

Book Reviews *

Fractals in Science. Edited by Armin Bunde (Justus Liebig University, Geissen) and Shlomo Havlin (Bar-Ilan University, Ramat-Gan, Israel). Springer-Verlag: Berlin. 1994. 298 pp. \$59.00. MS-DOS diskette, ISBN 3-540-56220-6. Macintosh diskette, ISBN 0-387-56221-4.

It wasn't too long ago that an individual could own *all* of the books available on fractals and chaos and their applications in science. Those days have now passed with an explosion of books and journals on these topics, which many believe are causing a paradigm shift in science. Many chemists now want to find out what this burgeoning branch of mathematics can contribute to their own research and teaching. Despite its ambitious title, *Fractals in Science* is a modest introduction to the field.

The editors begin their exposition with their own brief (24 page) introduction, but a truly naive reader would probably benefit by consulting several of the references found there before embarking on some of the other sections. The intention of this book is to provide a multidisciplinary view of fractal applications. Some chemists will find most of the nine chapters useful, particularly Chapter 4, Self-Affine Interfaces (by János Kertész and Tamás Vicsek), Chapter 6, Polymers (by Mohamed Daoud), Chapter 7, Kinetics and Spatial Organization of Competitive Reactions (by Sidney Redner and Francois Leyvraz), and Chapter 8, Fractal Analysis in Heterogeneous Chemistry (by David Avnir, Ricardo Gutfraind, and Dina Farin). Each of the chapters contains a bibliography; citations in several chapters include references as late as 1993. The book also includes a subject index.

Fractals in Science is accompanied by a diskette containing programs illustrating fractal structures described in Chapter 9, Computer Exploration of Fractals, Chaos, and Cooperativity (by Dennis C. Rapaport and Martin Meyer). The hardware requirements for the DOS version I tested are modest: at least 386 DX or 486 PC with EGA or VGA color graphics; installation requires simply copying the files. All of the programs ran flawlessly on my systems. Applications include most of the standard repertoire of simple fractal models: self-affine two- and three-dimensional structures, invasion percolation, diffusion-limited aggregation, sandpile dynamics, coupled pendula, Monte Carlo simulation of the Ising model, lattice polymer reptation, the Mandelbrot set, fractal landscapes, molecular dynamics of soft disks in two dimensions, and cellular automata. The user can adjust parameters to investigate behaviors with varied conditions. The close correspondence between these extremely simple models and complex physical phenomena is what has convinced so many that fractals have a fundamental role in nature.

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JA945027V

Stereochemistry of Organic Compounds. By Ernest L. Eliel (University of North Carolina at Chapel Hill), Samuel H. Wilen (City College of the City University of New York), and Lewis N. Mandel (Australian National University). Wiley & Sons: New York. 1994. xv + 1267 pp. \$75.00. ISBN 0-471-01670-5.

This long-awaited, comprehensive treatise on stereochemistry fulfills all the expectations of this reviewer. It is written at such a level that it can serve as a textbook for an upper division or graduate class yet is also extensively-referenced and will serve equally well, therefore, in the research environment.

All aspects of the stereochemistry of organic compounds are covered in an introductory and 13 following chapters. The chapter titles provide an indication of the comprehensive nature of this book: (2) Structure, (3) Stereoisomers, (4) Symmetry, (5) Configuration, (6) Properties of Stereoisomers. Stereoisomer Discrimination, (7) Separation of Stereoisomers. Resolution. Racemization, (8) Heterotopic Ligands and Faces (Prostereoisomerism, Prochirality), (9) Stereochemistry of Alkenes, (10) Conformation of Acyclic Molecules, (11) Configuration and Conformation of Cyclic Molecules (12) Stereoselective Synthesis, (13) Chiroptical Properties, (14) Chirality in Molecules Devoid of Chiral Centers. In addition, there is an extensive glossary as well as a very good index.

*Unsigned book reviews are by the Book Review Editor.

Only chapter 12, on stereoselective synthesis, does not provide a complete and in-depth coverage of the subject. This chapter, contributed by Lewis Mander, is acknowledged by the authors in the preface as providing only an overview. Indeed, to completely cover that subject by itself would require a multivolume set constituting many thousands of pages (one is currently under production by Houben-Weyl). Overall, this book meets all the requirements and expectations of this reviewer, who can enthusiastically recommend it for both departmental and personal libraries.

