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

through" applies. This may be unfair; somehow I also read into the book the implicit statement that "if you think things are bad here, you should see the United States." If true, this assessment derives more from the contributions of the two Americans who participated in the symposium than from any British proclamation of superiority. I am not convinced that Britain is significantly closer than we to that hypothetical steady state which theoretical ecologists like to dream about.

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Chemistry of Natural Products

Only infrequently does one who reviews a volume the size of this one find that the task is not onerous but actually thrilling and immensely stimulating. R. H. F. Manske, who edited the volume, **The Indole Alkaloids** (Academic Press, New York, 1965. 877 pp., $32), is to be congratulated for having assembled an all-star cast of collaborators for the production of this latest volume of his definitive series, "The Alkaloids: Chemistry and Physiology."

In the entire field of the chemistry of natural products, the explosive advances made during recent years in the chemistry of the indole alkaloids probably have no parallel. In volume 7 of the series (1960), treatment of the subject comprised some 200 pages; the present volume runs to something like four times that number of pages, with most of the content being new. Material reported in previous volumes is summarized to the extent that the present volume is self-consistent but not repetitive.

The book contains 22 chapters written by such authorities in the alkaloid field as A. R. Battersby, E. Coxworth, B. Gilbert, J. E. Saxton, E. Schlittler, G. F. Smith, A. Stoll, W. I. Taylor, and Manske himself, with the assistance of coauthors in some instances. The impact of the development of new physical methods such as nuclear magnetic resonance (NMR), mass spectrometry, and x-ray analysis on the solution of the problem of structure assignment and stereo conformation is apparent throughout the volume. This is strikingly emphasized by the fact that in volume 7, which covers the literature through 1957, five pages were devoted to alkaloids of the *Aspidosperma* and the structure of no member of the group was known. In volume 8, 178 pages are devoted to this group. The extensive compilations of fragmentation patterns and NMR data will be of invaluable help to those who, in the future, engage in structural studies of natural products.

Classification of the alkaloids is becoming increasingly difficult, and for the most part a system based on botanical origin has been used in this volume. This necessarily involves some overlap, but repetition is avoided by judicious cross-referencing. The book's appeal to the taxonomist will be great.

The literature is covered through 1964, a feat not frequently encountered. In some chapters references to *Chemical Abstracts* are included in citing work published in obscure journals, a practice that merits commendation.

The typography is excellent. The relatively high cost of the book seems quite justified in view of the plethora of projection structures and tables. I noted only one minor error.

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Geobotany

The science of geobotany, or the use of plants as indicators of variations in the chemistry or water availability of the substrate, has not been adequately developed in the United States. Government agencies have made a few studies of the use of indicator plants in prospecting, and several bulletins describing phreatophytes that indicate groundwater have been published. University research in this field has not been significant, and that of private companies, of course, is not being published. The governmental organization and integration of environmental projects in Russia have advanced the science markedly in that country. A geobotanist is automatically included on all geological expeditions. Maps of plant distribution are first made from the air and later ground checked as additional environmental data are acquired. Fine maps of plant distribution are available for all of Russia, and detailed studies are being made continuously by a large staff of well-trained scientists.

This volume, **Plant Indicators of Soils, Rocks, and Subsurface Waters** (Consultants Bureau, New York, 1965. 222 pp., $27.50), edited by A. G. Chikishev, is a collection of papers given at a joint conference of the Geographical Section of the Moscow Society of Naturalists, the All-Union Research Institute of Hydrogeology and Engineering Geology, and the All-Union Aerogeological Trust by workers who have been studying the effectiveness of geobotanical indicators in solving a wide range of scientific and practical problems. According to the preface, plant indicators are being used "in the agricultural evaluation of territories, in engineering and geological surveys, for clarifying hydrogeological conditions in irrigated districts, for studies of swamps intended for industrial and agricultural uses, in prospecting for certain species of useful fossils, etc." The book includes fairly generalized review papers by the well-known geobotanists, Viktorov, Voronkova, Vostokova, Vyshivkin, Shvyryaeva, and Nesvetailova, and detailed accounts of specific projects by 44 new workers.

A half-dozen papers deal with the use of plants in determining the chemical composition of, and depth to, groundwater. This knowledge has aided greatly in the search for freshwater in southern deserts, and in areas of salt water north of the Caspian Sea. Other papers describe the use of plants in determining the structure of peat deposits, and the degree of decomposition, the humidity, ash content, and groundwater level in bogs.

Plant distribution is used in engineering geology to determine the extent of particular soil units, the mechanical composition of the subsoil, and general hydrogeological conditions. Indicator plants are also used to assess soil fertility, delineate alluvial plains, evaluate salinization, dryness, and so forth.

Indicator plants are being used as aids in mapping Quaternary deposits of various kinds, including fluvioglacial and morainic deposits, and in prospecting for salt domes and kimberlite dikes.

Shvyryaeva gives a fine discussion of the compilation of geobotanical maps. If data are collected on the soils, the age, genesis, and lithology of the underlying rocks, the salinity of the rocks, the depth and mineralization at the groundwater table, and the geomorphology at the time of plant map-