

## BOOK REPORTS

The Book Reports section is a regular feature of *Computers & Mathematics with Applications*. It is an unconventional section. The Editors decided to break with the longstanding custom of publishing either lengthy and discursive reviews of a few books, or just a brief listing of titles. Instead, we decided to publish every important material detail concerning those books submitted to us by publishers, which we judge to be of potential interest to our readers. Hence, breaking with custom, we also publish a complete table of contents for each such book, but no review of it as such. We welcome our readers' comments concerning this enterprise. Publishers should submit books intended for review to the Editor-in-Chief,

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*Functional Modeling of Systems*. By Edward N. Baylin. Gordon and Breach Science Publishers (1990). 437 pages. \$95.00.

Contents:

1. Introduction. 2. Functional cohesion and organizational modeling. 3. Underlying concepts of functional modeling. 4. Procedural diagramming fundamentals. 5. Basics of the structure-flow charting method. 6. Structure-flow charting of the supply acquisition system. 7. More about levels of control in the structure-flow chart. 8. More about the concept of function. 9. More about classes and levels of objective-defined functions. 10. More about subsystem identification methods. 11. Flow functions.

*Problems in Mathematical Analysis*. By Piotr Biler and Alfred Witkowski. Marcel Dekker, Inc. (1990). 227 pages. \$49.75.

Contents:

1. Real and complex numbers. 2. Sequences. 3. Series. 4. Functions of one real variable. 5. Functional equations and functions of several variables. 6. Real analysis, measure and integration. 7. Analytic functions. 8. Fourier series. 9. Functional analysis.

*Number Theory and Dynamical Systems*. Edited by M.M. Dodson and J.A.G. Vickers. Cambridge University Press (1989). 172 pages. \$24.95.

Contents:

1. Non-degeneracy in the perturbation theory of integrable dynamical systems. 2. Infinite dimensional inverse function theorems and small divisors. 3. Metric diophantine approximation of quadratic forms. 4. Symbolic dynamics and diophantine equations. 5. On badly approximable numbers, Schmidt games and bounded orbits of flows. 6. Estimates for Fourier coefficients of cusp forms. 7. The integral geometry of fractals. 8. Geometry of algebraic continued fractals. 9. Chaos implies confusion. 10. The Riemann hypothesis and the Hamiltonian of a quantum mechanical system.

*Advances in Homotopy Theory*. Edited by S.M. Salamon, B. Steer and W.A. Sutherland. Cambridge University Press (1989). 177 pages. \$27.95.

Contents:

1. Homotopy fixed points in the algebraic K-theory of certain infinite discrete groups. 2. Applications of loop spaces to some problems in topology. 3. Invariants of fixed-point-free circle actions. 4. Bitangent spheres and critical points. 5. The enveloping ring of a  $\prod$ -algebra. 6. Cohomologie des groupes symé triques et application de Quillen. 7. Looping Massey-Peterson towers. 8. Characters and elliptic cohomology. 9. Self maps of H-spaces. 10. Character rings in algebraic topology. 11. The rank filtration of Quillen's Q-construction. 12. Obstruction

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theory and the strict associativity of Morava K-theories. 13. Loop groups and harmonic maps. 14. An almost groupoid structure for the space of (open) strings and implications for string field theory. 15. Steenrod squares of polynomials.

*Neural Network Design and the Complexity of Learning.* By J. Stephen Judd. The MIT Press (1990). 150 pages. \$24.95.

Contents:

1. Neural networks: hopes, problems, and goals. 2. The loading problem. 3. Other studies of learning. 4. The intractability of loading. 5. Subcases. 6. Shallow architectures. 7. Memorization and generalization. 8. Conclusions.

*The Logic of Architecture Design, Computation, and Cognition.* By William J. Mitchell. The MIT Press (1990). 292 pages. \$19.95.

Contents:

1. Building descriptions. 2. Architectural form. 3. Design worlds. 4. Critical languages. 5. Reasoning about designs. 6. Types and vocabularies. 7. Design operations. 8. Languages of architectural form. 9. Function. 10. Functionally motivated design.

*Algorithms 2 Data Structures and Search Algorithms.* By Pierre Berlioux and Philippe Bizard. John Wiley & Sons (1990). 164 pages. \$19.95.

Contents:

1. Programs, proofs of programs and data structures. 2. Sequences. 3. Sets. 4. Priority queues. 5. Searching a graph: introduction. 6. Finding a path through a graph. 7. Finding a minimum-weight path through a graph.

*Improving Floating-Point Programming.* Edited by Peter J.L. Wallis. John Wiley & Sons (1990). 191 pages. \$29.95.

Contents:

Part I. Fundamentals. 1. Basic concepts. 2. Machine arithmetic. 3. Model arithmetic. Part II. Error control. 4. Sources of error. 5. Different approaches to interval arithmetic. 6. The Karlsruhe accurate arithmetic approach. Part III. Embedding of Karlsruhe arithmetic. 7. The embedding of accurate arithmetic in PASCAL-SC. 8. The embedding of accurate arithmetic in Ada. Part IV. Improving accuracy. 9. Automatic identification of scalar products. 10. Guidelines for selected transformations of existing programs. 11. Manipulation of expressions. 12. E-Methods for improving accuracy.

*Directory of Portable Databases.* Cuadra/Elsevier (1990). 315 pages. \$85.00 (Subscription).

Contents:

1. Introduction. 2. Using the directory. 3. Descriptions of portable databases. CD-ROM products. Diskette products. Magnetic tape products. 4. Indexes.

*The Conquest of the Microchip.* By Hans Queisser. Harvard University Press (1988, 1990). 200 pages. \$24.95 (cloth) \$9.95 (paper).

