quence," reveals just the opposite. Jaki asserts (p. 292) that Curtis and Shapley were the "respective leaders" in the controversy over the island universe theory, which culminated in their historic Great Debate in 1920; in fact, surviving letters (now at the National Academy of Sciences) show that the sides in the conflict appeared oblique at the time and that the first participants proposed for the debate were Shapley and W. W. Campbell, not Curtis. Jaki's detailed discussion of the debate rests upon its published proceedings; but the papers actually presented, as well as over two dozen letters between Curtis and Shapley related to the event, still exist, and they show that the published version barely resembles what truly occurred. Jaki repeats (p. 301) the familiar saw that on 1 January 1925, when Hubble's classic discovery of Cepheids in spirals was formally announced at a meeting of the AAAS, both Curtis and Shapley were present and that the finding abruptly ended one era and began a new one; again, private papers show that Curtis was not present, that almost everyone in the field had known of the discovery for many months (the *New York Times* had even run a story on it in November of 1924), and that some distinguished astronomers were not immediately convinced by it.

It would be too much to expect a single author to ferret out every source; and, overall, Jaki has made an admirable effort in that regard. The book's dust jacket boldly claims that this will undoubtedly be "the definitive reference work on the Milky Way's history for many years to come." For the recent periods this is sheer hyperbole; for the early ones, which constitute the bulk of the book, it likely will be true.

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Aquatic Diets

Fish Nutrition. JOHN E. HALVER, Ed. Academic Press, New York, 1972. xii, 714 pp., illus. $32.50.

Mammalian nutrition has for many years been studied systematically by means of synthetic feeds of controlled composition. Use of these methods with fish presents problems, however. A special expertise, which has evolved only relatively recently, is required to prevent the loss of soluble constituents or the breakup of the food in the water and to make sure that the exact amount of test material is actually ingested by the fish. It is therefore a pleasure to find this book summarizing what has been discovered about fish nutrition.

The volume is edited by a pioneer in the field and gives pride of place to the doyen of fish nutritionists, Arthur Phillips, Jr., who has contributed the first chapter. There are 11 chapters in all, each by one or two distinguished contributors, presenting altogether a most useful collection of information. Separate chapters deal with requirements for calories, vitamins, proteins, and lipids. Others show the effects of absorption of excessive or unbalanced proportions of nutrients and of consuming nonnutritive or even toxic materials that happen to be included in the diet. The remaining chapters, apart from one on fish enzymes, are concerned with feed formulation, husbandry techniques, and disease, and the text concludes with an appendix setting out typical diets. A bibliography concludes each chapter, and there is a full author index and a general subject index at the back of the book.

As most of the experimental work in toxicology has been done with mammals, the consequences for fish of eating such materials as soybean and cottonseed can usually only be surmised. Thus Friedman and Shibko's chapter is devoted largely to the responses of mammals, but the advantage of this approach is that it points the way to future studies using fish. L. M. Ashley's chapter on nutritional pathology balances more evenly the findings on mammals and fish and where possible draws valid comparisons between the two.

Hugh Tarr's chapter ("Enzymes and intermediary metabolism") cannot honestly be said to fit into the pattern of the book at all, but it is a superb chapter which gives a biochemical background to the experimental animals. As in standard biochemistry textbooks, the Embden-Meyerhof and hexose monophosphate pathways and the tricarboxylic acid cycle are laid out—but here at each step a reference number shows where the appropriate enzyme has been found in fish.

A consequence of the long time taken to compile this book is that there are few references beyond 1966; one author refers to a paper "recently" published in 1962. Apart from this I have two main criticisms. The first relates to the Latin nomenclature—no fewer than 25 Latin names are misspelled: rainbow trout comes in various chapters as *Salmo iredius* (sic), *S. gairdneri*, and *S. gairdnerii*, and *Thynnus alalunga* on p. 279 appears as *Germo alalunga* on p. 312. In a reference work of such importance these should have been standardized. Second, there is considerable duplication which could have been eliminated by tactful editing: the symptoms of vitamin deficiency in fish have been tabulated independently by three of the authors, and, incredibly, in three separate chapters there are photomicrographs of "clubbed" gill filaments resulting from pantothenic acid deficiency. There are also two independent photographs of goitrous tumors and two of lipoid degeneration of the liver, the latter two apparently borrowed from the same source.

