Szilard

The Collected Works of Leo Szilard. Scientific Papers. BERNARD T. FELD, GERTRUD WEISS SZILARD, and KATHLEEN R. WINSOR, Eds. M.I.T. Press, Cambridge, Mass., 1972. xxii, 738 pp., illus. $17.50.

The present volume is the first of a collection of Leo Szilard's writings. It contains his scientific publications and some biographical material (including a foreword by Jacques Monod, Szilard's own curriculum vitae, and brief essays by Carl Eckart, Maurice Goldhaber, Bernard Feld, Aaron Novick, and Julius Tabin). Later volumes will contain his other writings, including *The Voice of the Dolphins* and essays on war, peace, science, and nuclear armaments.

Szilard once made a proposal concerning the admissions policy of a then-new university (Brandeis) in which he was visiting professor: Admission should require a sufficiently low score on a "stupidity test," stupidity being a measure of the discrepancy between an applicant's abilities and his estimate of those same abilities. This had many virtues, Szilard said, including especially the fact that it would be wholly uncorrelated with standard Ivy League admissions policies and thus give Brandeis a selective advantage for good students.

A second story to be added to the collection of Szilardiana had as its setting a serious illness which kept Szilard hospitalized in 1959–60, from which however he recovered. During that illness he had many devices for cheering up his friends. One visitor reports the following statement: "I will be known as a man who wrote three important papers in the last year of his life, all of them wrong."

I had occasion to become familiar with one of the "wrong" papers he referred to in 1960, "On the Nature of the Aging Process" (p. 447 in this volume). It gave me a certain insight into what Monod refers to in his foreword as Szilard's "mode of being." Without denigrating Szilard's scientific accomplishments as such, I think it is the revelation of his style, or mode of being, which chiefly justifies this volume. The characteristic which impressed me most in the paper on aging is his facility for getting at the uncluttered essence, for a strategic theoretic simplification which gives testable implications in areas not much affected by that simplification, and which can be judiciously extended from the "zero'th approximation" to the first and second as that proves worthwhile. When this paper first appeared I heard it criticized more than once on the ground that it was "too simple"—in just those respects in which Szilard had aimed to make it so. Szilard had a passion for the central simple idea, and this passion was associated with a very low Stupidity Index.

This paper and the companion work on memory (p. 497) are examples of good theory (right or wrong), as at an earlier time (1934) had been Szilard's secret patent on the neutron chain reaction (p. 639). In other areas the theoretical groundwork was firmer. Two basic papers in thermodynamics (pp. 34 and 103, with English translations following) were published in 1925 and 1929, the second finally resolving the paradox of Maxwell's demon and laying the foundations of what was later to be called information theory. Szilard's own later comment: "At the time only one person read it, and he said it was wrong."

In chronological order follow a series of papers in nuclear physics (1934–39) and then the famous Einstein letter to President Roosevelt, followed in turn by a series of Manhattan Project documents. These record Szilard's most immediately consequential work, and they provide the background for his later intense preoccupation with the great issues of war and peace. As Szilard first conceived the chain reaction, so with Fermi he initiated its reduction to practice in the uranium-graphite pile. And, as I think later volumes will show, he was among the first who learned to think well about the historical consequences.

After the war Szilard became "professor of biophysics and social sciences" at Chicago. It is too bad, in a way, that these twin concerns are separated in the present collected works. I think that as inseparable aspects of Szilardian style they belong together—the work of a man adding to biological knowledge and working very hard, at the same time, to "save the world." Some of Szilard's political analysis is almost quaintly *more geometrico*, a characteristic which sometimes confused his readers. He was trying there as elsewhere to unclutter the essence.

Further on in the sequence of Szilard's papers are an account of the important chemostat principle, which he discovered, a series of papers based on chemostat studies, and the papers on aging. His last and crowning works dealt with theory also—on enzyme formation, on antibody formation, and (what may turn out to be the most important) on the biophysical mechanism of information storage and retrieval in the brain. I do not know how to assess his priority with respect to such topics. Szilard did not so much make discoveries as announce what they were going to be. This is a higher art which depends on good style in thinking. Anyway, concerns over priority were foreign to his nature. He loved good ideas and gave them away at every opportunity.

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Foods and Feeders

Insect and Mite Nutrition. Significance and Implications in Ecology and Pest Management. Proceedings of a conference, Lexington, Ky., April 1972. J. G. RODRIGUEZ, Ed. North-Holland, Amsterdam, 1972 (U.S. distributor, Elsevier, New York). xiv, 702 pp., illus. $30.

This volume is a compilation (with too little integration) of papers presented at a conference on "the significance of insect and mite nutrition." The rapid translation of the conference into print is praiseworthy, but may also account for some of the shortcomings of the book. The concept of "significance" is enlarged on as "significance and implications in ecology and pest management"; yet this is hardly referred to in the 42 contributions occupying the first 550 of some 700 pages. There are some general reviews, but the volume is primarily a collection of research papers. Most workers in arthropod nutrition will probably choose to try and collect two or three reprints of articles of particular interest to them rather than go abundance and pay postage on the whole 1½ kg. Quite a lot of the material has already been published elsewhere, anyway. Although each of the six main sections is introduced by a "section editor," who in most cases has tried to draw the section together, there is little evidence that authors have seen these introductions and been encouraged to modify their manuscripts accordingly.

