a comprehensive description of the morphological forms the finished virus particles assume in the cells. She also provides an extensive bibliography of previous research related to visualization of viruses within plant cells.

Of particular interest to the reviewer is Esau's demonstration that intact BYV particles can be seen traversing the pores through the cell walls of adjacent phloem cells, whereas there is no evidence that intact TMV passes through phloem pores or plasmodesmata linking other cell types. These findings reinforce the view that transmission of TMV from cell to cell may be via TMV RNA. Also of interest is the demonstration that intact TMV particles can be found within nuclei, chloroplasts, and the cytoplasm but not within mitochondria. The discovery of TMV particles within dividing cells, sometimes in close proximity to chromosomes, with the opportunity for virus particles to become distributed between two new cells as mitosis is completed, is a compelling demonstration of how TMV can continue to invade new cells arising in meristems. It would be of great interest to extend this type of analysis to pollen and egg cells to see if it could provide an explanation for the exclusion of TMV from cells which give rise to seeds that are largely free of virus. I do not believe that direct visualization of TMV within cells provides much insight into the actual sites and mechanisms of TMV RNA reproduction and TMV protein synthesis, but visualization has certainly provided definitive evidence as to what cells and organelles are invaded by plant viruses. The quality of the techniques used for electron microscopy and the clarity of the writing in this book could not be surpassed.

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Genetics

Modern Genetics. Vol. 3. J. A. SERRA. Academic Press, New York, 1968. xii + 793 pp., illus. $27.50.

Is genetics now too big for adequate treatment by a single author under one title? This is the third volume of a three-volume treatise on the entire domain of modern genetics, to the neglect only of population genetics—"a completely revised and rewritten edition of a book first published in Portugese about fourteen years ago . . . successfully used as an advanced genetics text. . . . It would, of course, have been incomparably easier to write a more specialized or concise book, but it would be difficult to justify yet another short text on genetics . . ." (from the author's preface).

There is room in the 1634-page text of this treatise to treat far more than the simpler type-systems, and Serra does. In the final volume, one chapter each is devoted to extrachromosomal inheritance, variations in chromosome number, variations in chromosome structure, position effect and variation in genes, and sex determination.

Serra begins each chapter by establishing terminology in which to couch elaborate distinctions among categories of phenomena. He presents, in considerable detail, often undeservedly neglected examples. Prominent among these are: the distinctive behavior in germ line and soma of chromosomes in *Sciara*, gall midges, and coccids; the meiotic peculiarities associated with parthenogenesis and polyploidy in several insect orders, oligochaetes, and numerous other animals and plants; the role of heterochromatin in position-effect in *Drosophila* and in the mouse; and modes of sex determination when the array of possibilities includes hermaphrodites and intersexes. Most of the more commonly encountered examples are also presented under each heading. Serra concludes each chapter with interpretation that attempts to gather the pieces into a coherent whole. The interpretative framework, however, is itself an elaborate construction fragilely based in evidence. For this reason, the work is better regarded as a monograph than as a text.

Much of Serra's terminology, although consistently and persistently applied, is not in common use and is difficult to master merely from context. The reader who desires enlightenment on any of the subjects in this third volume must refer to definitions in both previous volumes. Fortunately the cross-referencing is extensive.

One key term defined earlier is *treption*. As distinct from mutations, treptions are changes in specific segments of the genetic material (which Serra considers by no means restricted to DNA) that are regularly inducible by specific agents, adaptive in character, normally restricted to somatic tissues, physiologically programmed, but occasionally induced by experimental mimicry of the cellular regulatory mechanism. In magnitude, treptions range from changes in chromosome number to changes in specific nucleotides. For the latter Serra adduces evidence best judged to be equivocal. Treptions provide "mass mutations" when such are appropriate to adaptive evolution. At least a third of the volume is devoted to distinguishing between instances and mechanisms of treption and mutation.

Other opinions with which the reader may take issue concern the nature of heterochromatin and the involvement of episomes, the organization of the chromosome, the genetic role of enzymes acting on DNA, or the existence of nongenetic DNA in eucaryotic chromosomes when the chromosomes are "condensed" but not when they are extended. There are also errors that escaped revision between the first writing and the time of publication. These seem inescapable in so compendious a work.

The book is difficult reading. Translation from the Portuguese produced an English that is not terse or clear or idiomatic. The publisher added nothing to its readability by printing large sections on a high-glare paper. The figures are not always clearly drawn or labeled.

Its chief merits lie in its huge bibliography, its collection of genetic phenomena still begging for explanation, and its inadvertent demonstration that we are not yet in a position to provide a coherent explanation for them. Unless and until such coherence is possible, genetics *is* too big for adequate treatment in a single work, except at the introductory level. Hence I recommend the book only to specialists able to discriminate the obsolete from the conjectural from the genuinely mysterious.

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History of Mathematics

A Source Book in Mathematics, 1200–1800. D. J. STRUIK, Ed. Harvard University Press, Cambridge, Mass., 1969. xviii + 430 pp., illus. $11.95. Source Books in the History of the Sciences.

With the upsurge of interest in things mathematical in recent years the book market is teeming with new English translations of significant works of giant mathematicians, or at least of portions of such works. As a result it is becoming ever more possible to use the classical mathematical documents

of the past as stepping-stones to a general understanding of the historical development of the subject. The recent appearance of the *Disquisitiones Arithmeticae* of Gauss, the reprinting at last of out-of-print English translations from the Greek by Heath, and the continuing publication of eight volumes of the mathematics of Newton provide the kind of source material to which one might add in time general historical and biographical detail to obtain an overall picture such as is given by Boyer, or by Eves, or by Struik in his *Concise History of Mathematics*. Struik now gives us a few additional stepping-stones in the recently published *Source Book*.