JA945110I

Biotransformations. A Survey of the Biotransformations of Drugs and Chemicals in Animals. Volume 6. Edited by D. R. Hawkins (Huntingdon Research Centre Ltd). The Royal Society of Chemistry: Cambridge. 1994. xxxii + 412 pp. £130.00. ISBN 0-85186-127-X.

Covering the literature of 1992, this sixth volume of the series encompasses biotransformation of chemical entities whether pharmaceuticals, agrochemicals, food additives, or environmental or industrial chemicals in vertebrates. An overview chapter highlights novel biotransformation, mechanisms of toxicity, and notable species differences. Abstracts are arranged according to compound class. The book includes key functional groups and cumulative indexes of compounds, key functional groups, and reaction types.

JA945095H

Organosilicon Chemistry. From Molecules to Materials. Edited by Norbert Auner (Technical University, Garching) and Johann Weis (Wacker-Chemie, GmbH, Burghausen). VCH: Weinheim. 1994. xxii + 349 pp. \$85.00. ISBN 3-527-29061-3.

At the "Munich Silicon Days '92" symposium, Professors Eugene G. Rochow and Richard Müller were honored, and the papers collected in this book were presented. The headings are (I) Tetravalent Organosilicon Compounds: Chemistry and Structure, (II) Subvalent and Unsaturated Organosilicon Compounds: Formation and Reactivity, (III) Hypervalent Organosilicon Compounds: Formation, Structure and Chemistry, (IV) Organosilicon Metal Compounds: Coordination Chemistry and Catalysis, and (V) Silicon Polymers: Formation and Application, followed by author and subject indexes.

JA945075F

Occupational Toxicants. Critical Data Evaluation for MAK Values and Classification of Carcinogens. Volume 6. Edited by D. Henschler (Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area). VCH: New York. 1994. viii + 368 pp. \$110.00. ISBN 3-527-27031-0.

Volume 6 in this series describes the database which determines the level of MAK values and summarizes the relevant international literature. It adds 29 new compounds, including their toxic effects and modes of action, effects in man and animals, and genotoxicity and carcinogenicity. Volumes 1–6 are indexed.

JA945104M

List of MAK and BAT Values 1993. Maximum Concentrations at the Workplace and Biological Tolerance Values for Working Materials. Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area. Report No. 29. VCH: New York. 1994. 140 pp. \$30.00. ISBN 3-527-27558-4.

The 500 chemical compounds listed in this booklet as carcinogens, germ cell mutagens, or embryotoxicants indicate the toxic potential people are exposed to at the workplace. A total of 29 chemical compounds were added and 9 were re-evaluated. This 1993 edition

includes two new chapters on Anorganic Fibrous Dust Particles and Their Carcinogenic Effects and Sensitizing Chemicals Causing Allergic Reactions in Human Beings. Chapter headings include Maximum Concentrations, Biological Tolerance Values, CAS Number Index, Constitution and Procedures of the Commission, and Substances Listed and Being Examined.

JA945103U

Highlights of Chemistry as Mirrored in *Helvetica Chimica Acta*. Edited by M. Volkan Kisakurek (University of Zurich) and Edgar Heilbronner (University of Basel). VCH: New York, 1994. 1000 pp. \$145.00. ISBN 3-527-29238-1.

With a comprehensive overview of 75 years of Swiss chemical research, this book highlights outstanding research that has appeared in *Helvetica Chimica Acta* since its foundation in 1917. Leading authors include Venanzi, Zollinger, Heilbronner, and Dunitz. An author index is provided.

JA9451022

Plants and the Chemical Elements. Biochemistry, Uptake, Tolerance and Toxicity. Edited by Margaret E. Farago (Imperial College of Science). VCH: New York, 1994. viii + 290 pp. \$120.00. ISBN 3-527-28269-6.

Although most plants derive their nutrients from the soil, this book is not a text on plant nutrition but instead covers aspects at the forefront of the environmental context. Researchers in the field discuss soil chemistry, the uptake of trace metals, and their actions in the plants' enzyme systems. Environmental aspect is the central theme, and chapters deal with responses to highly mineralized soils, evolution of metal tolerant species, hyper accumulation, toxic effects, and contamination by radio nuclides. Experimental techniques and methods are discussed, and a subject index is included.