Contents:

1. Crystal crises. 2. Inner space. 3. Under the radar umbrella. 4. The mother of invention. 5. Transistors come of age. 6. Settling in silicon valley. 7. Completing the circuit. 8. Handotai Senso. 9. Whither America? 10. Europe on the sidelines. 11. The crystal microcosm.

*Methods and Programs for Mathematical Functions.* By Stephen L. Moshier. Ellis Horwood Limited (1989). 415 pages. \$16.95 \$39.95 (cloth).

Contents:

1. Floating point arithmetic. 2. Approximation methods. 3. Software notes. 4. Elementary functions. 5. Probability distributions and related functions. 6. Bessel functions. 7. Other special functions.

*Machine Learning. Paradigms and Methods.* Edited by Jaime Carbonell. MIT/Elsevier (1990). 394 pages. \$27.50.

Contents:

1. Introduction: paradigms for machine learning. 2. Model of incremental concept formation. 3. Explanation-based learning: a problem solving perspective. 4. Design by derivational analogy: issues in the automated replay of design plans. 5. Connectionist learning procedures. 6. Classifier systems and genetic algorithms. 7. Data-driven approaches to empirical discovery. 8. A theory of the origins of human knowledge. 9. Creativity and learning in a case-based explainer.

*AI in the 1980s and Beyond.* Edited by W. Eric L. Grimson and Ramesh S. Tapil. The MIT Press (1990). 374 pages. \$15.00.

Contents:

1. Artificial intelligence: a perspective. 2. Knowledge-based systems: the view in 1986. 3. Expert systems tools and techniques: past, present and future. 4. A case study on evolution of system building expertise: medical diagnosis. 5. Artificial intelligence and software engineering. 6. Intelligent natural language processing: current trends and future prospects. 7. Automatic speech recognition and understanding. 8. Intelligent vision. 9. Making robots see and feel. 10. Robot programming and artificial intelligence. 11. Robot hands and tactile sensing. 12. Autonomous mobile robots.

*Jump Linear Systems in Automatic Control.* By Michel Mariton. Marcel Dekker, Inc. (1990). 299 pages. \$99.75 (U.S. and Canada) \$119.50 (All other countries).

Contents:

1. Hybrid dynamic models. 2. Controllability and stability. 3. Control optimization. 4. Robustness. 5. The jump linear quadratic Gaussian problem. 6. Optimal filtering. 7. Control under regime uncertainty. 8. Extensions and open problems. Appendixes. 1. Stochastic processes and dynamic systems. 2. Stochastic control: stability and optimization.

*Computable Set Theory.* By Domenico Cantone, Alfredo Ferro and Eugenio Omodeo. Oxford Science Publications (1989). 347 pages. \$59.95.

Contents:

1. Introduction. Part I. Fundamentals. 2. Classes and ordering. 3. The validity problem. 4. A partial solution to the finite satisfiability problem. 5. Elementary syllogistics. 6. Multilevel syllogistics. 7. Restricted quantifiers, ordinals and  $\omega$ . Part II. Extended multilevel syllogistics. 8. The powerset operator. 9. Map constructs. 10. The unionset operator. 11. The choice operator.

*Ocean Waves Mechanics, Computational Fluid Dynamics and Mathematical Modelling.* Edited by M. Rahman. Computational Mechanics Publication (1990). 954 pages. \$145.00.

Contents:

1. Keynote lecture. 2. Mechanics of ocean waves. 2a. Invited lectures. 2b. contributed papers. 3. Computational fluid dynamics. 3a. Invited lectures. 3b. Contributed papers. 4. Mathematical modelling. 4a. Invited lectures. 4b. Contributed papers.

*Computers, Pattern, Chaos and Beauty. Graphics from an Unseen World.* By Clifford A. Pickover. St. Martin's Press (1990). 394 pages. \$29.95.

Contents:

Part I. Introduction. 1. Computers and creativity. 2. Hidden worlds. Part II. Representing nature. 3. Fourier transforms (The prisms of science). 4. Unusual graphic representations. 5. Image processing of the Shroud of Turin. 6. Physics: charged curves. 7. Summary of Part II. Part III. Pattern, symmetry, beauty. 8. Genesis equations (or biological feedback forms). 9. More beauty from complex variables. 10. Mathematical chaos. 11. Number theory. 12. Synthesizing nature. 13. Synthesizing ornamental textures. 14. Dynamical systems. 15. Numerical approximation methods. 16. Tessellation automata derived from a single defect. 17. Summary of Part III and conclusion of book. Appendixes. A. Color plates. B. Additional recipes. C. Suggestions for future experiments. D. Descriptions for chapter frontpiece figures.

*How to Read and Do Proofs. An Introduction to Mathematical Thought Processes.* By Daniel Solow. John Wiley & Sons (1982, 1990). 242 pages. \$19.95.

Contents:

1. The truth of it all. 2. The forward - backward method. 3. On definitions and mathematical terminology. 4. Quantifiers I: The construction method. 5. Quantifiers II: The choose method. 6. Quantifiers III: Induction. 7. Quantifiers IV: specialization. 8. Quantifiers V: nester quantifiers. 9. The contradiction method. 10. The contrapositive method. 11. Nots of nots lead to knots. 12. Special proof techniques. 13. Summary. Appendixes. A: Putting it all together: Part I. B: Putting it all together: Part II.

*Papers · Experiences · Perspectives.* By A. Alan B. Pritaker. Systems Publishing Corporation (1990). 577 pages. \$29.95.

Contents:

1. Role of the industrial engineer. 2. Industrial engineering process. 3. Modeling perspectives. 4. Model evolution. 5. Modeling and simulation languages. 6. Model analysis. 7. Decision theory and support. 8. Control paradigms. 9. Applications.

