in adaptation or explored molecular or other mechanisms that might cause trade-offs. Trade-offs are central to current thinking not only about specialization and the limits to coevolution but also about the persistence of genetic variation in parasite-host interactions (Godfray and Hassell).

This volume may not fully reflect the state of its subject: for example, only May raises (and does not fully explore) the important point (taken up elsewhere by authors such as D. S. Wilson, P. Ewald, and H. Bremermann) that if many genotypes of a parasite infect individual hosts, the evolution of greater virulence is to be expected, unless it is strongly opposed by group selection (a term not found in this book). Overall, this volume strikes one as a typical symposium proceedings: a highly uneven, heterogeneous conglomerate, to be mined for the conceptual and empirical nuggets from which an evolutionary parasitology may yet be melded.

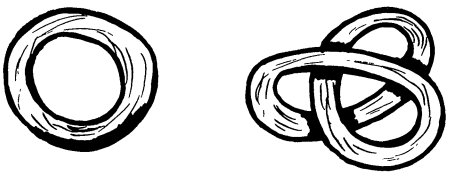
DOUGLAS J. FUTUYMA
Department of Ecology and Evolution, State University of New York, Stony Brook, NY 11794

Topological Ramifications

Knots and Physics. LOUIS H. KAUFFMAN. World Scientific, Teaneck, NJ, 1991. xii, 538 pp., illus. $65; paper, $34. Series on Knots and Everything, vol. 1.

During the last eight years a combination of excitement and bewilderment has enveloped much of the world of academic mathematics. In the beginning, V. F. R. Jones discovered a very simple but totally new way of associating a polynomial to any link of ordinary loops of string. That contribution to topology and knot theory was interpreted in terms of statistical mechanics, extended via the representation theory of algebras, and then amplified through the use of the methodology of quantum field theory and the language of differential geometry to produce results in the theory of manifolds. All these diverse subjects were thrown into a common turmoil with repercussions in many other parts of mathematics and theoretical physics.

In this book Louis Kauffman tackles all of this, and more besides, starting from very little indeed. So formidable a task is made possible by his cheerful approach of studied informality. His aim is to communicate and to teach; clearly he has had a lot of fun working in this area, and he is happy to pass on his enthusiasm. The first impression, on opening the book, is that it is awash with neat diagrams drawn with a thick pen. Not numbered, they form part of the text, often part of a sentence. But then the subject of discussion is usually how to combine, mathematically, little two-dimensional pieces of geometry; so why not draw them? The result is a very readable introduction to recent research on the interaction between mathematics and mathematical physics. The approach may, at times, seem elementary to those who already know much about the subject in hand. However, devotees of dreary sequences of symbols might reflect upon the fact that it was by manipulating little pictures that Kauffman was able both to produce the most stunning of the few known applications of the Jones polynomial (the solution of one of the 19th-century conjectures of P. G. Tait about ways of drawing alternating knots) and to discover one of its generalizations.



Two unknots. "For topology, the mathematical advantages of the closed form are overwhelming. We have a uniform definition of a knot or link and correspondingly, a definition of **unknottedness**. A standard ring, as shown [above left] is the canonical unknot. Any knot that can be deformed to this ring (without tearing the rope) is said to be unknotted." [From *Knots and Physics*]

Trefoil and its mirror image. "I wish to emphasize the advantages of the closed loop form in doing experimental topological work. For example, one can form both the trefoil T . . . and its mirror image T^* . . . . The trefoil T **cannot** be continuously deformed into its mirror image T^*. It is a remarkably subtle matter to prove this fact. One should try to actually create the deformation with a model—to appreciate this problem." [From *Knots and Physics*]

The first part of the book describes combinatorial knot theory and ways of associating polynomials to knots and links together with some applications. Physics begins to appear with states models for these invariants, with Feynman diagrams, and with discussion of the Yang-Baxter equations. Wherever possible a diagrammatic interpretation of a tensor is used, and that approach extends even to a description of the Drinfeld quantum-double method of solving those equations. The three-manifold invariants of E. Witten are described in a section entitled "Integral heuristics" that features the Chern-Simons operator used as a Lagrangian. The Temperley-Lieb algebra makes frequent appearances; it is used to give a very elementary proof of the existence of those three-manifold invariants ($SL(2)_q$ case only) and later, in part 2, to establish the Turaev-Viro invariants using an extremely palatable version of the quantum $6j$ symbols. Here the presentation could have been improved had the book waited a few months; that is the drawback of writing on material so close to the frontiers of research.

