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## 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,

Professor Ervin Y. Rodin  
Campus Box 1040  
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One Brookings Drive  
St Louis, MO 63130, U.S.A.

*Types and Programming Languages.* By Benjamin C. Pierce. The MIT Press, Cambridge, MA. (2002). 623 pages. \$60.

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Preface. 1. Introduction. 1.1. Types in computer science. 1.2. What type systems are good for. 1.3. Type systems and language design. 1.4. Capsule history. 1.5. Related reading. 2. Mathematical preliminaries. 2.1. Sets, relations, and functions. 2.2. Ordered sets. 2.3. Sequences. 2.4. Induction. 2.5. Background reading. I. Untyped systems. 3. Untyped arithmetic expressions. 3.1. Introduction. 3.2. Syntax. 3.3. Induction on terms. 3.4. Semantic styles. 3.5. Evaluation. 3.6. Notes. 4. An ML implementation of arithmetic expressions. 4.1. Evaluation. 4.3. The rest of the story. 5. The untyped Lambda-calculus. 5.1. Basics. 5.2. Programming in the Lambda-calculus. 5.3. Formalities. 5.4. Notes. 6. Nameless representation of terms. 6.1. Terms and contexts. 6.2. Shifting and substitution. 6.3. Evaluation. 7. An ML implementation of the Lambda-calculus. 7.1. Terms and contexts. 7.2. Shifting and substitution. 7.3. Evaluation. 7.4. Notes. II. Simple types. 8.1. Types. 8.2. 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*Thermomechanical Fatigue and Fracture.* Edited by M. H. Aliabadi. WIT Press, Southampton. (2002). 329 pages. \$173.

Contents:

1. Thermomechanical crack growth using boundary elements (M.H. Aliabadi, D. dell'Erba and N.N.V. Prasad). 1. Introduction. 2. DBEM for steady state problems. 3. Numerical implementation. 4. DBEM for transient problems. 5. Crack growth simulation. 6. Numerical examples. 7. Conclusions. Appendix.

2. Finite element modelling of thermo-mechanical fracture: Theory and case studies (B.K. Dutta and H.S. Kushwaha). 1. Introduction. 2. Development of a compatible and complete crack tip element. 3. Determination of stress intensity factor at crack tip. 4. Analysis of a bimaterial strip having a crack tip at interface. 5. Analysis of a power plant nozzle with kinked crack. 6. Analysis of PWR vessel under pressurized thermal shock. 7. Conclusions.

3. Prediction of crack initiation and growth under thermal fatigue (A. Fissolo, C. Robertson and V. Maillot). 1. Statement. 2. Experimental procedures. 3. Crack initiation. 4. Crack growth prediction. 5. Perspectives. 6. Conclusions.

4. Predicting crack growth along polymer interfaces due to water attack and thermal fatigue (C.K. Gurumurthy, E.J. Kramer and C.-Y. Hui). 1. Introduction. 2. Hydro-thermal fatigue testing of polymer interfaces. 3. Modeling for hydrothermal fatigue crack growth. 4. Sub-critical crack growth along PI/epoxy interface. 6. Predictions. 7. Discussion. 8. Conclusions. Appendix 1.

5. The saturation of thermomechanical fatigue damage in brittle materials (E.D. Case). 1. Introduction. 2. Experimental techniques for characterizing microcrack damage. 3. Thermal shock/thermal fatigue. 4. Effects of specimen size, environment and microstructure on thermal shock/thermal fatigue damage. 5. Summary and conclusions.

6. Plasticity induced heating in the fracture and cutting of metals (A.T. Zehnder, Y.K. Potdar and K. Bhalla). 1. Introduction. 2. Theory of thermomechanical coupling in solids. 3. Thermal dissipation of plastic work. 4. Dynamic crack growth. 5. Stable crack tearing. 6. Transient thermal fields in metal cutting. 7. Summary and conclusions.