*Organization of Engineering Knowledge for Product Modelling in Computer Integrated Manufacturing. The Second Toyota Conference.* Edited by T. Sata. Elsevier (1989). 461 pages. \$128.25.

Contents:

1. Organizing committee. 2. List of contributors. 3. Intelligent CAD. 4. Knowledge management for preliminary computer-aided mechanical design. 5. The basic research issues in computer-aided design and manufacturing processes. 6. Bionical manufacturing systems –bio-modelon based system design-. 7. Spatial reasoning: from robotics to engineering. 8. Artificial intelligence in computer aided design. 9. Product modelling for design and production. 10. Knowledge integrated product modelling for design and manufacture. 11. Modeling design processes as evolving first order interpretations. 12. Product modelling for flexible integration of design and manufacturing activities. 13. Improving product models and kernel modellers. 14. Feature-based product modeling for process planning. 15. A framework for 3D modelling: constraint-based description and non-manifold geometric modeling. 16. Tools for intelligent human communication and collaboration for better manufacturing. 17. Capturing context dependent rules from interaction sequences: an example for mechanical design. 18. Artificial evolution and intimate machines.

*Asymptotic and Computational Analysis.* Edited by R. Wong. Marcel Dekker, Inc. (1990). 755 pages. \$115.00 (U.S. and Canada) \$138.00 (All other countries).

Contents:

Part I. Invited papers. 1. Graphs as an aid to understanding special functions. 2. Asymptotics of integrals, series, and operators. 3. Asymptotic expansions for the coefficient functions associated with linear second-order differential equations: The simple pole case. 4. Landen transformations of integrals. 5. Accelerating the convergence of Chebyshev series. 6. Practical methods for the uniform asymptotic evaluation of oscillating integrals with several coalescing saddle points. 7. New inequalities for the zeros of confluent hypergeometric functions. 8. How (un)stable are vandermonde systems? 9. Singular point and exponential asymptotics. 10. Uniform asymptotic remainders. 11. Period tripling and subharmonic oscillations in Marangoni flows in a cylindrical liquid bridge. 12. Positive solutions for degenerate and ondegenerate elliptic systems: existence and numerical approximations. 13. Observable tunneling in several dimensions. 14. On Stokes' phenomenon and converging factors. 15. Singularly perturbed boundary value problems viewed in the Liñard plane. 16. On the asymptotic theory of the Orr-Sommerfeld problem. 17. Gevrey property of formal solutions in a parameter. 18. A Riccati approach to the Airy equation. 19. A system of polynomials associated with the Chester, Friedman, and Ursell technique. 20. Rational approximation of the step, filter, and impulse functions. 21. Polynomial asymptotic estimates of Gegenbauer, Laguerre, and Jacobi polynomials. 22. Integrals with a large parameter and the maximum-modulus principle. 23. Finite axial extension and torsion of elastic helicoidal shells. 24. Some properties of convolution sequences and asymptotics for the Taylor coefficients for products of Bessel Functions. 25. A generalization of Olver's algorithm for linear difference systems.

Part II. Contributed papers. 1. Continental shelf wave scattering: partial removal of the rigid lid. 2. Some aspects of invariant subspaces computation. 3. Error bounds via complete monotonicity for a uniform asymptotic expansion the the Legendre function  $P_n^{-m}(\cos hz)$ . 4. Computational asymptotics of fourth-order operators. 5. Universal asymptotic distribution functions mod 1. 6. On the  $n$ -variable saddle point and steepest descent methods. 7. Applications of the method of steepest descents in wave-propagation problems. 8. The asymptotics of Pearcey's integral for complex variables. 9. Asymptotic Methods in magnetoconvection. 10. The interior layer structure for a linear parabolic problem with discontinuous data. 11. Asymptotic expansions of solutions to  $\Delta u - u = f$  at infinity. 12. Approximating zeros of solutions of second-order linear ODEs by "phase function" methods. 13. Asymptotic expansions of integrals of two Bessel functions. 14. On eigenvalues with exponentially small imaginary part.

*Galois Theory. Second Edition.* By Ian Stewart. Chapman and Hall Mathematics (1990). 202 pages. \$52.50 (cloth) \$22.50 (paper) (U.S.) \$63.00 (cloth) \$27.00 (paper) (Canada).

Contents:

1. Background. 2. Factorization of polynomials. 3. Field extensions. 4. The degree of an extension. 5. Ruler and compasses. 6. Transcendental numbers. 7. The idea behind Galois theory. 8. Normality and separability. 9. Field degrees and group orders. 10. Monomorphisms, automorphisms, and normal closures. 11. The Galois correspondence. 12. A specific example. 13. Soluble and simple groups. 14. Solution of equations by radicals. 15. The general polynomial equation. 16. Finite fields. 17. Regular polygons. 18. Calculating Galois groups. 19. The 'fundamental theorem of algebra'.

*Introduction to Queueing Theory. Second Edition* By B. V. Gnedenko and I. N. Kovalenko. Birkhäuser (1989). 314 pages. \$59.00.

Contents:

1. Problems of queueing theory under the simplest assumptions. 2. The study of the incoming customer stream. 3. Some classes of stochastic processes. 4. Semi-Markov models of queueing systems. 5. Applications of more general methods. 6. Statistical simulation of systems.

*Advances in Software Science and Technology. Volume 1.* By Shoten. Academic Press, Inc. (1990). 221 pages. \$49.00.

