pressions. For printing, MathType will work directly with many laser jet and dot matrix printers, although for the dot matrix printer you will need a font type manager.

While MathType comes with a complete tutorial, it is so intuitive that you can just dive in and be using it reasonably proficiently in 20–30 min. The manual allows you to fine tune the few less obvious things such as tabs. For example, the following demonstration expression was typeset in under 90 s.

$$\begin{pmatrix} \sum_{j=1}^{\infty} x_j^2 & \sqrt{\frac{a}{b}} \\ \alpha & \Delta \end{pmatrix} \geq \int_0^7 z^3 e^z \, \mathrm{d}z = \overline{x+y}$$

The 2 × 2 matrix, the integral, the square root, the quotient, and the average all have one or more fill-in-the-blank boxes and were selected by a single mouse click. The Greek symbols were single mouse operations from the symbol template.

As supplied, MathType uses the standard typesetting rules for equations. The average user will be satisfied by the defaults. However, everything is adjustable by the user including fonts, sizes, and spacing. Fine tuning can be performed by moving any component by single screen pixels at 100% viewing. Higher resolution is provided by the expanded views (one quarter pixel at 400%).

Anyone familiar with the equation setter in Microsoft Word 2.0 for Windows has already used a subset of MathType. The Word version condenses more functions into pulldown menus, which slows use by requiring subselection of items, lacks user configurable popups, templates and macros, and does not have all the flexible formatting features of MathType. While the Word version is good for small equation setting problems, serious setters will find the full MathType version indispensable.

As far as using MathType for setting equations, it worked flawlessly and is a true pleasure to use. However, there were problems. It is supposed to work directly with an HP LaserJet II with extra memory but no font cartridges (it can exploit font cartridges if available). Even with extensive and very helpful assistance from a Design Science technical support engineer, we were never able to get it to print properly; the MathType fonts were not being successfully downloaded. When I received Word, which had the necessary True Type scalable fonts, the problem went away. The True Type fonts were successfully downloaded as predicted by the engineer. According to Design Science, the True Type scientific fonts will be included in the upcoming release 3 (there will be no release 2) but are not included in the current version. On the other hand, MathType worked flawlessly under Windows 3 or 3.1 with a PostScript printer.

There are problems with the transfer of equations from MathType to other word processors. The latest release of WordPerfect 5.1 for Windows (4/30/92) accepts cut and paste from MathType only if you are using the Windows print drivers; you cannot have a WordPerfect print driver installed or both the screen and printout are trashed. The WordPerfect people are working on this problem. For Word, which uses a subset of MathType, you would have expected few or no problems. However, there are difficulties. While you can cut and paste expressions into Word, any attempt to edit them with Word immediately trashes the expression. Word does not recognize the MathType format, believes it to be a drawing, and messes it up when it tries to load the equation into the drawing editor. The error is irreversible unless you have kept a separate copy of the equation. You can also paste the equation into the Word equation editor, but this can result in some loss of formatting flexibility. Version 3 will solve this problem by including OLE (object linking and embedding).

In summary, MathType is an outstanding tool to those who have to set modest to complex scientific equations. For those who have had to set equations using the UNIX eqn or the WordPerfect 5.1 variant, one taste of MathType and you will never go back. When the file format problems are overcome, it is difficult to envision a more perfect product.

*Book Reviews**

Physical Sciences Data. Volume 43. Vapor–Liquid Equilibrium Data—Salt Effect. By Shuzo Ohe (Science University of Tokyo). Elsevier Kodansha: Amsterdam-Tokyo. 1991. xxxii + 360 pp. $218.00. ISBN 0-444-98687-1.

This monograph has been centrally concerned with the topic of reducing distillation problems involving separations of azeotropic mixtures by taking advantage of the salt effect disturbance of the ratios of solute and solvent in the vapor and liquid phases. Such salt effect disturbances seem generally to have been less widely exploited in commercial processes than disturbances effected by additions of volatile components. This has been importantly related to a lack of accurate theoretical predictions of the effects of additions of particular salts to different solute/solvent systems.

