

beginning with Mendel's laws and the physical basis of evolution. Problems relating to population genetics are discussed clearly, and the role of polymorphism in evolution forms a special chapter. This section could perhaps have been profitably expanded. As the author points out, the relationship of falciparum malaria to the sickle cell gene is the best example of single gene heterosis, and it is a pity that the subject is dismissed in summary fashion. The clarity of the series of chapters on the mechanism of evolution is noteworthy, and these chapters provide a solid foundation for the section on evolution and man.

Unfortunately the chapters on human evolution are rather less satisfying. There is, for example, no real discussion of the problem of whether human evolution has come to a halt now that childhood mortality and birth rate have decreased. Thus we find no mention of Crow's useful index, Opportunity for Selection, with its initially surprising conclusion that the lower the birth rate the higher the index becomes. Although the phenomenon, unique to man, of cultural evolution is mentioned, it does not receive the treatment it deserves. The important but often neglected point that biological and cultural evolution are part and parcel of the same unified process could have been made more strongly. The book is, in general, well illustrated, but the inclusion of jejeune drawings in a serious text strikes a harshly discordant note. Despite these minor criticisms *Evolution and Genetics* is a sound treatise that can be expected to have a limited appeal. However, it seems unlikely that it will substitute for, let alone replace, the standard texts in the field.

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Enzymatic Mechanisms

Molecular Biochemistry. Edward M. Kosower. McGraw-Hill, New York, 1962. xii + 304 pp. Illus. \$12.50.

As I predicted in an earlier review [*Science* 136, 1113 (1962)], the time is ripe for a profusion of books discussing the new and active field of biochemical or enzymatic mechanisms, or, as Kosower described it, molecular biochemistry.

The present book, a scholarly work aimed at the second-year graduate student, is organized in three sections. In one, on biochemical patterns, the author presents "a survey and classification of many of the reactions of intermediary metabolism" (63 pages), in which he attempts to initiate the nonbiochemist into some of the more important reactions and reaction sequences in metabolic reactions and the biochemist into a classification of biochemical reactions from an organic mechanistic point of view.

With this background, it is then possible to discuss in detail "the mechanisms of many of these reactions, with the relationship of the enzymatic reaction shown where possible." In this section, which is the heart of the book, the mechanisms of the following reactions are discussed: carboxylation and decarboxylation, enolization and aldol condensation, nucleophilic displacements, hydration and dehydration, imines, hydrolysis of esters and amides, principles of oxidation-reduction reactions, one-electron, two-electron, and atom or group transfer, pyridine nucleotides, flavins, and phosphates. It would have been desirable in certain of the discussions if the enzymatic counterparts of these reactions had been presented in more detail. As the author himself points out, his special interests are reflected in his treatment of pyridine nucleotides, a very complete and incisive treatment occupying 54 of the 208 pages of the second section. But this emphasis can certainly be justified on the basis of the author's experience in the field and also because a considerable amount of material is available on this topic. Other topics are not amenable to such treatment because the information needed to treat them within the context of this book simply does not exist. Consequently the book cannot be considered to be a balanced treatment of all topics in molecular biochemistry; it is rather a selection of some of the topics that have been amenable to experimental investigation. Particularly noteworthy are the discussions of the mechanisms of oxidation-reduction reactions and phosphate reactions, both of which are of great importance in biochemical systems and both of which have hitherto received little attention. Kosower's discussion has admirably corrected this deficiency.

The third, miniscule section deals with "one of the central problems of

biochemistry, the 'active site'." It is an unfortunate reflection of the present state of our knowledge that this section is not the major part of this book, because it is obviously to this end that the book was written.

The book in general is well written and contains many ideas that will stimulate further research. The author has performed a heroic job of keeping the book up-to-date with many citations to 1962 articles; activity in this area can be measured by the fact that, even with such an accomplishment, the book is already out of date. Graduate students—of biochemistry and, in particular, chemistry—and others interested in this area will find this a valuable book.

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Botanical Classification

Plant Taxonomy. Methods and principles. Lyman Benson. Ronald, New York, 1962. ix + 494 pp. Illus. \$11.50.

According to the author's preface, this book is "primarily written as a textbook for students who have already acquired some familiarity with plant classification." Its "orientation . . . is toward research," and it places "primary emphasis upon the dynamic application of taxonomic methods and principles. . . ." However, the book reflects too heavily Benson's own taxonomic views and research; because of this imbalance it may prove unsuccessful as a textbook. One finds, for instance, over a page of index references to *Quercus* and *Ranunculus* collectively, whereas such genera as *Achillea*, *Crepis*, *Layia*, *Oenothera*, *Potentilla*, *Rubus*, *Solidago*, and *Tragopogon* are scantily represented, or not listed. Similarly, such terms as *biotype*, *cline*, *cytotaxonomy*, *deme*, and *karyotype* are discussed briefly or not at all. At least a passing knowledge of the important research on these genera and of the meaning and significance of bio-systematic terminology should be a part of the background of every plant taxonomist, even of those who believe that the study of evolution and the practice of taxonomy are disparate fields with little or no overlap in their objectives.

