have been studied and rate constants for the reaction have been derived. However, even here the hypothesized kinetics do not yet make possible a clear understanding of the varied geometrical configurations adopted by the reaction.

Readers not familiar with the chemical literature may receive the impression that all self-organizing processes in chemistry may be classified as dissipative structures. This is not the case. In the last century, a periodic precipitation phenomenon was discovered. Periodic precipitates called "Liesegang rings" can be generated in a variety of ways. One way is by saturating a filter paper with a dilute solution of a salt A and then placing a drop of a concentrated solution of a salt B, which forms a precipitate with A, in the center of the filter paper. As B diffuses out, a precipitate is formed in one of a variety of geometric patterns, for example concentric rings or spirals (*1*). Other self-organizing processes that occur during phase separation are well known, and elegant mathematical treatments, which use deterministic and stochastic methods similar to those developed in the text, are available (*3*). Because these structure-forming processes are of interest in chemistry and biology, reference to this earlier work and a discussion of its significance should have been included.

The book will be of interest to physical scientists seeking a recent review of work on self-organizing processes in chemistry and biology. In addition, many mathematicians will find that the models pose sharp problems concerning the behavior of nonlinear differential equations. Although the authors indicate which sections of the book should be read by experimental chemists, biologists, or sociologists interested primarily in applications, much of the material in the recommended sections requires a sophisticated mathematical background, which many potential readers will not have.

The authors point out that many of the topics covered in the book are still the subject of active research. The book should help to focus and sharpen analysis of these topics, and should also contribute to the growing recognition that processes of self-organization are amenable to both theoretical and experimental study. These processes will be a rich source of problems for many years to come.

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An Infamous Element

The Chemistry of Mercury. C. A. McAULIFFE, Ed. Macmillan of Canada/Maclean-Hunter Press, Toronto, 1977. viii, 288 pp., illus. $34.95.

In retrospect, the protagonist of this story always has been a villain. Yet around the middle of the 17th century John Woodall wrote in praise of mercury:

> The perfect cure proceeds from thee,
> For Pox, for Gout, for Leprosie,
> For scab, for itch, of any sort
> These cures with thee are but a sport.

This reflected the prevailing medical opinion. In Europe in the years between 1500 and 1900, mercury and some of its compounds were credited with curative powers, particularly in the treatment of syphilis, a scourge that ravished prince and pauper alike. Two types of mercury "therapy," rubbing and tubbing, became part of the Mother Goose collection our children still read today ("Rub-a-dub-dub, three men in a tub . . ."). The toxicity of the most obviously toxic mercurial compounds was recognized, however, as another verse of later vintage shows:

> Auntie Jane gave Baby Nell
> What she thought was calomel.
> But, alas, what baby ate
> Was pure corrosive sublimate.
> A dreadful error, I confess—
> One atom and one baby less.

But it remained for Alfred Stock to establish in the early 20th century that mercury vapor is a dangerous hazard. It was the mercury pollution scandals of recent years that led to the present sharp decline in the utilization of mercury and in the commercial production of its compounds.

Mercury—so aptly named quicksilver—has always fascinated people. We no longer share the belief of Thomas Dover, the "quicksilver doctor," that mercury cannot be harmful because it has no sharp corners or edges, but who can resist being intrigued by the sight of a globule of mercury rolling across a table top? Moreover, mercury and its compounds are still with us in everyday life—in thermometers, in dental amalgams, in mercury-vapor lamps, and so on. Mercury still finds industrial applications, such as the mercury cell used in the electrolytic preparation of chlorine and caustic soda. In university laboratories, research on the inorganic and, especially, the organic chemistry of mercury continues at a brisk pace. An up-to-date book on mercury chemistry is therefore useful and welcome.

The Chemistry of Mercury contains short accounts of four aspects of the subject. A 40-page history of mercury by W. V. Farrar and A. R. Williams is the opening chapter. In ten short sections the authors discuss diverse topics, including mercury in the ancient world, in China, and in alchemy, the mercury industry, mercury in the development of the "new chemistry," mercury-nitrogen compounds, mercury in industry and in pharmacy, organomercurials, and mercury as a poison. This chapter makes fascinating reading, and one wishes it could have been longer. (For a whole book on the history of mercury, but with emphasis on matters medical rather than chemical, the reader is referred to L. J. Goldwater's *Mercury: A History of Quicksilver*.)

The remaining three chapters of the book are devoted to recent advances in the chemistry and biochemistry of mercury and its compounds. The coordination chemistry of mercury, very broadly defined, is discussed by W. Levason and C. A. McAuliffe, mainly from a structural point of view. The coordination chemistry of organomercurials is not included, which is unfortunate since the subject is not covered in the organomercury chapter. Levason and McAuliffe's chapter is the only one of the four that deals with inorganic aspects of mercury chemistry, and it is regrettable that the authors restricted their coverage to bonding and solid state structure, omitting any discussion of the preparation, reactivity, and synthetic applications of inorganic mercury compounds. The important subject of mercury(II) in solution is summed up in a paragraph of only eight lines. Although mercurials with novel substituents, such as $Hg(SCF_3)_2$, $Hg(SeCF_3)_2$, $Hg[N(CF_3)_2]_2$, $Hg[ON(CF_3)_2]_2$, $Hg[N(SiMe_3)_2]_2$, and $Hg(NSF_2)_2$, are mentioned, an account of their interesting chemistry and their use in synthesis is not given. Nor does the discussion of compounds in which mercury is bonded to other metals cover their reactivity and applications. Even though one can criti-

cize this chapter because of these omissions, one cannot fault the authors on what they have written, for they have done a fine job of presenting the inorganic structural chemistry of mercury.

