

ten chapters written by prominent jet researchers, is the first monograph devoted to astrophysical jets. Although most of the text focuses on extragalactic jets, one chapter deals with the phenomenology of stellar jets and others address topics of general significance for jet studies, such as collimation and stability. The critique of methods commonly used to interpret radio observations of jets is an important theme that dominates several chapters. In radio galaxies, jets are detectable only through their emission of synchrotron radiation, which depends on the distributions of magnetic field and energetic electrons. In order to estimate such basic quantities as pressures and densities inside jets, it has been necessary to construct chains of inference that are shaky at best, and that in some cases have been discredited. Direct measurements of jet velocities via Doppler shifts are impossible because synchrotron emission produces no spectral line features. We do not even know whether extragalactic jets are composed of ordinary electron-proton plasma or of electron-positron pairs (as is suggested by one theory of jet formation). The situation is not quite as bad for jets from "young stellar objects" (YSOs), since these appear to be relatively cool structures that emit both atomic and molecular lines.

Several chapters grapple with theoretical issues related to the production, collimation, and stability of jets. Theoretical obstacles to a comprehensive theory of jets are formidable, and these chapters emphasize the uncertainties as well as offer some tentative paths toward answers. For instance, Birkinshaw presents an excellent introduction to the theory of beam stability, illustrating from laboratory experience and linear calculations why jets are expected to be highly unstable. Yet they are observed to propagate over a range of distances encompassing nine orders of magnitude in scale. What is more disturbing, they often appear to bend through large angles without losing coherence. Can this be explained through the application of classical fluid dynamics, as Icke suggests, or is more subtle analysis required? The authors are remarkably circumspect about "selling" the latest trendy models, including those in which they have a personal stake. Thus, Eilek and Hughes expose the glaring gaps in our understanding of particle acceleration, and Birkinshaw uses specific examples to show that interpretations of "knots" and "wiggles" in jets in terms of unstable modes usually do not work.

The book does have its idiosyncrasies and omissions. For example, Icke's elegant discussion of classical fluid mechanics is not balanced by a correspondingly detailed discussion of the possible role of magnetic fields in jet propagation, which many re-

searchers suspect to be crucial. Williams's chapter on numerical simulations neatly summarizes his groundbreaking work at Cambridge but does not give adequate coverage to the important work done elsewhere. It also appears to have been completed too early to include the recent breakthroughs in magnetohydrodynamic simulations.

On the whole, the evenness of the book's level and tone is a tribute to Philip Hughes's editorial skills. Although the book seems to be aimed at the practicing astrophysicist who wishes to get up to speed on the subject of jets, the treatment of technical issues is sufficiently discursive that the book could be used as a graduate text. Thorough cross-referencing among chapters and two useful indexes are welcome features. I note only one failing in Hughes's leadership of this project. Despite his plea that the term *jet* be used to refer only to the morphological feature on the sky and *beam* to denote the physical object, he has not managed to enforce this terminology even in his own book. Birkinshaw obeys, but Leahy, Icke, Williams, and Wiita all use the term *jet* with abandon. I suppose I will continue to do the same.

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Catness

The Natural History of the Wild Cats. ANDREW KITCHENER. Comstock (Cornell University Press), Ithaca, NY, 1991. xxii, 280 pp., illus., + plates. \$27.50. Natural History of Mammals Series.

The publication of R. F. Ewer's *The Carnivores* (Cornell University Press) in 1973 was a watershed in our understanding of the Carnivora, coupling Ewer's vast personal knowledge of the group with a first comparative synthesis of available information. For those interested in the Felidae, C. A. W. Guggisberg's *Wild Cats of the World* (Taplinger) followed in 1975, and that descriptive work remains a very useful summary of the older and largely anecdotal literature about the felids. With these earlier works as a starting point, Andrew Kitchener has placed virtually all recent behavioral and ecological studies on cats in a broad comparative perspective. In fact, nearly 80 percent of his 420 references were published after 1973. The result is a quick and perceptive entrée for anyone interested in cats.

Nearly anyone can identify a cat as a cat, be it a 250-kilogram lion or a 2-kilogram



"A medium intensity threat by a Fishing cat."
 [From *The Natural History of the Wild Cats*, after Novak and Paradiso, 1983]

rusty-spotted cat, because the cats are all so similar in form. But beyond this easy recognition of morphotype (confused only by the fossa, a cat-like civet from Madagascar), the systematics of the Felidae is troubled. There is a thin fossil record, especially for the smaller forms; there are very few specimens for some species from remote localities; and there is considerable intraspecific variation in some widely distributed species. In addition, experts disagree on how to classify island, disjunct, and holarctic forms. In sum, the systematics of the cats is a mess. After describing what makes a cat a cat and sketching the origins of the group, Kitchener proceeds to lead the reader out of the woods, using the felid "lineages" recently identified and described through molecular means by Stephen O'Brien and his colleagues at the National Cancer Institute. Kitchener does yeoman service in gleaning from a diverse and sometimes arcane literature information on body size, conservation status and legal protection, life history parameters, food habits, hunting success rates, densities and home-range size, and various other topics. Presented in tabular form, these data are useful for specialists and those engaged in broad syntheses but do not detract from the flow of the text, because the author tells you what he thinks it all means. Kitchener necessarily focuses his discussion of behavioral development on domestic cats because that is where the work has been done. His discussion of the social organization of wild cats is limited to what has been learned about the large and medium-sized forms, such as the lion, puma, cheetah, ocelot, serval, and lynxes, because these are the species we know something about. Apart from the remarkable studies on the Iriomote cat, the small cats remain virtually unstudied in the wild.

