

The Taxa of Dinosaurs

The Dinosauria. DAVID B. WEISHAMPEL, PETER DODSON, and HALSZKA OSMÓLSKA, Eds. University of California Press, Berkeley, CA, 1990. xvi, 733 pp., illus. \$85.

Perhaps more than any other vertebrate group, dinosaurs spark the imagination. Adding to the mystique has been an absence of technical reviews placing them in a modern systematic context. *The Dinosauria* is the first attempt to provide a compendium and comprehensive review of dinosaur systematics and taxonomy.

The book is divided into two sections. The first includes three chapters on dinosaurs generally. An initial chapter explores the origin of dinosaurs and their relationship to other groups. This chapter is largely a review of previous work, but diagnoses of the major groups using derived characters are provided, and alternative phylogenetic patterns, like the monophyly of the prosauropods, are discussed.

The second chapter, on dinosaur paleobiology, is a refreshing treatment of such issues as extinction, metabolism, diet, and behavior. These topics are prone to fantastic claims and exaggeration, but here the discussions are balanced and lack the dogmatic tone based on pure speculation often encountered. Chapters on carnosaur paleobiology and sauropod paleoecology that might have been included here seem to have snuck into the systematic sections.

The chapter on dinosaur distribution, by Weishampel, provides up-to-date information, listed according to continent within geologic age, concerning occurrences of dinosaur remains. Unfortunately, many of the most recent finds are referred to via personal communications—a situation sure to create headaches for later workers—and therefore must be viewed as preliminary at best.

The systematic sections that make up the core of the book are a mixed bag of 24 chapters of original quantitative systematic treatment and general review. Their strongest asset is that each includes a useful standardized taxonomic table. These tables provide a classification for each group down to the species level, list taxonomic synonyms, and include information on each taxon's geographic occurrence, stratigraphic position, and what anatomical elements it is known from.

In other respects the systematic sections are less illuminating. According to the editor, "Authors were challenged to apply cladistic methods of analysis to their groups, including the explicit identification of outgroups." The results are uneven, owing at least in part to the diversity of their authors'

feelings about the nature of phylogenetic evidence and degree of familiarity with cladistic analysis.

A cornerstone of cladistic analysis is the examination of characters as phylogenetic evidence. Although discussed in the text, important characters are not always illustrated. Some authors include informative specimen drawings showing characters discussed in the text, but others simply display reconstructions of skulls or entire animals. Many of the illustrations lack scale bars.

The most serious problem with the book is a lack of data matrices showing character distributions for each of the taxa included. The distribution of homoplasy and the extent of missing data, both of which could have been indicated in data matrices, are extremely important in analyzing groups that have as patchy a fossil record as dinosaurs.

There are several inconsistencies between what the editors had in mind and what the authors actually did. For instance the editors "have avoided the use of quotation marks around paraphyletic taxa by using explicit statements about their status and then referring to them in the vernacular." I would have hoped that such care would extend to polyphyletic groupings as well, but in several chapters the classification listed in the table is at odds with the phylogeny presented. For example, Galton places *Lufengosaurus* as the sister taxon to *Plateosaurus* in his cladogram but presents it as part of a paraphyletic Melanosauridae in his table and in his text diagnoses it with the Plateosauridae. Such confusions regarding monophyly are found in several sections of the book.

The editors also called for the explicit identification of outgroups, but they are not indicated in many of the chapters, and where indicated they are often not properly dealt with. Rowe and Gauthier are the only contributors who make explicit not only what their outgroups are but the order of splitting relative to the ingroup.

Many authors do not provide evidence (in the way of shared derived characters) that support the monophyletic groupings shown in their classifications and phylogenies. Ostensibly the diagnoses of groups, with a few notable exceptions, do not differentiate between derived characters (characters supporting monophyly) and primitive similarities.

Inevitably, comparisons need to be made between this book and recent systematic treatments of other animal groups such as Estes and Pregill's *Phylogenetic Relationships of the Lizard Families* and Benton's *The Phylogeny and Classification of the Tetrapods*, which not only provide data matrices but discuss some of the difficulties encountered in the systematic analysis, entertain alterna-

tive hypotheses of relationship, and use state-of-the-art systematic procedures. In this light *The Dinosauria* comes up short. The nonempirical tone and the lack of systematic rigor in most of the sections make the systematic analyses disappointing. Nevertheless, *The Dinosauria* succeeds in providing an overview of dinosaur taxa, paleobiology, and distribution that will form a starting place for more ambitious systematic efforts.

