come down because "climatologists are no longer content with the analysis of data designed only for weather forecasting." They have gone beyond, developing budgets of energy and water that render "the seemingly noncomparable climatic elements amenable to precise and unifying physical interpretation." Chang's experience with such climatologists as C. F. Brooks and C. W. Thornthwaite, his own research on soil temperature, evapotranspiration, and geographic-scale distributions, and his association with the advanced agriculture of Hawaii and its university have enabled him to make an important contribution toward our fuller understanding of those indispensable organisms, the domesticated plants.

DAVID H. MILLER
Department of Geography,
University of Wisconsin-Milwaukee

Ecosystems

Fundamentals of Forest Biogeocoenology. V. SUKACHEV and N. DYLIS. Translated from the Russian edition (Moscow, 1964) by J. M. Maclennan. Oliver and Boyd, Edinburgh, 1968. viii + 672 pp., illus. £ 12. 12s.

Twentieth-century Russian scientists have contributed importantly to the development of the science of forest ecology, and now English-reading ecologists have access for the first time to the data and thinking of the current generation of Soviet scholars in this field. Sukachev and his colleagues write about the forest ecosystem, but describe it as a "biogeocoenose," preferring the latter term as specifically emphasizing "the fact that here we have a unit of organisms closely inter-related with their environment" and avoiding the term "ecology" in dealing with community studies because in the Soviet Union it is identified primarily with autecology.

The ten chapters are separately authored by scientists in the Forestry Laboratory and in the V. L. Kamarov Botanical Institute of the Academy of Sciences of the U.S.S.R. The late V. N. Sukachev wrote the first and last chapters and is listed as the senior editor. N. Dylis, his senior research assistant, is senior author of the longest chapter (156 pp.), dealing with the vegetation component of the forest ecosystem, and junior editor of the entire work.

Chapters 2 through 6 deal separately and in detail with the atmospheric, plant, animal, microorganism, and soil components of the forest ecosystem. They provide an individual guide into much basic Russian work, which is fully covered by the excellent Russian bibliography presented. The data derive from studies similar to those carried out contemporaneously in Europe and North America, and so afford important comparisons from a major portion of the world's temperate forests. Such matters are dealt with as evapotranspiration losses from different types of forests, leaf mass and leaf surface in various forest stands, and characteristics of microorganisms in forest soils. Both forest animals and soil microorganisms are dealt with exhaustively.

The treatment of succession (chapter 7) is brief and general, as is that of the other synthetic elements of ecosystem (or biogeocoenose) analysis. The reader will look in vain for a treatment of forest geography in the U.S.S.R., but the development of the principles of forest classification is traced from Morozov's 1912 book on "forest science" to the All-Union Congress on Forest Typology in 1950 and on to the Ninth International Botanical Congress in Montreal in 1959. Russian plant sociologists have made unique contributions in the classification of forest types. Their more comprehensive approach should be compared to the use of lesser vegetation as type indicators in similar boreal forests by the Finns and Scandinavians.

Compared to much Russian writing on ecology, *Fundamentals of Forest Biogeocoenology* is remarkably free from political dialectic, personal attacks on other scientists, and nationalistic bias. Sukachev does attack Nesterov as making statements which are "often undefined, indecipherable, and occasionally ill-written" but dismisses his classification of forest merely as "an unsuccessful eclectic combination of several of Morozov's suggestions." Those Western scientists whose views are quoted are generally treated with intelligence and respect.

The reading is heavy, for Russian ecology has a dialectic all its own and considerable space is devoted to its elucidation or perhaps confounding. Nevertheless, this is by far the most readable, intelligible, and complete guide to Russian forest ecology available. As such, it will be an essential part of the library of every serious English-speaking ecologist concerned with forests.

It is notable that a lengthy "non-Russian" bibliography is appended and that the 14 collaborators have gone to considerable effort to select illustrations from these listed works. A kind conclusion is that this commendable effort is no more unsuccessful than that of English and German authors with regard to Russian literature in the same field. Much important U.S. work is ignored, and the items that are listed appear to have been chosen at random or perhaps because the library of the Botanical Institute happened to have the reprints. At least the authors tried, and this is about all I can say for my coverage of Russian research in my own book on the same topic.

STEPHEN H. SPURR
Horace H. Rackham School of Graduate Studies,
University of Michigan, Ann Arbor

Biochemical Agents

Antimetabolite des Nucleinsäure-Stoffwechsels. Biochemische Grundlagen der Wirkung. PETER LANGEN. Akademie-Verlag, Berlin, 1968. 220 pp., illus. DM 38.

The last major book on antimetabolites, by the late D. W. Woolley, appeared in 1952 when only a few nucleic acid base analogs were available. In the meantime many of these drugs have become useful chemotherapeutic agents in the treatment of cancer (6-mercaptopurine, 5-fluorouracil, cytosine arabinoside), immune reactions (azathioprine), virus diseases (iododeoxyuridine), and gout (allopurinol). In addition, many antimetabolites have become of considerable interest as biochemical tools. A book evaluating the contribution of these agents to biological and medical science would be most welcome if it treated the subject in depth. Langen's specialized monograph, however, only summarizes the biochemical actions of the structural analogs of purines, pyrimidines, and a few related compounds. The author reviews enzyme inhibition due to substrate replacement by analogs at the active and allosteric sites, the incorporation of the drugs into DNA or RNA or both, mechanisms of resistance, and routes of degradation. Another chapter describes the problems associated with the relative nonselectivity of these agents in tumor chemotherapy and the approaches that are being considered to improve their effectiveness on the basis of an understanding of their biochemical properties. The last section of the book lists the major

inhibitory actions associated with about 50 purine, pyrimidine, and ribonucleoside analogs.