7. Tensile ductility and fracture of aluminum-SiC composites under changing temperature conditions (G. González-Doncel). 1. Introduction. 2. Microstructure of discontinuously reinforced Al-SiC composites. 3. Creep of Al-SiC composites under isothermal conditions. 4. Creep of Al-SiC composites under changing temperature (thermal cycling) conditions. 5. Tensile elongation. 6. Fracture behavior. 7. Model for fracture elongation of Al-SiC composites under thermal cycling creep conditions. 8. Further remarks. 9. Conclusions. List of symbols.

8. Effects of residual stress on thermal fatigue phenomena of aluminum die casting dies (M. Hihara). 1. Introduction. 2. Present state in thermal fatigue of aluminum die casting dies. 3. Measurements of residual stress and observations of heat checking on the actual die. 4. Thermal fatigue behavior on various hot work die steels. 5. Thermal fatigue behavior for die steels and maraging die steels. 6. Thermal fatigue behavior on nitriding and peening-nitriding-peenin treated die steels. 7. Thermal fatigue behavior of multiple nitrided dies steel specimens. 8. Thermal fatigue behavior hot work die steels treated by sulphonitriding. 9. Effects of thermal fatigue phenomenon on hot work die steels to surface formed PVD, CVD and PCVD thin films. 10. Thermal fatigue behavior of surface on electric discharge machined hot work die steels. 11. Application examples. 12. Conclusion.

*The Effects of Competition: Cartel Policy and the Evolution of Strategy and Structure in British Industry.* By George Symeonidis. The MIT Press, Cambridge, MA. (2002). 542 pages. \$55.

Contents:

Acknowledgments. 1. An introductory overview. 1.1. A natural experiment. 1.2. Key theoretical concepts. 1.3. Empirical methodology. 1.4. Outline of the book. 1.5. Policy implications. 2. Cartel policy and the evolution of competition in British industry. 2.1. Introduction. 2.2. The origins of British cartel policy. 2.3. The 1956 act. 2.4. Restrictive practices in the 1950s. 2.5. The impact of the 1956 legislation on firm conduct. 2.6. Concluding remarks. 3. The competition data. 3.1. Introduction. 3.2. Data sources on competition in British industry. 3.3. The construction of the data set. 3.4. The determinants of collusion. 3.5. Concluding remarks. 4. Price competition and the evolution of concentration in exogenous sunk cost industries. 4.1. Introduction. 4.2. Theoretical framework. 4.3. A specific example: The linear demand model. 4.4. The data. 4.5. Empirical model and results. 4.6. Concluding remarks. 5. Price competition, advertising, and market structure in advertising-intensive industries. 5.1. Introduction. 5.2. Theoretical framework. 5.3. A specific example: the linear demand model with quality. 5.4. The data. 5.5. Econometric models and results. 5.6. Two case studies. 5.7. Concluding remarks. 6. Price competition, innovation, and market structure in R&D-intensive industries. 6.1. Introduction. 6.2. Theoretical framework. 6.3. The data. 6.4. Empirical models and results. 6.5. Concluding remarks. 7. Price competition and profitability: Are cartel laws bad for business? 7.1. Introduction. 7.2. Theoretical issues. 7.3. Case-study evidence. 7.4. The data. 7.5. Empirical models and results. 7.6. Concluding remarks. Epilogue. Appendix A: A survey of collusive agreements in British manufacturing industries. Appendix B: Data sets. Table B1: Data set for chapter 4. Table B2: Data set for the concentration regressions of chapter 5. Table B3: Data set for the advertising regressions of chapter 5. Table B4: Data set for the innovation regressions of chapter 6. Table B6: Data set for chapter 7. Glossary of British terms. References. Index.

*Thermoelastic Fracture Mechanics Using Boundary Elements.* By Diego N. dell'Erba. WIT Press, Southampton. (2002). 146 pages. \$109, £68.

