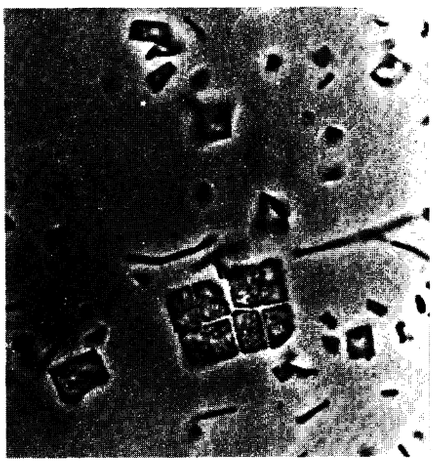

"Square-shaped bacteria [such as] were noted by Walsby (1980) in a brine pool of the Gavish Sabkha, Sinai. The bacteria appeared to divide in two dimensions, giving rise to floating, gas-vacuolated, 'postage stamp'-like sheets of cells." Cells in the center here are about 2 micrometers wide. [From *Hypersaline Environments*]

of dissolved organic carbon in evaporite formation. There follows an account of the biology of the microorganisms that inhabit hypersaline environments, in which the organisms are treated chapter by chapter according to physiological type—archaebacteria, anoxygenic phototrophs, cyanobacteria, and so on. The final part of the book consists of a series of chapters devoted to hypersaline environments, in some cases particular lakes such as the Dead Sea, in others particular classes of environment such as solar salterns. These chapters contain geochemical and microbiological details of each environment and are in places repetitious of the earlier sections, but it is difficult to see how else the subject could be treated.

The author's background in geochemistry is evidenced by the unusually comprehensive discussion of different brine chemistries and the technical problems involved in brine analyses. This part of the book ought to be a mandatory introduction for any microbiologist working with hypersaline environments. Nevertheless, an opportunity has been lost in that there is no clear account of the factors that determine why a brine develops in a particular way, for example why a lake becomes a soda lake or a bitter lake. Such accounts exist in the geological literature, but they are ferociously difficult for the nonspecialist.

With its wealth of other valuable geochemistry, however, this book is something of a tour de force as a reference work. It is true that some areas are equally well covered by other recent publications (such as, *Halophilic Bacteria* edited by Rodriguez-Valera and published by CRC Press), but this book is unique in that in it one can find every saline environment from deep-sea basins to the Antarctic lakes complete with relevant geology, geochemistry, and microbiology appropriately referenced, including useful coverage of the older literature. There are a few inaccuracies in the microbiological content (for example the misapprehension that sesterterpanyl lipids are present only in haloalkaliphiles), and where is the coverage of alkaline salterns? However, these matters do not detract from what will be a classic reference work for halophilologists.

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"View of the southern basin [of the Dead Sea], showing the extensive salt deposits which have developed at the periphery of the lake." [From *Hypersaline Environments*]

Nuclear Physics

Treatise on Heavy-Ion Science. Vol. 8, Nuclei Far from Stability. D. ALLAN BROMLEY, Ed. Plenum, New York, 1989. xxiv, 727 pp., illus. $125.

In the first few decades after World War II our understanding of the inner workings of the atomic nucleus and the forces that govern the motion of its constituents reached a comfortable state of maturity. It was realized, however, that our knowledge was not broadly based. The most abundant data from this period were obtained from stable nuclei or their immediate neighbors, nuclei close to stability. If the studies were extended to a larger number of nuclei, conclusions concerning nuclear phenomena could be improved and strengthened.

The study of nuclei far from stability began in earnest about two decades ago and rapidly evolved into one of the most vibrant areas of nuclear physics research. Experimental investigtion of such nuclei is more difficult than in the case of nuclei close to stability, but the rewards increase as well. For each problem of interest, a particular nucleus that is likely to provide the clearest and most unambiguous evidence is selected for study. If interesting results are obtained, then the investigations are extended to neighboring nuclei and a strong case is built on systematic observations of similar effects. Furthermore, not only are nuclei far from stability much more abundant than those close to it, their composition is also radically different, with "abnormal" ratios of protons to neutrons. It is, therefore, reasonable to expect that many interesting, previously unobserved phenomena will occur only among such nuclei.

This book proves how well-founded the aspirations for this new field of nuclear physics were. It does not attempt to treat all aspects of nuclei far from stability, a task that would be impossible in a single volume. However, it gives a good representation of the diverse activities in this field.

Two chapters are devoted to the technical problems associated with the production and study of nuclei far from stability. The nuclei of interest are typically produced in small amounts and are accompanied by an abundance of unwanted species. Ingenious methods have been devised to filter away unwanted products so as to isolate the species sought. These impressive technological advances have been a prerequisite to scientific achievement.

The progress in our knowledge of nuclear sizes and shapes, as well as the identification of regions where they change surprisingly quickly, is described in two other chapters.

Two decades ago, nuclei at low excitation were thought to have a single, well-defined shape that would gradually change as a function of excitation energy. The book provides ample evidence that many different shapes can coexist in one nucleus and that minor changes in excitation energy may result in drastic changes of shape. These studies demonstrate the increasing analytical power that systematic data on nuclear structure for a long sequence of isotopes or isotones provide.

The remainder of the book deals mainly with studies of highly exotic nuclei. These nuclei have such large decay energies or abnormal compositions that they are at the limit where a bound nuclear system breaks up instantly into two components. Consequently, their short and precarious existence is spent under considerable "strain," which results in some unusual features. For example, it has been found that adding neutrons to an already neutron-rich light nucleus results in a ballooning of its size, with the excess neutrons forming a thick skin outside the nuclear core. Studies of exotic nuclei have also resulted in the discovery of previously unknown modes of radioactive decay such as beta-delayed multiparticle decays, proton radioactivity, and the emission of clusters of nucleons. All these new or unusual decay modes have provided us with opportunities to study new nuclear properties or with additional means of obtaining information on already known properties.

This book comes at an opportune time. The study of nuclei far from stability has made significant advances in the past few years, and there is an abundance of interesting discoveries to digest. At the same time, the book demonstrates that this exciting epoch is not near its end and that technological improvements already in progress promise more discoveries down the road.

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