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Review

Reviewed Work(s): *Conceptual Foundations of Quantum Mechanics*, 2nd rev. ed. by Bernard d'Espagnat

Review by: James L. Park

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scription almost always seems imminent, yet remains elusive. The situation now is no different; many interesting things are happening that somehow will eventually fit together.

Prokaryotic cellular transcription of all RNA species is still thought to be mediated by a tetrameric "core" enzyme consisting of two large subunits (β and β') and two probably identical small subunits (α). Another subunit (σ) probably always mediates catalytic initiation functions physiologically but dissociates from the core enzyme during elongation of the RNA chain. This degree of enzymatic complexity is neither obligatory for transcription nor the limit. Certain phage-encoded functional RNA polymerases are monomers of about a fifth the size of the *E. coli* enzyme. On the other hand, eukaryotic transcription enzymes (reviewed by Roeder) fall into at least three structurally distinct classes, each having different functional assignments.

The structural complexity of RNA polymerase is matched by the intricacies of transcription, which are subdivided into phases of initiation, elongation, and termination. Although isolated enzyme subunits do not possess measurable activities, assignments of subunit contributions to assembled enzyme function are now being made through mutant subunit reconstruction experiments (reviewed by Zillig and co-workers) and affinity label techniques. A prerequisite to many studies is a relatively painless technique for isolating large quantities of enzyme, and efforts in this direction are reviewed by Burgess.

Much of the current work presented is focused on aspects of transcription that are susceptible to regulation, such as protein structural modification, initiation, and termination. The details of the elongation mechanism remain murky, as does the mechanism of enzyme movement. So far, regulation of transcription does not seem to involve a cistron-specific, generalized slowing of elongation rates. Regulation of termination is a major topic. Regulatory mechanisms of antagonizing rho-dependent termination and thus facilitating downstream gene expression have been demonstrated directly by Yanofsky's group. Such sequences (called attenuators) precede structural gene sequences in the tryptophan operon and are subject to antitermination regulation. During lambda phage transcription, a still curious effect of the lambda N gene product occurs at the level of initiation but nevertheless gives rise to an enzyme transcript that is resistant to both attenuator sequences and normal termination sequences downstream from structural genes.

A major portion of the book deals with another current topic: how RNA polymerase selects proper initiation sites on the DNA. Details of initial interactions are reviewed by Chamberlin, particularly

with respect to evidence suggesting melting of helical DNA regions as an obligatory step in the formation of stable DNA-enzyme complexes capable of RNA chain initiation. Although the enzyme may well melt DNA strands to initiate an RNA chain, there are suggestions that groove fitting may be used during elongation. Another approach, reviewed by Gilbert, concerns looking for DNA sequence regions that promoters and regulatory binding sites might have in common, as well as what can be learned from mutations that change promoter efficiencies.

The book contains a coherent assembly of reviews and research articles resulting in a source that is very probably a necessity for any library striving for even minimal coverage of biological research.—*Michael Cashel, Molecular Genetics, National Institute of Child Health and Human Development, NIH, Bethesda*

Biology and the Future of Man

Charles Galpérine, ed. Proc. Internat'l Conf., Sorbonne, 1974. 609 pp. Forest Grove, OR: ISBS, 1976. \$27.50 paper.

If nuclear war can be avoided, the human species probably has a future, but the quality and acceptability of that future are much in doubt. Many of the problems to be faced and, it is hoped, to be solved—in the sense that at least the majority of people will like the solution—have a not inconsiderable biological element to them: problems of environmental conservation, health and well-being, genetic diversity, and biological individuality. It is therefore good for biologists to get together frequently to discuss openly the problems as they currently exist and as they are likely to develop. This book is the outcome of such a set of discussions, held at the Sorbonne in 1974.

