type. An improved coverage of water quality and of hydrology of arid regions accounts for much of the expansion. A useful summary of water purification methods has also been added as an appendix.

The book has three major parts. The first covers the general principles of occurrence and movement of ground water. Some of the topics in this section are the hydrologic cycle, porosity, permeability, confined water, unconfined water, and ground-water maps. The second part covers the utilization of water and includes discussions of water quality, diversion of surface water, recovery of ground water, ground-water yield, ground water in areas of permafrost, and ground water in arid regions. The third section contains a discussion of ground water that has unusual thermal or chemical properties.

Many of the recent advances in ground-water geology are not discussed. Topics such as well hydraulics, isotopic composition of water, and geophysical exploration for ground water are either not included or are treated superficially. Some of the terminology also lacks a modern perspective. For example, the term *permeability* is used to describe the variable that many hydrologists prefer to call "hydraulic conductivity." The definition of *permeability* used in the book perpetuates Meinzer's cumbersome expression, which, however, has been dressed in metric units.

Despite these limitations, the book will be valuable to those who desire a general coverage of the topic. A liberal use of diagrams, combined with clear and concise writing, will serve to reduce the language barrier for those whose knowledge of French is limited.

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Introduction to Nuclear Power Costs. Arnold Rochman. Simmons-Boardman, New York, 1959. 50 pp. $2.95.

Information on individual nuclear power cost components is presented as a basis for an analytical study of nuclear-power economics. Such a study would be of great interest to the nuclear energy profession if it were based on current information. However, the author uses data derived from the open literature of the period 1946 to 1954, when classification restrictions were still in force. Because of this, information of vital importance to nuclear-power economics, such as the cost of enriching uranium and the cost of processing spent fuel elements, has been excluded. Such an omission gives one the impression that the study was made 5 years ago and just published. A book so out of date will be of little use in the rapidly expanding field of nuclear-power economics. Because more authoritative and more current treatments of the subject are available, the purchase of this book by libraries and individuals is not recommended.

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Conference on the Chemistry of Muscular Contraction. Igaku Shoin Ltd., Tokyo, Japan, 1958 (distributed in the United States by Charles E. Tuttle, Rutland, Vt.). 140 pp. Illus.

The Committee of Muscle Chemistry of Japan has published in this book the papers presented at the Conference on the Chemistry of Muscular Contraction held in Tokyo in October 1957. Though it was organized on an international level, many leading laboratories in the field were not represented at the conference, very probably for geographical reasons. Thus, the papers do not give a complete picture of the muscle research of today but present, understandably enough, a fairly good cross section of the work of Japanese investigators. In the postwar era a group of very active and enthusiastic Japanese workers made important contributions in the field of muscular contraction. The world-wide recognition that their work has received is reflected in the success of this conference, where 11 of the 24 papers were presented by 22 foreign participants, from five countries.

The character of the great majority of the papers is that of journal articles, complete with experimental materials, methods, and results. The presentation of discussions, written comments, and addenda, following each paper, helps put the data presented in the right perspective. Though the conference was held nearly one and a half years ago, much of the material has not been published elsewhere as yet.

It is beyond the scope of this review to evaluate critically the papers presented. On the other hand, a few highlights may be more appropriate than a mere table of contents. The controversy over whether myosin B dissociates or only changes its shape upon the addition of adenosine triphosphate is resolved in a conciliatory manner by von Hippel, Gellert, and Morales. Myosin B contains three different types of particles; of these, upon the addition of adenosine triphosphate, the largest ones extend, the middle ones dissociate, and the smallest ones—corresponding to myosin A—do not change. Gergely and Kohler calculate from light-scattering data, with oversimplified theory, the stoichiometry and association constants of myosin A and F actin. Association and dissociation reactions in this system are established beyond any doubt; however, one should bear in mind that synthetic actomyosin and the natural myosin B appear to be quite different in nature. On the other hand, it seems that myosin B is not a simple polymer of myosin A, as the Morales group originally thought, but contains some sort of cement, which can be removed by centrifugation, as von Hippel reports in an addendum.

Kominz, Saad, and Laki give an account of the work on invertebrate tropomyosin and discuss the possible participation of the tropomyosins in the structure of myosin. Tryptic digestion of denatured myosin liberates a tropomyosin-like fragment, thus substantiating Laki's theory that the tropomyosins are building stones of myosin.

Asakura, Hotta, Imai, Ooi, and Oosawa, in a very instructive paper, show that the polymerization of actin is similar to the formation of a three-dimensional network. Polymerization proceeds only above a critical protein concentration, which is decreased by increasing divalent cation concentration. The binding of the cations to actin can be demonstrated by electrophoretic and conductivity measurements, but there is no change in the binding properties when actin polymerizes or depolymerizes, or even when it is inactivated by denaturation. Therefore, it is likely that the cation and the actin-to-actin binding sites are at a considerable distance from each other. The authors report in an addendum the striking observation that under certain conditions actin will act as an adenosine triphosphatase, dephosphorylating slowly not only the intrinsically bound, but also the extraneous, adenosine triphosphate.

Tonomura, Matsumiya, Morita, and Kitagawa present double refraction of flow and viscosity data on myosin B solutions, which show that the particles interact strongly, forming an intermolecular entanglement. They also studied the binding of pyrophosphate to myosin B by the equilibrium dialysis technique. The polyanion causes deformation of the myosin particles, and the deformed protein has a much lower affinity for the pyrophosphate anions. Thus, most of the pyrophosphate is liberated upon deformation, but the deformation, once it has been accomplished, is not affected by the removal of the pyrophosphate anions.

The interaction of pyrophosphate with myosin B was studied along different lines by Uchida, Miyazaki, and Nagai. Presumably pyrophosphate binds to the same sites as adenosine triphosphate, thus acting as a competitive inhibitor of the adenosine triphosphate effects (adenosine triphosphatase, viscosity response, superprecipitation). Magnesium ions seem to mediate the binding of pyrophosphate. Engelhardt, reviewing the work of his laboratory, emphasizes that myosin can combine with substances like Congo red or nucleic acid, reproducing the properties of actomyosin. On the other hand, a myosin-like protein from sperm combines with actin, also giving an actomyosin-like complex.

Considerable attention was given by the authors to the relaxing factors. Ebashi, discoverer of the relaxing effect of microsome preparations, reports on his studies on the effect of surface active agents and phosphatases upon the granules. The adenosine triphosphatase and the relaxing activity can be dissociated, the latter being more labile than the former. The factor proved to be identical with the Kielly-Meyerhof granules. Lorand, Molnar, and Moos also present data on the relaxing system.

In a very interesting paper Natori and Sakai describe their experiments with isolated myofibrils. The dissection under oil permits the myofibrils to remain native, showing the same mechanoelastic properties as the muscle fibers and contracting upon addition of minute amounts of watery solutions. Strikingly, in their effect on contracting ability, "no difference could be found between ATP distilled water and NaCl solution." Watanabe attempts to elucidate the role of sulfhydryl groups in contraction and relaxation of glycerinated fibers from the effect of heavy metals and sulfhydryl reagents upon the mechanical properties of the fibers.

Space does not permit review of the remaining 12 papers. The book presents a valuable source of material for all those who are engaged in investigation of muscular contraction. It is well printed, with numerous graphs and tables, but there are many typographical errors and the English of the Japanese workers somtimes is peculiar, though this does not affect one's understanding of the text.

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