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.

George C. Comstock
University of Wisconsin

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 mèthode 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.

mitochondrium. The mitochondria at no time contained any orange-colored droplets or any droplets at all. Neither did they become rounded, loop- or ring-shaped. As a matter of fact, they behaved in a manner quite like what has been described as normal for the cells of tissue cultures (Lewis and Lewis, 1915).[3] Once a loop-shaped mitochondrium was seen, but this unbent and became a thread again without the formation of any globule. The very small orange-colored droplets unite into larger ones, others appear in the cell, and thus in the course of five or six hours several additional fat droplets of different sizes can be seen. While this process is going on, the fat droplets previously noted and drawn take on a bright orange stain, so that in a very short time it is impossible to distinguish by means of color those droplets which were present in the cell before the addition of the Sudan III. yolk. The color exhibited by the fat droplet in the living cell, while a bright yellowish-red, was never the same shade as that obtained in a culture fixed and stained with Sudan III. Nile blue sulphate could not be used in these experiments because as has been previously shown, it stains bodies that are not fat in the living cell. The fat droplets of the mesenchyme cells remain distinctly smaller than those of the clasmatocyte. Neither the mesenchyme cell nor the clasmatocyte were ever observed in the process of engulfing a yolk globule. It is doubtful whether either type of cell ingests fat in tissue cultures.

Certain of the cultures, which when living contained no loop- or ring-shaped mitochondria, after the application of different fixatives contained in varying numbers swollen, varicose and ring-shaped mitochondria according to the method of fixation employed. The question of fixation is necessarily quite different in these cultures, since most of the cells are spread out in a thin layer unprotected even by plasma from the direct action of any chemical placed upon them. Nevertheless since certain forms of mitochrondria were shown in these cultures to be the result of the method of preservation, it would certainly seem probable that these same shapes observed by other investigators (Dubreuil, 1911[4] Guilliermond, 1913),[5] were obtained in the same manner.

In the above observations there was no need to resort to fixed preparations, as all the structures of the cell were clearly seen, and the bright orange-colored droplets could be followed without fear of confusing them with the easily distinguishable mitochondria. The fat droplets accumulated in the living cell without being associated at any time with the mitochondria and without any changes taking place in the shape of the mitochondria such as have been claimed by other observers (Dubreuil 1911,[4] Russo 1910,[6] etc.).

Margaret Reed Lewis

[3] Lewis, M. R., and Lewis, W. H., "Mitochondria and other Cytoplasmic Structures in Tissue Cultures," *Amer. Jour. of Anat.*, 17, 1915.

[4] Dubreuil, G., "Les nitrochondries des cellules-adi peuses," *Compt. rend. Soc. Biol.*, 1911.

[5] Guilliermond, A., "Sur les nitrochrondries des champignons," *Compt. rend. Soc. de Biol.*, 1913.

[6] Russo, A., "Sui mutamenti che subiscono i mitochondrî ed i materiali dentoplasmici dell oocite di coniglia in diversi periodi di inanizione," *Arch. f. Zellf.*, 4–5, 1910.

THE AMERICAN MATHEMATICAL SOCIETY

The twenty-fifth summer meeting of the society was held, by invitation, at Dartmouth College, Hanover, N. H., on Wednesday, Thursday and Friday, September 4–6, 1918, connecting with the meeting of the Mathematical Association of America, which began on Friday morning. The joint dinner of the two organizations, on Thursday evening, was attended by fifty-six members and friends, who were greeted by Dean Laycock in the name of the College. At the joint session on Friday morning Professor A. G. Webster gave an address on "Mathematics of warfare."

The college dormitories were opened for the accommodation of the visitors, and meals were served in the commons. Headquarters and general gathering place between the sessions was provided in College Hall, where an informal reception was held on Wednesday evening. A letter of welcome from Business