JA945101+

Advances in the Chemistry of Insect Control III. Edited by G. G. Briggs (AgrEvo UK Ltd). The Royal Society of Chemistry: Cambridge, 1994. vi + 250 pp. £47.50. ISBN 0-85186-992-0.

Third in the series, this monograph contains lectures from the symposium Advances in the Chemistry of Insect Control, held at Queens' College, Cambridge, in July, 1993. The symposiums three themes were new approaches, new lead and structure optimization, and natural product syntheses. The material details advances since the previous volume in 1990 and contains a brief subject index.

JA945094P

Electrochemistry and Clean Energy. Edited by J. A. G. Drake. The Royal Society of Chemistry: Cambridge, 1994. viii + 104 pp. £32.50. ISBN 0-85186-472-4.

Electrochemistry promises to become an important part of the ecology-oriented society of the future since electricity is not a pollutant. This volume contains a selection of the papers presented at the symposium Electrochemistry and Clean Energy, held at the Royal Society of Chemistry's Annual Congress in April, 1993, at the University of Southampton. Looking at key areas of this important topic, this book covers fuel cells, solar cells, rechargeable batteries, the photocatalytic detoxification of water and illustrates the direction of current research.

JA945093X

Thermodynamic Properties of Individual Substances. Volume 3. B, Al, Ga, In, Tl, Be, Mg, Ca, Sr, Ba and Their Compounds. Part Two. Tables. Edited by L. V. Gurvich (Russian Academy of Sciences), I. V. Veyts (Russian Academy of Sciences), C. B. Alcock (University of Notre Dame), and V. S. Iorish (Russian Academy of Sciences). CRC Press, Inc: Boca Raton, FL, 1994. xv + 448 pp. \$229.00. ISBN 0-8493-9928-9.

A total of 414 tables contain the thermodynamic properties for boron, aluminum, gallium, indium, thallium, beryllium, magnesium, calcium, strontium, barium, and their compounds. Also, 47 additional tables are included for halides of gallium, indium, and thallium and 90 tables are updated. The numbering of the tables continues that of the two previous volumes.

JA945090K

Current Topics in the Chemistry of Boron. Edited by George W. Kabalka (University of Tennessee). The Royal Society of Chemistry: Cambridge, U.K. 1994. xiv + 406 pp. £59.50. ISBN 0-85186-535-6.

Summarizing the current status of boron chemistry, these proceedings of the Eighth International Meeting on Boron Chemistry cover all aspects including synthetic methods, molecular structure, bonding theory, mechanistic principles, medical applications, and material science. The chapter headings are (I) Organoborane Chemistry, (II) Chiral Organoboranes in Synthesis, (III) Medical Applications of Boron, (IV) Carborane Chemistry, (V) Metallaborane Chemistry, and (VI) Heteroborane Derivatives and Complex Borohydrides, which are followed by a subject index.

JA945083W

Chemically Modified Surfaces. Edited by Joseph J. Pesek (San Jose State University) and Ivan E. Leigh (CertainTeed Corporation). The Royal Society of Chemistry: Cambridge, U.K. 1994. xi + 223 pp. £49.50. ISBN 0-85186-595-X.

Providing a forum for new contributions on the chemical modification of different materials and surface characterization, these proceedings of the Fifth Symposium on Chemically Modified Surfaces are of current interest. In addition to traditional topics for the series, this book features a plenary lecture on conversion of oxide to hydride surfaces, modifying polymer surfaces, modifying and characterizing catalysts, and surface studies on membranes and thin films, which is followed by a subject index.

JA945085G

The Development of Plastics. Edited by S. T. I. Mossman and P. J. T. Morris (The Science Museum, London). The Royal Society of Chemistry: Cambridge, U.K. 1994. x + 120 pp. £35.00. ISBN 0-85186-575-5.

These proceedings of the 1993 Annual Chemical Congress Symposium cover the history of synthetic materials from the natural and semisynthetic materials of the Victorian era to the more modern plastics developed during and after the Second World War. The contents include Victorian Plastics—Foundations of an Industry; Parkesine and Celluloid; Britain and the Bakelite Revolution; Materia Nova: Plastics and Design in the U.S., 1925–1935; Synthetic Rubber: Autarky and War; Polythene: The Early Years; Plastics and Prosperity, 1945–1970; Versatility of Acrylics, 1934–1980; Fibre Reinforced Composites; and a subject index.