The preponderance of illustrative material from Pacific coast flora may limit the book's utility outside that region, although some may consider its restricted taxonomic and geographic scope a pedagogic virtue. Six pages are devoted to cytological technique, yet chromosomes are illustrated in only one figure and are discussed rather briefly (despite a chapter entitled "Data from cytogenetics"). There is a fine dedication to Harvey Monroe Hall, an American pioneer in the field of biosystematics, who was responsible for the direction taken by a considerable portion of taxonomic research carried on in the United States during the middle decades of this century. Curiously, however, Benson devotes little space to the school of genecology inspired by Hall and Göte Turesson or to the work of Hall's colleagues and successors—Clausen, Keck, and Hiesey.

Among this book's assets are the copious and excellent illustrations, the portions dealing with description and documentation, and the comprehensive up-to-date bibliography. The book is an honest and sincere presentation, but its unevenness may prevent its wide use as a text and thus cause it to miss the audience for which it is primarily intended. It should be read by every botanist interested in systematics, for it is a readable résumé of Benson's own work on oaks and buttercups.

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I.Q., an Oversold Concept

Creativity and Intelligence. Explorations with gifted children. Jacob W. Getzels and Philip W. Jackson. Wiley, New York, 1962. xvii + 293 pp. Illus. \$6.50.

This book reports an important piece of psychological research carried on in the late 1950's at the University of Chicago. As the phrase "gifted children" will suggest to those who are familiar with the psychological literature of the past 40 years, the study stems basically, although at some distance in time, from Lewis M. Terman's pioneer work with gifted children (defined as children with an I.Q. of 140 or greater) in California. The Getzels and Jackson study is also, and perhaps this is its greatest significance, an astringent corrective to the

oversold concept of the I.Q. and its accompanying test paraphernalia. The I.Q., in the hands of officious school counselors and credulous school administrators and teachers, has for several decades cowed children and their parents with the idea that the quantity of a fixed, real, given-by-nature, precisely measurable, and important trait called intelligence, to which a single number could be attached, had been ascertained with exactness in that particular child's case. And of course it was almost as bad to have a very high I.Q. as it was to have a very low one; in either event, the expectations were definite, and the student's self-esteem inevitably suffered abrasions at some time or other.

Getzels and Jackson were by no means the first psychologists to recognize the folly of this system, nor for that matter were they first to carry out investigations establishing the relationship of measures of general intelligence to measures of creativity. Their contribution lies rather in their dramatic use of the test results, especially in the telling individual cases they report, and in their informed and penetrating discussion of the issues upon which their data shed some light.

The data themselves consist of intelligence test scores, creativity test scores, and measures of scholastic achievement of some 500 boys and girls in grades 6 through 12 in a private school in the Chicago area. On the basis of a rational combination of the intelligence test scores and the creativity scores, two small groups, of 26 and 28 students respectively, were designated as "High Creativity" and "High Intelligence." These two groups, which proved to be about equal in academic achievement in spite of marked I.Q. differences, were contrasted in terms of values and of cognitive style exhibited in other test performances. The "high creativity" subjects showed significantly more humor, playfulness, incongruities, unexpected endings, and stimulus-free (as opposed to perceptually rigid or stimulus-bound) themes in the stories they invented, and more violence as well, it may be noted. In values, "high intelligence" subjects put more emphasis upon conventional success and upon conformity to adult values as desirable goals.

The data are slight in themselves and would not warrant the far-reaching interpretations the authors have placed upon them were it not for their internal consistency and sensibleness as well as

their neat dovetailing with a host of other findings that are emerging from an impressive volume of recent research on creativity in a wide variety of settings. Getzels and Jackson seem to have summed up the tenor of much of this recent work in their own study.

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Cancer Cell Behavior

An Introduction to the Biochemistry of the Cancer Cell. Harris Busch. Academic Press, New York, 1962. xiv + 424 pp. Illus. \$13.50.

In this timely book Harris Busch has attempted to look at the cancer cell in the light of the impressive strides made in biochemical genetics during the past decade. It is not surprising that the discussion is limited in its scope, since consideration of the cancer cell is equivalent to the consideration of the whole field of cellular biochemistry. Busch has focused his attention here on aspects of cancer cell behavior. He considers the chemistry of nuclear structures and their roles in protein synthesis, and he draws heavily on his own studies on the chemistry and metabolism of nuclear proteins in normal and neoplastic tissues. The relationship of this genetic discussion to cancer is brought out in a chapter on cancer chemotherapy and in a chapter that deals with carcinogenesis.

The second part of the book deals with what Busch calls the phenotype of cancer cells. This designation seems somewhat forced, since no common phenotype in cancer cells is apparent, save perhaps the tendency of most tumors to have high rates of aerobic and anaerobic glycolysis. The discussion of toxohormone, an agent from tumors which suppresses the activity of liver catalase, is very good. A chapter on mucoproteins, better designated as glycoproteins, is interesting but not very pertinent to any "cancer cell phenotype." Cancer antigens, paraproteins associated with plasmacytomas, are also considered.

The author has contributed considerably to knowledge on the interplay of glycolysis and amino acid metabolism and to the utilization of plasma