

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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Markovian Queues. By O.P. Sharma. Prentice Hall, Englewood Cliffs, NJ. (1990). 82 pages. \$39.00.

Contents:

Preface. Symbols and notations used. 1. Introduction and definitions. 2. A new approach to the M/M/1 queue. 3. The two-dimensional state model for markovian queues. 4. Matrix method for markovian queues. 5. Transient analysis of an M/M/r machine interference model. 6. Transient analysis of multiple-unit reliability systems. References. Bibliography. Index.

Tensor Methods for Engineers and Scientists. By M. Farrashkhalvat and J.P. Miles. Prentice Hall, Englewood Cliffs, NJ. (1990). 209 pages. \$93.50.

Contents:

Preface. 1. Vectors. 2. Matrix algebra and determinants. 3. Tensor analysis. 4. Covariant differentiation. 5. Orthogonal curvilinear co-ordinates and physical components. 6. Applications in continuum mechanics. 7. Turbulence equations. Appendix. Chain rules. Answers to problems. References.

Linear Algebra and Differential Equations. By A.C. Baker and H.L. Porteous. Prentice Hall, Englewood Cliffs, NJ. (1990). 424 pages. \$31.95.

Contents:

Preface. 1. Systems of linear equations. 2. Vector spaces. 3. Linear transformations. 4. Linear differential equations. 5. Matrix representation of linear transformations. 6. Linear operators, eigenvalues and eigenvectors. 7. Similarity invariants and canonical forms. 8. Inner product spaces and orthogonal series. 9. Self-adjoint operators. 10. Partial differential equations. References. Solutions to exercises. List of symbols.

Handbook of Algorithms and Data Structures, In Pascal and C. By G.H. Gonnet and R. Baeza-Yates. Addison-Wesley Publishing Company, Reading, MA. (1991). 424 pages. \$34.50.

Contents:

1. Introduction. 2. Basic concepts. 2.1 Data structure description. 2.2 Algorithm descriptions. 3. Searching algorithms. 3.1 Sequential search. 3.2 Sorted array search. 3.3 Hashing. 3.4 Recursive structures search. 3.5 Multidimensional search. 4. Sorting algorithms. 4.1 Techniques for sorting arrays. 4.2 Sorting other data structures. 4.3 Merging. 4.4 External sorting. 5. Selection algorithms. 5.1 Priority queues. 5.2 Selection of kth element. 6. Arithmetic algorithms. 6.1 Basic operations, multiplication/division. 6.2 Other arithmetic functions. 6.3 Matrix multiplication. 6.4 Polynomial evaluation. 7. Text algorithms. 7.1 Text searching without preprocessing. 7.2 Searching preprocessed text. 7.3 Other text searching problems. I. Distributions derived from empirical observation. II. Asymptotic expansions. III. References.

Understanding the Representational Mind. By Josef Perner. MIT Press, Cambridge, MA and London, England. (1991). 348 pages. \$35.00.

Contents:

1. Introduction: mind \times representation. I. Representation. 2. The concept "representation". 3. Toward the representational mind. 4. Understanding representations and appearances. II. Mind. 5. Characterizing "the mental". 6. Early understanding: emotion and seeing. 7. Acquiring a theory of knowledge. 8. Understanding thinking and belief. 9. Understanding desire and gaining self-control. III. Developmental issues. 10. Representational change and theory change. 11. Origins of commonsense psychology. Notes to chapters. Bibliography.

Cognition through Color. By Jules Davidoff. MIT Press, Cambridge, MA and London, England. (1991). 217 pages. \$32.50.

Contents:

1. Introduction. 2. The neurophysiology of modularity. 3. The neuropsychology of the color module. 4. Modularity studied by equiluminance. 5. The temporary representation: modular approaches. 6. Boundaries and surfaces. 7. Object knowledge. 8. Colors without objects. 9. The colors of objects. 10. Objects and their names. 11. Color naming. 12. Overview. References.

Software Tools for Computer Aided Learning in Mathematics. By C.E. Beevers, M.M.G. Foster, B.S.G. Cherry and G.R. McGuire. Avebury Technical, Academic Publishing Group, Hampshire, England. (1991) 206 pages. £29.50.