The main content of the monograph comprises some 700 illustrative plots of parameters related to vapor–liquid equilibria for a very comprehensive collection of solute–solvent systems. A preceding guide sheet to the component features of diagrams is provided. In general, the plots seem favorably to compare experimental findings of alterations of the parameters produced by a variety of different salts and their concentrations with predicted relationships calculated from considerations of the preferential solvation approach developed by the author.

The data sheets are preceded by an introductory preface and some 20 pages of introductory and explanatory referenced text. Unfortunately this section has been rather poorly edited, which has resulted in it being somewhat difficult to make easy correlations with the tables and figures contained throughout the text.

F. A. Lewis, *Queen's University*

Perspectives of Nonlinear Dynamics. Volumes 1 and 2. By E. Atlee Jackson (University of Illinois). Cambridge University Press: Cambridge. 1991. Volume 1: xix + 496 pp. Volume 2: xvii + 633 pp. Volumes 1 and 2: $69.95 (hardback) and $32.95 (paperback). ISBN 0-521-34504-9 (Volume 1, hardback), 0-521-42632-4 (Volume 1, paperback), 0-521-35458-7 (Volume 2, hardback), and 0-521-42633-2 (Volume 2, paperback).

Nonlinear dynamics occupies a peculiar place in chemical research today. Its importance, in such fields as combustion, spectroscopy, and chemical oscillations, is growing rapidly, yet almost none of its practitioners received any formal training in the subject, and there are few courses on nonlinear dynamics being taught in universities at a mathematical level accessible to most graduate students in physical chemistry or chemical physics.

This two-volume set may provide at least a partial remedy for this gap. These books represent an attempt to "afford an introductory access to concepts which will stimulate imagination in the future". Jackson identifies these concepts as (1) classic and modern analytic methods, (2) topological and other global viewpoints, and (3) computational and heuristic approaches. The first two areas are treated more thoroughly and more satisfactorily than the third, but since most students of chemistry find numerical techniques easier to grasp than "purer" mathematical ones, the weakness in the numerical area is not a fatal one.

Jackson's treatment is somewhat idiosyncratic. The book was clearly written by an interesting person who is fond of his subject matter. The cartoons and occasional digressions (e.g., on the wisdom of attempting to apply catastrophe theory to social problems) make the books more entertaining, though they do contribute to their length. Jackson places great emphasis on intuition and thoughtful approximation, characterizing as "myths" the commonly held notions that linear equations are easier to solve than nonlinear equations and that an analytical solution, if it exists, gives the most useful information about a system. One of the strongest points in Jackson's treatment is the inclusion of many cleverly constructed exercises, supplemented by very helpful "comments" that range from complete solutions to encouragement to struggle on. The historical perspective Jackson presents is another attractive feature, as is the 6-page glossary of mathematical terms and symbols.

The focus is on ordinary differential equations and difference equations (maps), especially with a few degrees of freedom, and these are treated in considerable detail. Partial differential equations and cellular

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*Unsigned book reviews are by the Book Review Editor.

automata are discussed more briefly, while differential delay equations and integro-differential equations are ignored. Jackson has a knack for cutting through jargon and obscurity to make complex and subtle ideas clear. In several instances, he provided new insights into topics like bifurcations and stability that I thought I already understood fairly deeply.

Students and research directors should find Jackson an attractive alternative to most mathematics and physics courses on nonlinear dynamics or to more formally oriented texts like Guckenheimer and Holmes. Jackson is a physicist, and the explicit treatment of chemistry is essentially confined to Volume 2. Even this material is limited to brief considerations of the Belousov–Zhabotinsky reaction, the Brusselator and the Turing instability. Jackson clearly prefers to take his examples from mechanics or optics. The chemical references in the lengthy bibliography (which is divided by subjects) end in 1987 and most are over a decade old in a field that has advanced rapidly in the past several years. A quick look at the references on neural nets showed a similar gap, though other parts of the bibliography seem to be more up to date. The text would have benefitted from more careful editing; the large number of minor typographical errors was distracting. Nonetheless, these volumes fill an important gap in the literature and provide a nice complement to the recent books by Gray and Scott and by Scott on chemical oscillations and chemical chaos, respectively. I plan to recommend them to any students of mine who need to learn nonlinear dynamics at anything more than an elementary level.