JA945084O

Further Advances in Chemical Information. Edited by H. Collier (Infonortics Ltd.). The Royal Society of Chemistry: Cambridge, U.K. 1994. viii + 192 pp. £45.00. ISBN 0-85186-545-3.

These proceedings of the 1993 Montreux Chemical Information Conference highlight changes in the information, chemical, and pharmaceutical industries. Another theme is the rapid developments of in-house systems, 2-D and 3-D searching, spreadsheets, and QSAR. Technical/research papers cover aspects of neural networks, reaction type informetrics, and the GRAMS project for learning about synthetic methods.

JA945088T

The Laboratory Environment. Edited by Rupert Purchase (Environmental Group, The Royal Society of Chemistry). The Royal Society of Chemistry: Cambridge, U.K. 1994. x + 258 pp. £49.50. ISBN 0-85186-605-0.

Based on the proceedings of a Royal Society of Chemistry Environment symposium, this book describes how chemists can provide a safe environment. Themes discussed are appropriate health surveillance measures for laboratory and other staff; the classification, handling and disposal of carcinogens; the recycling of laboratory waste; literature sources for assessing reactive chemical hazards; and the relationship between client and contractor in the design and construction of laboratory areas. A subject index is included.

JA9450871

Annals of the New York Academy of Sciences. Volume 726. DNA Damage: Effects on DNA Structure and Protein Recognition. Edited by Susan S. Wallace, Bennett Van Houten, and Yoke Wah Kow. The New York Academy of Sciences: New York. 1994. x + 385 pp. ISBN 0-89766-885-5.

This volume results from the conference DNA Damage: Effects on DNA Structure and Protein Recognition, sponsored by the New York Academy of Sciences. The contents include (Part I) Structural and Conformational Modifications Induced by DNA Damage and Workshop on Computational Biology, (Part II) Protein Motifs Involved in DNA Recognition, (Part III) Interactions of Polymerases, (Part IV) DNA Recombination Proteins, (Part V) Recognition of DNA Damage by Single Proteins, (Part VI) Recognition of DNA Damage by Multiprotein Complexes, Poster Papers, and subject and contributors indexes.

JA945089L

The Role of Oxygen in Improving Chemical Processes. 6th BOC Priestley Conference. Edited by M. Fetizon (Ecole Polytechnique) and W. J. Thomas (University of Bath). The Royal Society of Chemistry: Cambridge, U.K. 1993. x + 286 pp. £57.50. ISBN 0-85186-725-1.

Based on the 6th BOC Priestley Conference, this book's themes include combustion processes, chemical synthesis, wet oxidation, and biological processes. Also included is a section on the history of pollution and development of skills to protect the environment, many of which involve oxygen as the ameliorating antidote.

JA9450869

Studies in Surface Science and Catalysis. Volume 85. Advanced Zeolite Science and Applications. Edited by J. C. Jansen (Delft University of Technology), M. Stocker (SINTEF SI), H. G. Karge (Fritz Haber Institute of the Max Planck Society), and J. Weitkamp (University of Stuttgart). Elsevier: Amsterdam. 1994. xv + 691 pp. \$243.00. ISBN 0-444-82001-9.

Based upon lectures given at the 10th International Zeolite Conference Summer School, this book focuses on zeolite science and technology, underexposed subjects at the IZC, and new and future applications of molecular sieves. There are 19 chapters and a keyword index.

JA945070I

Studies in Surface Science and Catalysis. Volume 87. Characterization of Porous Solids III. Edited by J. Rouquerol (CNRS-France), F. Rodriguez-Reinoso (Universidad de Alicante), K. S. W. Sing (University of Bristol), and K. K. Unger (Johannes Gutenberg-Universität). Elsevier: Amsterdam. 1994. xiv + 812 pp. \$265.50. ISBN 0-444-81491-4.

