the "fully-integrated" and the "in-betweens." These two latter groups, in fact, are mentioned only once, in one paragraph. Keniston makes it clear that his sample of extremely alienated students is not typical of American youth; they were, he says, selected "precisely *because* their alienation was extreme." But while, as he says, there *is* a long scientific tradition of studying the extreme to understand the typical, it is fallacious to endow the normal with the very qualities which the abnormal exhibits. There is a curious leap, from establishing the fact that alienation may be induced by certain qualities found within a culture, to saying that the culture itself is alienation-producing; and from there to the next crag of saying that American culture is an "alienated" one. Yet this is exactly what Keniston does, and the reader of the literature of alienation once more is thrown back on a meager store of information: we are told by Keniston that "We are approaching . . . a new turning point in American society . . .," that there is a "loss in the sense of social power," there is a "mid-century malaise," and that "we have grown discontented, confused, and aimless." Something called a "technological process" is said to be responsible for this, and the preachment is summarized in Keniston's pious words: "We must not return to the past, but transcend the present."

Although American society draws some of its best as well as its worst critics from the ranks of the alienated as here described, it by no means follows that since this is so the society itself is a victim of the very "sickness" which produces its critics. We have never had any hard statistics on the extent of personal alienation in American culture. Yet there are some hard statistics on students; despite the recent rash of student rebellion at Berkeley and elsewhere, it is painfully clear that undergraduate conformists are still as numerically preponderant as they have ever been. To perch a theory of American society on the present student generation (a questionable undertaking at best) would give rise to no such apocalyptic expectations as Keniston here suggests. But to ground this heavy theory upon the tiny band of Inburn, his co-alienates, and their various mothers, sisters, cousins, and aunts, imposes a heavy burden on them; never have so few been used to prove so much.

Fungal Genetics

Little more than two decades ago, at the time that Beadle and Tatum demonstrated the direct relationship between genes and enzymes, fungal genetics as a field of serious research was, for practical purposes, nonexistent. To be sure, a few fungi had been examined genetically, but the genetic aspects of such work was typically more or less incidental to efforts to clarify such aspects as life cycles, patterns of sexuality, and pathogenicity. During the recent past the development of the field has been spectacular along two divergent lines of primary interest: one is the study of the genetics of systems peculiar to or of special significance in the fungi; the other, and by far the more popular, is the study of basic genetics in fungal materials, because of the numerous favorable characteristics for genetical research afforded by the fungi.

Karl Esser and Rudolf Kuenen's comprehensive treatment of the subject, **Genetik der Pilze** (Springer-Verlag, New York, 1965. 503 pp., $17), reflects this dichotomy. Of the seven chapters, the first two are devoted to the morphology and developmental histories of those fungi that have played significant roles in genetical research and to reproduction in fungi, with emphasis on genetic aspects insofar as these are known. These chapters, especially the latter, are particularly welcome because they provide a detailed and up-to-date exposition of a field having a massive but fragmentary literature that has not previously been available in a single account. The authors' interpretations are often quite novel and always definitive; all mycologists will find details and views here with which to disagree, but this should enhance the overall value of this section with respect to the thorough understanding of what follows. The remainder of the book, with chapters on DNA-replication, recombination, mutation, gene function, and extrachromosomal inheritance, deals with the purely genetic aspects of the subject, with particular emphasis on those methods of analysis or phenomena that are peculiar to or especially prominent in the fungi —for example, analysis of ordered and unordered tetrads, heterokaryotic allelic tests, somatic recombination, and the like. Information from studies with other microorganisms but not available for the fungi—for example, replication of DNA and regulatory systems—is included only to the extent necessary to cast the subject of fungal genetics in its true perspective as a significant facet of modern genetics.

This book has much to recommend it to those interested either in fungi or in genetics, and it should be indispensable to those interested in both of these subject areas. Perhaps its most valuable feature is the extent of its bibliographies, which are grouped at the ends of the individual chapters (for example, about 500 references are listed, complete with titles, for the chapter on reproduction), and of its tabular materials, which include, in most cases, the citation of specific references for individual entries. This is the second noteworthy book on fungal genetics published in the past 2 years. The first, *Fungal Genetics* by Fincham and Day, a less exhaustive treatment of the subject than the present volume, nicely filled a need for a well-presented account of a previously neglected area of biological significance. *Genetik der Pilze*, with its somewhat different emphasis and very comprehensive treatment, is a most useful addition to the limited reference literature on fungal genetics. Research workers in the fields of genetics and mycology will derive the greatest benefit from this new treatment of the subject, but it should also find wide usage among advanced students. It is to be hoped that publication of an English edition will not be long delayed.

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Inherited Anemia

The discovery of a single amino acid substitution in sickle-cell hemoglobin heralded a new era in biochemical genetics. The evolutionary basis for the structural homologies and the inherited variation of the hemoglobin polypeptides have served as a prototype for our understanding of the evolution of proteins. The precise structural alterations of the various abnormal hemoglobins have been disclosed with remarkable rapidity. We now recognize some 32 abnormal hemoglobins known to differ from normal hemoglobin by a single amino acid substitution and one abnormal hemoglobin, Lepore, which is the consequence of an unequal crossing over between the β and δ loci.