Irving R. Epstein, *Brandeis University*

Electron and Proton Transfer in Chemistry and Biology. Edited by A. Müller (Universität Bielefeld), H. Ratajczak (University of Wroclaw), W. Junge (Universität Osnabrück), and E. Diemann (Universität Beilefeld). Elsevier: Amsterdam and New York. 1992. xiv + 394 pp. $203.00. ISBN 0-444-88862-4.

This book contains the Proceedings of an international meeting held at the Universität Bielefeld in Germany, September 19–21, 1990. It was organized by the Zentrum für Interdisziplinäre Forschung (ZIF). After a brief preface by the editors, there follows a list of the contributors with their affiliations, 22 chapters, an author index, and a brief subject index.

Chemistry for the Protection of the Environment. Environmental Science Research. Volume 42. Edited by L. Pawlowski (Technical University of Lublin), W. J. Lacy (Lacy and Associates, Alexandria, VA), and J. J. Dlugosz (U.S. Environmental Protection Agency). Plenum Press: New York and London. 1992. xvi + 824 pp. $149.50. ISBN 0-306-43904-2.

This book contains the Proceedings from an International Conference on Chemistry for the Protection of the Environment held in Lublin, Poland, September 4–7, 1989. It opens with a tribute to Andre Van Haute who was a member of the Committee on the title subject and who died in 1989. This is followed by a preface by the editors and 70 chapters, which are grouped under the following headings: General Problems; Monitoring Methods for Surface and Ground Water and Analysis of Pollutants; Pathways of Chemicals in the Environment; Physicochemical Treatment: Ion Exchange; Physicochemical Treatment: Coagulation, Flocculation and Sorption; Physicochemical Treatment: Oxidation–Reduction Processes; Physicochemical Treatment; Membrane Processes; and Miscellaneous Methods for Removal of Pollutants. There is a brief subject index.

Clean Air at Work. New Trends in Assessment and Measurement for the 1990s. Edited by R. H. Brown (Occupational Medicine and Hygiene Laboratories, London), M. Curtis (Health and Safety Directorate, Commission of the European Communities, Luxembourg), K. J. Saunders (BP Research Centre, Sunbury-on-Thames), and S. Vandendriessche (Community Bureau of Reference, Commission of the European Communities, Brussels). Royal Society of Chemistry: Cambridge. 1992. xx + 508 pp. £65.00. ISBN 0-85186-217-9.

This book contains the Proceedings of an International Symposium held in Luxembourg, September 9–13, 1991. It was organized by the Commission of the European Communities, Health and Safety Directorate and the Community Bureau of Reference in collaboration with the Royal Society of Chemistry, Analytical Division, Automatic Methods Group and in cooperation with the WHO and six national organizations involved in health and safety in the workplace. After the welcoming address by W. J. Hunter, there are 110 papers, in typescript form, organized under the following headings: Session I. Legal Background and Standards; Session II. Measurement Methodology: Practical and Changing Needs; Session III. Measurement Methodology: Gases and Vapours; Session IV. Measurement Methodology: Aerosols; Session V. Data and Information Management; Session VI. Indoor Air; Session VII. Measurement Quality; and Session VIII. Future Needs. The book ends with a summary report, acknowledgements, and an index of authors.

Catalytic Control of Air Pollution. Mobile and Stationary Sources. ACS Symposium Series No. 495. Edited by Ronald G. Silver, John E. Sawyer, and Jerry C. Summers (Allied-Signal Automotive Catalyst Company). American Chemical Society: Washington, DC. 1992. viii + 176 pp. $49.95. ISBN 0-8412-2455-2.

This book was developed from a symposium sponsored by the Division of Colloid and Surface Chemistry of the American Chemical Society at the Fourth Chemical Congress of North America (202nd National Meeting of the American Chemical Society) in New York, NY, August 25–30, 1991. After a brief preface by the editors, it consists of 12 chapters organized under the following headings: Mobile Source Emission Control and Stationary Source Emission Control. There are indexes of authors, their affiliations, and subjects.

Supramolecular Architecture. Synthetic Control in Thin Films and Solids. ACS Symposium Series No. 499. Edited by Thomas Bein (Purdue University). American Chemical Society: Washington, DC. 1992. x + 442 pp. $97.95. ISBN 0-8412-2460-9.