Contents:

List of figures. Preface. 1. Introduction. 1.1 What we cover in this book. 1.2 Overview of the CALM project. 1.3 Building a CALM unit. 2. CAL in general. 2.1 Display. 2.2 Control. 2.3 Input. 2.4 Messages and queries. 2.5 Pop-up menu and help. 2.6 Graphics and animation. 2.7 Use of student files. 2.8 Summary. 3. CAL in mathematics. 3.1 Mathematical display. 3.2 Mathematical input. 3.3 Evaluating an expression. 3.4 Checking answers. 3.5 Using randoms. 3.6 IBM compatibility. 3.7 Summary. 4. Test section. 4.1 The student's view. 4.2 The teacher's view. 4.3 The programmer's view. 4.4 Lessons learnt. 4.5 Summary. 5. Graphics routines for mathematics. 5.1 Setting up the graphics routines. 5.2 Drawing a curve. 5.3 Parametric curves. 5.4 Simple diagrams. 5.5 Instructive animations. 5.6 Summary. 6. Mathematical games. 6.1 The sky's the limit. 6.2 Mathematical models. 6.3 Fireman. 6.4 Some disadvantages of CAL. 6.5 Summary. 7. Conclusions. 7.1 Educational evaluation of CALM. 7.2 Some summative evaluation of CALM. 7.3 Some CALM reflections. 7.4 Some disadvantages of CAL. 7.5 The future for CALM. Appendices. A. Elements of Pascal. B. Some aspects of MS-DOS. C. Graphics support library. D. Index of routines.

A Theory of Computer Semiotics, Semiotic Approaches to Construction and Assessment of Computer Systems. By P.B. Andersen. Cambridge University Press, New York, NY. (1990). 416 pages. \$59.50.

Contents:

Prologue. Introduction: scope and setting. 1. Theoretical framework. 2. Requirements from HCI. 3. Computer semiotics: an emergent research field. 4. The structure of the book. 5. Empirical coverage. I. Theory. 1. The structuralist heritage. 2. Adapting and extending structuralist methods. II. Computers. 1. The basic means of expression. 2. Composite computer based signs. III. Language, work, and design. 1. Language as interpretation. Semantic fields in the postal giro. 2. Language as action. Language games in the postal giro. 3. Task analysis. Controlling control. Epilogue. References.

Numerical Recipes in Pascal. By William H. Press, Brian P. Flannery, Saul A. Teukolsky, and William T. Vetterling. Cambridge University Press, New York, NY. (1989). 759 pages. \$49.50.

Contents:

Preface to the Pascal edition. Preface. List of computer programs. 1. Preliminaries. 2. Solution of linear algebraic equations. 3. Interpolation and extrapolation. 4. Integration of functions. 5. Evaluation of functions. 6. Special functions. 7. Random numbers. 8. Sorting. 9. Root finding and nonlinear sets of equations. 10. Minimization or maximization of functions. 11. Eigensystems. 12. Fourier transform spectral methods. 13. Statistical description of data. 14. Modeling of data. 15. Integration of ordinary differential equations. 16. Two point boundary value problems. 17. Partial differential equations. Appendix A. References. Appendix B. Table of program dependencies.

Functional Integrals and Collective Excitations. By V.N. Popov. Cambridge University Press, New York, NY. (1991). 216 pages. \$59.50 (cloth) \$27.95 (paper).

Contents:

I. Functional integrals and diagram techniques in statistical physics. 1. Functional integrals in statistical physics. 2. Functional integrals and diagram techniques for Bose particles. 3. Functional integrals and diagram techniques for Fermi particles. 4. Method of successive integration over fast and slow variables. II. Superfluid Bose systems. 5. Superfluidity. 6. Low density Bose gas. 7. The modified perturbation scheme for superfluid Bose systems. 8. Quantum vortices in superfluids. III. Plasma and superfluid Fermi systems. 9. Plasma theory.

10. Perturbation theory for superconducting Fermi systems. 11. Superconductivity of the second kind. 12. Collective excitations in superfluid Fermi systems. 13. Bose spectrum. 14. Superfluid phases in ^3He . 15. Collective excitation in the B-phase of ^3He . 16. Collective excitation in the A-phase of ^3He . 17. Superfluidity and Bose excitations in ^3He films. IV. Crystals, heavy atoms, model Hamiltonians. 18. Functional integral approach to the theory of crystals. 19. Effective interaction of electrons near the Fermi surface. 20. Crystal structure of a dense electron-ion system. 21. Quantum crystals. 22. The theory of heavy atoms. 23. Functional integral approach to the theory of model Hamiltonian.

Comparison of Statistical Experiments. By Erik Torgersen. Cambridge University Press, New York, NY. (1991). 675 pages. \$99.50.

Contents:

1. Statistical experiments within the measure theoretical framework. 2. Convexity. 3. Two-person, zero-sum games. 4. Statistical decision problems. 5. Vector lattices. 6. Deficiencies. 7. Equivalence, representations and functionals of experiments. 8. Comparison of linear models. 9. Majorization and approximate majorization. 10. Complements: further examples, problems and comments.

Kummer's Quartic Surface. By R.W.H.T. Hudson. Cambridge University Press, New York, NY. (1991). 222 pages. \$24.95 (paper).