Contents:

Part I. Research contributions. 1. JPSG-A phrase structure grammar for Japanese. 2. Logical semantics of multiple world mechanism for knowledge representation in logic programming. 3. Adaptive optimal segmentation schemes for multiattribute files. 4. Methods for transforming attribute grammars into efficient action routines. 5. Program transformation of CCFG programs. 6. Attribute graph grammars with applications to Hichart program chart editors. 7. A type inference system for FP programs. 8. Overview of GMW+Wnn system. 9. Floating-point numbers and real numbers. Part II. Tutorial. 1. Category theory for algebraic specification. 2. On concurrent programming in smalltalk-80. Part III. Society news. 1. Rules for submission of English papers and English paper style guidelines. 2. Author's guide. 3. Japan Society for Software Science and Technology membership application form.

*TEDIUM and the Software Process.* By Bruce I. Blum. The MIT Press (1990). 265 pages. \$30.00.

Contents:

Part I. Concepts. 1. The software process. 2. A philosophical framework. 3. TEDIUM, MUMPS, and the INA example. Part II. Description. 4. The data model. 5. Program specifications. 6. The system. Part III. Evaluation. 7. Evaluation of TEDIUM. 8. Examination of the software process. Appendices. A. References and bibliography. B. Command summary. C. INA project analysis.

*SIGMA. A Knowledge-Based Aerial Image Understanding System.* By Takashi Matsuyama and Vincent Shang-Shouq Hwang. Plenum Publishing Corporation (1990). \$59.50.

Contents:

1. Introduction. 2. System architecture and reasoning scheme in SIGMA. 3. Algorithms for evidence accumulation. 4. LLVE: Expert system for top-down image segmentation. 5. Experimental results and performance evaluation. 6. Conclusion.

*Eurographics 1989.* Edited by W. Hansmann, F.R.A. Hopgood and W. Strasser. Elsevier Science Publishers B.V. (1989). 500 pages. \$134.25/Dfl. 255.00.

Contents:

1. Interaction tools. 2. Realism. 3. Interaction models. 4. Rendering parametric surfaces.

*The Definition of Standard ML.* By Robin Milner, Mads Tofte and Robert Harper. The MIT Press (1990). 101 pages. \$15.00.

Contents:

1. Introduction. 2. Syntax of the core. 3. Syntax of modules. 4. Static semantics for the core. 5. Static semantics for modules. 6. Dynamic semantics for the core. 7. Dynamic semantics for modules. 8. Programs. Appendices. A. Derived forms. B. Full grammar. C. The initial static basis. D. The initial dynamic basis. E. The development of ML.

*Execution Models of Prolog for Parallel Computers.* By Péter Kacsuk. The MIT Press (1990). 275 pages. \$27.95.

Contents:

1. Parallel processing. 2. Logic programming and prolog. 3. Parallel processing of logic programs. 4. A Parallel prolog abstract machine. 5. Enhancement of parallelism. 6. Mapping of PPAM code on processor arrays. 7. DAP prolog. 8. Implementation principles of DAP prolog. 9. Conclusion and future work. Appendixes. 1. T-prolog implementation of ECDAM. 2. Occam implementation of ECDAM. 3. DAP implementation of ECDAM. 4. Examples for array mode of DAP prolog.

*Connectionist Modeling and Brain Function.* Edited by Stephen José Hanson and Carl R. Olson. The MIT Press (1990). 423 pages. \$37.50.

Contents:

Part I. Overview. 1. Introduction: Connectionism and neuroscience. 2. Computational neuroscience. Part II. Associative memory and conditioning. 3. The behavioral analysis of associative learning in the terrestrial mollusc *kunax nazunyn*: The importance of inter-event relationships. 4. Neural models of classical conditioning: A theoretical viewpoint. 5. Unsupervised perceptual learning: A paleocortical model. Part III. The somatosensory system. 6. Biological constraints on a dynamic network: The somatosensory nervous system. 7. A model of receptive field plasticity and topographic reorganization in the somatosensory cortex. 8. Spatial representation of the body. Part IV. The visual system. 9. The development of ocular dominance columns: mechanisms and models. 10. Self-organization in a perceptual system: How network models and information theory may shed light on neural organization. 11. Solving the brightness-from-luminance problem: A neural architecture for invariant brightness perception.

*Design of Devices and Systems. Second Edition.* By William H. Middendorf. Marcel Dekker, Inc. (1990). 511 pages. \$49.75 (U.S. and Canada) \$59.50 (All other countries).

Contents:

1. Design and the engineer. 2. Product liability. 3. Need analysis and specifications. 4. The feasibility study. 5. Patents. 6. Alternative designs and innovations. 7. The model. 8. Decisions. 9. The design of systems. 10. Detailed design of devices and systems. 11. Product design using computers. 12. Optimum design. 13. Reliability. 14. Accelerated life testing. 15. Human factors engineering. 16. The art of design.

*Computability and Logic. Third Edition.* By George S. Boolos and Richard C. Jeffrey. Cambridge University Press (1989). 304 pages. \$49.50 (cloth) \$17.95 (paper).

Contents:

1. Enumerability. 2. Diagonalization. 3. Turing machines. 4. Uncomputability via the busy beaver problem. 5. Uncomputability via diagonalization. 6. Abacus computable functions are turing computable. 7. Recursive functions are abacus computable. 8. Turing computable functions are recursive. 9. First-order logic revisited. 10. First-order logic is undecidable. 11. First-order logic formalized: Derivations and soundness. 12. Completeness of the formalization; compactness. 13. The Skolem-Löwenheim theorem. 14. Representability in  $Q$ . 15. Undecidability, indefinability and incompleteness. 16. Provability predicates and the unprovability of consistency. 17. Non-standard models of arithmetic. 18. Second-order logic. 19. On defining arithmetical truth. 20. Definability in arithmetic and forcing. 21. The decidability of arithmetic with addition, but not multiplication. 22. Dyadic logic in undecidable: 'eliminating' names and function symbols. 23. The Craig interpolation lemma. 24. Two applications of Craig's lemma. 25. Monadic versus dyadic logic. 26. Ramsey's theorem. 27. Provability considered modal-logically. 28. Undecidable sentences. 29. Non-standard models of  $Z$  are not recursive.

