. 79, Part 1. 4°, pp. 86; Vol. 83, Part 2, 4°, pp. 28; Vol. 91, 4°, pp. 290. Edward C. Pickering, Director. Cambridge, Mass. 1918.

The *Annals of the Harvard College Observatory* occupy a unique position in the literature of astronomy by reason of their great extent and the wide range of subject matter included in them. Collectively they form an impressive memorial to the indefatigable director who has inspired the production and publication of more than three fourths of the four score volumes composing the series. In diversity of subject matter, in successful coordination of effort and in condensed presentation of material the three volumes briefly cited above are typical of the institution from which they come.

The first of the three, prepared by Leon Campbell, contains observations of three hundred and twenty-three variable stars made during the years 1911-16, in continuation of a program commenced twenty-two years earlier. In accordance with the general policy of the observatory its purpose is the accumulation and preservation of reliable data for future study of the changes in the amount of light received from stars of the class designated variables of long period. These changes of brilliancy are notoriously irregular in character and our knowledge of the causes upon which they depend is only fragmentary. The relation between these causes and the data furnished by the present volume is committed to the future investigator.

The second volume cited, prepared under the direction of Alexander McAdie, lies in the very different field of meteorology and contains observations made at Blue Hill Observatory (Mass.) in the year 1917. Apart from a brief preface the work is wholly tabular in character and contains both in detail and in summarized form the customary meteorological data.

The last of the volumes named above, prepared jointly by Annie J. Cannon and Edward C. Pickering is an initial installment of the Henry Draper Catalogue of Stellar Spectra, to be completed in seven more similar volumes. For the most part its pages are tabular in character and are intended to place at the disposal of the theorist, data as accurate and as extensive as can be derived from the great store of Harvard photographs of stellar spectra, relative to the spectrum and magnitude of a great number of stars, so chosen as to be typical of every part of the sky. These photographs, taken partly at Harvard and partly in Peru, have been laboriously examined and classified by Miss Cannon and others and the result of four years of such labor is a catalogue showing as its chief data the magnitude and the spectral type for more than 200,000 stars. The classification is naturally upon the system originated at Harvard and now in general use, in which for the most part, stellar spectra constitute a continuous sequence whose chief divisions are represented serially by the letters B, A, F, G, K, M, with subdivisions of these classes upon a decimal system. The physical significance of this series is recognized to be of fundamental importance in every investigation of the larger problems of stellar astronomy. In accordance with its distinctly enunciated plan that we have noted above, the present volume is devoted to the preparation of material out of which the implications of this series may be worked more perfectly than has yet been done. As a contribution to that end the introduction to the volume contains explicit definition and illustration of each spectral class and of many of their subdivisions, presented in brief but very convenient form.

The three volumes are worthy additions to a long line of predecessors whose characteris-

tics have become so well determined and so familiar that if title pages were removed and all reference to the authors deleted, no astronomer could be left in doubt as to the source from which they came.

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The Chemistry of Food and Nutrition. By Henry C. Sherman. Second edition. New York, The Macmillian Co. 1918.

This well-known text-book has been rewritten and presents modern knowledge upon the subject of nutrition in an exceptionally clear and readable form. The chemistry of foods is described, then the digestion and metabolism of the different food-stuffs. The review of the subject of the "vitamines" and of "growth hormones" is excellently handled and nowhere have these "accessory factors" in nutrition been more clearly defined. Sherman's long experimental studies of the salt metabolism and especially the calcium metabolism give authority to his discussion of the inorganic food-stuffs. The chapter on the dietary standards and economic use of food is of an order of excellence which has never been surpassed. Sherman's experience, based upon his own painstaking researches into the dietary habits of the poor classes of New York City, conducted for the New York Association for Improving the Condition of the Poor, leads him to declare that "the most frequent deficiency in American dietaries is inadequacy of the total food or energy value and most dietaries actually observed are of such composition as would furnish enough of each essential element if the total amount of food eaten were sufficient to provide a liberal energy supply."

Sherman clearly sets forth the principles of a sufficient and economical dietary in such a manner as to bring to mind the really great progress in the science of dietetics which has taken place in the last decade. This excellent and thoroughly scientific treatise upon nutrition should be in the hands of all who are interested in the food question, both as it appears now and as it will shape itself after the war. It is a pleasure to note that the author has been unusually conscientious and generous in giving credit to the work of others.

Graham Lusk

SPECIAL ARTICLES

THE FORMATION OF THE FAT DROPLETS IN THE CELLS OF TISSUE CULTURES

Experiments of Daddi (1896)[1] and more particularly those of Riddle (1910)[2] show that Sudan III., fed to animals, is taken up by fat in the intestine, passes through the intestinal wall in combination with fat, and is deposited in the body cells in the form of red fat globules. These observations suggested a method for testing out the question as to whether or not the mitochondria form the fat droplets. If Sudan III. remains attached to the fat, as Riddle seems convinced it does, and the cells store up this Sudan III. fat, the question arises, is the Sudan III. fat deposited in the mitochrondria before appearing as red fat globules in the cytoplasm? If such were the case, we should be able to find traces of the Sudan III. in the mitochondrium, at least during the final stages in the formation of the fat droplet, but this could not be done, and as will be seen below, the mitochondria take no part in the formation of the fat droplet under such conditions.

The yolk of a hen egg was mixed with Sudan III. until it became red. A small quantity of this red yolk was then diluted with Locke-Lewis solution and placed on a number of twenty-four-hour cultures of 6–9-day chick embryos (Lewis and Lewis method). Certain of the cells were then selected and their unstained fat droplets noted and drawn. Each of these cells was carefully followed for the next few hours, or until a number of fat droplets had appeared in the cytoplasm. These took the form of exceedingly small, reddish-yellow droplets, often far removed from any

[1] Daddi, L., "Nouvelle méthode pour colorer la graisse dans les tissues," *Arch. Ital. de Biol.*, 26, 1896.

[2] Riddle, O., "Studies with Sudan III. in Metabolism and Inheritance," *Jour. Exper. Zool.*, 8, 1910.