This book was developed from a symposium sponsored by the Division of Inorganic Chemistry at the 201st National Meeting of the American Chemical Society in Atlanta, GA, April 14–19, 1991. After a brief preface and an introductory chapter by the editor, it contains 27 chapters in typescript form organized under the following headings: Two-Dimensional Assemblies: Thin Films; Layered and Low-Dimensional Structures; and Three-Dimensional Frameworks and Amorphous Networks. There are indexes of authors, their affiliations, and subjects.

Particle Technology and Surface Phenomena in Minerals and Petroleum. Edited by Mahendra K. Sharma (Eastman Chemical Company) and G. D. Sharma (University of Alaska). Plenum Press: New York and London. 1991. viii + 298 pp. $79.50. ISBN 0-306-44181-0.

This book contains the Proceedings of the International Symposium on Particle Technology and Surface Phenomena in Minerals and Petroleum sponsored by the Fine Particle Society and held in San Diego, CA, August 21–25, 1990. After a brief preface by the editor, it contains 18 chapters in typescript form organized under the following headings: Asphaltene Aggregation and Characterization; Theoretical Aspects and Reservoir Characterization; Colloidal Dispersions in Minerals/Petroleum; and Surface Phenomena and Petroleum Recovery. There are indexes of authors and subjects.

Frontiers of Polymer Research. Edited by Paras N. Prasad (State University of New York at Buffalo) and Jai K. Nigam (Shriram Institute for Industrial Research, Delhi). Plenum Press: New York and London. 1992. xii + 628 pp. $129.50. ISBN 0-306-44096-2.

This book contains the Proceedings of the First International Conference on Frontiers of Polymer Research held in New Delhi, India, January 20–25, 1991. This conference was inaugurated by the Prime Minister of India, Mr. Chandra Shekhar. The book offers, in typescript form and with many illustrations, a number of the papers and posters presented at the conference. These are organized under three main divisions: Polymers for Photonics; Polymers for Electronics; and High Performance Polymers. There is a subject index.

Surface Phenomena and Additives in Water-Based Coatings and Printing Technology. Edited by Mahendra K. Sharma (Eastman Kodak Company). Plenum Press: New York and London. 1991. x + 310 pp. $85.00. ISBN 0-306-44103-9.

This book contains the Proceedings of the International Symposium on Surface Phenomena and Additives in Water-Based Coating and Printing Technology sponsored by the 21st Annual Meeting of the Fine Particle Society and held in San Diego, CA, August 21–25, 1990. After a short preface by the editor, the book contains 21 chapters, in typescript form, presented under the following sections: Additives and Water-Based Coating/Ink Systems; Surface Modifications and Wettability; and Ink/Coating Formulations and Their Characterization. There are indexes of authors and subjects.

General and Synthetic Methods. Volume 13. A Specialist Periodical Reported. Edited by G. Pattenden (University of Nottingham). The Royal Society of Chemistry: Cambridge. 1991. xii + 500 pp. £140.00. ISBN 0-85186-944-0.

The format of this latest volume in the specialist periodical series remains the same as in previous issues. The titles and authors of the chapters are as follows: Chapter 1: Saturated and Unsaturated Hydrocarbons (A. R. Howell); Chapter 2: Aldehydes and Ketones (K. E. B. Parkes); Chapter 3: Carboxylic Acids and Derivatives (D. W. Knight); Chapter 4: Alcohols, Halogeno Compounds, and Ethers (J. B. Sweeney and J. Virden); Chapter 5: Amines, Nitriles, and other Nitrogen-containing Functional Groups (G. M. Robertson); Chapter 6:

Organometallics in Synthesis (C. J. Richards, S. E. Thomas, and M. Wills); Part I: The Transition Elements (C. J. Richards and S. E. Thomas); Part II: Main Group Elements (M. Wills); Chapter 7: Saturated Carbocyclic Ring Synthesis (J. D. Kilburn); Chapter 8: Saturated Heterocyclic Ring Synthesis (S. D. A. Street and P. J. Whittle); and Chapter 9: Highlights in Total Synthesis of Natural Products (C. W. Ellwood, D. C. Harrowven, and G. Pattenden). A section entitled "Reviews on General and Synthetic Methods" compiled by S. M. Higton and G. Pattenden completes the book.