*Eurographics 89.* Edited by W. Hansmann, F. R. A. Hopgood and W. Strasser. North-Holland (1989). 552 pages. \$134.25 (U.S.) \$255.00 (Dfl.)

Contents:

1. Interaction tools. 2. Realism. 3. Interaction models. 4. Rendering parametric surfaces. 5. Applications of visualisation. 6. Architecture. 7. Texturing and anti-aliasing. 8. Formal specification. 9. Lighting and shading. 10. Fundamental algorithms. 11. Interactive visualisation. 12. Graphics standards. 13. Modelling I. 14. Animation. 15. Modelling II. 16. Colour section.

*Handbook of Semiconductor Silicon Technology.* Edited by William C. O'Mara, Robert B. Herring and Lee P. Hunt. Noyes Publications (1990). 795 pages. \$96.00

Contents:

1. Silicon precursors: Their manufacture and properties. 2. Polysilicon preparation. 3. Crystal growth of silicon. 4. Silicon wafer preparation. 5. Silicon epitaxy. 6. Silicon material properties. 7. Oxygen, carbon and nitrogen in silicon. 8. Carrier lifetimes in silicon. 9. Preparation and properties of polycrystalline-silicon films. 10. Silicon phase diagrams.

*Algorithmic Algebraic Number Theory.* By M. Pohst and H. Zassenhaus. Cambridge University Press (1989). 465 pages. \$89.50.

Contents:

1. Basics of constructive algebraic number theory. 2. The group of an equation. 3. Methods from the geometry of numbers. 4. Embedding of commutative orders into the maximal order. 5. Units in algebraic number fields. 6. The class group of algebraic number fields.

*Representations and Characters of Finite Groups.* By M. J. Collins. Cambridge University Press (1990). 242 pages. \$59.50.

Contents:

1. General representation theory. 2. Complex characters. 3. Suzuki's theory of exceptional characters. 4. Coherence and exceptional characters. 5. The characterisation of characters. 6. Isometries.

*Chaotic Evolution and Strange Attractors.* By Lezioni Lincee. Cambridge University Press (1989). 96 pages. \$39.50 (cloth) \$12.95 (paper).

Contents:

Part I. Steps to a deterministic interpretation of chaotic signals. 1. Descriptions of turbulence. 2. A bit more on turbulence. The Navier-Stokes equation. 3. The Hénon mapping. 4. Capacity and Hausdorff dimension. 5. Attracting sets and attractors. 6. Extracting geometric information from a times series. Part II. The Ergodic theory of chaos. 7. Invariant probability measures. 8. Physical measures. 9. Characteristic exponents. 10. Invariant manifolds. 11. Axiom A and structural stability. 12. Entropy. 13. Dimensions. 14. Resonances. 15. Conclusions.

*Presentations of Groups.* By D. L. Johnson. Cambridge University Press (1990). 204 pages. \$49.50 (cloth) \$16.95 (paper).

Contents:

1. Free groups. 2. Schreier's method. 3. Nielsen's method. 4. Free presentations of groups. 5. Some popular groups. 6. Finitely-generated Abelian groups. 7. Finite groups with few relations. 8. Coset enumeration. 9. Presentations of subgroups. 10. Presentations of group extensions. 11. Relation modules. 12. An algorithm for  $N/N_i$ . 13. Finite  $p$ -groups. 14. The nilpotent quotient algorithm. 15. The Golod-Shafarevich theorem.

*The Subgroup Structure of the Finite Classical Groups.* By Peter Kleidman and Martin Liebeck. Cambridge University Press (1990). \$29.95.

Contents:

1. Motivation and setting for the results. 2. Basic properties of the Classical Groups. 3. The Statement of the Main Theorem. 4. The structure and conjugacy of the members of  $C$ . 5. Properties of the finite simple groups. 6. Non-maximal subgroups in  $C$ : The examples. 7. Determining the maximality of members of  $C$ , Part I. 8. Determining the maximality of members of  $C$ , Part II.

*Nonlinear Controllability and Optimal Control.* Edited by H. J. Sussmann. Marcel Dekker, Inc. (1990). 472 pages. \$99.75 (U.S. and Canada) \$119.50 (All other countries).

Contents:

1. Synthesis, presynthesis, sufficient conditions for optimality and subanalytic sets. 2. Upper and lower semi-continuous differential inclusions: A unified approach. 3. Global controllability by nice controls. 4. Integrability of certain distributions associated with actions on manifolds and applications to control problems. 5. Right and left invertibility of nonlinear control systems. 6. Equivalence and invariants of nonlinear control systems. 7. Dual variational methods in optimal control theory. 8. Invariance of extremals. 9. Symplectic geometry for optimal control. 10. Linear systems with quadratic costs. 11. The ubiquity of Fuller's phenomenon. 12. Regularity properties of optimal trajectories: Recently developed techniques. 13. Graded and nilpotent approximations of input-output systems. 14. High-order small-time local controllability.

*Lecture Notes in Biomathematics. Mathematical and Statistical Approaches to AIDS Epidemiology.* Edited by C. Castillo-Chavez. Springer-Verlag (1989). 405 pages. \$47.10.

Contents:

1. Statistical methodology and forecasting. 2. Infectivity and the human immunodeficiency virus (HIV). 3. Heterogeneity and HIV transmission dynamics. 4. Social dynamics and AIDS. 5. The immune system and the HIV.