One naturally turns at this point to the earlier *Source Book in Mathematics* which first made its welcome appearance in 1929 under the editorship of David Eugene Smith. Commentaries and English translations of mathematical papers produced in the period 1450–1900 were supplied then by various scholars of repute in the history of the subject and by others well known for their contributions to pure mathematics. The new *Source Book*, on the other hand, is the work of the editor alone and as such reflects a uniform strategy of approach and a high level of historical elucidation in introductory commentary and explanatory footnote. It demonstrates the advantages of combining the masterhand of a creative mathematician with the seasoned thought of an outstanding scholar in historical perspectives. If the commentaries were taken by themselves in chronological order they would constitute an abridgment of a concise history of mathematics as Struik once wrote it out.

Mathematical categorizations of selections, similar to those in the Smith volume, are used here too. A few selections are duplicated, but with a difference. This is the case, for example, with Leibniz's "A new method for maxima and minima . . ." from the *Acta Eruditorum*, vol. 3 (1684), which, according to Struik, "opens the modern period in the history of the calculus." Struik supplies his own translation of the paper, which differs in detail from that of Evelyn Walker in the excerpt to which she was limited. Moreover, he corrects a fallacious impression left by the earlier work in that he presents separately the short section in which an integration symbol first appears. He explains that "two years after Leibniz had published his first account of the differential calculus, he published a paper on the inverse tangent problem in which the symbol $\int$ appears. This was done in a rather casual way since the paper was a review of a book by the Scottish pupil of Newton, John Craig." In general where there is a partial duplication of materials, as in Desargues, Recorde, Stevin, Wallis, Pascal, Fermat, and the brachystochrone of Johann and Jakob Bernoulli, the Struik volume excels. It also has the advantage of being a handsome edition with fine photographs of occasional pages from the masterpieces.

The sampling of Descartes' *Géométrie* is more satisfactory by far than that found in other anthologies. Smith gave an overly short excerpt taken from the translation of the whole of Appendix I by himself and Marcia Latham which was published in 1925. Midonick gave an even less adequate account in her *Treasury of Mathematics*, in which she excerpted from the Smith excerpt. It was almost a fashion to treat Descartes so, for the same fragmentation is found in Newman's *World of Mathematics*, where an excerpt from the First Book of the Smith-Latham translation appears. Struik, on the other hand, although basing his translation on the Smith-Latham work, modifies where necessary and dips into three different sections of the *Géométrie* to give the flavor and the meaning of the whole. The first is from Book III. He calls it "Theory of Equations"; in it "the Renaissance algebra of Cardan and his successors" is applied to the theory of equations. The second is "The Principle of Nonhomogeneity," presenting the application of Descartes' "reformed algebra to the geometry of the Ancients," as found in Book I. The third selection is taken from Book II, in which an illustration of the coordinate method is given in finding the *genre* of a curve described in a prescribed way. The Struik presentation is an aid to an understanding of the whole of Descartes' masterpiece and encourages a reading of it. No samples can do complete justice to the mathematical innovation imbedded in the whole of the Appendix I to the *Discours*.

Although the period 1200–1800 has been well harvested in the past, Struik has managed to highlight other important papers hitherto inaccessible to the nonspecialist in the history of mathematics. It is regrettable that the 19th century is not represented, and one hopes for a sequel in which Struik might record insights into the origins of contemporary mathematical activity.

Struik's contribution is an indispensable addition to the anthology section of the bookshelves. One might well file with it a copy of his paper to which he makes reference, "A selected list of mathematical books and articles published after 1200 and translated into English" (*Scripta Mathematica*, vol. 15, 1949). Struik expressed the hope that the final pattern of his book "does give a fairly honest picture of the mathematics typical of that period in which the foundations were laid for the theory of numbers, analytic geometry, and the calculus." In this purpose he has succeeded admirably.

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Endocrinology

The Investigation of Hypothalamic-Pituitary-Adrenal Function. Proceedings of a symposium, London, 1967. V. H. T. JAMES and J. LANDON, Eds. Cambridge University Press, New York, 1968. xii + 311 pp., illus. $13.50. Memoirs of the Society for Endocrinology, No. 17.

Half of this volume deals with basic work and the other half with clinical investigations. Despite the title, there is relatively little here on hypothalamic involvement in pituitary-adrenal function except in the first four articles. These are among the most interesting, although any new information on the isolation, chemistry, or physiology of corticotrophin-releasing factor is conspicuous by its absence.

Motta and her collaborators sum up evidence that the negative feedback of adrenal cortical steroids is exerted via the hypothalamus rather than directly on the pituitary; implants of adrenocorticotrophic hormone (ACTH) in the median eminence also inhibit pituitary ACTH release via a hypothalamic mechanism. Egdahl discusses his hypothesis that the cerebral cortex tonically inhibits ACTH release, probably by secreting an inhibitory "hind-brain factor." Motta *et al.* report actual evidence for such a factor in crude extracts of calf brain. The latter, if confirmed, may explain why removal of all brain tissue to the level of the inferior colliculus results in elevated ACTH secretion. R. Guillemin demonstrates that inhibition of thyroid-stimulating-hormone secretion by stress does not necessarily go hand in hand with increased