Part 2 claims to be "devoted to all manner of speculation and rambling." It is, in a way. The $6j$ symbols appear as an ingredient of generalized Penrose spin networks. There are also detailed instructions for constructing, from cardboard and string, a machine to demonstrate the nature of the quaternion group; a discussion of the chromatic polynomial of a graph and its relationship to the Potts model of thermodynamics; some words about the efficacy of hitches for securing a horse with real rough rope; and a discussion of the relevance of knots in the theory of DNA and in dynamical systems. This peculiarly provocative potpourri betrays its conception in the form of individual lectures; it is fairly easygoing and is a rich source of ideas for student projects or teatime conversation.

The book contains a few mistakes; it has a fine set of references with abysmal nomenclature; and it contains considerable idiosyncrasy. Nevertheless it succeeds in telling the story, in a way that maximizes its accessibility, of how knots and physics have recently come together.

W. B. R. LICKORISH
Department of Pure Mathematics and Mathematical Statistics, University of Cambridge, Cambridge CB2 1SB, United Kingdom

Books Received

Additive Number Theory of Polynomials Over a Finite Field. Gove W. Effinger and David R. Hayes. Clarendon (Oxford University Press), New York, 1991. xvi, 157 pp., illus. $45. Oxford Mathematical Monographs.

Advanced Wastewater Treatment and Reclamation. J. Kurbiel, Ed. Pergamon, London, 1991. xii, 294 pp., illus. Paper, $105. Water Science and Technology, vol. 24, no. 7. From a conference, Cracow, Poland, Sept. 1989.

Analogue Electronic Circuits and Systems. Amitava Basak. Cambridge University Press, New York, 1992. xiv, 361 pp., illus. $89.95; paper, $34.95. Electronic Texts for Engineers and Scientists.

Antigen Processing and Recognition. James McCluskey. CRC Press, Boca Raton, FL, 1991. viii, 257 pp., illus. $139.95.

Arctic Ecosystems in a Changing Climate. An Ecophysiological Perspective. F. Stuart Chapin III *et al.*, Eds. Academic Press, San Diego, CA, 1992. xviii, 469 pp., illus. $95. Physiological Ecology.

Banach Spaces for Analysts. P. Wojtaszczyk. Cambridge University Press, New York, 1992. xiv, 382 pp., illus. $89.95

Biogeography of Mediterranean Invasions. R. H. Groves and F. Di Castri, Eds. Cambridge University Press, New York, 1992. xvi, 485 pp., illus. $125.

Biological Feedback. René Thomas and Richard D'Ari. CRC Press, Boca Raton, FL, 1990. vi, 316 pp., illus. $159.95.

Biotechnology in Agriculture. A Dialogue. M. S. Swaminathan, Ed. Macmillan India, Madras, 1991. x, 371 pp., illus. Rs. 320.

The Bone-Biomaterial Interface. J. E. Davies, Ed. University of Toronto Press, Buffalo, NY, 1991. xiv, 502 pp., illus. $140. Based on a workshop, Toronto, Dec. 1990.

Calcium, Oxygen Radicals and Cellular Damage. C. J. Duncan, Ed. Cambridge University Press, New York, 1992. xii, 224 pp., illus. $79.95. Society for Experimental Biology Seminar Series, 46. From a symposium, Warwick, UK, March 1990.

Cancer Selection. The New Theory of Evolution. James Graham. Aculeus, Lexington, VA, 1992. xvi, 213 pp., illus. $20.

Cellular Neurobiology. A Practical Approach. John Chad and Howard Wheal, Eds. IRL (Oxford University Press), New York, 1991. xxii, 287 pp., illus. Spiral bound, $75. Practical Approach Series.

Cerebral Blood Flow Measurement with Stable Xenon-Enhanced Computed Tomography. Howard Yonas, Ed. Raven, New York, 1991. xxiv, 327 pp., illus. $80. Based on a conference, Orlando, FL, Feb. 1990.