Since I reviewed this series last year (1991), nothing has changed. This volume continues to maintain the thorough scientific standard of the previous volumes and provides a reasonable overview of the main synthetic organic literature covering the period of 1988. As commented before, the structure schemes are very frequently several pages from their discussion. While the almost universal use of computer programs for the structure drawing is common, it can often lead to many errors. This is the case in this volume, to the degree that some of the chemistry is unintelligible. Naturally, this makes the text difficult and tedious to follow. More attention to this aspect would greatly improve the readability.

This series is a valuable addition to the departmental library and to the individual's collection, if unlimited/sizable funds are available.

Philip D. Magnus, *University of Texas at Austin*

World Scientific Lecture and Course Notes in Chemistry. Volume 5. Theoretical Heterogeneous Catalysis. By R. A. van Santen (Eindhoven University of Technology). World Scientific: Singapore, New Jersey, London, and Hong Kong. 1991. xi + 396 pp. ISBN 981-02-0384-5.

This book presents the title topic by discussing the quantum physics of the solid state of how the general processes of heterogeneous catalysis can be understood. As a major contributor to this area, van Santen is well-qualified to discuss this material. It gives a general view of how reactions occur on surfaces rather than the calculation of exact potential energy surfaces. When a specific reaction, such as CO dissociation on a metal surface, is considered, the understanding is developed in qualitative terms of densities of states, orbital overlaps, and charge transfer based on relative orbital energies. While equations usually start from so called "first-principals" approaches, the results are most often obtained from Hückel level calculations. The overall result is to see how solid state physics can be used to understand a generic catalytic reaction, i.e., parameters are chosen for general equations to fit a specific case. Stable surface states are the main consideration with activation energies barely being mentioned, and dynamics are not considered at all.

The approach taken in van Santen's book is quite different from that of two other recent books on the theoretical understanding of heterogeneous catalysis. In textbook fashion, van Santen's book starts with the elementary equations of solid state physics and develops them to produce surface states and adsorbed molecule states that have relevance to catalysis. In the book edited by J. B. Moffat (J. B. Moffat, Ed. *Theoretical Aspects of Heterogeneous Catalysis*; Van Norstrand Reinhold: New York, 1990), the chapters are problem oriented and each is written by an expert who has contributed to that particular problem. There are three chapters on zeolite catalysis, three chapters on hydrocarbon conversions, two chapters on acid-base catalysis, and one chapter each on hydrodesulfurization, metal-support interactions, and band structure. There are very few equations in this book with the emphasis being on the conclusions drawn from theoretical calculation on a particular problem. In contrast, the book editor by F. Ruette (R. Ruette, Ed. *Quantum Chemistry Approaches to Chemisorption and Heterogeneous Catalysis*; Kluwer Academic Press: Dordrecht, 1992) has chapters in which various authors present the application of one particular calculational method to chemisorption and catalysis. Chapter topics include the Generalized Valence Bond view, ab initio calculations of clusters, density functional theory, model Hamiltonian approach, MINDO, Extended Hückel theory, Bond-Order Conservation approach, etc. Each book is useful in its own way. The van Santen book is most useful in providing a background in chemisorption and catalysis from a solid state physics viewpoint.

Van Santen's book opens with the usual introductory chapter on the importance of catalysis. The first half of the book (Chapter 2) contains an introduction to chemisorption based on solid state band theory so that the chemisorption bond is seen as an integral part of an extended surface. Although no one disputes this, most of the journal literature is written with the implicit assumption that the chemisorption bond is sufficiently localized that a moderately sized metal cluster gives a reasonably accurate picture of most aspects of the chemisorption bond. Chapter 2 starts with an introduction to Extended Hückel theory, which is used extensively throughout the book. Later the Green's function method, the free electron model, and configuration interaction are introduced. This chapter is very dense with equations, which require concentrated effort to relate to the text. Starting from one-dimensional models, surface states and adsorption energies are obtained. Electron–electron interactions are introduced to discuss electron correlation and image dipoles. The topic of adsorption site occupancy is introduced with a discussion of on-top and bridge CO. The relative energies of CO adsorbed on different sites are a result of balancing several factors which are determined by parameter choices.