*Volterra Integral and Functional Equations.* By G. Gripenberg, S-O. Londen and O. Staffans. Cambridge University Press (1990). 701 pages. \$99.50.

Contents:

1. Introduction. Part I. Linear theory. 2. Linear convolution integral equations. 3. Linear integrodifferential convolution equations. 4. Equations in weighted spaces. 5. Completely monotone kernels. 6. Nonintegrable Kernels with Integrable Resolvents. 7. Unbounded and unstable solutions. 8. Volterra equations as semigroups. 9. Linear nonconvolution equations. 10. Linear nonconvolution equations with measure kernels. Part II. General nonlinear theory. 11. Perturbed linear equations. 12. Existence of solutions of nonlinear equations. 13. Continuous dependence, differentiability, and uniqueness. 14. Lyapunov techniques. 15. General asymptotics. Part III. Frequency domain and monotonicity techniques. 16. Convolution kernels of positive type. 17. Frequency domain methods: Basic results. 18. Frequency domain methods: Additional results. 19. Combined Lyapunov and frequency domain methods. 20. Monotonicity methods.

*Neural Programming.* Edited by Masao Ito. Japan Scientific Societies Press (1989). 254 pages. \$96.00.

Contents:

Part I. Motor programming in the cerebral cortex. 1. Motor cortex and reaching. 2. Supplementary motor cortex and self-initiated movement. 3. Frontal cortex activity and motor set. 4. Motor programming in the premotor cortex of monkeys. 5. Corticospinal projections from the motor areas in the frontal lobe. Part II. Contribution of the cerebellum, basal ganglia and thalamus to neural programming. 6. Motor programme for voluntary movement in the cerebro-cerebellar neuronal circuit. 7. The neostriatal mosaic: compartmental organization of corticostriatal input, striatonigral output and dopaminergic feedback systems. 8. Motor regulation in the basal ganglia. 9. Motor programming in basal ganglia. 10. Activity of thalamic neurons conveying the basal ganglia output to the motor cortex. Part III. Programming in the visual system. 11. Neural commands for the control of saccadic eye movement: required transformations of signals observed in the superior colliculus. 12. Relation of cortical areas MT and MST to smooth pursuit eye movements. 13. How is the visual associative memory represented in neurons of the primate temporal cortex? Part IV. Programming in neuronal network and system. 14. Network models for eye movement control. 15. Neural networks for generation of eye and arm movement trajectories. 16. Neural network models for formation and control of multijoint arm trajectory. 17. Using associative content-addressable memories to control

movement. 18. Neural network models of vector coding, learning, and trajectory formation during planned and reactive arm and eye movements.

*Software Engineering. Methods and Management.* By Anneliese von Mayrhauser. Academic Press, Inc. (1990). 864 pages. \$49.95.

Contents:

Part I. Methods. 1. Introduction. 2. Problem definition. 3. Functional requirements collection. 4. Qualitative requirements. 5. Specifications. 6. Design: Strategies and notations. 7. Software system structure design. 8. Detailed design. 9. Coding. 10. Testing. 11. Operation and maintenance. Part II. Management. 12. Management by metrics. 13. Feasibility and early planning. 14. Models for managerial planning. 15. Project personnel. 16. Software development guidelines.

*Solid Shape.* By Jan J. Koenderink. The MIT Press (1990). 699 pages. \$65.00.

Contents:

Part I. Prologue. 1. Introduction. 2. Shape and space. Part II. Space. 3. Euclidean space. 4. Curved submanifolds. Part III. Smooth entities. 5. Curves. 6. Local patches. Part IV. Static shape. 7. Global patches. 8. Application to ecological optics. Part V. Dynamic shape. 9. Morphogenesis. 10. Shape in flux. Part VI. Epilogue. 11. Shape models. 12. How to draw and use diagrams.

*Advanced Research in VLSI. Proceedings of the Sixth MIT Conference.* Edited by William J. Dally. The MIT Press (1990). 398 pages. \$50.00.

Contents:

Part I. Application-specific design. 1. STONN: A stochastic neural network chip. 2. Very high performance signal processing using the residue number system. 3. Practical dictionary management for hardware data compression. Part II. Accelerators. 4. Synergism of VLSI architecture and algorithms: The MARS VLSI system. 5. ES-Kit: Rapid prototyping of scalable high performance systems. Part III. Timing and verification. 6. Performance-oriented technology mapping. 7. Synchronous circuit verification by symbolic simulation: An illustration. 8. A timing analysis of level-clocked circuitry. Part IV. Communication in concurrent systems. 9. Let's route packets instead of wires. 10. Adaptive, minimal routing in hypercubes. 11. Priority arbitration with busses. Part V. Communication in parallel systems. 12. The role of randomness in the design of parallel architectures. 13. System design of the J-machine. 14. The fat-pyramid: A robust network for parallel computation. Part VI. Synthesis and/or testability. 15. Don't cares in multi-level logic synthesis. 16. Necessary and sufficient conditions for robust delay-fault testability of combinational logic circuits. 17. Extended stuck-fault testability for combinational networks. Part VII. Timing issues in circuit design. 18. The limitations to delay-insensitivity in asynchronous circuits. 19. Differential high-bandwidth communication circuits. Part VIII. High-performance packaging. 20. VLSI packaging for high performance computing. 21. Physically compact, high-performance multicomputers. 22. Theoretical aspects of VLSI pin limitations. Part IX. Placement and routing. 23. Simulated annealing on fractals: Theoretical analysis and relevance for combinatorial optimization. 24. On the switchbox routing in diagonal grid. 25. Heuristic algorithms for combined standard cell and macro block layouts. Part X. Sensors, circuits, and architecture. 26. Silicon micro-instrumentation. 27. BiCMOS circuit design.