Chemistry and Properties of Biomolecular Systems. E. Rizzarelli and T. Theophanides, Eds. Kluwer, Norwell, MA, 1991. xiv, 226 pp., illus. $79. Topics in Molecular Organization and Engineering, vol. 8.

Chemistry of Superconductor Materials. Preparation, Chemistry, Characterization and Theory. Terrell A. Vanderah, Ed. Noyes, Park Ridge, NJ, 1992. xxvi, 818 pp., illus. $125.

The Chronological Annotated Bibliography of Order Statistics. Vol. 4, 1962–1963. H. Leon Harter. American Sciences Press, Columbus, OH, 1992. viii, 173 pp. Paper, $95. Series in Mathematical and Management Sciences, vol. 20.

The Early Evolution of Metazoa and the Significance of Problematic Taxa. Alberto M. Simonetta and Simon Conway Morris, Eds. Cambridge University Press, New York, 1992. x, 296 pp., illus. $69.95. From a symposium, Camerino, Italy, March 1989.

Elementary Particles and the Universe. Essays in Honor of Murray Gell-Mann. John H. Schwarz, Ed. Cambridge University Press, New York, 1992. x, 212 pp., illus. $49.95. From a symposium, Pasadena, CA, Jan. 1989.

The Encyclopedia of Environmental Studies. William Ashworth. Facts on File, New York, 1992. x, 470 pp., illus. $60.

The Energy Method, Stability, and Nonlinear Convection. Brian Straughan. Springer-Verlag, New York, 1992. xii, 242 pp., illus. $49.80. Applied Mathematical Sciences, 91.

Finite Size Scaling and Numerical Simulation of Statistical Systems. V. Privman, Ed. World Scientific, Teaneck, NJ, 1990. x, 518 pp., illus. $58.

Flying Buttresses, Entropy, and O-Rings. The World of an Engineer. James L. Adams. Harvard University Press, Cambridge, MA, 1992. vi, 264 pp., illus. $24.95.

Fragile X/Cancer Cytogenetics. Ann M. Willey and Patricia D. Murphy, Eds. Wiley-Liss, New York, 1991. xiv, 203 pp., illus. $69.50. Progress in Clinical and Biological Research, vol. 368. From a symposium, Albany, Oct. 1989.

Fundamentals of Exploratory Analysis of Variance. David C. Hoaglin, Frederick Mosteller, and John W. Tukey, Eds. Wiley Interscience, New York, 1992. xviii, 430 pp., illus. $54.95. Wiley Series in Probability and Mathematical Statistics.

Genetics and Conservation of Rare Plants. Donald A. Falk and Kent E. Holsinger, Eds. Oxford University Press, New York, 1991. xviii, 283 pp., illus. $49.95. Based on a conference, St. Louis, March 1989.

Genetics and Evolution of the Domestic Fowl. Lewis Stevens. Cambridge University Press, New York, 1992. xiv, 306 pp., illus. $89.95.

Goethe's History of Science. Karl J. Fink. Cambridge University Press, New York, 1992. xii, 242 pp., illus. $47.95.

The Golden Century of Oil, 1950–2050. The Depletion of a Resource. C. J. Campbell. Kluwer, Norwell, MA, 1991. xvi, 345 pp., illus. $99. GeoJournal Library, vol. 19.

A Guide to Analog ASICs. Paul M. Brown, Jr. Academic Press, San Diego, CA, 1992. xii, 338 pp., illus. $75.

Hair of West-European Mammals. B. J. Teerink. Cambridge University Press, New York, 1992. viii, 224 pp., illus. $69.95.

Handbook of Sputter Deposition Technology. Principles, Technology and Applications. Kiyotaka Wasa and Shigeru Hayakawa. Noyes, Park Ridge, NJ, 1992. xii, 304 pp., illus. $76.

Hearing and Speech. Quentin Summerfield, Ed. Erlbaum, Hillsdale, NJ, 1991. iv, 443 pp., illus. $59.95. Special issue of *Quarterly Journal of Experimental Psychology*, section A.

Hermes' Dilemma and Hamlet's Desire. On the Epistemology of Interpretation. Vincent Crapanzano. Harvard University Press, Cambridge, MA, 1992. xiv, 386 pp., illus. $45; paper, $16.95.

High-Temperature Superconductivity. An Introduction. Gerald Burns. Academic Press, San Diego, CA, 1991. xvi, 199 pp., illus. Paper, $19.95.