Contents:

Acknowledgments. Preface. 1. Introduction. 1.1. General. 1.2. Fracture mechanics. 1.3. Numerical methods. 1.3.1. The finite element method. 1.3.2. The boundary element method. 1.4. Overview of this work. 1.5. Author's published work. 2. Thermoelasticity and fracture mechanics. 2.1. Introduction. 2.2. Three-dimensional thermoelasticity. 2.2.1. Notations and basic postulates. 2.2.2. Basic equations of thermoelasticity. 2.2.3. Equations of equilibrium/strain-displacement relationships. 2.2.4. Heat conduction equation. 2.2.5. Thermoelasticity equations. 2.3. Fracture mechanics. 2.3.1. Historical overview. 2.3.2. Crack deformation modes. 2.3.3. Thermoelastic crack front fields. 2.3.4. Stress intensity factors. 2.3.5. Strain energy release rate. 2.3.6. The  $J$ -integral. 2.4. Analysis of crack growth. 2.4.1. Fatigue crack growth. 2.4.2. Crack growth direction criteria. 2.5. Summary. 3. Boundary integral equations and the boundary element method. 3.1. Introduction. 3.2. Boundary integral equations for steady-state thermoelasticity. 3.2.1. Notation. 3.2.2. Temperature equation for an internal point. 3.2.3. Temper-

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*Workflow Management: Models, Methods, and Systems.* By Wil van der Aalst and Kees van Hee. The MIT Press, Boston, MA. (2002). 368 pages. \$40.

Contents:

Series Foreword. Acknowledgments. Introduction. 1. Organizing workflows. 2. Modeling workflows. 3. Management of workflows. 4. Analyzing workflows. 5. Functions and architecture of workflow systems. 6. Road map for workflow system development. 7. Sagitta 2000 case study. Appendix A. Workflow theory. Appendix B. Workflow modeling using UML. Solutions to exercises. Glossary. Bibliography. Index.

*Geomodeling.* By Jean-Laurent Mallet. Oxford University Press, Oxford. (2002). 599 pages. \$80.

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*The Physics of Extragalactic Radio Sources.* By David S. De Young. The University of Chicago Press, Chicago, IL. (2002). 558 pages. \$45.

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*Current Topics in Computational Molecular Biology*. Edited by Tao Jiang, Ying Xu and Michael Q. Zhang. The MIT Press, Cambridge, MA. (2002). 542 pages. \$55.

Contents:

Preface. I. Introduction. 1. The challenges facing genomic informatics (Temple F. Smith). II. Comparative sequence and genome analysis. 2. Bayesian modeling and computation in bioinformatics research (Jun S. Liu). 3. Bio-sequence comparison and applications. 4. Algorithmic methods for multiple sequence alignment (Tao Jiang and Lusheng Wang). 5. Phylogenetics and the quartet method (Paul Kearney). 6. Genome rearrangement (David Sankoff and Nadia El-Mabrouk). 7. Compressing DNA sequences (Ming Li). III. Data mining and pattern discovery. 8. Linkage analysis of quantitative traits (Shizhong Xu). 9. Finding genes by computer: Probabilistic and discriminative approaches (Victor V. Solov'yev). 10. Computational methods for promoter recognition (Michael Q. Zhang). 11. Algorithmic approaches to clustering gene expression data (Ron Shamir and Roded Sharan). 12. KEGG for computational genomics (Minoru Kanehisa and Susumu Goto). 13. Datamining: Discovering information from bio-data (Limsoon Wong). IV. Computational Structural Biology. 14. RNA Secondary structure prediction (Zhouzhi Wang and Kaizhong Zhang). 15. Properties and prediction of protein secondary structure (Victor V. Solov'yev and Ilya N. Shindyalov). 16. Computational methods for protein folding: Scaling a hierarchy of complexities (Hue Sun Chan, Hüseyin Kaya and Seishi Shimizu). 17. Protein structure prediction by comparison: Homology-based modeling (Manuel C. Peitsch, Torsten Schwede, Alexander Diemand and Nicolas Guex). 18. Protein structure prediction by protein threading and partial experimental data (Ying Xu and Dong Xu). 19. Computational methods for docking and applications to drug design: Functional epitopes and combinatorial libraries (Ruth Nussinov, Buyong Ma and Haim J. Wolfson). Contributors. Index.

