of their claims about the hazards. But they also document the human costs exacted by the permeability of bodies and family lives to the toxic wastes themselves, as well as the battle scars received in struggles with corporate and government officials from 1979 to the present. For example, this study notes the rage, the sense of powerlessness, and depression experienced by Woburn activists when confronting the self-interested corporate scientists working to protect industrial profits or the government scientists working to vindicate records of government "regulation" (which was often ineffectual if not actually collusive with the local plants). Even more painful, many of these activists, having already suffered illnesses and deaths of their children, were then attacked as "troublemakers" by neighbors who were workers at the polluting plants for threatening local livelihoods. It is for these reasons that I view *No Safe Place* as asserting the power of economic over environmental interests in local disputes.

Each of these three portraits represents a fragmentary view of a social and political system that has attachment to conflicting goals. Communities seek both to expand investment and employment and to protect local ecosystems from industrial withdrawals and additions. But what is available in the markets for local investment is a diversity of industries with "dirty" as well as clean outputs, albeit usually less dirty than the factories that polluted Woburn. Though wastes may be less extensive than in earlier production facilities, for example, modern synthetic chemicals may be far more toxic and less biodegradable than their earlier counterparts. Water and land may be required from the community's ecosystems, and the transportation of goods, of workers, and of wastes each has local consequences for residences, shopping areas, and parks. What are sensitized community groups to do? How should potential investors respond to local demands for both investment and protection of environmental amenities? And finally, how should local and regional government officials respond to these tensions?

These three works point to three underlying dimensions of local conflicts. The first is the type of hazard: human health hazards as distinguished from other environmental risks, that is, threats to the existing uses by citizens of local ecosystems. Local conflicts are most intense around issues of human health (especially those arising from existing production facilities). At the other end of this dimension, when issues have more to do with environmental preservation and resource conservation, citizens are more prepared to negotiate with some flexibility for a larger share of the benefits or a smaller share of the costs. The sort of dispute settlement outlined by Crowfoot and Wondolleck may be more acceptable for these issues. When the primary local concern is with avoiding risks of becoming a future Woburn or Love Canal, Portney's scenario of rigid NIMBY-type resistance is more likely to emerge. Interestingly, toxic waste treatment facilities *have* been sited in recent years, often under conditions that may accredit Portney's "risk substitution." Local residents accept a local toxic waste treatment facility rather than face the total decline of their local economy and community.

A second major dimension is the time horizon: local conflicts over existing facilities are different from those over proposed facilities. Respondents in Portney's studies could readily express NIMBY attitudes because, unlike the Woburn FACE group, they didn't have to fight against neighbors, local political officials, and government agency representatives struggling to cling to their roles and entitlements, along with owners and managers of the polluting factories. Likewise, Crowfoot and Wondolleck's EDS participants were screened through a variety of social, economic, and political sieves to arrive voluntarily at the negotiating table. They too had degrees of freedom, because they were concerned primarily with future options and not sunk social and personal investments that carry a social, economic, and political momentum. In Woburn, participants had to "fight rather than switch" because the human health costs had already been exacted and compensation and future protection were both needed. For other community conflicts studied, participants could switch rather than fight. In the cases other than Woburn, moreover, the participants could evade the conflicts by withdrawing from the local social system. This same pattern might extend to include prospective investors, future government regulators, and potential victims of hazardous wastes or other environmental risks. This capacity to switch rather than fight generally lowers the willingness of some or all participants in an environmental struggle to commit all their resources to the battle. For example, when firms can locate new facilities elsewhere, they may choose to do so after engaging in some limited (and cost-effective) local conflicts. Some citizens who have economic options may likewise move out of the area if the initial battle goes against them. In Woburn the affected families had no such freedoms, and working-class citizens often lacked economic resources to move away.

A third crucial dimension is the social and political role of scientists. Portney's respondents mistrusted scientific "experts." In contrast, EDS participants made heavy use of a diversity of somewhat qualified experts, who fulfilled the traditional role of neutral arbiter of fact. But in Woburn, citizens' complaints had been discredited by a coalescence of scientific as well as economic and political actors. On this basis, FACE and other local activists were hostile to scientific advisers to industry and government. Brown and Mikkelsen celebrate the Woburn form of "popular epidemiology" in reaction to this dismissal. Ironically, though, it was professional biostatisticians from the Harvard School of Public Health who became essential resources in organizing and certifying much of this "popular" activity of data collection and analysis. FACE and other Woburn groups thus had to confront both their rage at the industrial and government scientists and their dependence on the "good ones" at Harvard. The painful experiences of Woburn residents (and, earlier, of similar groups in Love Canal) with illnesses and then with the "scientific" denial of their claims have been widely disseminated by the national media. This may help explain why Portney's survey respondents mistrusted experts who reassured them about the safety of modern toxic waste treatment facilities.

Paradoxically, what these three interesting works least elucidate are the rigidities and flexibilities of the private sector, although they hint that investors' patterns are somewhat isomorphic with citizens' predilections.

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Cosmic Emanations

Beams and Jets in Astrophysics. P. A. HUGHES, Ed. Cambridge University Press, New York, 1991. xii, 583 pp., illus. $75; paper, $27.95. Cambridge Astrophysics Series.

The discovery of cosmic jets during the late 1970s and early '80s caught astronomers by surprise and initiated a major new area of study in astronomy. Jets produced in the nuclei of certain elliptical galaxies retain an extraordinary degree of collimation while crossing distances as large as a million light-years. At high resolution, we find that these jets are already well collimated within a few light-years of the galactic nucleus, where they are inferred to have speeds very close to the speed of light. At least one binary star system, SS 433, produces a pair of high-speed jets, and the production of slower jets seems to be a common aspect of star formation.

Beams and Jets in Astrophysics, comprising

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 researchers 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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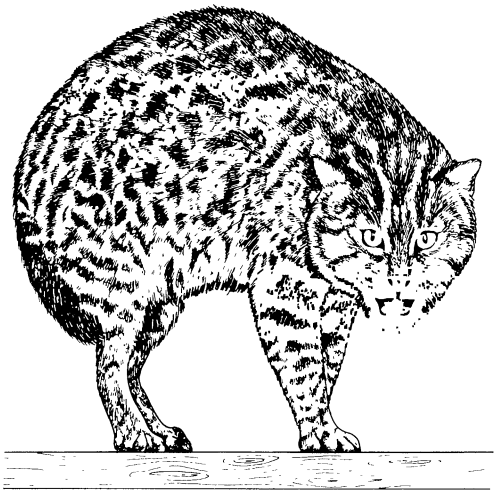
Catness

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 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.



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