Many aspects of this field have already been the subject of reviews, but it is convenient to have this information, derived from more than 1000 references, assembled in one book. Many of the data are presented in tables which classify for the various antimetabolites information on the specific enzymes inhibited, formation of analog-containing "fraudulent" polynucleotides, and enzymes deleted in resistant cells. The sections dealing with incorporation of halogenated pyrimidines into RNA and DNA and the resulting biochemical alterations probably represent the most original of the author's compilations, and provide a valuable summary of the effects resulting from the replacement of a normal base by a structural analog in polynucleotides.

The author's aim is to encourage the chemist to synthesize more useful compounds, to outline for the biologist the role of the antimetabolites in molecular biology, and to relate for the physician the therapeutic effects of the drugs to their fundamental mechanisms of action. However, the extensive individual variations among the drugs make it difficult to predict the biochemical or therapeutic properties of a new antimetabolite. The book is quite brief on the macromolecular effects of the drugs, and a more comprehensive coverage of this area would have provided the reader with a better understanding of current investigational trends. The author has chosen to describe more individual drugs rather than provide greater detail about those few which have been studied more intensively. Coverage of the literature stops in early 1967, but many important references are not included.

Nevertheless, the monograph should be remarkably useful for those who wish to acquire a general knowledge of what has been learned from and about purine and pyrimidine analogs. The specialist will find the book valuable as a source of references and as a guide to the biochemical effects of specific antimetabolites. The reader who has satisfied his academic language requirements by choosing German rather than statistics will be glad he did, since the only section of the book in English is a 7-page summary.

H. GEORGE MANDEL
Department of Pharmacology, George Washington University School of Medicine, Washington, D.C.

Bacteria

Biochemistry of Bacterial Growth. JOEL MANDELSTAM and K. MCQUILLEN, Eds. Wiley, New York, 1968. x + 540 pp., illus. $11.

To the teacher of modern bacterial physiology, there is a difficulty in that such a large number of disciplines come together in the study of the functioning of the cell. Where does one start: with chemistry and move toward genetics, or with genetics and move toward chemistry? This book answers these questions in a unique way. The editors, and their nine collaborators, first provide a terse abstract of the entire text, bringing together in a few pages the contents of the book: the structure of bacteria, the growth of cells, intermediary metabolism, the synthesis of nucleic acids and proteins, bacterial genetics, the regulation of metabolism, and spore formation and germination. This is followed by a 60-page section in which the same material is presented at a one-step-more-detailed level. Finally, each topic is again treated separately, in substantial detail, in the nine principal chapters of the book.

The text, directed to the student with only a knowledge of general chemistry, strives to develop a relatively advanced understanding of bacterial biochemistry while at the same time providing an integrated view of the cell. This treatment has the additional advantage that the writers of the specialized chapters can assume the students to have a certain fundamental knowledge of genetics or biochemistry, for example, knowing that they have been through the introductory material. For course work the book seems well balanced in the proportions of its space given to structure, growth, metabolism, and the synthesis of macromolecules and their regulation. Currently exciting subjects, such as genetics, nucleic acid metabolism, and protein synthesis, are treated particularly well. Classical subjects such as bacterial nutrition are omitted. It is an unfortunate omission that after an extensive discussion of glucose catabolism and the tricarboxylic acid cycle there is almost no mention of fermentations, the balance of electrons, and the terminal respiratory chain.

In writing a text for class use the authors have made some concessions. Most notable has been the general omission of historical reference and experimental detail. Where this has not been carried to extreme the result is a straightforward and interesting presentation. On the other hand, at the extreme the chapters on intermediary metabolism and the regulation of metabolic activities become simply compilations of the names of enzymes. Since these same chapters are illuminated with many good figures, the text adds little. Lacking, to choose specific examples, are a general discussion of the use of bacterial auxotrophs, preferential utilization of supplements and isotopically labeled tracers, antimetabolites, and analogs. Since the student must learn that our understanding of the cell is dependent on experiment, and since in the experimental discussions are found inseparably a view of how the bacteriologist works and a view of how the cell works, a somewhat less dogmatic approach would be desirable.

DONALD P. NIERLICH
Department of Bacteriology, University of California, Los Angeles

Chemist's Reference

Nuclear Magnetic Resonance Spectra and Chemical Structure. Vol. 1, The Spectral NMR Parameters of Compounds with Analyzed Spectra. Compiled by W. BRÜGEL. Academic Press, New York, 1968. xvii + 235 pp., illus. In loose-leaf binder. $35.

This collection of high-resolution NMR data fills a definite gap in the analytical chemist's reference shelf. The publication of Brügel's tables marks the first compilation of this kind that is up to date, critical, comprehensive, and easy to use. The organization of the data is lucid; for instance, chemical shifts and coupling constants from proton spectra are given by 88 classes of compounds, a system which I consider of choice for easy reference.

The physical makeup of the book is superb: a loose-leaf binder with 29.7-by-21.1-cm sheets, containing a table of contents, excellently printed tabulations of data, and an index of compounds. The sheets are made of exceptionally strong paper; the two copies of the book which have been in constant use for six months in our laboratory would otherwise have been worn out. Literature searches for material published before 1966, which—in spite of other NMR data collections—have been quite tedious, are now virtually unnecessary, thanks to Brügel's tables.

The bulk of volume 1 refers to protons. Since the accumulation of data on other nuclei has gained momentum in the last few years, I trust that future