ward linkage between economic incentives in the form of low interest rates and low taxes on capital, on the one hand, and capital formation and productivity growth, on the other. Of course, economic theory tells us that lowering the price of capital services by means of lowering interest rates or taxes will lead to more capital formation. But it remains one of the great puzzles of economic science that, after more than 20 years of careful econometric research, the data simply do not provide strong confirmation for this proposition. And the more complex linkage between capital taxation and productivity growth is even more difficult to confirm empirically. In an otherwise excellent paper, Dale Jorgenson claims that there is an inverse correlation between effective corporate tax rates and productivity growth. But he clearly has read his own tables through rose-colored lenses; my calculator tells me that the correlation is +0.39. Productivity performance has been dismal since 1973, despite effective corporate tax rates that have been substantially lower since 1975 than at any time during the postwar period.

If excess egalitarianism and insufficient willingness to subsidize capital formation are given too much emphasis by the contributors to the volume, the failure of the government to provide adequate funding for higher education and basic research is given perhaps too little. The point is, quite understandably, not missed by Donald Kennedy, president of Stanford University, who notes that federal funding for graduate fellowships, traineeships, and research facilities peaked in the mid-1960's. Perusal of the National Science Board's most recent issue of *Science Indicators* reveals that federal funding for basic research also declined in constant dollars after 1969 and did not begin to rise again until 1976. The 1969 level of funding was not again equaled until 1978, according to the published data. If the more accurate R&D price deflators developed by Edwin Mansfield, another contributor to this volume, are applied, the peak was not reached until 1983.

Another potentially important source of the poor U.S. economic performance is given only passing attention in this volume: our failure to adopt and rapidly diffuse several key organizational innovations of the Japanese. These innovations in quality control, inventory management, and "flexible" manufacturing are only now becoming widely visible in the United States. They may yet have a significant impact on productivity.

Although the contributors to this volume do not provide a wholly satisfactory explanation for what ails the United States, they offer some valuable insights about the obstacles confronting Japan in making the transition from technological follower to leading innovator. Although government "targeting" has often been successful in traditional manufacturing industries, Okimoto reminds us that in high technology targeting has failed at least as often as it has succeeded. The successes of consumer electronics and semiconductors have not been matched in lasers, commercial aviation, and software. Aoki adds that the effectiveness of government targeting of high-technology industries is likely to diminish in the future, owing to increased budgetary stringency, growing jurisdictional conflicts among ministries concerned with economic development, and changes in the Japanese political environment that render government agencies less able to mediate interest-group conflicts without the intrusion of electoral politics. In any event, Okimoto argues that substantial institutional changes will be required for Japan to assume a leading position in technologies that are heavily dependent on basic research or creative design. Although some of the traditional rigidities in labor and capital markets that might impede innovation are beginning to give way, the educational system remains inflexible in responding to market demands for technical training in emergent fields, and research funding remains considerably less meritocratic in Japan than in the United States.

Ordinarily, if a conference volume contained a dozen first-rate papers (as this volume does), one would judge it a success. But this book sets higher standards for itself. The editors insist that we should regard the work as a complex whole, and it is in this respect that it is most disappointing. We have 43 distinguished commentators wrestling with an issue of vast importance under the auspices of a national academy. What is most distressing is that the conclusions on which there is widest agreement, the elements of the book's "positive sum strategy" for economic growth, are founded as much on ideology as on analysis and evidence. Many of the contributions deal carefully and competently with particular pieces of the larger puzzle, but many others are more akin to congressional testimony than to scientific papers. Unfortunately, the editors, in a generous but ill-conceived effort to be even-handed, accord to the mere opinions of some participants a weight roughly equal to that given the closely reasoned arguments and empirically grounded findings of others.

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Biological Oxygenation

Circulation, Respiration, and Metabolism. Current Comparative Approaches. R. GILLES, Ed. Springer-Verlag, New York, 1985. xviii, 568 pp., illus. $102. Proceedings in Life Sciences. From a symposium, Liège, Belgium, Aug. 1984.

The enormous variety of approaches to and levels of analysis of oxygen transport and utilization in animals is amply illustrated by the contributions to this volume stemming from the first International Congress of Comparative Physiology and Biochemistry. The book is a collection of 45 invited papers from seven symposia of this meeting. There is something in it for almost every comparative biochemist or physiologist. The symposia cover topics ranging from intracellular metabolism and *p*H to red blood cells to organ system physiology to hibernation to racing greyhounds. Most of the chapters are well written and succinct.

