

research per se, then, appears to be that within industry research can be limited to short loops away from immediate commercial returns, whereas academics, subject to less direct and detailed control from their sponsors, can allow themselves longer loops.

A similar comment applies to the other line of big-science development in physics, the accelerator and particle-physics line. As Robert Seidel makes clear in his essay "The origins of the Lawrence Berkeley Laboratory," E. O. Lawrence's prewar development of a sequence of ever-larger cyclotrons was strongly coupled to the medical interests of his sponsors, and particle-physics research at Berkeley was parasitic upon accelerator development and medical uses. After the war, though, the particle physicists succeeded in extending their research loops seemingly indefinitely. The clearest instance of this is in the founding of CERN, the European organization for particle physics, in the early 1950s. As the CERN historians Dominique Pestre and John Krige argue, the attraction of CERN for its sponsoring governments was precisely that the research to be conducted there would, by design, escape the circuits of industry and the military. This was what made CERN a potential site for and symbol of postwar European unity and cooperation, and this essentially political consideration made possible the birth of a "pure," relatively

decoupled, big science. In the United States, accelerator-based physics was in general much slower to attain similar autonomy, in a process that remains to be clearly elucidated, though Schweber's comparison of MIT and Cornell is illuminating.

The coming of this kind of autonomous big science, symbolized by particle physics, has taken place within a new and distinctively postwar regime of science politics and science administration. In this area, *Big Science* includes contributions by Sharon Traweek on "Big science and colonialist discourse: building high-energy physics in Japan," Robert Smith on the academic coalition-building behind the Hubble Space Telescope, and W. K. H. Panofsky on "SLAC and big science" (back to Stanford again). Allan Needell offers some fascinating insights into the biography of Lloyd Berkner, one of the first great postwar science administrators, and his movement between the project of further integrating science into the military-industrial complex and that of fostering the new pure big science. And C. W. F. Everitt's insightful account of the Gravity Probe B test of general relativity—37 years from first proposal to planned launch in 1997—includes some wonderful first-hand reports on the mysteries and brute contingencies of federal science politics. "I, from a distance of 30 feet, have witnessed an exchange between two Congressional staffers last-

ing twenty seconds that added \$1 million to our budget authorization," he recalls. "Likewise, from a wall seat at a Space Science Board meeting I have heard two sentences from different speakers, one calm, one impassioned, so transform a debate that a straw vote of 8 to 6 against a report . . . was followed an hour later by an almost unanimous vote of approval."

Though this last group of essays is interesting and of immediate relevance to policy-makers, I think that *Big Science* loses its wider audience here. To put it bluntly, to get to grips with the "new world order" of the late 20th century it is the performativity of Silicon Valley that we need to worry about, not the politics of the Superconducting Super Collider.

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Conservation Realities

Neotropical Wildlife Use and Conservation.
JOHN G. ROBINSON and KENT H. REDFORD,
Eds. University of Chicago Press, Chicago,
1991. xviii, 520 pp., illus. \$62; paper, \$28.

"It is perhaps brazen to link the words conservation and use, as we have done in the title of this book," write Robinson and Redford, "but it is our opinion that wildlife has been, is, and will always be used by people, and those of us who advocate the conservation of wild species and biological communities must incorporate that use into our conservation strategies." On this premise they and over 40 other authors consider whether and how the large-bodied animal species of the neotropics can be managed to yield economic, scientific, aesthetic, and other benefits.

Patterns of use by native peoples and subsistence hunters are examined. Basically, people eat anything large enough to hunt and will hunt any species having utility or value, whether for leather, wool, feathers, venom, or adornment. From 1976 to 1979, 21.5 million mammals were legally exported from Argentina. In Amazonas, Brazil, rural hunters kill about 3.5 million vertebrates annually. It is doubtful that species with strong economic, ecological, or societal importance can, or should, be relegated to zoolike preserves. In any case, absolute protection in small reserves may not suffice to ensure continuity for many populations.

James Shaw notes that in 1900 the



Vignette: An Argument about Determinism

In 1574 Tycho Brahe delivered the first of a series of invited lectures at the University of Copenhagen. "The result," writes Victor Thoren in a recent biography of Tycho (The Lord of Uraniborg, Cambridge University Press), "was about what one expects to get when a scientist waxes philosophical or historical":

Having established the positive aspects of his intellectual position [the utility of astronomy as an empirical science] Tycho moved to refute the various criticisms of astrology. No one could deny that plagues and wars killed off large numbers of people who had different horoscopes, but any responsible astrologer would leave room in his predictions for the possibility of general calamities that had nothing to do with the specific fate of the individual. Nor did the fact that people could be born at the same instant but meet different ends discredit astrology, for the stars did not determine the basic circumstances of life but, rather, produced the variations that distinguished the fates of people who lived in the same basic circumstances. Twins, who shared both horoscope and circumstances, were actually born at slightly different times, and one was always weaker than the other. Most important was that astral influences were influences, not determinants. . . . Thus the ancient objection that prognostications were not even desirable, as they merely diluted the joy of happy events and added worry to the grief of sad events, was forestalled by the possibility of resisting the influences working to produce undesired situations.