To a cat specialist, it is obvious that Kitchener is not a specialist. He fails in his knowledge of wild cat lore. For example, he reports there were 140,000 tigers in India at the turn of the century and now there may be 4000. Some tiger specialists insist the turn-of-the-century figure is 40,000. On the other hand, no one really knows how many tigers there were in 1900. The point is there were a lot and now there are very few. I was disappointed to see that Kitchener missed the pioneering work on snow leopards by Rodney Jackson and his associates and that he did not include the recent and rapidly expanding literature on reproductive physiology in wild cats. Further, his section on cat conservation seems weak. But cat specialists are in a quandary on the best approaches to saving some of these species, so this is difficult to fault. In sum, Kitchener's is a valiant attempt to master a difficult subject.

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Books Received

Adverse Effects of Pertussis and Rubella Vaccines. A Report of the Committee to Review the Adverse Consequences of Pertussis and Rubella Vaccines. Christopher P. Howson, Cynthia J. Howe, and Harvey V. Fineberg, Eds. National Academy Press, Washington, DC, 1991. xiv, 367 pp., illus. \$39.95.

Algal Cell Motility. Michael Melkonian, Ed. Chapman and Hall (Routledge, Chapman and Hall), New York, 1992. viii, 236 pp., illus. \$45. Current Phycology, 3.

Astrophysical Formulae. A Compendium for the Physicist and Astrophysicist. Kenneth R. Lang. 2nd ed. Springer-Verlag, New York, 1991. xxx, 783 pp., illus. \$49. Springer Study Edition.

The Basal Forebrain. Anatomy to Function. T. Celeste Napier, Peter W. Kalivas, and Israel Hanin. Plenum, New York, 1991. x, 489 pp., illus. \$110. Advances in Experimental Medicine and Biology, vol. 295. From a conference, Chicago, May 1990.

Basics of Interferometry. P. Hariharan. Academic Press, San Diego, CA, 1991. xviii, 213 pp., illus. \$39.95.

Belonging to the Universe. Explorations on the Frontiers of Science and Spirituality. Fritjof Capra and David Steindl-Rast with Thomas Matus. Harper Collins, New York, 1991. xvi, 217 pp. \$18.95.

Blood Cell Growth Factors. Their Present and Future Use in Hematology and Oncology. Martin J. Murphy, Jr., Ed. AlphaMed, Dayton, OH, 1991. viii, 238 pp., illus. Paper, \$89. From a symposium, Beijing, Aug. 1991.

Cardiovascular Drugs and the Management of Heart Disease. Gordon A. Ewy and Ronald C. Wittmann, Eds. 2nd ed. Raven, New York, 1992.

Catalog of the Colorado Flora. A Biodiversity Baseline. William A. Weber and Ronald C. Wittmann. University Press of Colorado, Niwot, CO, 1992. xiv, 215 pp., illus. \$34.95.

Cell Biology of Extracellular Matrix. Elizabeth D. Hay, Ed. 2nd ed. Plenum, New York, 1991. xviii, 468 pp., illus. \$85.

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Death, Dying and Society. Craig Newnes, Ed. Published for the Psychology and Psychotherapy Association by Erlbaum, Hillsdale, NJ, 1992. vi, 176 pp., illus. Paper, \$19.95. Special issue of *Changes: An International Journal of Psychology and Psychotherapy*.

Doing Simple Math in Your Head. W. J. Howard. Coast Publishing, Coos Bay, OR, 1992. vi, 130 pp., illus. Paper, \$9.95.

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The Ecology of Fishes on Coral Reefs. Peter F. Sale, Ed. Academic Press, San Diego, CA, 1991. xviii, 754 pp., illus. \$69.95.

Electricity and Magnetism. W. N. Cottingham and D. A. Greenwood. Cambridge University Press, New York, 1992. xviii, 197 pp., illus. \$54.95; paper, \$19.95.

Elementary Particles. I. S. Hughes. 3rd ed. Cambridge University Press, New York, 1992. xxii, 431 pp., illus. \$80; paper, \$29.95.

Existence and Explanation. Essays Presented in Honor of Karel Lambert. Wolfgang Spohn, Bas C. van Fraassen, and Brian Skyrms, Eds. Kluwer, Norwell, MA, 1991. xii, 243 pp. \$89. University of Western Ontario Series in Philosophy of Science, vol. 49.

Farmer-Financed Irrigation. The Economics of Reform. Leslie E. Small and Ian Carruthers. Published in association with the International Irrigation Management Institute by Cambridge University Press, New York, xiv, 233 pp., illus. \$69.50.

Farming in Nature's Image. An Ecological Approach to Agriculture. Judith D. Soule and Jon K. Piper. Island Press, Washington, DC, 1992. xx, 286 pp. \$34.95; paper, \$19.95.

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The Ideas of Particle Physics. An Introduction for Scientists. G. D. Coughlan and J. E. Dodd. 2nd ed. Cambridge University Press, New York, 1992. xii, 244 pp., illus. \$59.95; paper, \$27.95.

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