Impact Modifiers for PVC. The History and Practice. John T. Lutz, Jr., and David L. Dunkelberger. Wiley Interscience, New York, 1992. viii, 205 pp., illus. $49.95. SPE Monographs.

Inclusion Compounds. Vol. 5, Inorganic and Physical Aspects of Inclusion. J. L. Atwood, J. E. D. Davies, and D. D. MacNicol. Oxford University Press, New York, 1991. xvi, 385 pp., illus. $98.

Infinite Electrical Networks. Armen H. Zemanian. Cambridge University Press, New York, 1992. xii, 308 pp., illus. $64.95. Cambridge Tracts in Mathematics, 101.

Introduction to Hamiltonian Dynamical Systems and the N-Body Problem. Kenneth R. Meyer and Glen R. Hall. Springer-Verlag, New York, 1991. xii, 292 pp., illus. $49.80. Applied Mathematical Sciences, vol. 90.

An Introduction to the Physics of Particle Accelerators. Mario Conte and William W. MacKay. World Scientific, Teaneck, NJ, 1991. 250 pp., illus. $58; paper, $28.

Mars Beckons. The Mysteries, the Challenges, the Expectations of our Next Great Adventure in Space. John Noble Wilford. Vintage (Random House), New York, 1991. xii, 244 pp., illus. Paper, $12. Reprint, 1990 ed.

Mathematics in Medicine and the Life Sciences. Frank C. Hoppensteadt and Charles S. Peskin. Springer-Verlag, New York, 1991. xii, 252 pp., illus. $39.95. Texts in Applied Mathematics, 10.

Methods in Enzymology. Vol. 205, Metallobiochemistry. Part B, Metallothionein and Related Molecules. James F. Riordan and Bert L. Valle, Eds. Academic Press, San Diego, CA, 1991. xxxiv, 681 pp., illus. $90.

Methods in Enzymology. Vol. 206, Cytochrome P450. Michael R. Waterman and Eric F. Johnson, Eds. Academic Press, San Diego, CA, 1991. xxxviii, 716 pp., illus. $90.

The Midbrain Periaqueductal Gray Matter. Functional, Anatomical, and Neurochemical Organization. Antoine Depaulis and Richard Bandler, Eds. Plenum, New York, 1991. x, 473 pp., illus. $125. NATO Advanced Science Institutes series A, vol. 213. From a workshop, Chateau de Bonas, France, July 1990.

Modelling and Applications of Transport Phenomena in Porous Media. Jacob Bear and J.-M. Buchlin, Eds. Kluwer, Norwell, MA, 1991. xii, 380 pp., illus. $119. Theory and Applications of Transport in Porous Media, vol. 5. From a lecture series, Rhode-Saint-Genèse, Belgium, Nov. 1987.

Neglect and the Peripheral Dyslexias. M. J. Riddoch, Ed. Erlbaum, Hillsdale, NJ, 1991. Variously paged, illus. $69.95. Special issue of *Cognitive Neuropsychology* (vol. 7, no. 5/6 and vol. 8, no. 3/4).

Neurotoxicology. Hugh A. Tilson and Clifford L. Mitchell, Eds. Raven, New York, 1992. xiv, 400 pp., illus. $108. Target Organ Toxicology Series.

Neutrino Physics. Klaus Winter, Ed. Cambridge University Press, New York, 1992. xiv, 670 pp., illus. $125. Cambridge Monographs on Particle Physics, Nuclear Physics, and Cosmology, 1.

The New Cosmos. Albrecht Unsold and Bodo Baschek. 4th ed. Springer-Verlag, New York, 1992. xvi, 438 pp., illus. $59. Translated from the German by William D. Brewer.

Papers in Experimental Economics. Vernon L. Smith. Cambridge University Press, New York, 1992. xvi, 812 pp., illus. $64.95.

Paternity in Primates: Genetic Tests and Theories. Implications of Human DNA Fingerprinting. R. D. Martin and A. F. Dixson, Eds. Karger, New York, 1992. xii, 287 pp., illus. $198.50. From a symposium, Kartause Ittingen, Switzerland, Sept. 1991.