In sharp contrast to our comprehension of the hemoglobinopathies is our

lack of understanding of common inherited anemia, thalassemia. The need for urgent clarification of the thalassemia disorders is brought into sharp focus by D. J. Weatherall's book **The Thalassemia Syndromes** (Davis, Philadelphia, Pa., 1965. 284 pp., $9). Drawing from a background of hematology and research in human genetics, Weatherall has succeeded in presenting an intelligible account of thalassemia, in which he analyzes the condition as a disturbance of normal protein synthesis. Thus we find discussions on the possible role of defective messenger RNA and blocked ribosomes, as well as on nonelectrophoretic amino acid substitution in the primary structure.

This monograph, which is based on a doctoral thesis, begins with a historical review that includes an interesting description of the first account of a form of familial anemia, now widely known as thalassemia ($\theta\alpha\lambda\alpha\sigma\sigma\alpha$, the sea). A short and appropriate account of the genetics and biochemistry of normal hemoglobin synthesis precedes chapters in which the genetic and biochemical studies of thalassemia are considered. The critical role of family material in understanding the genetics of thalassemia is emphasized by inclusion of extensive, lucidly presented, pedigree data. The prevalence and clinical characteristics of thalassemia in different races is conveniently contrasted in tabular form. The structural studies, which include peptide mapping, performed on hemoglobin from affected individuals, are fully described and informatively illustrated. In a work that is so commendable, there can be little objection in offering minor criticism. The present tendency to designate the genes β^S, β^D, and β^G as alleles is likely to lead to confusion. Once it has been established that two genes control different sequences in a given polypeptide chain, it would seem more explicit to refer to these as linked, but nonallelic genes. Moreover, hemoglobins H (β_4) and Barts (γ_4) should be considered multimers of normal polypeptide chains, rather than as hemoglobin variants. In a few places the number of hemoglobin polypeptide chains is incorrectly printed as a superscript rather than a subscript.

Weatherall has succeeded in presenting a perspicacious and lively treatise on a difficult group of heterogeneous inherited syndromes. His book is highly recommended to those working in the field of biochemical and medical genetics, as well as those interested in the more restricted area of genetic control of hemoglobin structure.

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By-products of Industrial Civilization

Britain more than any other country deserves the epithet "cradle of the industrial revolution." On page 35 of this volume, **Ecology and the Industrial Society** (Wiley, New York, 1965. 403 pp., $11), edited by Gordon T. Goodman, R. W. Edwards, and J. M. Lambert, there is a description of Newcastle about 250 years ago: "This country all about is full of ye coale, ye sulfur of it taints ye aire and it smells strongly to strangers." It is thus peculiarly appropriate that the British Ecological Society should devote one of its annual symposia (the fifth) to an examination of what man has wrought as a by-product of his domination of nature. The overall impact of this book is that of a well-documented, unimpassioned review and assessment of some of the effects on plants and animals, including man, of various waste products and of more deliberately created poisons which have been introduced into air, water, and soil.

Of the individual contributions, two deal specifically with problems of air pollution, the rest being about equally divided into those concerned with water and with land. Two contributions, on the ecology of domestic pests (Solomon) and on marine fouling organisms (Crisp), seemed out of place, no matter how interesting their subjects are intrinsically. The others are something of a mosaic of bits and pieces of expertise, but owing to their subject matter they do provide a coherent picture. Quality of the individual chapters is high. I regretted finding nothing concerned with the effects of industrialization on land use itself, but this might easily have gotten out of hand. It also seems a loss not to publish the discussions as they have been published in the past. Especially with a topic like this one, the discussion might have been as revealing with respect to the outlook for the future as the more factual presentations themselves.

A general account of the sources, amounts, and effects of the main air pollutants (Thomas) is followed by a short description of decline in lichen diversity as an indicator of air pollution, using Newcastle as an example (Gilbert). Hynes then attempts a comprehensive review of water-pollution problems. He makes specific recommendations based on the position that we know how to solve most of the problems, but that, aside from vested interest and other considerations opposing improvement, ". . . education is needed to tell the general public that they will get only the water and amenities they deserve." Templeton reviews what is known concerning disposal in the sea of radioactive wastes, but makes no real attempt at evaluation. There is an informative discussion of modes of sewage treatment and disposal (Hawkes), which reminds us how recent such efforts really are. The more specialized papers also include what is known of oxygen levels in streams (R. W. Edwards and Owen) and of the problems involved in estimating the effects of pollution on fisheries (Herbert). Tarzwell reviews the effects of synthetic pesticides on aquatic organisms. Moore and C. A. Edwards also examine the pesticide problem, the former pointing out how widespread the chlorinated hydrocarbons are in the tissues of various British birds, the latter focusing on the persistence of these substances in soils, and on the often unintended changes in arthropod fauna that result. Two papers concern themselves with efforts to revegetate wastelands (Knabe, and Weston and others), and one (Bradshaw and others) points out the extent to which certain plants have developed resistance to the heavy metals that commonly remain at the surface in areas of mining.

It is fitting that the symposium was held at Swansea, close to an area of mining wastes described as so ugly that ". . . the difficulties of landscape improvement had seemed so insuperable as to lead locally to a general feeling of hopelessness regarding any future development of the Valley." Despite the existence of such extreme situations, I came away from the book with the impression that the authors feel that the motto "we'll muddle