Contents:

1. Kummer's configuration. 2. The quartic surface. 3. The orthogonal matrix of linear forms. 4. Line geometry. 5. The quadric complex and congruence. 6. Plücker's complex surface. 7. Sets of nodes. 8. Equations of Kummer's surface. 9. Special forms of Kummer's surface. 10. The wave surface. 11. Reality and topology. 12. Geometry of four dimensions. 13. Algebraic curves on the surface. 14. Curves of different orders. 15. Weddle's surface. 16. Theta functions. 17. Applications of Abel's theorem. 18. Singular Kummer surfaces.

The Popularization of Mathematics. Edited by A.G. Howson and J.-P. Kahane. Cambridge University Press, New York, NY. (1991). 210 pages. \$49.50 (cloth) \$14.95 (paper).

Contents:

1. A study overview. Geoffrey Howson and Jean-Pierre Kahane. 2. Mathematics in different cultures. Report of the working group. 3. Mathematics for the public. Edward J. Barbeau. 4. Making a mathematical exhibition. Ronnie Brown and Tim Porter. 5. The role of mathematical competitions in the popularization of mathematics in Czechoslovakia. Vladimir Burjan and Antonin Vrba. 6. Games and mathematics. Miguel de Buzmán. 7. Mathematics and the media. Michele Emmer. 8. Square one TV: a venture in the popularization of mathematics. Edward Esty and Joel Schneider. 9. Frogs and candles—tales from a mathematics workshop. Gillian Hatch and Christine Shiu. 10. Mathematics in prime-time television: the story of fun and games. Celia Hoyles. 11. Cultural alienation and mathematics. Gordon Knight. 12. Solving the problem of popularizing mathematics through problems. Mogens Larsen. 13. Popularizing mathematics at the undergraduate level. Brian Mortimer and John Poland. 14. The popularization of mathematics in Hungary. Tibor Nemetz. 15. Sowing mathematical seeds in the local professional community. Tony Shannon. 16. Mathematical news that's fit to print. Lynn Steen. 17. Christmas lectures and mathematics masterclasses. Christopher Zeeman. 18. Some aspects of the popularization of mathematics in China. D.Z. Zhang, H.K. Liu and S. Yu.

Vortex Element Methods for Fluid Dynamic Analysis of Engineering Systems. By R.I. Lewis. Cambridge University Press, New York, NY. (1991). 566 pages. \$125.00.

Contents:

I. The surface vorticity method for inviscid ideal fluid flow. 1. The basis of surface singularity modelling. 2. Lifting bodies, two-dimensional aerofoils and cascades. 3. Mixed flow and radial cascades. 4. Bodies of revolution, ducts and annuli. 5. Ducted propellers and fans. 6. Three-dimensional and meridional flows in turbomachines. II. Free shear layers, vortex dynamics and vortex analysis. 7. Free vorticity shear layers and inverse methods. 8. Vortex dynamics in inviscid flows. 9. Simulation of viscous diffusion in discrete vortex modelling. 10. Vortex cloud modelling by the boundary integral method. 11. Further development and applications of vortex cloud modelling to lifting bodies and cascades. 12. Use of grid system in vortex dynamics and meridional flows. Appendix: computer programs.

Optimal Control, An Introduction to the Theory with Applications. By Leslie M. Hocking. Oxford University Press, New York, NY. (1991). 254 pages. \$80.00 (cloth) \$35.00 (paper).

Contents:

1. Optimal control problems. 2. Systems of differential equations, matrices, and sets. A. Time-optimal control of linear systems. 3. Controllability. 4. Time-optimal control. 5. Further examples. B. The Pontryagin maximum principle. 6. The basic Pontryagin maximum principle (PMP). 7. Extensions to the PMP. 8. Linear state equations with quadratic costs. 9. Proof of the Pontryagin maximum principle. 10. Further applications and extensions. C. Applications of optimal control theory. 11. Some applied optimal control problems. 12. Numerical methods for optimal control problems. Bibliography. Outline solutions to the exercises.

The Second Computer Revolution: Visualization. Richard M. Friedhoff and William Benzon. W.H. Freeman and Company, New York, NY. (1991) 212 pages. \$24.95.

Contents:

1. Introduction: visual thinking with computers.
2. We create the world we see.
3. Images from energy.
4. Computer graphics.
5. Visual experiments.
6. Emergent technologies.