The edited papers in this volume were selected from 155 presentations at the Third IUPAC Symposium on the Characterization of Porous Solids (COPS-III). The proceedings include the final report summary of the IUPAC subcommittee on Recommendations for the Characterization of Porous Solids. Topics covered are (1) simulation and modeling of pore structures and pore-filling mechanisms, (2) novel experimental

techniques with particular reference to high-resolution techniques, (3) model pore structures and reference materials, and (4) porous materials of technological importance. An author and a keyword index are followed by a listing of other volumes in the series.

JA945107Z

Studies in Surface Science and Catalysis. Volume 88. Catalyst Deactivation. Edited by B. Delmon (Université Catholique de Louvain) and G. F. Froment (Université Gent). Elsevier: Amsterdam. 1994. xiv + 698 pp. \$265.50. ISBN 0-444-81682-8.

The proceedings here originated from some 30 countries and were presented at the 6th International Symposium on Catalyst Deactivation held in Belgium during 1994. Fundamental and applied aspects include fluid bed catalytic cracking, hydrotreatment, hydrodesulfurization, catalytic reforming, and phthalic anhydride synthesis. Mechanisms of poisoning, sintering, and coking are investigated and modeled. New experimental techniques for the characterization and the quantification of the deactivation are also introduced. An author index and a listing of other volumes in the series are included.

JA945108R

Linking the Gaseous and Condensed Phases of Matter: The Behavior of Slow Electrons. Edited by Loucas G. Christophorou (Oak Ridge National Laboratory and University of Tennessee), Eugen Illenberger (Freie Universität), and Werner F. Schmidt (Hahn-Meitner Institut). Plenum Press: New York. 1994. x + 596 pp. \$139.50. ISBN 0-306-44800-9.

The 1993 NATO Advanced Study Institute at Patras, Greece, established the new field of Interphase Science, which aims to unify knowledge on all phases of matter. This text publishes those proceedings by experts in the field of electronic properties of molecular gases, clusters, liquids, and solids focused on the behavior of slow electrons in matter. Its nine section headings are (1) Interactions of slow electrons as a function of state, (2) Ionization in dilute and in condensed matter, (3) Elementary processes induced in clusters by electrons and photons, (4) Electron motion in gases and liquids, (5) Electron attachment in the gaseous and the condensed phases of matter, (6) Electron-ion recombination in gases liquids, (7) Electron transfer at interfaces, (8) Applications, and (9) Summary of discussion panel. A subject index and participant list conclude.

JA9451325

Isopentenoids and Other Natural Products: Evolution and Function. Edited by W. David Nes (Texas Tech University). American Chemical Society: Washington, DC. 1994. viii + 255 pp. \$69.95. ISBN 0-8412-2934-1.

These symposium proceedings from the Division of Agricultural and Food Chemistry of the American Chemical Society reexamine the modern concept of evolution proposed by biologists and integrate the contributions of chemistry and biochemistry, the "synthetic theory of organic evolution." Isopentenoids and sterols are focused upon, as is the biochemical pathway from gene to enzyme to enzyme product. Other chapters cover lipids, lignans, and membranes. Author, affiliation, and subject indexes are provided.

JA945129L

Fullerenes: Recent Advances in the Chemistry and Physics of Fullerenes and Related Materials. Edited by Karl M. Kadish (University of Houston) and Rodney S. Ruoff (SRI International). The Electrochemical Society, Inc.: Pennington, NJ. 1994. xx + 1736 pp. \$98.00. ISBN 1-56677-082-3.

This first volume of an intended series presents the symposium proceedings of the Fullerenes Group of the Electrochemical Society. It is organized into 14 topical areas with a section of contributions from over 30 scientists from the former Soviet Union. Topics covered include Production and Technology, Extraction and Purification, Theory, Gas Phase and Mass Spectrometry, Surface Science and Thermody-

namics, Solid-State Properties, Biochemistry and Pharmaceutical Chemistry, Organic Functionalization, Photoexcited States, ESR and Electrochemistry, Organometallic Chemistry, Metallofullerenes, Carbon-Coated Nanocapsulates, and Fullerenes Science in the C.I.S. Author and keyword indexes conclude.

JA945130K

Thin-Layer Chromatography: Reagents and Detection Methods. Volume 1b. By H. Jork (Universität des Saarlandes), W. Funk (Fachbereich Technisches Gesundheitswesen), W. Fisher (Abteilung Lab Chrom 1), and H. Wimmer (Eckhardt-Strabe 23). VCH: Weinheim, Germany. 1994. xvi + 496 pp. \$130.00. ISBN 3-527-28205-X.