"Siona and Secoya hunters [in northeastern Ecuador] sharpening spears. Bamboo-tipped spears are a traditional weapon for hunting terrestrial game such as peccaries and tapirs. Since the 1950s, the shotgun has replaced both the spear and blowgun in most hunting. Most of these shotguns are single shot 16 gauge. Factory manufactured shells are expensive, so all hunters reload the plastic shell casings with primers, shot, and gunpowder purchased from river traders." [From W. T. Vickers's paper in *Neotropical Wildlife Use and Conservation*]

outlook for wildlife in the United States was not much better than what is currently being predicted for Latin America. For example, in 1913, the imminent extinction of the pronghorn "antelope," the bighorn sheep, and the elk was predicted, yet today these species are harvested through sport hunting. Can the wildlife management strategy that has made this possible be adapted to Latin America? Shaw reviews the enormous cultural, political, economic, demographic, and ecological differences between the Americas that make wildlife management in Latin America especially challenging. Existing philosophies, techniques, and theories may not be readily transplantable to Latin America without modification for tropical systems, developing economies, different sociopolitical profiles, and different social views of nature.

Several papers discuss theoretical models for determining potential harvest levels. Unfortunately, as with many models, assumptions are unverified or will be found to be species-specific and thus have limited applicability. The most detailed data are those of Franklin and Fritz for guanacos. Franklin and Fritz conclude, on the basis of two decades of research, that sustainable harvest is feasible. The time it took to reach

this conclusion underscores the need for intensive research on other wildlife species. On a more hopeful note, several species of economic importance (caiman, white-winged doves, whistling ducks, capybaras, pacas, iguanas) are amenable to ranching or farming. Unfortunately, these are only a small proportion of the wildlife species utilized, both legally and illegally, from Mexico to Argentina.

Wildlife biology in North America is looked down upon by many ecologists and other biologists, and this is largely the fault of the wildlife biologists themselves, who, with their strongly regional orientation and the close linkage of their work to local game departments, have been long on politics and mundane census studies and short on global theories of management strategy and policy. Undoubtedly, the bright future for wildlife in North America is due to their efforts, but now it is time for them to turn their attention to the question of wildlife management elsewhere in the Americas, where the greatest wildlife diversity resides.

The future of Latin American game and non-game wildlife lies in an international melding of ecology, wildlife biology, conservation, economics, and politics. Can

Neotropical wildlife be preserved and used sustainably? Yes, but only if governments and scientists work together to produce solid data and new theories of management. We know that by protecting economically important game and non-game species, we ensure concomitant management of many associated species of vertebrates, invertebrates, and plants. Major attention must be given to habitat protection. Law enforcement efforts based on reasonable (rather than draconian) wildlife laws need to be instituted throughout Latin America. Educational materials are needed for school children and the general public that illustrate the total value of wildlife and the need for wildlife protection.

There may be more species of wildlife to preserve in the Neotropics than in North America and they may be harder to study, but there is no reason to think that the task is beyond our abilities. This volume is a very positive first step in describing its magnitude and complexity.

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Books Received

Asteroids to Quasars. A Symposium Honouring William Liller (Cambridge, MA, June 1987). Phyllis M. Luger, Ed. Cambridge University Press, New York, 1992. xxvi, 307 pp., illus. \$59.95.

Astronomical Masers. Moshe Elitzur. Kluwer, Norwell, MA, 1992. xiv, 351 pp., illus. Paper, \$45. Astrophysics and Space Science Library, vol. 170.

Asymptotics Beyond All Orders. Harvey Segur, Saleh Tenveer, and Herbert Levine, Eds. Plenum, New York, 1992. xiv, 389 pp., illus. \$105. NATO Advanced Science Institutes Series B, vol. 284. From a workshop, La Jolla, CA, Aug. 1991.

The Aurora Watcher's Handbook. Neil Davis. University of Alaska Press, Fairbanks, 1992. x, 230 pp., illus. \$35; paper, \$20.

The Autoimmune Diseases II. Noel R. Rose and Ian R. Mackay, Eds. Academic Press, San Diego, CA, 1992. xx, 444 pp., illus. \$95.

Autoimmune Endocrine Disease. Anthony P. Weetman. Cambridge University Press, New York, 1992. xiv, 260 pp., illus. \$59.95. Cambridge Reviews in Clinical Immunology.

Automation in Biotechnology. Isae Karube, Ed. Elsevier, New York, 1991. xviii, 386 pp., illus. \$154.50. From a conference, Aichi, Japan, Oct. 1990.

The Common Names of North American Butterflies. Jacqueline Y. Miller, Ed. Smithsonian Institution Press, Washington, DC, 1992. x, 177 pp., illus. Paper, \$14.95.

Comparative Spermatology 20 Years After. Baccio Baccetti, Ed. Raven, New York, 1992. xxxvi, 1112 pp., illus. \$175. Sero Symposium Publications, vol. 75. From a congress, Siena, Italy, Aug. 1990.

Conapack. Program for Canonical Analysis of Classification Tables. László Orlóci. SPB Academic, The Hague, 1991. 126 pp., illus. Paper, \$22. Ecological Computations Series, vol. 4.

A Concise Dictionary of Astronomy. Jacqueline Mitton. Oxford University Press, New York, 1992. viii, 423 pp., illus. \$24.95.