*The Volume of Convex Bodies and Banach Space Geometry.* By Gilles Pisier. Cambridge University Press (1989). 250 pages. \$49.50.

Contents:

1. Notation and preliminary background. 2. Gaussian variables.  $K$ -convexity. 3. Ellipsoids. 4. Dvoretzky's theorem. 5. Entropy, approximation numbers, and Gaussian processes. 6. Volume ratio. 7. Milman's ellipsoids. 8. Another proof of the QS theorem. 9. Volume numbers. 10. Weak cotype 2. 11. Weak type 2. 12. Weak Hilbert spaces. 13. Some examples: The Tsirelson spaces. 14. Reflexivity of weak Hilbert spaces. 15. Fredholm determinants.

*The Mathematics of Projectiles in Sport.* By Neville De Mestre. Cambridge University Press (1990). 175 pages. \$22.95.

Contents:

1. Motion under gravity along. 2. Motion in a linear resisting medium. 3. Motion in a non-linear resisting medium. 4. The basic equations and their numerical solution. 5. Small drag or small gravity. 6. Corrections due to other effects. 7. Spin effects. 8. Projectiles in sport and recreation.

*High-Voltage Engineering. Theory and Practice.* Edited by M. Khalifa. Marcel Dekker, Inc. (1990). 524 pages. \$99.75 (U.S. and Canada) \$119.50 (All other countries).

Contents:

1. Introduction. Part I. 2. Electric fields. 3. Ionization and deionization processes in gases. 4. Electrical breakdown of gases. 5. The corona discharge. 6. The arc discharge. 7. Insulating liquids. 8. Solid insulating materials. Part II. 9. High-voltage busbars. 10. Gas-insulated switchgear. 11. Circuit breaking. 12. High-voltage



cables. 13. Grounding Systems. 14. Overvoltages on Power Systems. 15. Insulation coordination. 16. High-voltage generation. 17. High-voltage measurements. 18. Testing techniques.

*Interpretation and Instruction Path Coprocessing.* By Eddy H. Debaere and Jan M. Van Campenhout. The MIT Press (1990). 192 pages. \$30.00.

Contents:

1. Architectures and languages. 2. A closer look at interpretation. 3. Optimizing interpretive execution. 4. Interpretive coprocessors. 5. Concluding remarks.

*Foundations of Robotics.* By Tsuneo Yooshikawa. The MIT Press (1990). \$40.00.

Contents:

1. Overview of robotics mechanisms and controller. 2. Kinematics. 3. Dynamics. 4. Manipulability. 5. Position control. 6. Force control. 7. Control of redundant manipulators. Appendixes. 1. Function atan2. 2. Pseudo-inverses. 3. Singular-value decomposition. 4. Lyapunov stability theory.

*The Age of Intelligent Machines.* By Raymond Kurzweil. The MIT Press (1990). 565 pages. \$39.95.

Contents:

1. What is AI, anyway? 2. Philosophical roots. 3. Mathematical roots. 4. The formula for intelligence. 5. Mechanical roots. 6. Electronic roots. 7. Pattern recognition: The search for order. 8. The search for knowledge. 9. The science of art. 10. Visions. 11. The impact on...

*Computers in Mathematics.* Edited by David V. Chudnovsky and Richard D. Jenks. Marcel Dekker, Inc. (1990). 410 pages. \$89.75 (U.S. and Canada) \$107.50 (All other countries).

Contents:

1. Keynote remarks at the conference on computers and mathematics. 2. SCRATCHPAD explorations for elliptic theta functions. 3. Integration and computers. 4. Some thoughts on proof discovery. 5. Computer algebra in the service of mathematical physics and number theory. 6. Impact of linear programming on computer development. 7. Uses of and limitations of computers in number theory. 8. Strip mining in the abandoned orefields of nineteenth century mathematics. 9. Polynomial factorization 1982-1986. 10. Factorization then and now. 11. Computer animation in mathematics, science, and art. 12. Physicists and computer algebra. 13. Symbolic computation: The early days (1950-1971). 14. What computer algebra systems can and cannot do. 15. Solutions of equations I: Polynomial ideals and Gröbner bases.

*Proceedings Eighth National Conference on Artificial Intelligence. Volume 1.* The MIT Press (1990). 570 pages. \$65.00.

Contents:

1. Organization of the American Association for Artificial Intelligence. 2. Program schedule. 3. List of papers. 4. Automated reasoning. 5. Cognitive modeling. 6. Commonsense reasoning. 7. Education and AI. 8. Intelligent interfaces. 9. Knowledge acquisition. 10. Knowledge representation.

*Proceedings Eighth National Conference on Artificial Intelligence. Volume 2.* The MIT Press (1990). 1,147 pages. \$65.00.

Contents:

1. Knowledge representation (continued). 2. Machine learning. 3. Natural language. 4. Robotics. 5. Vision. 6. Invited talks and panels.

*PC Scheme. User's Guide and Software.* By Texas Instruments. Foreword by David H. Bartley, John C. Jensen, and Donald W. Oxley. The MIT Press (1990). 380 pages. \$37.50

Contents:

Part 1. User's guide. 1. Introduction. 2. Getting started. 3. Debugging. 4. The EDWIN editor. 5. Windows. 6. Graphics. 7. Advanced features. 8. Error messages. 9. Implementing constraints. Appendixes. A. A scheme session. B. The %graphics primitives. Part 2. Language reference manual. 1. Introduction. 2. Syntax. 3. Semantics. 4. Data types and operations. 5. SCOOPS. 6. Definitions by category. 7. Alphabetic catalog of language elements.

*Programming in Scheme.* By Michael Eisenberg. Edited by Harold Abelson. The MIT Press (1990). 304 pages. \$32.50.

