dustrial worker. But it is a small elite that can enjoy leisure in his special sense. And a little further research would show him that there are still those, but no longer an aristocratic elite at the top, who are able to pursue, without regard for the clock, the cultivation of the mind and the enjoyments of a cultured life. Besides, in his indictment of modern civilization, de Grazia tends to look with overkindly eyes on the civilizations of the past. Did workers of the Middle Ages, mostly serfs and peasants bound to the land, really enjoy as free time the equivalent of every second day in the year? What evidence has he that in ancient Rome "health and hygiene were as good as they've ever been"? Did a "rude ruddy industrialism glow" in America before it was choked by the tyranny of the clock? There are numbers of such statements that make tendentious comparisons between the present and early times. Furthermore, de Grazia should correct his reference to the UNESCO Declaration of Human Rights—it should, of course, be the U.N. Declaration.

In spite of the needless invidiousness of some of de Grazia's comparisons, his work conveys a very important message. The illusory character of much of the "free time" we attribute to modern developments is admirably revealed and so are the causes of it—the clutter of transportation, the bottlenecks of industry, the plethora of paperwork, the cost of mobility, and the like. On the other hand, the reluctance to give the man of ingenuity and intellectual resource, the deeper if slower thinker, a freer rein to work things out his own way and at his own pace, call urgently for the wisdom of our planners and policy-makers. Moreover, the human need to find enjoyment in what one does, in one's work and in one's play, distinct from excitation and hurry and artificial stimulation, the need to reflect more and to contemplate more, and the need for the kind of education that would encourage rather than dull this need, cannot be overestimated.

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Biology Study Series

The Physiology of Flowering. W. S. Hillman. Holt, Rinehart, and Winston, New York, 1962. xii + 164 pp. Illus. $4.50.

The author of this little volume, W. S. Hillman, is a competent investigator who has made significant contributions to the field, and in this book he reviews many experiments and discusses numerous concepts within a limited space. He has quite successfully organized a very useful summary of significant information on the physiology of flowering, particularly with reference to the processes that affect the initiation and early development of flowers.

After an introductory chapter on the morphology and measurement of flowering, the author presents a condensed statement of the phenomenon of photoperiodism, ranging from definitions and examples of the phenomenon to summaries on the role of leaves, the light requirements, the role of the dark period, and the modifying effects of temperature. He then analyzes the nature of photoperiodism with respect to the effect of the quality of the light at the time of the low-intensity light break during the dark period, and spends a considerable amount of space on circadian rhythms and on light-dark cycles of different length. There are other chapters on temperature and flowering, on "floral hormones," and on the chemical control of flowering, as well as sections on other phenomena related to floral initiation.

Hillman stresses a concept with which some might disagree—that flowering is not a qualitative change, that meristematic regions from which floral or vegetative organs develop are merely extremes of a continuum.

The author has intentionally included conflicting evidence and differing concepts in a given area, because he believes that this type of presentation will give the student a truer picture of the field. Since this is done within the limited space dictated by specifications for the series in which this volume is published, the presentation is extremely condensed, with no tabular or graphical data. The only illustrations are photographs of flowering plants. One wonders if the student who has limited contact with original papers in this field may not find this difficult reading.

This book will probably be most useful to graduate students and their teachers, although it was written for a wider audience. The graduate student will find it a balanced, comprehensive survey of the state of knowledge in this area of biology, which should be more useful to him than symposia volumes or annual reviews. The numerous references to significant papers and reviews will enable the student to use this book as a sound introduction to one of the most fascinating aspects of plant physiology. The book is well indexed and quite free of typographical errors.

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Improving Intelligence

Intelligence and Experience. J. McV. Hunt. Ronald, New York, 1961. ix + 416 pp. $8.

Almost anyone who has considered the matter would agree that the variability men show in linguistic, mathematical, mechanical, musical, or any other kind of ability is in part attributable to differences that are primarily genetically determined and in part to differences in experience, education, and training. When instead of ability in one of these areas one writes *intelligence*, the situation gets more confused, for *intelligence* has sometimes been used as a description and sometimes as an explanation of performance. Moreover, there has been great disagreement over how much of the variance of intelligence should be attributed to hereditary differences and how much to environmental differences. There has never been any satisfactory answer to this question. Most children get both their genes and their early training from the same parents; statistical analyses for one population have not agreed with statistical analyses for a different population; the appropriateness of the methods of analysis has been questioned; attempts to devise intelligence tests free from the influence of cultural differences have never been satisfactory; and so the argument has gone on.

Hunt takes the position that the hereditary contribution has usually been overemphasized. His thorough analysis of the evidence leads him to

conclude that experience, particularly early childhood experience, plays a larger role than has usually been assumed.