A recurrent theme of the contributions is the evolution of physiological and biochemical strategies of adaptation to a wide variety of environmental and organismal conditions. Despite the diversity of species and levels of analysis in these chapters, many commonalities emerge, as do nice illustrations of August Krogh's principle that for a particular problem of interest to biologists there is usually a species better suited for study than others. This is exemplified in the comparative approaches to exercise covered in symposia 1 and 3. Physiologists and biochemists who do not often browse outside the human literature will marvel at the metabolic and physiologic lessons to be learned from flying insects, running dogs, and diving mammals.

Principles of respiratory gas exchange are universal, but the ways in which they are applied have a fascinating dependence on the respiratory medium (air *versus* water), the respiratory exchange organ (lungs, gills, or skin), the "plumbing" of the circulatory system (whether the respiratory exchange organs are in series or in parallel or both with the heart), and the "plumbing" of the gas exchanger (open-pool lungs, countercurrent gills, cross-current bird lung). The principles for solving these problems are presented clearly and comprehensively in symposium 2.

Symposium 7 covers a topic of universal interest to comparative biologists, adaptations to temperature. One of the most impressive solutions to facing a long, cold winter without available food is mammalian hibernation, to which two papers are devoted. There are also fascinating solutions at the cellular level that involve membrane structure. One paper describes how polar fishes have solved the problem of living in

freezing cold water by adding antifreeze to their systems.

As Peter Hochachka points out in his preface, three clear themes (or biases) are evident in this book. First, the biochemists and physiologists who wrote the chapters share an interest in principles of function that are universally applicable. Second, instructive variations on the universal functions appear in diverse species in similar environments and in similar species in diverse environments. Finally, most of the authors share the conviction, made familiar by Krogh, that the organism itself may be a valuable experimental parameter for illuminating particular biological problems.

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Cell Biology

Cell Motility. Mechanism and Regulation. HARUNORI ISHIKAWA, SADASHI HATANO, and HIDEMI SATO, Eds. Liss, New York, 1986. xiv, 627 pp., illus. $96. From a conference, Nagoya, Japan, Sept. 1984.

This book is the proceedings of a satellite conference of the third International Congress on Cell Biology. Its main merit for a North American and European audience is its strong Japanese flavor. The study of cell motility has many roots in Japan, and 29 of the 48 papers are from Japanese laboratories. The broad title of the book notwithstanding, the focus of the contributions is on the actin-based cytoskeleton and on mitosis. More precisely, the book focuses on primitive motile systems, with more than half the contributions dealing with organisms other than animals, in keeping with the significant interest Japanese workers have taken in such systems as models for higher organisms.

The volume is divided into six sections: Molecular Interaction of Actin and Myosin, Actin Regulatory Proteins, Cell Models for Movement, Cytoskeletal Involvement in Cell Division, and Structural Integrity of Microfilament System I and II, the last of these being a catchall. As an introduction, Ebashi writes an interesting and revealing personal account of the history of the study of muscle regulation. On the other hand, Bennett's summation is inappropriate to the book because of its esoteric treatment of the field and because his perspective is out of keeping with the rest of the volume. However, the editors have made the text very readable, with few typographical errors, and a good subject index has been provided.

The book makes an elegant case for the continued usefulness of primitive motile systems as models for study. Representatives of two major American laboratories, those of Korn and Pollard, present complementary general discussions of the mechanism of actin polymerization and *Acanthamoeba* actin-binding proteins, showing how much detailed biochemical information, similar to that found for higher systems, can come about from study of such a lowly organism. These papers are complemented by those of Sutoh *et al.*, Hatano *et al.*, and Isenberg *et al.*, who report on specific actin-binding proteins from other lower organisms. There are also many papers on vertebrate muscle and non-muscle myosin, actin, and the associated proteins, ranging from a nice report on conformational effects of light-chain phosphorylation on myosin by Onishi to reports on caldesmon, cofilin, gelsolin, and actinogelin. For me, one of the more exciting and novel reports (even though it is over two years old) is Higashi-Fujime's demonstration that movements of myosin filaments along unidirectional actin bundles can be visualized in vitro by dark-field microscopy. This line of investigation is now being actively pursued by several groups.