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Structure of Chromosomes

Chromosome Banding. A. T. SUMNER. Hyman, Boston, MA, 1990. xiv, 434 pp., illus. \$65.

The discovery of how to resolve bands along mammalian chromosomes heralded the era of modern cytogenetics. Now the exuberant bandwagon days have waned, supplanted in both resolution and verve by a new generation's genome sequencing. At this historical transition comes a timely summing up by the most tenacious of the original bandmasters. With 100 figures, 2000 references, and 28 tables, this work chronicles a complete technological era from 1968 to 1989. The theme is always "What can we know about chromosome structure as revealed by banding?" Every banding mechanism is described; C-banding, G-, R-, Q-, T-, G-11, C_d-, N-, Ag-NOR, replication, fluorochrome, decondensation, nuclease, and immunological bandings are detailed, not in the manner of a lab manual, but as a window on chromosome organization. Cytochemical mechanisms of each technique are thoroughly discussed, with each author's opinion carefully cataloged. Like Thucydides, Sumner puts his opinions aside and writes from above. He indicates the field's successes and failures and the big questions still remaining. The cytochemical mechanism of almost every technique remains disconcertingly in doubt. That such once-burning questions, now unfashionable and unfundable, will remain unresolved underscores the era's end.

Sumner extends the taxonomy of banding to all phyla, including insects and plants. What species show G-bands, replication bands, fluorochrome bands, base composition isochores, and meiotic chromomeres is completely referenced, and evolutionary relationships are clearly indicated. The meaning of heterochromatin and its heteromorphisms is similarly reviewed. For academic, but not medical, cytogeneticists, this book

will become the classic reference. It sets the stage for genome sequencing while stopping short of a possible opening soliloquy.

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Books Received

Decline of the Sea Turtle. Causes and Prevention. Committee on Sea Turtle Conservation, National Research Council. National Academy Press, Washington, DC, 1990. xvi, 259 pp., illus. Paper, \$14.95.

The Discipline of Curiosity. Science in the World. Janny Groen, Eefke Smit, and Jurd Eijssvoogel, Eds. Elsevier, New York, 1990. vi, 156 pp. Paper, \$25.

Dynamics of Dinosaurs and Other Extinct Giants. R. McNeill Alexander. Columbia University Press, New York, 1991. viii, 167 pp., illus. Paper, \$12.95. Reprint, 1989 ed.

Ecological Economics. Energy, Environment and Society. Juan Martinez-Alier with Klaus Schlupmann. Blackwell, Cambridge, MA, 1990. xxvi, 287 pp., illus. Paper, \$18.95. Translated from the Spanish edition (1984). Reprint, 1987 ed.

Electron Energy Loss Spectrometry. The Technology of High Performance. Harald Ibach. Springer-Verlag, New York, 1991. viii, 178 pp., illus. \$59. Springer Series in Optical Sciences, vol. 63.

Electrophysiology and Microinjection. P. Michael Conn, Ed. Academic Press, San Diego, CA, 1991. xvi, 504 pp., illus. Spiral bound, \$45. Methods in Neuroscience, vol. 4.

Engendering Archaeology. Women and Prehistory. Joan M. Gero and Margaret W. Conkey, Eds. Blackwell, Cambridge, MA, 1991. xiv, 418 pp., illus. \$59.95; paper, \$21.95. Social Archaeology. From a conference, Georgetown, SC, April 1988.

Environmental Disputes. Community Involvement in Conflict Resolution. James E. Crowfoot and Julia M. Wondollock. Island Press, Washington, DC, 1991. xviii, 278 pp. \$34.95; paper, \$22.95.

Enzyme Engineering 10. Hirosuke Okada, Atsuo Tanaka, and Harvey W. Blanch, Eds. New York Academy of Sciences, New York, 1990. xxii, 897 pp., illus. Cloth or paper, \$225. Annals of the New York Academy of Sciences, vol. 613. From a conference, Kashiokojima, Japan, Sept. 1989.