In the third quarter of the book (Chapter 3), the molecular orbital basis of metal catalysis is discussed. Adsorption and dissociation of CO and H_2 are most often used to illustrate principles. This chapter stresses the population and depopulation of bonding and antibonding orbitals of adsorbing molecules or fragments in their interaction with the metal density of orbital states.

Adsorption and reactivity on oxide surfaces are treated in Chapter 4. The electronic state of surface oxygen is found to play a large role in reactivity, acidity, and basicity of oxide surfaces. Transition metal oxides are treated as localized electron systems in which d orbital occupancy, hybridization, and ligand field theory are important. In Chapter 5 there is a brief introduction to statistical thermodynamics theory applied to alloys and zeolites.

This book is not a place to learn quantum chemistry and will not by itself lead one to making their own quantum mechanics applications. It would be an aid to a student who has already studied quantum chemistry and is interested in its application to surface chemistry and catalysis. It would help a theoretician gain knowledge for applications to catalysis. Finally, it would provide background to an experimentalist who desires better theoretical underpinnings to experimental results.

George Blyholder, *University of Arkansas*

Compendium of Organic Synthetic Methods. Volume 7. By Michael B. Smith (University of Connecticut). John Wiley and Sons: New York and Chichester. 1992. xix + 547 pp. $59.95. ISBN 0-471-60713-4.

This book covers literature from 1987 through 1989. The coverage is "representative" rather than exhaustive, and examples of a wide variety of useful synthetic transformations are presented. The new volume follows the same organizational scheme used previously in the series and continues the new section added in Volume 6 on the preparation of "Oxides". Preparative examples are divided into two main sections, monofunctional and difunctional compounds, and then subdivided and indexed according to starting material and product type. Further subdivision is made according to reaction types, e.g., alkylation, reduction, etc. An author index is included at the end of the volume.

Some of the classifications used in the Compendium are either not consistent or do not follow common practice. For example, enzymatic reduction of 7-methylhept-5-en-2-one to the corresponding alcohol in 96% ee is listed under "Reduction of Ketones to Alcohols, Asymmetric Reduction" (Section 42A, p 38) but the conversion of 2-allyl-2-methylcyclopentan-1,3-dione to a 9:1 mixture of diastereomeric hydroxyketones using "Bakers Yeast" is included under "Alkylation of Ketones, Forming Alcohols" (Section 42B, p 45). Addition reactions of various organometallic reagents to ketones to form alcohols are also listed as "Alkylation" processes somewhat at variance with the usual meaning of this reaction descriptor.

The division of reactions in the Compendium into mono- and difunctional examples has a somewhat arbitrary character. For example, an example of a 1,5-Wittig rearrangement of an allylic alkynylalkyl ether (Section 302, p 299) is listed as a difunctional transformation under "Alkyne-Alcohol, ..." yet the alkynyl group neither participates directly in the reaction nor is changed in position in going from starting material to product. Indeed, the only *functional* change is that from ether to alcohol.

In these times of large data bases of synthetic reactions accessible through computer searching, the question arises as to what value a series like the Compendium may still have. Why should one look for examples of synthetic methods between book covers rather than by the Boolean exploration of Reaccs or SynLib or CAS on Line? The answer of course is that the random or serendipitous discovery, the unanticipated insight, is still largely limited to the human brain. Browsing is a frequently rewarding experience and series like the Compendium are particularly valuable and useful in this regard. The examples which are included in Volume 7 appear to be chosen with an eye to the generality of the methods, and they are presented in a clear and immediately accessible fashion. The structures are well-drawn and the reagents are given without the use of too many obscure or idiosyncratic three-, four-, and five-letter codes. The abbreviations that are used are listed at the beginning of the book, and it is interesting to note that in Volume 7 these occupy more than three pages compared to the half page needed in, for example, Volume 2! Overall, the Compendium of Organic Synthetic Methods continues to be an excellent source of well-chosen examples of useful synthetic methodology.

David Goldsmith, *Emory University*