As liquid chromatography was influenced by instrumentation developed for gas chromatography, so has thin-layer chromatography experienced a new impetus as a result of instrumentation and automation coupled with the availability of improved stationary phases and working techniques. Yet, the applications are far more numerous than the publications. This text brings together four specialists in the field of thin-layer chromatography to review reagents and detection methods to help the practical analyst increase detection specificity. Part I covers Specific Detection Methods—Activation Reactions, Reagents for the Recognition of Functional Groups, and Reagent Sequences. Part II includes Reagents in Alphabetical Order, Named Reagents and Reagent Acronyms, and a Collective Index to Volumes 1a and 1b.

JA945131C

Formulation and Delivery of Proteins and Peptides. Edited by Jeffrey L. Cleland (Genentech, Inc.) and Robert Langer (Massachusetts Institute of Technology). American Chemical Society: Washington, DC. 1994. xi + 364 pp. \$89.95. ISBN 0-8412-2959-7.

Designed to provide an updated review of recent research in the field, these symposium proceedings of the Division of Biochemical Technology of the American Chemical Society are divided into three sections: formulation, lyophilization, and delivery. Author, affiliation, and subject indexes are included.

JA945133X

Chaos in Chemistry and Biochemistry. Edited by Richard J. Field (University of Montana) and László Györgyi (Eötvös Loránd University, Hungary). World Scientific: River Edge, NJ. 1993. xiv + 290 pp. \$64.00. ISBN 981-02-1024-8.

Less than two years ago I reviewed *Chemical Chaos* by Stephen K. Scott in this journal (Noyes, R. M. *J. Am. Chem. Soc.* **1992**, *114*, 6948)

and perhaps should not have reviewed this book as readers need to acquire different viewpoints on related books in a very current field. However, the two books actually have somewhat different objectives.

Scott, as a single author, developed the mathematical theory in detail and examined a few experimental systems in depth. Field and Györgyi, as organizing editors, have elicited articles from different authors to examine a wide range of experimental systems. Theory is emphasized in two chapters by William R. Derrick on the mathematics of chaos and by V. Gontar on a new theoretical approach, which I found too condensed to be useful. Derrick makes the interesting observation that models based on chemistry tend to select so many variables that an understanding of dynamic behavior is difficult and speculative while models based on mathematics tend to involve few variables and do not agree well with experiment. Those entering this complicated field do not easily escape both Scylla and Charybdis.

The treatment of chemical chaos discusses the Belousov–Zhabotinsky reaction. J.-C. Roux examines flow systems, while Marek and Schreiber talk of perturbed systems. Field and Györgyi present their elegant detailed modeling of selected mechanisms. Roux still raises the old question as to whether this relatively straightforward homogeneous reaction can exhibit true chaos. I was somewhat surprised to find myself being quoted on this subject for some remarks I made almost 10 years ago. The transition in experimental systems from regular periodic behavior to irregular aperiodic chaotic behavior does not seem to have a sharp boundary.

As if homogeneous systems were not complicated enough, surfaces can create additional problems. Markus Eiswirth has written a chapter on heterogeneous catalysis, and J. L. Hudson has treated electrochemical systems. Such systems may be better than purely chemical ones for the study of chaos because large bodies of data can be accumulated relatively easily on electrodes.

Biochemical systems certainly involve large numbers of parameters and must offer the prospect of chaotic behavior. Larter, Olsen, Steinmetz, and Geest have written a chapter on chaos in the peroxidase reaction, and Albert Goldbeter has written on other chaotic biochemical systems. Behaviors appear to be unequivocally chaotic, but I was disappointed that mechanisms of these enzyme reactions are so poorly understood that attempts to model experiment involve terms selected on the basis of mathematical form rather than on known chemical processes.

I found no suggestions of useful applications of chaos. The field is fascinating, and these studies may give us useful ways to learn more about mechanisms. However, the chief message that I draw from the study of chaos is that we will never acquire enough detailed information about complicated systems to permit us to make exact long-range predictions. After all, we knew even before chaos became a field of study that the publication of horoscopes served no useful purpose.

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JA934786V