Contents:

1. Programming in scheme. 2. Sample projects I. 3. Expressions and procedures. 4. Making choices. 5. Recursion. 6. Debugging. 7. Sample projects II. 8. Pairs, lists, and symbols. 9. Subprocedures. 10. Sample projects III. 11. Environments. 12. Procedures. 13. Altering bindings, altering objects. 14. Debugging II. 15. Sample projects

IV. 16. A sampler of advanced topics. Appendixes. A. An Edwin mini-manual. B. Answers to selected exercises. C. References and bibliography.

*Glory and Failure. The Difference Engines of Johann Müller, Charles Babbage and Georg and Edvard Scheutz.* By Michael Lindgren. Translated by Dr. Craig G. McKay. The MIT Press (1990). 414 pages. \$45.00.

Contents:

Part I. History and technology. 1. Babbage, Müller, and the first difference engines. 2. Scheutz and the Swedish difference engines. Part II. Analysis. 3. The machines, the men, and the market. Appendixes. 1. Rediscovery and restoration. 2. Distribution list. 3. Berzelius' statement.

*Reflection Groups and Coxeter Groups.* By James E. Humphreys. Cambridge University Press (1990). 204 pages. \$39.50.

Contents:

I. Finite and affine reflection groups. 1. Finite reflection groups. 2. Classification of finite reflection groups. 3. Polynomial invariants of finite reflection groups. 4. Affinite reflection groups. II. General theory of Coxeter groups. 5. Coxeter groups. 6. Special cases. 7. Hecke algebras and Kazhdan-Lusztig polynomials. 8. Complements.

*Artificial Intelligence at MIT: Expanding Frontiers.* Edited by Patrick H. Winston with Sarah A. Shellard. The MIT Press (1990). 656 pages (Volume 1). 634 pages (Volume 2). \$40.00 (each volume). \$70.00 (2 volume set).

Contents: Volume 1

Part I. Scalable solutions for real-world problems. 1. Intelligence in scientific computing. 2. Abstraction in numerical methods. 3. Intelligent tools for mechanical design. 4. ARIEL: A massively parallel symbolic learning assistant for protein structure and function. 5. SIBYL: A qualitative decision management system. 6. Using English for indexing and retrieving. 7. The programmer's apprentice. 8. Recognizing a program's design. Part II. Fueling the next generation. 9. Logical vs. analogical or symbolic vs. connectionist or neat vs. scruffy. 10. Excerpts from the society of mind. 11. HyperBF: A powerful approximation technique for learning. 12. Principle-based parsing: Natural language processing for the 1990s. 13. Machine translation: A principle-based approach. 14. Repairing learned knowledge using experience. 15. Model-based reasoning: Troubleshooting. 16. Invention from first principles: An overview. 17. Mathematical knowledge representation. 18. Three universal relations. Part III. Creating hardware and software revolutions. 19. An architecture for mostly functional languages. 20. Performance analysis of k-ry n-cube interconnection networks. 21. The J-machine system. 22. Guarded horn clause languages: Are they deductive and logical? 23. Organizations are open systems.

Contents: Volume 2

Part IV. Conquering unstructured environments. 24. A robust layered control system for a mobile robot. 25. A robot that walks: Emergent behaviors from a carefully evolved network. 26. Task-level planning of pick-and-place robot motions. 27. Automatic synthesis of fine-motion strategies for robots. Part V. Jumping through hoops and manipulating objects. 28. Using associative content-addressable memories to control robots. 29. Preshaping command inputs to reduce system vibration. 30. Legged robots. 31. Biped gymnastics. 32. Using an articulated hand to manipulate objects. 33. An experimental whole-arm manipulator. 34. Calibrating closed kinematic chains. 35. Identifying the kinematics of robots. Part VI. Recognizing objects and understanding images. 36. Object recognition by constrained search. 37. On the recognition of parameterized 2D objects. 38. Aligning pictorial descriptions. 39. Maximizing rigidity: Recovery of 3-D structure from motion. 40. Direct methods for recovering motion. 41. Computational vision and regularization theory. 42. The MIT vision machine. 43. Parallel networks for machine vision.

*Mathematical Modelling. A Tool for Problem Solving in Engineering, Physical, Biological and Social Sciences.* By D. N. P. Murphy, N. W. Page and E. Y. Rodin. Pergamon Press (1990). 339 pages. \$49.00.

Contents:

Part I. Methodology and tools. 1. Role of mathematics in problem solving. 2. Problem definition: The starting point. 3. System characterization. 4. Mathematical modeling. 5. Mathematical formulations-I. 6. Analysis of mathematical formulations-I. 7. Mathematical formulations-II. 8. Analysis of mathematical formulations-II. 9. Simulation. 10. Parameter estimation. 11. Design of experiment. 12. Validation. 13. Pitfalls in modelling. Part II. Case studies. 14. Dynamics of malaria spread. 15. Designing a pneumatic pump. 16. Forecasting airline passenger growth. Part III. Supplementary material. 17. Modelling exercises. 18. Reference material.

*Logic Programming. Proceedings of the Seventh International Conference.* Edited by David H. D. Warren and Peter Szeredi. The MIT Press (1990). 788 pages. \$55.00.

Contents:

1. Concurrent logic languages. 2. Architectures. 3. Logic databases. 4. Implementation. 5. Constraints, attribute grammars. 6. Independent and-parallelism. 7. And-parallelism. 8. Parallel systems and algorithms. 9. Grammars, program mappings, proof construction. 10. Semantics. 11. Language issues. 12. Higher-order logic, abduction. 13. Negation. 14. Program termination. 15. Program synthesis and optimization. 16. Program analysis and transformation. 17. Abstracts of invited lectures. 18. Abstracts of advanced tutorials.