R. Ruibal of the comparative behavior of West Indian anoles, K. S. Norris's thoughtful discussion of color adaptation and thermal relationships in desert species, and Dawson's interesting exposition of the physiological responses of lizards to temperature.

While much of the current work on lizard ecology appears in the herpetological journals, a great deal is scattered, and to date no reviews or summaries have appeared, although one is in press. The interested scientist has been at a distinct disadvantage in his attempts to explore this new literature. This symposium fills this gap, and even if more general review works should be forthcoming, the serious lizard ecologist will turn again and again to the major contributions which appear here. For this reason the tables and graphs which are so liberally used are particularly welcome.

It should also be pointed out that the entire symposium as it appears in this book was carefully and effectively planned out and presented. This isn't a loose collection of papers covering a wide range of subjects, but a highly selected and integrated presentation of the ecological research most energetically being pursued at the present time.

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## Biological Macromolecules

**Conformation of Biopolymers.** Papers read at an international symposium, Madras, India, Jan. 1967. G. N. RAMACHANDRAN, Ed. Academic Press, New York, 1967. Vol. 1, xiv + 425 pp., illus., $19.95; vol. 2, x + 356 pp., illus., $14.75.

As is well known, proteins and nucleic acids are polymers of relatively simple molecules joined together by chemical bonds to give long chains. Their biological functions are directly dependent on the conformations in which the chains exist—that is, on the specific manner in which the chains are folded and twisted in space. The folding and twisting are brought about by the action of various kinds of intra- and intermolecular forces, such as hydrogen bonds and van der Waals forces, involving both the polymer molecules themselves and the solvent molecules that surround them. The study of the conformations of biological macromolecules is not easy, but powerful tools are available and a great many people are involved in efforts to apply them to the problem. Recent progress has been rapid, but it will surely be many years before we have answers to many of the questions that can now be asked.

The two volumes under review contain 48 papers, all of which are progress reports on recent research in the laboratories of the participants in the Madras symposium. Of the 48 papers more than three-quarters are concerned with problems related to protein conformations; the remaining papers deal with the somewhat simpler problems of the conformations of nucleic acids and polysaccharides. Some of the papers contain material that will be of interest to biochemists in general, but most of them are clearly intended for the specialist.

Emphasis has been placed on the following particular physical and theoretical approaches to the problem of protein conformation: the restrictions imposed on conformations by steric repulsions and by the potential energy of interaction between nonbonded atoms along the polymer chain (three papers); the interpretation of optical rotatory dispersion and circular dichroism (six papers); and the statistical mechanics of polypeptide and protein chains and cooperative transitions between different conformations of these chains (four papers). Nine papers are devoted to the special conformational problems encountered in polymers containing large amounts of proline, and in particular to the unusual and fascinating protein collagen. Relatively little space is devoted to the vast amount of detailed information on protein conformations that is now rapidly becoming available through the application of x-ray diffraction to crystalline globular proteins. Only passing attention is given to the confusing and vexing—but important—question of the role of the solvent in determining macromolecular conformations.

The Madras symposium was presided over by Linus Pauling. His interesting historical account of the study of protein structure at Caltech serves as an introduction to the collection of papers.

These volumes will be a useful addition to all libraries intending to maintain a reasonably complete coverage of current work on the physical chemical study of biological macromolecules.

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## Identification Guide

**The Particle Atlas.** A Photomicrographic Reference for the Microscopical Identification of Particulate Substances. WALTER C. MCCRONE, RONALD G. DRAFTZ, and JOHN GUSTAV DELLY. Ann Arbor Science Publishers, Ann Arbor, Mich., 1967. xvi + 406 pp., illus. Boxed, $125.

A few weeks before receiving *The Particle Atlas* for review I saw the advertising brochure describing in glowing terms this "scientific achievement to add new reliability to your library or laboratory." "Here is the way you can identify almost any particle you can detect," it continued. I am tempted to quote more from this masterpiece of the advertising art in "full color," but my readers are probably more interested in the contents of the book itself.

Let us start by saying that the atlas is a beautiful book. The printing house strove for an "art book" type of presentation, and with reasonably good success (in the review copy there are two or three pages on which the blues are somewhat out of register). The book contains over 500 color micrographs of all kinds of particulate substances, the particles ranging in size from only a few microns to about 100. All the techniques which can enhance color in the light microscope have been exploited. The micrographs are shown at magnifications ranging from 40 to 500, with two at 900. The authors would have done well to omit these last ones, which are vivid unintentional illustrations of the so-called "empty" magnification.

For whom is the *Atlas* produced? The foreword identifies the potential users as persons working in air-pollution control, industrial hygiene, clean-room monitoring, and criminalistics (*sic*). To this list the advertising folder adds about ten other groups, among them workers in agriculture, food processing, metallurgy, and parenterals. Whoever the prospective users may be, the authors must expect them to have little knowledge of microscopy, for they have included a 23-page elementary presentation of such subjects as the refractive index, crossed polars (I dislike this expression, which seems to be gaining favor in certain circles), dispersion staining, measurement of physical properties, x-ray powder diagrams, the electron microscope, the electron microprobe, and so forth. On the whole the presentation seems suitable for those without college training.