However, these slips detracted little from my enjoyment of a fine book which should be a source of reference material for fish culturists, nutritionists, and biology students for a long time to come. It is beautifully produced and contains a large number of informative photographs and photomicrographs.

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Molecular Biology

The Mechanism of Protein Synthesis and Its Regulation. L. BOSCH, Ed. North-Holland, Amsterdam, and Elsevier, New York, 1972. xiv, 590 pp., illus. $38. Frontiers of Biology, vol. 27.

Control Mechanisms and Protein Synthesis. S. D. WAINWRIGHT. Columbia University Press, New York, 1972. x, 550 pp., illus. $20.

These two books attempt to present a contemporary view of protein synthesis and its regulation. Taking a global view one must say that on the whole they have succeeded, particularly for a reader with access to both of them—an expensive undertaking, by the way. In many ways they are complementary, one dealing mainly with synthesis, most successfully with prokaryotic systems, and the other mainly with regulation, with principal emphasis on eukaryotic systems, specifically of vertebrate animals.

The Mechanism of Protein Synthesis and Its Regulation attempts in 16 chapters to present the state of the art as

of late 1971. The chapters deal, in not always logical sequence, with aminoacyl transfer RNA synthetases, chain elongation, initiation, and termination, tRNA's and their structure, suppressors, ribosomal proteins and RNA's, translation of viral RNA's (bacterial, plant, and animal), bacterial messenger RNA and its translation in protein synthesis, and mRNA and informosomes of animal cells, ending with a consideration of protein synthesis in mitochondria and chloroplasts.

As is to be expected from such an encyclopedic work cohesion and consistency are lacking: contributions differ not only in style and clarity but in depth, penetration, and even philosophy. There are some truly comprehensive and analytical chapters, such as the ones by Rudland and Clark and by Revel on initiation, by Zachau and by Cramer and Gauss on tRNA, and by Wittmann and Stöffler on bacterial ribosomal proteins. Others are much more superficial, though useful, surveys. Finally, there is a highly provocative speculative contribution by Spirin on informosomes. The absence of a chapter, or chapters, specifically and critically devoted to regulation, particularly in eukaryotic cells, where so much novel and exciting work is unfolding, is regrettable. It is disappointing not to find any discussion of polyadenylation of eukaryotic mRNA or a description and evaluation of the relation of heterogeneous nuclear RNA to mRNA, of unique versus repetitive sequences in eukaryotic DNA, of mRNA for histones, and especially of possible mechanisms by which hormones may regulate protein synthesis in metazoan animals. If this seems to weigh the scales too far toward eukaryotes, explicit and critical discussion of regulation in prokaryotes is also lacking. Clearly the word "regulation" should have been dropped from the title.

One final question of principle, applying not just to this book but to many similar compendia: Just who is it the publishers and editors are trying to reach? Experts surely are sufficiently familiar with their areas of expertise to find such a volume only marginally useful, with little in it that is not covered in other works on their shelves. Worse still, they more than the average reader will suffer from the built-in obsolescence of books of this kind. For novices and readers from other fields, the price would appear to be prohibitive in view of the shortcomings inherent in this kind of undertaking. It is probably futile to ask commercial publishers to reflect whether they are really rendering a service to the scientific community by these policies of overkill for publications in molecular biology. But perhaps their advisory editors might become a little more discriminating in the future.

The second book, by Wainwright, is subject to far fewer criticisms. In his stated goal of writing a comprehensive and critical text covering recent developments for graduate students just beginning work in biochemistry and molecular biology the author has succeeded admirably. He has written an eminently readable book permeated and unified by his own keen grasp of the subject matter, and his objective and well-documented evaluation of what has been and what remains to be accomplished from the same vantage point of late 1971. My main question here is one of emphasis. As I indicated in the introductory paragraph, this book slights the "protein synthesis" part of its title. To allot but one chapter to this topic results in such a dense and condensed presentation as to make not only for a lack of depth but for very heavy going at the very outset—a great pity, for beyond this bar lies easy and rewarding sailing. To the objection that expansion of this chapter might have resulted in a book of excessive length my answer would be that there are several instances where greater brevity might not have been amiss. One might mention particularly the somewhat lengthy historical introduction in the chapter "Induced enzyme synthesis" and some of the details of prokaryotic regulation, since it is stated that the reader is expected to have had introductory courses in biochemistry and biology. But these are minor matters: Wainwright has succeeded in an almost impossible task.

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