The Cytoplasm of the Plant Cell. By A. Guilliermond. Authorized translation from the unpublished French MS. by Lenette Rogers Atkinson. Foreword by W. Seifriz. (Waltham, Mass: The Chronica Botanica Co.; Calcutta: Macmillan & Co., Ltd.), 1941. Pp. 247, 152 Figs. $4.75.

This important work, written by an acknowledged authority, summarises our knowledge of a subject which has undergone a remarkable development during the last thirty years, largely through the labours of the author himself and his school. As stated, the aim here is a morphological study of the cytoplasm, rather than an enquiry into the physiological activity of the cell: the latter aspect borders upon the domain of physical chemistry.

After a brief historical sketch of our knowledge of the cell, beginning with Robert Hooke's discovery of the honey-comb structure of cork, the author says that for solving the problem of cytoplasmic structure it is essential to employ the special mitochondrial technique (described on p. 57), supplemented by the use of the ultramicroscope and micromanipulator, vital staining and examination *in vivo*. Most ordinary fixing reagents, which contain alcohol and acetic acid, destroy the lipides of the chondriosomes and render these bodies invisible —a fact which explains why they had so long escaped observation except by a few cytologists.

A short chapter (II) defines the strictly living contents of the cell (cytoplasm and nucleus, chondriosomes and plastids) as distinct from the non-living (cell-wall, vacuoles, lipide granules, inclusions like starch, crystals, etc.). Chapter III stresses the correctness of Dujardin's classic description of the cytoplasm based upon a study, now over a hundred years old, of the living substance of the infusoria: like the latter, the plant's cytoplasm is a perfectly homogeneous substance, showing none of the structures variously described by later observers as reticular, fibrillar, aleveolar, granular or emulsion-like. The other physical and physiological properties of the cytoplasm are briefly discussed: its viscosity, torsional elasticity, density and irritability; its power of forming a peripheral layer (the ectoplasm) which is denser, more refractive and richer in lipides than the endoplasm but which, contrary to earlier belief, cannot be regarded as a morphological membrane nor differentiated by staining; lastly, its strange property of allowing passage to certain basic dyes, *e.g.*, neutral red and cresyl blue which, however, cannot stain the living cytoplasm nor the chondriosomes or plastids but accumulate only in the vacuoles.

Chapters IV and V are concerned with the constitution and physical chemistry of this complex colloidal system of protein and lipide molecules in a watery medium holding minerals in solution. Then follows the strictly morphological part of the book which relates largely to the special contribution of the Guilliermond school. Chapters VI to XIX describe the structure and rôle of the plastids and chondriosomes; the mysterious (and to some cytologists still improbable) relation between the chloroplasts and chondriosomes; the vacuolar system, the Golgi apparatus and other cytoplasmic formations; the lipide granules and, finally, the alterations produced in the cytoplasm by physical and biological agents such as X-rays, various salts, and parasites. The concluding ten pages give a full summary of the results. Of about 540 works cited in the Bibliography the vast majority have appeared since the year 1910. It was about this time that the discovery or perfection of certain techniques, the ultramicroscope, mitochondrial methods, vital staining, the micromanipulator and microcinema, enabled observers satisfactorily to stain the elusive chondriosomes and to examine them critically in the living state. Chondriosomes had already been demonstrated in plant cells by Meves as early as 1904, but the rapid development of the whole subject with the startling discoveries by Pensa (1910), Lewitsky (1911) and Guilliermond (1911), which suggested a close genetic relationship between the chloroplasts and chondriosomes, shows convincingly how in the history of science technique sometimes dominates discovery.

It is impossible, in this short space, to do justice to the mass of observations brought together in this valuable book; and most of them have no doubt been reviewed individually by others. But the highlights of the combined picture now presented are:—

(i) The cytoplasm is a homogeneous substance in the plant cell, as it is in the animal.

(*ii*) Except in the bacteria and blue-green algæ, it holds minute living bodies, the chondriosomes, sometimes called chondrioconts when they are rod-like, mitochondria when dot-like. Originally regarded as artefacts, the chondriosomes are now known to divide and change their form, showing a striking resemblance with bacteria in their size, shape and staining properties. This resemblance we now know to be purely deceptive; the chondriosomes are not symbiotic bacteria, as they were once believed to be. For one thing, they do not respond to the centrifuge as do bacteria within the same cell.

(*iii*) The origin of the chondriosomes is still a mystery. Possibly, as Lewitsky suggested, they arise by differentiation from the cytoplasm, but they have never been observed to arise *de novo*; they most probably pass on from cell to cell during division.

(*iv*) The plastids of green plants are only transformed chondriosomes. During the development of mature cells from meristems they have been found to arise by differentiation from some of the chondriosomes which become enlarged and are able to manufacture chlorophyll and starch. Conversely, the plastids have been observed, at certain stages in the life-history of green plants, to become smaller and smaller, to lose their chlorophyll, and finally to revert to the inactive form as chondriosomes. These transformations may be repeated in both directions several times in a life-history.

(*v*) "Nothing is positively known about the rôle of the chondriosomes". Like the plastids to which they give rise, they appear to be the seat of important surface phenomena in the metabolism of the cell, but the exact nature of these processes is shrouded in mystery.

(*vi*) The aleurone grains of seeds are only dehydrated and condensed vacuoles. On germination they take up water and swell up into vacuoles which contain a more or less concentrated colloidal solution capable of being shown up by vital stains, like the aleurone grains themselves.

(*vii*) The vacuoles probably arise *de novo*, through absorption of water by colloidal granules secreted by the cytoplasm.

(*viii*) The fungi possess chondriosomes but no trace whatever of plastids, even of the colourless type. Are they, in their origin, algæ dispossessed of their chlorophyll? What is the relation of the Cyanophyceæ, in which no trace is found either of chondriosomes or of plastids, with the rest of the algæ? Perhaps the non-green races of the Flagellata will help towards a solution of these questions. But the bacteria still stand quite apart, and baffle all attempts to line them up with the rest of the plant world. Are they plants at all?

(*ix*) What happens at death? You watch an apparently healthy cell, with only its vacuole stained in neutral red. Everything seems normal, but abruptly the stain leaves the vacuole, and colours the cytoplasm and nucleus. The change that has come about, expressed in this innocent way, must be a change of vast magnitude. What is the nature of this change? What is the mechanism of the vital processes that have now ceased? The narrowing down of this gap in our knowledge is the concerted aim of the morphologist, the cytophysiologist and the physical chemist.

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Food—the Deciding Factor. By Frank Wokes. (Penguin Special No. S. 87. Penguin Books Co., London), 1941. Pp. xi + 144.

During the last few months, the public is becoming increasingly alive to the necessity of a well-planned and equitable food policy for the world as a whole. Eminent scientists and economists of Britain are ventilating their views on this subject through the colums of *Nature*. It is believed that the adoption of a sane and humane food policy would be helpful in avoiding international conflicts which have become so dreadfully frequent.

In a Penguin Special the question of Food, which represents one of the most important deciding factors in the successful prosecution of a world war, is discussed by Frank Wokes in all its aspects. Morale on the Home front is as important as the offensive spirit on the battle-field and maintenance of both these essential qualities is intimately