*Foundations of Object-Oriented Languages.* By Kim B. Bruce. The MIT Press, Cambridge, MA. (2002). 384 pages. \$45.

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*Microsound.* By Curtis Roads. The MIT Press, Cambridge, MA. (2001). 378 pages. \$47.95. \*\*WITH CD\*\*

Contents:

Introduction. Acknowledgments. Overview. 1. Time scales of music. 2. The history of microsound from antiquity to the analog era. 3. Granular synthesis. 4. Varieties of particle synthesis. 5. Transformation of microsound. 6. Windowed analysis and transformation. 7. Microsound in composition. 8. Aesthetics of composing with microsound. 9. Conclusion. References. Appendixes. A. The cloud generator program. B. Sound examples on the CD. Name index. Subject index.

*TeXReference Manual.* By David Bausum. Kluwer Academic, Boston, MA. (2002). 388 pages. \$99.

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*Riemannian Geometry and Geometric Analysis.* By Jürgen Jost. Springer, Berlin. (2002). 535 pages. \$54.95.

Contents:

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*Handbook of Numerical Analysis, Volume VIII: Solutions of Equations in  $\mathbb{R}^n$  (Part 4), Techniques of Scientific Computing (Part 4), Numerical Methods for Fluids (Part 2)*. Edited by P. G. Ciarlet and J. L. Lions. North-Holland, Amsterdam. (2002). 661 pages. \$125, EUR 125.

Contents:

General preface. Solution of equations in  $\mathbb{R}^n$  (Part 4). Computational methods for large eigenvalue problems (H.A. van der Vorst). Techniques of scientific computing (Part 4). Theoretical and numerical analysis of differential-algebraic equations (P.J. Rabier and W.C. Rheinboldt). Numerical methods for fluids (Part 2). Mathematical modeling and analysis of viscoelastic fluids of the Oldroyd kind (E. Fernández-Cara, F. Guillén and R.R. Ortega).

*The Complexity Theory Companion*. By Lane A. Hemaspaandra and Mitsunori Ogihara. Springer, Berlin. (2002). 372 pages. \$49.95.

Contents:

Preface. Invitation. Usage. 1. The self-reducibility technique. 1.1. GEM: There are no sparse NP-complete sets unless  $P=NP$ . 1.2. The Turing case. 1.3. The case of merely putting sparse sets in  $NP=P$ : The Hartmanis-Immerman-Sewelson encoding. 1.4. Open issue: Does the disjunctive case hold? 1.5. Bibliographic notes. 2. The one-way function technique. 2.1. GEM: Characterizing the existence of one-way functions. 2.2. Unambiguous one-way functions exist if and only if bounded-ambiguity one-way functions exist. 2.3. Strong, total commutative, associative one-way functions exist if and only if one-way functions exist. 2.4. Open issue: Low-ambiguity, commutative, associative one-way functions? 2.5. Bibliographic notes. 3. The tournament divide and conquer technique. 3.1. GEM: The semi-feasible sets have small circuits. 3.2. Optimal advice for the semi-feasible sets. 3.3. Unique solutions collapse the polynomial hierarchy. 3.4. Open issue: Are the semi-feasible sets in  $P/linear$ ? 3.5. Bibliographic notes. 4. The isolation technique. 4.1. GEM: Isolating a unique solution. 4.2. Toda's theorem:  $PHC \subseteq PPP$ . 4.3.  $NL/poly = UL/poly$ . 4.4. Open issue: Do ambiguous and unambiguous nondeterminism coincide? 4.5. Bibliographic notes. 5. The witness reduction technique. 5.1. Framing the question: Is  $\#P$  closed under proper subtraction? 5.2. GEM: A complexity theory for feasible closure properties of  $\#P$ . 5.3. Intermediate potential closure properties. 5.4. A complexity theory for feasible closure properties of  $OptP$ . 5.5. Open issue: Characterizing closure properties. 5.6. Bibliographic notes. 6. The polynomial interpolation technique. 6.1. GEM: Interactive protocols for the permanent. 6.2. Enumerators for the permanent. 6.3.  $IP = PSPACE$ . 6.4.  $MIP = NEXP$ . 6.5. Open issue: the power of the provers. 6.6. Bibliographic notes. 7. The nonsolvable group technique. 7.1. GEM: Width-5 branching programs capture nonuniform- $NC^1$ . 7.2. Width-5 bottleneck machines capture  $PSPACE$ . 7.3. Width-2 bottleneck computation. 7.4. Open issue: How complex is majority-based probabilistic symmetric bottleneck computation? 7.5. Bibliographic notes. 8. The random restriction technique. 8.1. GEM: The random restriction technique and a polynomial-size lower bound for parity. 8.2. An exponential-size lower bound for parity. 8.3. PH