However, all "nutritionalists" are bound to find something of value to them in the book—perhaps a technique they might adapt, a novel way of expressing the insect response, or a speculation concerning a metabolic chain which may lead them to reassess the

interpretation of their own work. Most aspects of nutrition do indeed find inclusion—the use of mutants in nutritional research, measurement and interpretation of food utilization, isolation of nutritional requirements, symbiotes, nutrition at the cellular or metabolic level, artificial diets, and some case histories where nutrition might possibly become involved in pest control. The problem for the reader is to find guidance for assessing the various authors' differing interpretations and approaches; he may also be left with the wrong impression that insect nutrition can play little practical part in pest control on crops. For example, the final chapter, with the all-embracing title of "Insect control strategies based on nutritional principles: a prospectus," concentrates almost entirely on the possibilities of pest control in manufactured foodstuffs. Even Maxwell ("Host plant resistance to insects—nutritional and pest management relationships") emphasizes the contribution plant resistance can make to our knowledge of insect nutrition at the expense of possible contributions in the other direction.

The book could well have been more argumentative and cohesive and is no substitute for a textbook to a worker seeking an interpreted summary of the literature. For example, the mites in "Food utilization by acarid mites" are *Caloglyphus berlesei*, "Chemical feeding requirements of oligophagous insects" refer to those of the Colorado beetle, and the "Neuroendocrine regulation of insect metabolism and the influence of nutrition" is about *Blaberus discoidalis*. In spite of this, each chapter (in an isolated way) is an entry point into a particular field for the worker changing the orientation of his research or for the graduate student starting a nutrition-based project. I therefore do recommend that workers have this book ordered for their libraries, but it is not a reference book necessary for their own bookshelves.

Most chapters carry an adequately up-to-date bibliography, but, as in so many books published in English, one is left with the impression that the non-English literature has contributed remarkably little to the subject. The book is attractively presented and printed with rather few typographical errors which are likely to mislead (except possibly "phospholysid" for "phospholipid"). It is annoying that legends to tables and figures are hardly distinguishable as such from the adjacent text and that the subject index is rather arbitrary. For example, the phrase "dietary imbalance" may occur only once as such, in a table heading, but the subject is mentioned frequently elsewhere and surely warrants keying out to where it is discussed in the text. The book bears many marks of hasty copy editing: joint authors are variably linked by "and" or "&," lists of authors in the text may be found in both alphabetical and chronological order, species are cited with and without their authors, and an "unpubl. obs." is equally likely to turn up as just "unpublished" or even "unpublished obs."

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Biochemistry of Metal Ions

The Inorganic Chemistry of Biological Processes. M. N. HUGHES. Wiley-Interscience, New York, 1973. viii, 304 pp., illus. $12.95.

This book is an outgrowth of a course designed to introduce advanced inorganic chemistry students to problems in biology germane to their expertise. A more apt title might be "The Role of Metals in Biological Processes," since the text is restricted to a treatment of metal ions and, specifically, those involved in life functions. The metabolic transformations of inorganic forms of elements such as nitrogen and sulfur are discussed only to the extent that metalloproteins are involved. However, to focus criticism on its ambiguous title would be unfair because this book serves a useful purpose within its intended scope.

A second scientific audience will also find this book of value, namely, biologists who are interested in the occurrence of metal ions in biological systems and the functions they fulfill there. To provide sufficient background for both chemists and biologists, Hughes presents fundamental biological information regarding proteins and their mediation of metabolic reactions on the one hand and a general introduction to the chemistry of metal ions on the other. However, in general, biologists would be well advised to have an advanced inorganic chemistry text at hand when they undertake this book. Chemists may require a biology text in order fully to appreciate processes such as oxidative phosphorylation.

This book is properly focused on the nature of metalloproteins and considers the respective contributions of the biochemical properties of the protein and the inorganic chemistry of the particular metal moiety to the mechanism of action of the conjugated complex. Methods of study which yield information concerning these complexes by exploiting either protein or metal properties are reviewed and typical results are noted. Deviations of one component from expected behavior are rationalized in light of contributions or perturbations by the other. Within this framework, examples from the various classes of metal-containing proteins are considered in detail with respect to their mechanism of action, and the strong relation between the specific metal ion involved and the function of the metalloprotein is emphasized. For instance, the properties of zinc which render it a strong Lewis acid are correlated with its role in hydrolytic enzymes; and the presence of the transition elements, copper, iron, and molybdenum, in oxidoreductases is justified through the electron transfer capabilities they possess by virtue of their characteristic unfilled *d* orbitals.

The book is short considering the breadth of the topic and the depth of the treatment. Obviously, then, the material is condensed and selected. However, it is concisely presented, organized, and objective. Each chapter includes a statement of purpose. Also, the book is well referenced (through 1971), thereby providing the reader with ample opportunity to explore interests or gain further explanations.

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Holography

An Introduction to Acoustical Holography. B. P. HILDEBRAND and B. B. BRENDEN. Plenum, New York, 1972. xii, 224 pp., illus. $14.50.

Optical and Acoustical Holography. Proceedings of a NATO Advanced Study Institute, Milan, May 1971. EZIO CAMATINI, Ed. Plenum, New York, 1972. xii, 436 pp., illus. $26.

These two books take up some recent developments in holography that have applications in fields as diverse as medicine, geology, and information storage. The book by Hildebrand and Brenden is a monograph on the theory and applications of holographic technique