A. J. Bloodworth's chapter on organomercury compounds covers its topic well and gives an excellent account of the preparation of these compounds, their reactions, and their use as reagents in synthesis. The discussion is well organized by reaction type. The chemistry is presented concisely and clearly. In particular, the excellent discussions of the mechanisms of the various processes in which a mercury-carbon bond is formed or broken will help the reader to obtain a good understanding of the chemistry involved. The section on the applications of organomercurials in synthesis singles out for detailed consideration the solvomercuration-demercuration of alkenes and alkynes, which has been applied with good advantage to the synthesis of diverse functionally substituted organic compounds, and the use of α-haloalkylmercurials as divalent carbon-transfer agents. The useful catalytic and stoichiometric organomercurial–transition-metal-based synthetic conversions, especially those involving palladium complexes, should also have been discussed in this section: such transition-metal-catalyzed processes are the "new wave" of synthetic organomercury chemistry. A notable omission in this chapter is the novel class of "pseudo-organomercurials" in which mercury is bonded not to carbon but rather to its congeners, silicon, germanium, and tin. These compounds, of which $[(CH_3)_3Si]_2Hg$ is a single representative, have a fascinating chemistry of their own and certainly deserve a few pages.

The final chapter, by K. H. Falchuk, L. J. Goldwater, and B. L. Vallee, covers the biochemistry and toxicology of mercury and its compounds. The toxicological effects of mercury and its derivatives result from the interactions of these substances with thiol, selenol, phosphate, and amino and carboxyl functions in amino acids, proteins, enzymes, nucleic acids, and various cellular components. These interactions are discussed in three short sections. The account of the toxicological aspects of mercury metabolism nicely supplements the section on mercury as a poison in the first chapter. Although this final chapter is short, it presents enough of the essential features of the subject to satisfy most chemists. More extensive discussions will be found in Goldwater's book and in *Mercury in the Environment* by L. T. Friberg and J. J. Vostal.

In summary, this book may be recommended as one that presents a reasonable and quite readable overview of modern mercury chemistry. Its price, unfortunately, will not attract the individual purchaser.

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Robinson and His Researches

Further Perspectives in Organic Chemistry. Papers from a symposium, Feb. 1977. Elsevier/Excerpta Medica/North-Holland, New York, 1978. viii, 212 pp., illus. $19.75. Ciba Foundation Symposium 53 (new series).

This symposium, organized by G. W. Kenner, commemorates Robert Robinson and surveys the impact of one of this century's greatest chemists on some aspects of contemporary bioorganic chemistry. Robinson had a lot to say about biosynthesis long before the experimental methods needed to study it were available, and it is fitting that reviews by A. J. Birch and A. R. Battersby cover recent laboratory findings on polyketides, alkaloids, and porphyrins. Robinson's role as a "minor prophet"—a phrase he used in the title of his recent volume of memoirs—is indeed verified by many of the results reported recently. Biogenetic synthesis and transformations are covered by D. Barton and S. V. Ley (phenols), R. Ramage (terpenes), G. E. Evans, M. G. Gardon, D. A. Griffin, F. J. Leeper, and J. Staunton (polyketides), J. M. Brown (micellar catalysis), and R. Breslow (proteolytic enzyme models). Robinson's other great love was the rationalization of reaction mechanism by means of electronic and steric effects, and these aspects of his work are revisited and amplified by M. J. S. Dewar (quantum theory) and J. Baldwin (rules for nucleophilic ring closures).

The main dishes in this feast of contemporary chemistry are interspersed with lively discussions by a group of experts gathered for the occasion, which include some fascinating and often divergent commentaries (which would have delighted Robinson) on the synthesis of peptides (inter alios Kenner, Chain, Todd, Woodward, Prelog, Eschenmoser), antileukemic lignans (Raphael), and organometallics (Birch). Lord Todd provides both the grace and the benediction. The excitement and challange of many facets of organic chemistry are conveyed successfully in these pages.

In reviewing such a free-flowing and obviously enjoyable occasion it is perhaps inappropriate to inject a critical note, but for the uninitiated it should be pointed out that neither the papers nor the discussions could be comprehensive. To take but one example, during the discussion of polyketide assembly (pp. 146–147), reference to the recent work of Lynen (see *Eur. J. Biochem.* **55**, 561 [1975] and other papers cited therein) would have cleared up many of the issues raised. This is but a minor criticism that should not prevent the organizers from a repeat of the occasion a decade from now. For the present, the reader can only marvel at the profound influence of this rugged pioneer. From both the historical and the contemporary standpoint, all students of organic chemistry should read this volume, together with *The Structural Relations of Natural Products* by Robinson and *Perspectives in Organic Chemistry* edited by Lord Todd and published in 1956 to commemorate Robinson's 70th birthday.

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Modeling Soil Processes

Solute Movement in the Soil-Root System. P. H. NYE and P. B. TINKER. University of California Press, Berkeley, 1977. xiv, 342 pp., illus. $23. Studies in Ecology, vol. 4.

In 1840 Justus Liebig wrote, "A rational system of agriculture must be based on an exact acquaintance with the means of nutrition of vegetables, and with the influence of soils and action of manure upon them." It is the contention of the authors of this welcome book that only in the past 20 years or so have we come within reach of that objective. It is hard to quarrel with their statement that the agricultural chemists and the plant physiologists seem scarcely to communicate with each other. The main method of investigation of soil nutrient questions has been field experiments that are

designed and interpreted by the statistical methods developed for this purpose by R. A. Fisher. This has been a highly successful approach, and forms the basis of modern fertilizer practice. However, for scientific purposes, it was overemphasized since it led agricultural chemists to be satisfied with correlations and regressions between fertilizer responses and chemical extracts, and inhibited the search for more fundamental and detailed explanations of their results.