Essays on the Theory of Scientific Cognition. Jerzy Kmita. Kluwer, Boston, and PWN, Warsaw, Poland, 1991. vi, 192 pp. \$59. Studies in Epistemology, Logic, Methodology, and Philosophy of Science, vol. 210. Translated from the Polish edition (Warsaw, 1976) by Jacek Holówka.

Fundamentals of Adhesion. Lieng-Huang Lee, Ed. Plenum, New York, 1991. xviii, 454 pp., illus. \$89.50.

Galileo, Bellarmine, and the Bible. Including a Translation of Foscarini's *Letter on the Motion of the Earth*. Richard J. Blackwell. University of Notre Dame Press, Notre Dame, IN, 1991. x, 291 pp. \$29.95.

General Relativity and Gravitation 1989. Neil Ashby, David F. Bartlett, and Walter Wyss, Eds. Cambridge University Press, New York, 1991. xviii, 502 pp., illus. \$49.50. From a conference, Boulder, CO, July 1989.

Global Climate and Ecosystem Change. Gordon J. MacDonald and Luigi Sertorio, Eds. Plenum, New York, 1990. x, 252 pp., illus. \$69.50. NATO Advanced Science Institutes Series, vol. 240. Series B, Physics. From a workshop, Maratea, Italy, Sept. 1989.

Large-Scale Mammalian Cell Culture Technology. Anthony S. Lubiniecki, Ed. Dekker, New York, 1990. xviii, 624 pp., illus. \$150. Bioprocess Technology, vol. 10.

Learning and Computation Neuroscience. Foundation of Adaptive Networks. Michael Gabriel and John Moore, Eds. MIT Press, Cambridge, MA, 1991. xvi, 613 pp., illus. \$50. A Bradford Book.

A Legacy of Change. Historic Human Impact on Vegetation in the Arizona Borderlands. Conrad Joseph Bahre. University of Arizona Press, Tucson, 1991. xviii, 231 pp., illus. \$29.95.

Life as a Geological Force. Dynamics of the Earth. Peter Westbrock. Norton, New York, 1991. 240 pp., illus. \$21.95. Commonwealth Fund Book Program.

Life Span Perspectives of Suicide. Time-Lines in

the Suicide Process. Antoon A. Leenaars, Ed. Plenum, New York, 1991. xviii, 325 pp., illus. \$39.50.

Lignans. Chemical, Biological and Clinical Properties. D. C. Ayres and J. D. Loike. Cambridge University Press, New York, 1991. xx, 402 pp., illus. \$95. Chemistry and Pharmacology of Natural Products.

Liquid Crystals. Nature's Delicate Phase of Matter. Peter J. Collings. Princeton University Press, Princeton, NJ, 1991. xiv, 222 pp., illus., + plates. \$39.50; paper, \$10.95. Princeton Science Library.

Liquid Metals. Concepts and Theory. N. H. March. Cambridge University Press, New York, 1991. xii, 492 pp., illus. \$100. Cambridge Monographs on Mathematical Physics.

Molecular Mechanisms in Cellular Growth and Differentiation. Anthony R. Bellvé and Henry J. Vogel, Eds. Academic Press, San Diego, CA, 1991. xxii, 365 pp., illus. \$95.

MRI Atlas of the Spine. Kenneth R. Maravilla and Wendy A. Cohen. Raven, New York, and Dunitz, London, 1991. x, 440 pp., illus. \$140.

Myelination and Demyelination. I. D. Duncan, R. P. Skoff, and D. Colman, Eds. New York Academy of Sciences, New York, 1990. xii, 461 pp., illus. Cloth or paper, \$140. Annals of the New York Academy of Sciences, vol. 605. From a conference, Arlington, VA, Nov. 1989.

National Interests in an Age of Global Technology. Thomas H. Lee and Proctor P. Reid, Eds. National Academy Press, Washington, DC, 1991. xii, 159 pp., illus. Paper, \$19.95. Series on Prospering in a Global Economy.

Natural and Artificial Parallel Computation. M. A. Arbib and J. A. Robinson, Eds. MIT Press, Cambridge, MA, 1991. xiv, 345 pp., illus. \$37.50. From a symposium, Syracuse, NY, March 1989.

