floors by silt-laden floods. In recent centuries these "post-Classical alluvia" have once again been subject to dissection. A similar cycle is identified for the late Pleistocene, with aggradation of somewhat coarser, less sorted and less stratified "older fill" from the stream headwaters to the coast. Whereas the "older fill" is attributed to a greater incidence of frost-weathering as well as to a seasonal incidence of more intensive rains, the "post-Classical fill" is thought to reflect vague and ill-defined climatic factors affecting the whole Mediterranean Basin simultaneously. Changes of land use, gradual or repeated devegetation, and other human influences are discounted or relegated to secondary and local significance.

Examined in detail, the field evidence is seldom adequate to support the bold generalizations and hypotheses put forward. Only a few examples can be cited here. The "older fill" is not universally contemporary, nor do these alluvia represent the total time-span of the Last Glacial anywhere in the Mediterranean Basin: all models of aggradation and downcutting aside, the actual events recorded in Provence (E. Bonifay), Mallorca (K. W. Butzer and J. Cuerda), eastern Algeria (J. Hilly), Latium and Tuscany (A. C. Blanc and others), the coastal plain of Israel (M. Pfannenstiel and others), Egypt (Butzer and C. L. Hansen), and elsewhere are incredibly complex. The Last Interglacial beaches of the Mediterranean, now partly dated by thorium-uranium (C. E. Stearns and D. L. Thurber), seldom include *Strombus bubonius* but rather have an impoverished, thermophile fauna (Bonifay and P. Mars, Butzer and Cuerda). Increased frost-weathering is not synonymous with periglacial weathering. Isolated stone artifacts can almost never be linked with specific lithic industries and therefore cannot be used to date alluvia. These comments serve to show why this reviewer is disappointed by the treatment of the older fills. Vita-Finzi's treatment of post-Classical alluvia stands up rather better: the data were all gathered personally, and the author's familiarity with classical archeology stands him in good stead. But valley alluvia are considered with little attention to colluvial deposits and the complex of slope processes; interactions of vegetation mat, soil properties, and denudational forces are neglected at the specific level; and interpretations are not based on sedimentological studies. The value of Vita-Finzi's monograph lies in the wealth of field data it brings together, and the fascinating problems it poses: the real answers must await many more local studies of the depth and detail of Vita-Finzi's own Tripolitanian work.

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The Science of Landforms

The Encyclopedia of Geomorphology. RHODES W. FAIRBRIDGE, Ed. Reinhold, New York, 1968. xvi + 1296 pp., illus. $38.50. Encyclopedia of Earth Sciences Series, vol. 3.

Geomorphology is a subject that links with many others while covering a wide field itself. Landscape, the raw material of geomorphology, is ubiquitous and the study of it is worldwide. It is therefore of particular interest and value to have assembled inside one cover the views of about 150 geomorphologists, who together discuss a very wide range of topics and represent a great variety of views, based on the study of landforms all over the world. Fairbridge has himself undertaken a major part of the work, contributing nearly 100 of the 410 articles. He is to be congratulated on assembling in this reference work so much information of interest to geomorphologists. The cross-reference system is very necessary and helpful in connecting articles on similar topics that are widely scattered throughout the book. There is also a detailed index.

In order to assess the balance of coverage of several major geomorphological topics, this reviewer followed these topics through the entries in which they arise throughout the volume. The result provided a great variety of viewpoints and of emphasis. There are some inconsistencies and several repetitions, but these are more than counterbalanced by the interest of different approaches and the range of examples cited. Nearly all of the articles are illustrated by clear line diagrams and maps, although some of these are printed too small. Again there is some repetition. There are also many photographs, most of which are of a high standard and add substantially to the value of the book. Each article is followed by a list of up-to-date references.

All fields of geomorphology are covered, and there is a very interesting set of articles on the philosophy and nature of geomorphology, including articles on general systems theory in geomorphology, geomorphological maps, and principles of geomorphology. The articles are not restricted to analysis of morphology but also include the stratigraphic or chronological approach to geomorphology. The article on the Quaternary period, by the editor, is particularly noteworthy in this respect. It is balanced by one on glacial geology and many others that deal with the development of glacial landforms.

One will have to go, however, to *The Encyclopedia of Applied Geology and Sedimentology*, which will be volume 6 in the series, to find articles on glaciology, glaciers, and glacier geophysics. This subdivision of the material in the different volumes is unfortunate, but inevitable in view of the great range of studies relevant to geomorphology. The earth sciences will eventually be covered in eight volumes, of which the present one—the latest published so far—is the third. Thus geomorphology takes its place here alongside geology, geophysics, and oceanography. The only concession in the volume to its links with geography, which are much stronger in Europe than in the United States, is an article entitled "Geography: concept, growth, and status." That geomorphology can stand as a science in its own right, however, is amply demonstrated by the vast amount of work which has been devoted to it and which is so ably displayed in all its variety by the geomorphologists who have contributed to this very useful encyclopedia.

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Pathogens

Viruses in Plant Hosts. Form, Distribution, and Pathologic Effects. KATHERINE ESAU. University of Wisconsin Press, Madison, 1968. xii + 228 pp., illus. $10. The 1968 John Charles Walker Lectures.

This book represents the substance of a series of three lectures its author presented at the University of Wisconsin in 1968. With the aid of a great many elegant electron micrographs of sectioned plant tissues infected either with beet yellows virus (which is confined largely to phloem) or with tobacco mosaic virus (which is found in nearly all cell types of the plant), she provides

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