

## Advisory Mechanisms

### **Worldwide Science and Technology Advice to the Highest Levels of Governments.**

WILLIAM T. GOLDEN, Ed. Pergamon, New York, 1991. xvi, 430 pp. \$59.50; paper, \$28.50.

This is not an ordinary book. Comprising over three dozen essays written by nearly three score authors, the book primarily aims to tell the reader how worldwide science and technology advice is shaped and rendered. The volume is edited by William T. Golden, a man of enormous experience and wisdom in the advisory corridors of our government. Only Golden could have persuaded so many distinguished individuals to prepare the essays that make up this volume.

At the heart of the book are descriptions of the science advisory mechanisms in some 35 countries, from Australia to Yugoslavia. (It is too bad that Zimbabwe was not included.) An unexpected fillip is an essay on activities of the Pontifical Academy of Sciences serving the Vatican, written by Maxine F. Singer, president of the Carnegie Institution of Washington and a member of that academy.

Each essay writer was asked by the editor to "(a) describe the science and technology advising organization to the highest levels of his or her government; and (b) comment on its effectiveness and how it actually influences policy formulation and action." The first request is handled reasonably well in most essays; the second issue is addressed less frequently and less effectively. This is not surprising, because it is a difficult one to address forthrightly and in any sort of depth in a short essay.

Nevertheless, the essays paint a fascinating panorama of the role science and technology play, or strive to play, in all these countries. The unity of science and technology notwithstanding, their role is different in each country. That's not surprising, because the needs for science and technology advice are different in, for example, Saudi Arabia and Sweden. Moreover, the centrally managed economies of Bulgaria and the People's Republic of China face problems that are unlike those of the developing economies of Egypt, India, or Indonesia. And even in the highly developed and technology-intensive Western European countries and Japan, the modalities of technical advice to the highest levels of government range widely for cultural and historical reasons. In our own United States, they change of

course from administration to administration.

Thus, the book is but a snapshot, albeit an engrossing snapshot, of technical advisory mechanisms as they functioned before the political upheavals in Eastern Europe, before the economic union of Western Europe scheduled for the end of 1992, and before the Persian Gulf conflict and its aftermaths.

At their best, the essays are insightful glimpses into a country's mechanism for providing its leaders with science and technology advice and into the associated science and technology issues—as well as into setting technical goals, targeting priority areas of effort, pursuing international cooperative approaches, and planning future directions. The occasional essay that misses this benchmark tends simply to outline the structure of a country's technical advisory organization.

Some issues addressed in the book are enduring and will be with us for decades. Global change, as well as public health and the quality of life, is admirably summed up in an introductory essay by D. Allan Bromley, the science and technology adviser to President Bush. The need for international cooperation in science, big and small, and the challenge "to identify the points of intersecting interests, and then construct frameworks for national cooperation pivoting on such interests" are stressed by Frank Press, president of the National Academy of Sciences. Curiously, not much is said anywhere in this volume about the need to deal with impacts of population growth across the globe or with the adequacy of food and energy supplies.

There are four overview essays: by Shalheveth Freier reporting on the International Forum on Science and Government held in Rehovot, Israel, in 1989; by Henry Durand on "Building up a common European science and technology policy"; by Abdus Salam and Azim Kidwai on "A blueprint for science and technology in the developing world"; and by Thomas R. Odhiambo, on "Designing a science-led future for Africa: a suggested science and technology policy framework". They are interesting, but not compelling. Finally, David Z. Beckler has an admirable primer on the do's and don't's of science advising. Every incoming president or prime minister should read it and heed it. But will they?

Overall, this unique book should be a valuable resource for students of the com-

plex issues growing out of the relationship between science and government. And that includes government officials, politicians, political scientists, the media, and the concerned public.

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## Toxicological Concerns

**An Environmental Odyssey.** People, Pollution, and Politics in the Life of a Practical Scientist. MERRIL EISENBUD. University of Washington Press, Seattle, 1991. xii, 264 pp. + plates. \$24.95.

This straightforward memoir of Merrill Eisenbud's professional life reflects a moderate and intelligent man, one who has spent more than 50 years investigating a daunting—if sometimes mundane—catalogue of what we have come to call "environmental" problems. Eisenbud began with industrial dust, went on to other problems in industrial toxicology during World War II (electrical insulating materials used in ships, zinc fumes, cashew nuts, mercury, noise), and landed after the war in the Atomic Energy Commission, where he made contributions on beryllium and uranium toxicity before becoming a leader in fallout studies, which eventually took him into more general environmental work. His is a world in which problems arise, solutions are sought, precision is cherished and excess avoided. It is not a cold or impersonal world. Although I have never met Eisenbud, I remember meeting people in remote parts of Brazil who praised him highly for his warmth, a quality that shines throughout this book. But Eisenbud's is a world in which professional discourse triumphs over irrational impulses and technicians enlighten businessmen and politicians.

To his credit, Eisenbud recognizes in the end that something is missing in his picture of the way the world works. Confronted with a mayor of New York City who has decided to appoint a politician (Kretchmer) rather than a professional as Environmental Protection Administrator, he writes, "I have never understood why Lindsay changed his mind. I have been told by others that Kretchmer was active in the liberal wing of the Democratic Party, and that Lindsay had incurred some obligations because of that faction's support for him during the recent election. I don't understand such things and still cannot believe they happen in real life." It will be hard for some to believe that Eisenbud, who spent many years working for the federal government as well as two in the Lindsay Administration in New York

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-