I would not object to the elementary presentation if it were reasonably rigorous. Unfortunately, this is not the case. The language is loose, to say the least, and the discussion is often interspersed with information implying knowledge of a much higher level. For instance, on page 8, in the discussion of interference phenomena, the phrase "coherent light" appears, quite properly, but without any explanation of what coherence means. Many examples could be quoted to show how elementary and misleading is the presentation.

The emphasis of the book is, as the subtitle indicates, on the recognition of particles. Yet the criteria for recognition are strangely fuzzy. The authors use also the term "sensitivity." For the light microscope, the "sensitivity" limit is given as about five times the resolving power of the optical system. For the electron microscope, the "sensitivity" is given as 100 Å instead of somewhere around 10 Å.

There are also inconsistencies in the book. On page 44, contrast in an electron micrograph is ascribed to "absorbence," on page 83 to scattering. In table 29 the "sensitivity" of the light microscope is given as "1 pg, $10^{-12}$ g," yet in the next line the "sensitivity" of the electron microscope is given as "0.01 pg, $10^{-18}$ g." This brings us to the question of units. I was completely puzzled by the use of the unit E, short for "Emich." Long after this unit has been introduced, we are informed that 1 E=$10^{-15}$ g. There are international agreements about names and prefixes to be used, and it does not help understanding if in one line the authors adhere to the adopted usage (pg for picogram) and then in another call a femtogram (fg) an Emich. Another example of the general tenor of the book is its treatment of the problem of illumination in the microscope. Three and a half pages are devoted to very detailed instruction for producing "critical, Köhler or diffuse illumination." The instructions are given in such a way as to be understandable to a low-grade technician, but do not indicate under what circumstances one type of illumination may be used more advantageously than another.

The authors attempt to create a "systematic taxonomy of particles." For this purpose they have developed a six-digit binary code based on the following classification characteristics: transparency, color (transmitted), color (reflected), birefringence, refractive index, and shape. To these six digits are added one or two digits in the decimal system ranging from 0 to 48, which are listed in table 1 on pages 292–302. I searched for a definition or explanation of these added digits and conclude that if one exists it is well hidden. According to the code, most of the materials represented by the color micrographs are characterized by three to five different numbers. As an example: "Cigarette ashes 0:000000, 1:000001, 8:001000, 32:100000, 33:100001." Admittedly, cigarette ashes appear to be an odd mixture of materials in different stages of combustion, but if I were a microscopist attempting to identify this material I would like a simpler system for doing so.

I have shown a draft of this review, together with the book, to one of my friends, who is an expert light microscopist. In his opinion the collection of color micrographs can be of very little help to the practitioner because too many of the sample micrographs look too much alike and there is not sufficient information about the conditions under which they were taken. None of the captions indicates the numerical aperture of the objective or the aperture of the condenser, and even the state of polarization is given in purely qualitative terms. Another irritating aspect of the book is its unashamed promotion of commercial products. Not all of them are products of McCrone Associates (the company owned by the senior author), but a fair number of McCrone products are listed. Some parts of the book read almost like a commercial catalog.

A book priced at $125 has to be really good. I cannot say so much of this one. For that price I would have expected, among other things, the elimination of the considerable number of typographical errors.

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## Strong Interactions

**High Energy Collisions of Elementary Particles.** R. J. EDEN. Cambridge University Press, New York, 1967. xii + 298 pp., illus. $9.50.

This summary of the present theoretical state of the art in strong interactions is a welcome addition to the bookshelf of the practicing high energy physicist. In a relaxed style that lends itself to casual reading, the author surveys both rigorous theoretical results on scattering amplitudes and the phenomenological description of scattering data. For graduate students this book will serve as an introduction to the field, but it does not seem to be designed for use as the primary textbook for the customary graduate courses.

For the specialist the highlights of this book are the chapters on asymptotic bounds on cross-sections and real parts of forward scattering amplitudes. The author, a well-known expert on this subject, reviews the existing rigorous theoretical bounds and outlines essential details of their proofs. It is a great convenience to have a compact summary of recent literature on this complicated subject. An interesting discussion of dispersion relations, Pomeranchuk theorems, and the Phragmén-Lindelöff theorem concludes the section on asymptotic amplitudes.

Major emphasis is placed on Regge theory and phenomenology. In view of the upsurge of interest in applications of Regge poles to scattering data this emphasis is well placed. A rather standard introduction to complex angular momentum in potential scattering and generalization to relativistic theory are included, followed by sections on factorization and fermion Regge poles. The developments on conspirator and daughter trajectories apparently occurred too late for inclusion in the book.

The author attempts to give his approach to the subject a phenomenological flavor by including a survey of experimental results in the initial chapter and by devoting a later chapter to specific applications of Regge pole models to data fitting. My own impression is that the principal weakness of the book lies in these chapters. The trends in the experimental data could have been more effectively presented by additional illustrating figures. The experimental study of Regge theory might have been described in greater detail for the limited number of reactions considered. A few errors occur in the phenomenology sections, but none of major consequence. Unfortunately, few references are given to the literature on comparison of theoretical models with the results of experiment. In most instances the author refers the reader to review articles that are not readily accessible.

Brief mention is made of the absorption-model and quark-model de-