The Neuropharmacology of Serotonin. Patricia M. Whitaker-Azmitia and Stephen J. Peroutka, Eds. New York Academy of Sciences, New York, 1990. xii, 718 pp., illus. \$160. Annals of the New York Academy of Sciences, vol. 600. From a conference, New York, July 1989.

The New Aspects of Time. Its Continuity and Novelities. Selected Papers in the Philosophy of Science. Milič Capek. Kluwer, Boston, 1991. xx, 348 pp., illus. \$94. Boston Studies in the Philosophy of Science, vol. 125.

New Directions in Understanding Dementia and Alzheimer's Disease. Taher Zandi and Richard J. Ham, Eds. Plenum, New York, 1990. xii, 161 pp., illus. \$59.50. Advances in Experimental Medicine and Biology, vol. 282. From a conference, Plattsburgh, NY, May 1989.

New Frontiers in Quantum Electrodynamics and Quantum Optics. A. O. Barut, Ed. Plenum, New York, 1990. x, 610 pp., illus. \$129.50. NATO Advanced Science Institutes Series, vol. 232. Series B, Physics. From an advanced study institute, Istanbul, Turkey, Aug. 1989.

Nitrogen in Terrestrial Ecosystems. Questions of Productivity, Vegetational Changes, and Ecosystem Stability. Carl Olof Tamm. Springer-Verlag, New York, 1991. xii, 115 pp., illus. \$89. Ecological Studies, vol. 81.

NMR Applications in Biopolymers. J. W. Finley, S. J. Schmidt, and A. S. Serianni, Eds. Plenum, New York, 1990. x, 515 pp., illus. \$115. Basic Life Sciences, vol. 56. From symposia, Los Angeles, CA, Sept. 1988, and Toronto, Canada, June 1988.

Nonlinear Waves in Solid State Physics. A. D. Boardman, M. Bertolotti, and T. Twardowski, Eds. Plenum, New York, 1990. viii, 500 pp., illus. \$120. NATO Advanced Science Institutes Series, vol. 247. Series B, Physics. From an advanced study institute, Sicily, Italy, July 1989.

Nonlinear Waves Processes in Excitable Media. Arun V. Holden, Mario Markus, and Hans G. Othmer, Eds. Plenum, New York, 1991. xii, 525 pp., illus. \$120. NATO Advanced Science Institutes Series, vol. 244. Series B, Physics. From a workshop, Leeds, U.K., Sept. 1989.

Operational Research and Systems. The Systemic Nature of Operational Research. Paul Keys. Plenum, New York, 1991. xvi, 267 pp., illus. \$49.50. Contemporary Systems Thinking.

Optical Fibers and Sources for Communications. M. J. Adams and I. D. Henning. Plenum, New York, 1990. x, 182 pp., illus. \$49.50. Updates in Applied Physics and Electrical Technology.

Optoelectronics for Environmental Science. S. Martellucci and A. N. Chester, Eds. Plenum, New York, 1991. x, 293 pp., illus. \$79.50. Ettore Majorana International Science Series (Physics Sciences), vol. 54. From a course, Erice, Italy, Sept. 1989.

Oscillations and Waves. In Strong Gravitational and Electromagnetic Fields. Nail R. Sibgatullin. Springer-Verlag, New York, 1991. xiv, 362 pp., illus. \$89. Texts and Monographs in Physics. Translated from the Russian edition (Moscow, 1984) by Nathaniel M. Queen.

Physical Foundation of Solid State and Electron Devices. Altan M. Ferendeci. McGraw-Hill, New York, 1991. xvi, 443 pp., illus. \$54.95. Electronics and Electronic Circuits.

Physics, Geometry, and Topology. H. C. Lee, Eds. Plenum, New York, 1990. x, 681 pp., illus. \$139.50. NATO Advanced Science Institutes Series, vol. 238. Series B, Physics. From an advanced study institute, Banff, Canada, Aug. 1989.

Plants for Reclamation of Wastelands. Tenjarla C. S. Sastry *et al.*, Eds. Publications and Information Directorate, Council of Scientific and Industrial Research, New Delhi, India, 1990. xii, 684 pp., illus., + plates. \$110.