The general structure of the proceedings appears to have been the preparation of introductory papers on particular themes by some of the participants; a round-table discussion of these papers and related issues by a small group of eminent authorities; a wider discussion open to all the participants; summary statements of these discussions by rapporteurs; and, finally, a broad overview of conclusions and possible policies. The issues accorded this treatment include various problems of environmental control and modern medicine, human genetics and demography, and ethical concerns about human reproduction, the handicapped, and death. Apart from the fact that some of the introductory papers appear not to have been available for publication, every word spoken at the conference—about a half French and a half English—is reproduced in this book. Without doubt it must have been both valuable and enjoyable to have been a

participant, and perhaps it was the hope of the organizers that, by reproducing all that was said, including all the salutations and compliments, the reader would be able to re-create in his imagination some of the atmosphere of the meeting. For this reader, however, the effect is no more than irritating, and rigorous editing would have been appreciated. Not every utterance of the eminent is worthy of being printed, and some of the off-the-cuff remarks recorded in the discussion must surely be an embarrassment to their authors. Furthermore, an excessive preoccupation with the obvious is in evidence.

But what of the substance of the papers? The book contains a balanced consideration of the practical and ethical problems in organ transplantation and therapeutic experimentation, some valuable discussion of the ecological issues of ecotoxicology, recycling of waste products, maintaining marine balances, and science in agriculture, and useful statements about the state and relevance of human population genetics, and the problems of population size and growth. It certainly identifies many of the issues of practical concern.

On the other hand, there are some surprising omissions. With the in-vogue preoccupation with the effects of man on the environment, the equally important concern of the effects of environmental change on the human condition has gone largely neglected. There is little in the book on the effects of modern living upon human well-being and, although some behavioral questions are discussed, the treatment tends to be naive and superficial. Generally the focus is on the dramatic rather than the commonplace; on transplantation surgery rather than public health; on schizophrenia and suicide rather than neuroses and boredom. But the book is certainly a start in the right direction, and many issues of practical and political concern where the work of biologists can be helpful are at least raised. One of the broader aims of the conference was to set up a "Universal Movement of Scientific Responsibility" composed of individual scientists rather than political or national groups. One wishes it well but hopes that if more publications are forthcoming, they will be less pretentious and long-winded.—*G. Ainsworth Harrison, Biological Anthropology, Oxford University*

Physical Sciences

Conceptual Foundations of Quantum Mechanics, 2nd rev. ed. Bernard d'Espagnat. 278 pp. W. A. Benjamin, 1976. \$26.50 cloth, \$16.50 paper.

Although the "new" quantum mechanics is now about 50 years old and its pragmatic efficacy as a regularizer of empirical experience has been nothing

less than triumphal, there remain to this day serious philosophical concerns regarding the impact of that theory upon man's conception of physical reality. This profound intellectual difficulty is the *raison d'être* for d'Espagnat's investigations.

Fortunately, the pertinent issues can be discussed at least partly in the customary conceptual and mathematical language of theoretical physics, though excursions into the abstract verbal world of traditional epistemology and ontology cannot be avoided. Both the physics and the philosophy are handled by d'Espagnat with skillful didactic style. Wherever possible, mathematical arguments are presented with an emphasis on simple but adequately representative cases, and all of the philosophical discourse reflects the unabashedly earthy perspective characteristic of most physicists. The book therefore offers nonspecialists, including properly motivated students, reasonably easy access to some of the most complex problems in the foundations of physics.

To ensure logical self-containment, the author wisely begins with a succinct review of quantum axiomatics, with special emphasis upon the density matrix. Included is a treatment of proper and improper mixtures—constructs originated by d'Espagnat himself several years ago. The remainder of the volume is devoted to three broad, interrelated topics: the problem of “quantum nonseparability” (e.g. the implications of the Einstein-Podolski-Rosen situation), the problem of measurement, and the attendant philosophical problem of physical reality. Naturally, other scholars in this subtle field, myself included, would dispute some of d'Espagnat's premises, arguments, and conclusions. However, to be fair I must describe his analyses as lucid and cogent; and I would recommend the book unreservedly to anyone interested in surveying quantum foundations problems.—*James L. Park, Physics, Washington State University*

Aspects of Energy Conversion. I. M. Blair, B. D. Jones, A. J. Van Horn, eds. Proc. Summer School, Lincoln College, Oxford, 1975. 847 pp. Pergamon Press, 1976. \$35.