Most of his evidence comes from the work of Piaget and his collaborators at the Rousseau Institute in Geneva. Piaget's carefully detailed analyses of the intellectual development of many children provide the basis for two long chapters in Hunt's book. Their contribution to Hunt's argument is a detailed, and often charming, account of the processes of intellectual development, of the continuous interaction between what the child can do (as a result of genetic constitution or earlier experience) and what the environment offers in the way of stimulation, challenge, and variety of experience. These chapters, by the way, can be read alone if one wants an excellent introduction to Piaget's work but is not interested in the basic argument that Hunt develops.

Earlier chapters discuss the evidence for and against the belief in intelligence as something fixed and predetermined, the evidence for and against the belief in predetermined development, and the evidence and speculation concerning intellectual development that have come from newer work on neurophysiology, learning, and the effects of early deprivation on later performance, and the ideas that come from work on programing computers to solve problems. Then come the chapters on Piaget's work, a chapter on the implications of Piaget's work and the other evidence presented, one that reinterprets much of the evidence that had earlier been interpreted to favor the idea of a fixed and predetermined development of intelligence, and a final chapter of recapitulation and summary.

Intelligence is a phenotype "for which the genes set limits of potential development but which is finally developed through encounters with the environment." Anyone who believes that the environmental contribution is only a minor one has a very strong case to answer. While there can be no general answer to the question of how much each factor contributes, Hunt suggests that "a sound scientific educational psychology of early experience" might raise the average Intelligence Quotient by something like 30 points. This estimate seems reasonable. In a technological culture that increasingly demands intellectual ability, the possibility of such an average increase justifies major efforts to develop the additional knowledge needed to give us a "sound scientific educational psychology of early experience."

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Microorganisms

The Biochemistry of Intracellular Parasitism. J. W. Moulder. University of Chicago Press, Chicago, 1962. xvi + 172 pp. $6.

This excellent book covers a topic which, with few exceptions, has been neglected, namely, the biochemistry of the microorganism that is neither a typical bacterium nor a typical virus.

Following his introductory chapter, Moulder considers four obligate intracellular parasites. The first one is the malarial parasite, "an organism with wide metabolic capability but with a comparative handful of restrictive enzymic peculiarities." Moulder then turns to the rickettsiae, which "have retained most of their enzyme systems but have lost many mechanisms for buffering themselves against unfavorable changes in their environment." Next in line are the agents of the psittacosis-lymphogranuloma venereum group which "depend on their hosts to generate energy-rich intermediates for them." Last are the pox viruses, which, despite their complexity, are viruses and thus depend "on the host for synthetic enzymes." Two of these parasites have been intensely studied in Moulder's laboratory.

Although the four types of intracellular parasites are arranged in order of increasing complexity, Moulder, in his concluding chapter, finds no evidence of an evolutionary history among them. There seems to be a complete gap in our knowledge of any intermediate step between the organismal type of intracellular parasite which has its own DNA-RNA-protein relationship and the viral type in which the RNA of the host has been substituted.

The strength of this book lies in the lucid development of each topic. For example, the discussion of the psittacosis agent evolves from the developmental cycle and susceptibility to sulfonamides and penicillin to the syntheses of folic acid and of some cell wall components. Moulder adheres closely to available evidence, but he offers provocative interpretations and speculations. Isolated observations that cannot be readily integrated with other information are usually omitted. The illustrations and general format are excellent. The book contains an index and a list of references that is extensive and up-to-date, but selective.

This book can be highly recommended to any earnest student of biology, rather than to those in any particular specialty. It is highly informative and stimulating, it covers a promising field of research, and any reader with a basic knowledge of biology can understand it.

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General Biology Textbook

Principles of Biology. Neal D. Buffaloe. Prentice-Hall, Englewood Cliffs, N.J., 1962. xiii + 365 pp. Illus. Trade ed., $9.25; text ed., $6.95.

Principles of Biology is one of the relatively few general textbooks of college biology that are written specifically for a one-semester course. The one-semester textbook presents a particularly difficult problem, for the author must convey the essence of biological science without superficiality and yet must avoid undue emphasis on detail. (I still consider *Animal Biology* by Haldane and Huxley, which appeared some 35 years ago, a model of such treatment.)

Buffaloe follows traditional patterns of textbook organization. There are ten chapters, of which the first three are concerned with science and biology, the nature of matter, and the organization of living matter. This material is covered in 40 brief pages that allow space primarily for listing, rather than for explaining, these important subjects and concepts. Chapter 4, profusely illustrated with interesting photographs, attempts the classification of organisms (both plant and animal), but again the author succeeds only in listing a few representatives of each division and phylum. Metabolism is treated in chapter 5, with emphasis on catabolism and