One strength of the volume is the large number of reports on the motile behavior of intact cells or cell fractions. These papers point out how far we still have to go to bridge the gap between the biochemistry of specific proteins and the events it underlies. Kamiya's report on the symmetrical oscillatory contractions of isolated plasmodial strands of *Physarum* is fascinating and raises many questions about the regulation of contraction and relaxation. Equally good reports on streaming in *Characeae* (Shimmen and Tazawa) and *Acetabularia* (Nagai and Fukui), movement of *Physarum* (Hatano), models of *Physarum* (Wohlfarth-Bottermann), axonal transport in squid axons (Allen and Weiss), and pigment movement in fish melanophores (McNiven *et al.*) make this section on cell behavior worthwhile reading. Again, the questions raised by such reports underscore the fact that our knowledge of the individual players is not matched by our knowledge of the rules of the game being played.

The section on cell division is highlighted by fantastic microscopic images, as is appropriate to the study of mitosis. This enigmatic problem has traditionally been approached by such methods, and good examples are present. The description of new mitosis-arresting drugs by Sato *et al.* may open up new avenues of research, whereas the direct experiments of Izutsu and Yoshida on the effects of microinjected dynein antibodies on mitosis may close a few doors.

The last sections of the book are dedicated primarily to actin bundles within cells. Particularly useful reports are those on stress fibers in situ by Ishikawa's and Fujiwara's groups and on the dynamics of stress fiber organization by Sanger *et al.* An exciting report by Owaribe and Masuda on the isolation of a contractile circumferential ring of actin found in retinal pigmented epithelial cells underscores their functional importance.

The papers in this book illustrate the wide range of problems approached and systems used in the study of cell motility. As in any proceedings volume there is unevenness in detail, but as a whole the volume is excellent. This is a volume that would be useful to both the biochemist and the morphologist because it emphasizes the strength and complexity of both approaches.

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Books Received

Automatic Control in Space 1985. J. P. Chretien, Ed. Published for the International Federation of Automatic Control by Pergamon, New York, 1986. x, 314 pp., illus. $68.75. IFAC Proceedings Series, 1986, no. 2. From a symposium, Toulouse, France, June 1985.

Averting Catastrophe. Strategies for Regulating Risky Technologies. Joseph G. Morone and Edward J. Woodhouse. University of California Press, Berkeley, 1986. x, 215 pp., illus. $17.95.

Behavior, Health, and Environmental Stress. Sheldon Cohen *et al.*, Plenum, New York, 1986. x, 284 pp., illus. $27.50.

The Collins Encyclopedia of Animal Behaviour. Peter J. B. Slater, Ed. Collins, London, 1986. xvi, 144 pp., illus. £9.95.

The Collins Encyclopedia of Animal Biology. R. McNeill Alexander, Ed. Collins, London, 1986. xvi, 144 pp., illus. £9.95.

The Collins Encyclopedia of Animal Ecology. Peter D. Moore, Ed. Collins, London, 1986. xvi, 144 pp., illus. £9.95.

A Colour Atlas of Insect Tissues. Via the Flea. Miriam Rothschild, Yosef Schlein, and Susumo Ito. Wolfe, London, 1986. 184 pp. £40.

Compendium of Post Accident Heat Removal Models for Liquid Metal Cooled Fast Breeder Reactors. B. D. Turland and J. Morgan, Eds. Published for the Commission of the European Communities by Harwood Academic Publishers, London, 1985 (distributor, STBS, London). pp. 1003–1418, illus. Paper, $12. European Applied Research Reports, Nuclear Science and Technology Section, vol. 6, no. 5 (1985).

Components of Scientific Instruments and Applications of Computers to Chemical Research. Bryant W. Rossiter and John F. Hamilton, Eds. Wiley-Interscience, New York, 1986. xiv, 834 pp., illus. $150. Physical Methods of Chemistry, 2nd ed., vol. 1.

Computer Applications in the Polymer Laboratory. Theodore Provder, Ed. American Chemical Society, Washington, DC, 1986. x, 323 pp., illus. $69.95. ACS Symposium Series, 313. Based on a symposium, Miami Beach, FL, April 1985.

Computers in the Classroom. Henry S. Kepner, Jr., Ed. 2nd ed. National Education Association Professional Library, Washington, DC, 1986. 175 pp., illus. Paper, $10.95.

The Consequences of Chromosome Imbalance. Principles, Mechanisms, and Models. Charles J. Epstein. Cambridge University Press, New York, 1986. xxii, 486 pp., illus. $59. Developmental and Cell Biology Series, 18.