This review is being written in the midst of a cold wave, with accompanying electric utility voltage reductions and major gas curtailments that close schools and factories and make homes uncomfortably cool by American standards. Undoubtedly such a situation adds emphasis to the reviewer's interest in the book, which details the summer school course taught at Oxford in 1975.

There are certain universalities—or perhaps better, “planetarities”—about energy, such as its sources, reserves, uses, storage, environmental impacts, and international oil price. These place the U.K.

and U.S. on similar footings, only to be differentiated by varying patterns of use, and more than a little influenced by differences in personal behavior and income, energy price, and institutions. It's one thing to trim a thermostat from 78° to 68°,—as has happened for some Americans—but another matter to drop 10 degrees from 60! Efficient public transport and electricity co-generation may be quite practicable in the U.K. but not nearly so in the U.S.

The many similarities in energy problems between the two countries mean that the proceedings can be quite valuable here (e.g. the discussion on energy use in industry). Probably of even greater value are the many comparisons made of corresponding energy supply and consumption patterns, such as the discussion on electricity co-generation. There is much to be learned by careful comparisons of energy systems and policies between the U.S. and its western European neighbors.

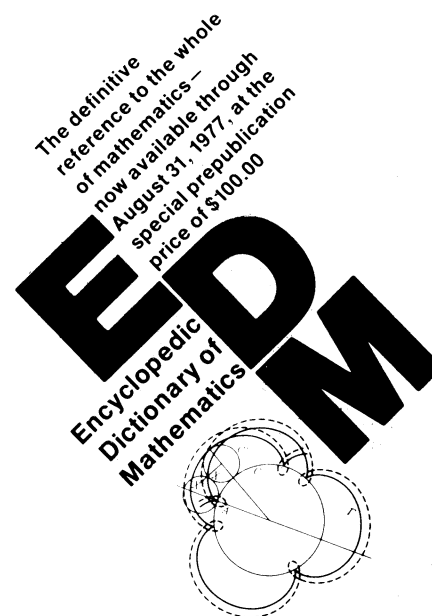
If you're looking for high levels of technical sophistication, don't bother looking up these proceedings; they're not intended to fill that need. But if you're interested in a technical discussion of energy use in the U.K., or comparisons with the U.S., you'll undoubtedly find this text interesting and the bibliographies very valuable.—*John H. Gibbons, Environment Center, University of Tennessee*

Potential Energy: An Analysis of World Energy Technology. Michael Kenward. 227 pp. Cambridge University Press, 1976. \$14.95 cloth, \$5.95 paper.

This is a good, useful, reasonable book with a very broad coverage of the energy field. In just over 200 pages the author covers a very large amount of information with insight and generally with objectivity. Of necessity the treatment of each field—coal, oil, nuclear fission, fusion, solar energy, geothermal, wind, and other types of energy—is short. But this concise treatment is an advantage; the book can be read as a whole. It is well organized, digesting many official reports and selecting its data carefully.

Although the data on costs and prices are out of date and thus cannot be used for reference (and this is acknowledged by the author), the relative values remain useful. There are some important omissions, but they do not reduce the value of the work below recommendation. Coal transportation by slurry pipeline should be included in any next edition. Fast-neutron breeders transmute net *more* fertile U-238 into fuel: the book speaks of a “faster” transformation in an important paragraph so simplified as to confuse rather than explain. The process is worth explaining well.

Nevertheless, the wide scope of the book is eminently worthwhile. In the last



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