Plastics. America's Packaging Dilemma. Nancy Wolf and Ellen Feldman. Island Press, Washington, DC, 1990. xii, 132 pp., illus. \$19.95; paper, \$12.95. Island Press Critical Issues Series, no. 3.

The Preservation and Valuation of Biological Resources. Gordon H. Oriens *et al.*, Eds. University of Washington Press, Seattle, 1991. x, 303 pp., illus. \$40. From a workshop, Lake Wilderness, WA, June 1985.

Radiative Corrections. Results and Perspectives. N. Dombey and F. Boudjema, Eds. Plenum, New York, 1990. x, 578 pp., illus. \$130. NATO Advanced Science Institutes Series, vol. 233. Series B, Physics. From a workshop, Brighton, U.K., July 1989.

Reconstructing Babylon. Essays on Women and Technology. H. Patricia Hynes, Ed. Indiana University Press, Bloomington, 1991. xvi, 206 pp. \$35; paper, \$12.50.

Research and Development in Expert Systems 7. T. R. Addis and R. M. Muir, Eds. Published for the British Computer Society by Cambridge University Press, New York, 1991. viii, 317 pp., illus. \$44.50. British Computer Society Conference Series, 2. From a conference, London, Sept. 1990.

Selective Activation of Drugs by Redox Processes. G. E. Adams *et al.*, Eds. Plenum, New York, 1990. xii, 361 pp., illus. \$89.50. NATO Advanced Science Institutes Series, vol. 198. Series A, Life Sciences. From a workshop, Fermo, Italy, Aug. 1989.

Selective Fluorination in Organic and Bioorganic Chemistry. John T. Welch, Ed. American Chemical Society, Washington, DC, 1991. viii, 215 pp., illus. \$57.95. ACS Symposium Series, 456. From a symposium, Boston, MA, April 1990.

Sensory Abilities of Cetaceans. Laboratory and Field Evidence. Jeanette A. Thomas and Ronald A. Kastelein, Eds. Plenum, New York, 1990. xiv, 710 pp., illus. \$127.50. NATO Advanced Science Institutes Series, vol. 196. Series A, Life Sciences. From a symposium, Rome, Aug. 1989.

A Simple Matter of Salt. An Ethnography of Nutritional Deficiency in Spain. Renate Lellep Fernandez. University of California Press, Berkeley, 1991. xiv, 252 pp., illus. \$34.95. Comparative Studies of Health Systems and Medical Care.

Siting Hazardous Waste Treatment Facilities. The Nimby Syndrome. Kent E. Portney. Auburn House, New York, 1991. xvi, 181 pp. \$37.95.

Sixth Cooley's Anemia Symposium. Arthur Bank, Ed. New York Academy of Sciences, New York, 1990. xiv, 590 pp., illus. Cloth or paper, \$150. Annals of the New York Academy of Sciences, vol. 612. From a symposium, New York, March 1990.

The Timetables of Science. A Chronology of the Most Important People and Events in the History of Science. Alexander Hellemans and Bryan Bunch. Simon and Schuster, New York, 1991. vi, 660 pp. Paper, \$19.95. A Touchstone Book. Reprint, 1988 ed.

Trace Elements in Nutrition of Children 2. Ranjit Kumar Chandra, Ed. Raven, New York, 1991. xvi, 232 pp., illus. \$55. Nestlé Nutrition Workshop Series, vol. 23. From a workshop, Marrakech, Morocco, May 1989.

Trajectories and Rays. The Path-Summation in Quantum Mechanics and Optics. Vol. 1. A. Ranfagni *et al.* World Scientific, Teaneck, NJ, 1991. xii, 227 pp., illus. \$55. World Scientific Lecture Notes in Physics, vol. 36.

Transport, Correlation and Structural Defects. Hellmut Fritzsch, Ed. World Scientific, Teaneck, NJ, 1991. x, 305 pp., illus. \$67. Advances in Disordered Semiconductors, vol. 3.

Wildlife and Habitats in Managed Landscapes. Jon E. Rodiek and Eric G. Bolen, Eds. Island Press, Washington, DC, 1991. xx, 218 pp., illus. \$45; paper, \$24.95.