

City, is sincere in believing that professionalism can, or even should, triumph over politics.

Sincere he is. He proves it with a final chapter that takes issue with the politicians and environmentalists who put pollution high on their list of priorities. Despite his own long commitment to controlling its effects, Eisenbud argues not only that pollution problems are getting too much attention (and money) but that the technology that causes pollution is on balance a good thing for society. His reasoning is good, as usual, and his conclusion challenging and important. Eisenbud hopes to turn the antitechnology environmentalist tide that carried his own career from insurance inspector to high federal and municipal office. It is doubtful he will succeed. Mayor Lindsay's way is still perforce the way of the democratic world, a world nevertheless more reasonable and honest for the likes of Eisenbud.

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## Ribosomology

**The Ribosome.** Structure, Function, and Evolution. WALTER E. HILL, PETER B. MOORE, ALBERT DAHLBERG, DAVID SCHLESSINGER, ROGER A. GARRETT, and JONATHAN R. WARNER, Eds. American Society for Microbiology, Washington, DC, 1990. xxiv, 678 pp., illus. \$99; to ASM members, \$86. From a conference, East Glacier Park, MT, Aug. 1989.

Systematic studies of ribosome structure and function were initiated in the late 1950s, making the ribosome the first RNA-protein particle to come under serious scrutiny. In the last ten years or so, other ribonucleoprotein particles, such as spliceosomes, have commandeered the spotlight, and ribosomes have received less attention. Nevertheless, a core of investigators has continued attempts to reveal the ribosome's secrets of how to assemble, translate, regulate, and so forth. Periodic meetings among this group have usually been accompanied by a book recounting recent progress. The latest book of this kind is *The Ribosome: Structure, Function and Evolution*.

The fact that ribosomology now is of substantial age, at least on the time scale of molecular biology, is illustrated by the inclusion of two historical chapters: a very personal view of the major breakthroughs in translation mechanisms and regulation of ribosome synthesis in *Escherichia coli* by Masayasu Nomura and a more technical historic account by Alexander Spirin.

The remaining part of this rich collection

of 57 reviews is divided into nine sections, and virtually all aspects of ribosome structure and function are addressed, as well as selected aspects of ribosome formation. The reader of the book will immediately notice that the major focus in the field is still the *E. coli* ribosome. This is understandable given the enormous number of person-years that have been required to bring knowledge of this "model ribosome" to its impressive level of sophistication. In addition, the studies on other ribosomes demonstrate that many important aspects of ribosome structure and function have been highly conserved through evolution.

A major portion of the book is devoted to studies of the architectural details of the ribosome, with an emphasis on rRNA structure. In fact, the book clearly shows that ribosomology, like many other areas of molecular biology, is in an RNA-centric era; only a few chapters provide information about the ribosomal proteins and translation factors. The bias of most contributors to this volume seems to be that rRNA is responsible for most of the catalysis performed by the ribosome, although Draper offers the view that RNA and protein have been co-evolving for so long that we probably are at least "2 times 10<sup>9</sup> years too late to entirely disentangle protein and RNA functions." The RNA-centric view is currently supported by the fact that virtually all ligands of protein synthesis (that is, tRNA, translation factors, antibiotics) can be footprinted on the rRNA, suggesting that these ligands at least contact the rRNA during protein synthesis. Several chapters present detailed refinements of rRNA secondary structure and describe the initial maneuvers in elucidating rRNA three-dimensional structure by crosslinking, electron microscopy, oligonucleotide hybridization, and phylogenetic studies of rRNA sequences. The book also summarizes an enormous collection of data mapping contact sites between ribosomal proteins and rRNA, studies that should ultimately lead to a complete three-dimensional model of this complex organelle.

Not all ribosomologists focus on rRNA structure. The book also reviews several new insights into ribosome function and formation. A few examples of fascinating news: RNA helicases participate in the initiation of protein synthesis by eukaryotic ribosomes; prokaryotic translation initiation factors help the ribosome to select the correct reading frame during translation initiation; a third binding site for tRNA ushers out tRNAs after they have completed their journey through the A and P sites and delivered their amino acid to the growing peptide chain; prokaryotic rRNA synthesis is stimulated by a transcription initiation factor

working on an upstream activating site; small nuclear RNAs are involved in processing of eukaryotic rRNA.

Another interesting topic covered in several chapters is the variety of elements (both internal and external to the ribosome) that modulate accuracy of translation. These include the structure of ribosomal components, codon context, and overexpression of proteins. Finally, the book contains a few chapters on the evolution of ribosomal components and the use of these studies in assigning evolutionary relationships between organisms. Among these chapters is one of the few that focus on ribosomal proteins. Interestingly, some ribosomal proteins are conserved in all biological kingdoms, whereas others seem to be specific to eubacteria or eukaryotes.

The strengths of this book are its encyclopedic nature and the care with which virtually all chapters have been written. This book is much more than just the proceedings of a meeting. Its weakness is the inevitable result of collecting contributions from so many authors; there are many redundancies and the level of detail is uneven. However, the latter is also a strength that should make the book interesting to a wider audience. Some chapters are excellent introductions to general problems such as analysis of RNA structure and protein-RNA interactions. Other chapters are sophisticated reading for the aficionados. This book is recommended as a "hitchhiker's guide to the ribosome" for everyone with an interest in translation, RNA-protein structures, and macromolecular structure-function relationships.

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## A Theory of Molecules

**Atoms in Molecules.** A Quantum Theory. RICHARD F. W. BADER. Clarendon (Oxford University Press), New York, 1990. xviii, 438 pp., illus. \$120. International Series of Monographs on Chemistry, 22.

Recent progress in computational algorithms and hardware performance has enabled theorists to make quantum-mechanical calculations that produce accurate estimates for experimentally measurable properties of molecules, such as equilibrium geometries, dipole moments, and total energies. The degree of accuracy varies with the size of the system under consideration, but even for molecules as large as C<sub>60</sub>F<sub>60</sub> quan-