Beyond Belief: Randomness, Prediction and Explanation in Science. Edited by John L. Casti and Anders Karlqvist. CRC Press, Boca Raton, FL. (1990) 334 pages. \$39.95 (U.S.) \$49.75 (elsewhere)

Contents:

- Introduction. John L. Casti and Anders Karlqvist.
1. What can we know? Robert Rosen.
 2. The anthropic cosmological principle: philosophical implication of self-reference. Rainer E. Zimmerman.
 3. Problems of explanation in physics. Peter T. Landsberg.
 4. Boscovich covariance. Otto Rössler.
 5. Entropy and correlations in discrete dynamical systems. Kristian Lindgren.
 6. Dimensions of atmospheric variability. R.T. Pierrehumbert.
 7. Sir Isaac Newton and the evolution of clutch size in birds: a defense of the hypothetico-deductive method in ecology and evolutionary biology. Bertram G. Murray, Jr.
 8. The generic properties of morphogenetic fields.
 9. Coping with complexity: deterministic chaos in human decisionmaking behavior. Erik Mosekilde, Erik Larsen, and John Sterman.
 10. Causality, chaos, explanation, and prediction in economy and finance. William A. Brock.
 11. Chaos, Gödel, and truth. John L. Casti.

Designing Intelligence, A Framework for Smart Systems. By Steven H. Kim. Oxford University Press, New York, NY. (1991). 273 pages. \$39.95.

Contents:

- I. Prelude.
1. Introduction.
2. Overview of framework.
- II. Factors.
3. Purpose.
4. Space.
5. Structure.
6. Time.
7. Process.
8. Efficiency.
- III. 9. Space-versus time.
10. Mechanism versus process.
- IV. Applications.
11. Autonomous robot.
12. Flexible factory.
13. Organizational design.
- V. Postlude.
14. Conclusion.
- Appendices.
- A. A general model of design.
- B. Predeterminism in reasoning and creativity.
- C. Axiomatic approach to design.
- D. A formal framework for learning systems.
- E. A general model for information.

Japan's Software Factories, A Challenge to U.S. Management. By Michael A. Cusumano. Oxford University Press, New York, NY. (1991). 513 pages. \$35.00.

Contents:

- Introduction. I. The software challenge.
1. Product-process strategy and Japan's software industry.
 2. The technology: recurring problems and integrated solutions.
 - II. 3. System Development Corporation: a U.S. factory experiment.
 4. Hitachi: organizing for process and quality control.
 5. Toshiba: linking productivity and reusability.
 6. NEC: a multiproduct, multiprocess factory network.
 7. Fujitsu: process control to automated customization.
 8. Standardization and cooperative R & D.
 - Conclusion 9. Software development: from craft to factory practice.
 - Appendices.
 - A. Survey of manager emphases: the process spectrum.
 - B. Japanese and U.S. project performance.
 - C. Market shares and customer satisfaction in Japan.

Differential Equations and Computer Algebra. By Michael F. Singer. Harcourt Brace Jovanovich, Publishers. London, England. (1991). 228 pages. \$49.95.

Contents:

1. Internal symmetries of differential equations. P.J. Olver.
2. Using trees to compute approximate solutions to ordinary differential equations exactly. R. Grossman.
3. Resonant surface waves in a square container. D. Armbruster, J. Guckenheimer and S. Kim.
4. Formal reduction of metamorphic differential equations containing a parameter. D.G. Babbitt and V.S. Varadarajan.
5. The Kovacic algorithm with applications to special functions. A. Duval.
6. Gevrey asymptotics and Stokes multipliers. Yasutaka Sibuya.
7. Differential Galois groups and G-functions. C. Mitschi.
8. Stabilizing differential operators. A.H.M. Levelt.

How to Set Parameters: Arguments from Language Change. By David Lightfoot. MIT Press, Cambridge, MA and London, England. (1991) 314 pages. \$27.50.

Contents:

- Preface. I. Parameters and triggers.
1. A selective theory of language acquisition.
 2. Arguments from the poverty of the stimulus.
 3. Negative data.
 4. Not every experience is a trigger.
 5. Conclusion
 - II. Simple triggers.
 1. Degree-0 learnability.
 2. Bounding nodes.
 3. Dutch government.
 4. Chinese AGR.
 5. Italian again.
 6. Conclusion.
 - III. Loss of object-verb order.
 1. An empirical argument for degree-0 learnability?
 2. Acquiring object-verb order.
 3. Old English.
 4. Reanalysis in English and its consequences.
 5. Comparisons.
 6. Conclusions.
 - IV. Infinitives.
 1. New accusative subjects and passives.
 2. Infinitives in Brazilian Portuguese.
 3. Conclusion.
 - V. The English case system.
 1. An inadequate account of NP movement.
 2. A theory of abstract case.
 3. The history of NP movement.
 4. Triggering a new abstract case system.
 - VI. Obsolescence and lexicalism.
 1. Impersonal verbs.
 2. Auxiliary verbs.
 3. Conclusion.
 - VII. Chaos, catastrophes and Creoles.
 1. Chaos and the gradualness of change.
 2. Catastrophes.
 3. Creoles.
 4. Conclusion.