Patients, Power and the Poor in Eighteenth-Century Bristol. Mary E. Fissell. Cambridge University Press, New York, 1992. xii, 266 pp., illus. $54.50. Cambridge History of Medicine.

Processor Networks and Aspects of the Mapping Problem. Peter A. J. Hilbers. Cambridge University Press, New York, 1992. x, 133 pp., illus. $34.95. Cambridge International Series on Parallel Computation, 2.

Radioactivity Measurements. Principles and Practice. W. B. Mann, A. Rytz, and A. Spernol. Pergamon, Oxford, U.K., 1992. x, 202 pp., illus. Paper, $40.

The Rocket Team. Frederick I. Ordway III and Mitchell R. Sharpe. Aircraft Designs, Monterey, CA, 1992. x, 311 pp., illus. Spiral bound, $48. Reprint, 1979 ed.

Satellite Surveillance. Harold Hough. Loompanics, Port Townsend, WA, 1991. x, 196 pp., illus. Paper, $21.95.

Sex Differences in Cognitive Abilities. Diane F. Halpern. 2nd ed. Erlbaum, Hillsdale, NJ, 1992. xiv, 308 pp., illus. $59.95; paper, $24.95.

Social Psychiatry. Theory, Methodology, and Practice. Paul E. Bebbington, Ed. Transaction Publishers, New Brunswick, NJ, 1991. xiv, 425 pp., illus. $39.95.

Solar Observations. Techniques and Interpretation. F. Sànchez, M. Collados, and M. Vàzquez, Eds. Cambridge University Press, New York, 1992. xii, 246 pp., illus. $64.95. Canary Islands Winter School of Astrophysics.

State of the World 1992. A Worldwatch Institute Report on Progress Toward a Sustainable Society. Lester R. Brown *et al*. Norton, New York, 1992. xvi, 256 pp. Paper, $10.95.

Stress and Coping in Infancy and Childhood. Tiffany M. Field, Philip M. McCabe, and Neil Schneiderman, Eds. Erlbaum, Hillsdale, NJ, 1992. xviii, 251 pp., illus. $49.95. Stress and Coping. From two symposia, Miami, 1987 and 1988.

Symmetry in a Kaleidoscope, 1. György Darvas and Dénes Nagy, Eds. International Society for the Interdisciplinary Study of Symmetry, Budapest, 1990. 112 pp., illus. Paper. Special Issue of *Symmetry: Culture and Science*.

The Third Chimpanzee. The Evolution and Future of the Human Animal. Jared Diamond. HarperCollins, New York, 1992. viii, 407 pp., illus. $25.

Three-Dimensional Integrated Circuit Layout. Andrew Harter. Cambridge University Press, New York, 1992. xxx, 207 pp., illus. $47.95. Distinguished Dissertations in Computer Science.

Time for the Stars. Astronomy in the 1990s. Alan Lightman. Viking Penguin, New York, 1992. xx, 124 pp., illus. $20.

The Tlingit Indians. George Thornton Emmons. Edited with additions by Frederica de Laguna. University of Washington Press, Seattle, and American Museum of Natural History, New York, 1991. xl, 488 pp., illus. $60.

Topology and Category Theory in Computer Science. G. M. Reed, A. W. Roscoe, and R. F. Wachter, Eds. Clarendon (Oxford University Press), New York, 1991. xii, 390 pp., illus. $75.

Toxic Work. Women Workers at GTE Lenkurt. Steve Fox. Temple University Press, Philadelphia, PA, 1992. xii, 178 pp. $29.95; paper, $14.95.

The Web of the Universe. Jung, the "New Physics" and Human Spirituality. John Hitchcock. Paulist, Mahwah, NJ, 1991. x, 243 pp., illus. Paper, $14.95.

When Did I Begin? Conception of the Human Individual in History, Philosophy and Science. Norman M. Ford. Cambridge University Press, New York, 1992. xx, 217 pp., illus. $37.95; paper, $16.95. Reprint, 1989 ed.

Wildlife and Habitats in Managed Landscapes. Jon E. Rodiek and Eric G. Bolen, Eds. Island Press, Washington, DC, 1991. xx, 217 pp., illus. $45; paper, $24.95.

The World of Martin F. Glaessner. B. P. Radhakrishna, Ed. Geological Society of India, Bangalore, 1992. xxiv, 263 pp., illus. $45.