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*Integrating Geographic Information Systems and Agent-Based Modeling Techniques for Simulating Social and Ecological Processes*. Edited by H. Randy Gimblett. Oxford University Press, Oxford. (2002). 327 pages. \$40.

Contents:

Preface (H. Randy Gimblett). 1. Integrating geographic information systems and agent-based technologies for modeling and simulating social and ecological phenomena (H. Randy Gimblett). 2. Providing a broad spectrum of agents in spatially explicit simulation models: The gensim approach (John Anderson). 3. Spatial units as agents: Making the landscape an equal player in agent-based simulations (Paul Box). 4. Geographic information systems and agent-based modeling (James D. Westervelt). 5. Management application of an agent-based model: Control of cowbirds at the landscape scale (Steven J. Harper, James D. Westervelt and Ann-Marie Trame). 6. Integrating spatial data into an agent-based modeling system: Ideas and lessons from the development of the across-Trophic-level system simulation (Scott M. Duke-Sylvester and Louis J. Gross). 7. Models of individual decision making in agent-based simulation of common-pool-resource management institutions (Peter J. Deadman and Edella Schlager). 8. An agent-based approach to environmental and urban systems within geographic information systems (Bin Jiang and H. Randy Gimblett). 9. Mobile agents with spatial intelligence (Robert M. Itami). 10. Simulating wildland recreation use and conflicting spatial interactions using rule-driven intelligent agents (H. Randy Gimblett, Merton T. Richards and Robert M. Itami). 11. An intelligent agent-based model for simulating and evaluating river trip scenarios along the Colorado River in Grand Canyon National Park (H. Randy Gimblett, Catherine A. Roberts, Terry C. Daniel, Michael Ratliff, Michael J. Meitner, Susan Cherry, Doug Stallman, Rian Bogle, Robert Allred, Dana Kilbourne and Joanne Bieri). 12. Agent-based simulations of household decision making and land use change near Altamira, Brazil (Kevin Lim, Peter J. Deadman, Emilio Moran, Eduardo Brondizio and Stephen McCracken). Index.

*Graph Colouring and the Probabilistic Method*. By Michael Molloy and Bruce Reed. Springer, Berlin. (2002). 326 pages. \$79.95.

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*Modeling and Simulation in Medicine and the Life Sciences*. Second Edition. By Frank C. Hoppensteadt and Charles S. Peskin. Springer, New York. (2002). 354 pages. \$54.95.

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*The Middle East Military Balance 2001-2002*. Edited by Shlomo Brom and Yiftah Shapir. The MIT Press, Cambridge, MA. (2002). 465 pages. \$37.95.

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*Strategic Computing: DARPA and the Quest for Machine Intelligence, 1983-1993*. By Alex Roland with Philip Shiman. The MIT Press, Cambridge, MA. (2002). 427 pages. \$50.

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