

Evidence of Primate Asymmetries, Springer-Verlag, in press]). Impressive new evidence also has been reported by the zoologist Marc Hauser and his colleagues (*Behavioral and Brain Sciences*, 14, 342 [1991]). It is ironic that, even while, as Corballis correctly observes, "animals are slowly but surely disappearing" from mainstream psychology, they may be enjoying something of a renaissance in the rapidly growing psychology of laterality.

Given the extent to which key issues are empirically driven, no one can have the last word on the subject of discontinuity and the evolution of cerebral asymmetry and the generative mind. Corballis, however, tackles this immensely difficult and multifaceted subject in a lively and engaging way and presents his views crisply, thoughtfully, and always with a modesty and a touch of good humor. *The Lopsided Ape* is full of intellectual riches, and it deserves and, I hope, will find a wide readership.

LAUREN JULIUS HARRIS
Department of Psychology,
Michigan State University,
East Lansing, Michigan 48824

The Landsat Case

Viewing the Earth. The Social Construction of the Landsat Satellite System. PAMELA E. MACK. MIT Press, Cambridge, MA, 1990. xii, 270 pp., illus. \$27.50. Inside Technology.

Early in the 1960s scientists and engineers familiar with military reconnaissance programs, weather satellites, and astronauts' observations recognized that there could be significant benefits from using remote sensing of the earth for assessing our planet's resources. Over the next decade and a half, NASA played the lead role in the development of this capability with its Landsat program. Space historian Pamela Mack not only delineates the creation of the Landsat system but also explains the failure of its proponents to give this technology a secure operational status in the United States during the 1980s.

Mack's book is of special interest because she presents her story as an extended case study in the social construction of technology. In her view, a narrative that focused on the technical goals and activities of the scientists and engineers who designed, developed, and operated Landsat satellites and analyzed Landsat images would be missing the most intriguing and important dimensions of this technological innovation. Siding with the avant-garde in the history of technology, Mack insists that negotiations among interest groups play the central role

in establishing the characteristics, applications, and meanings of new technological systems. She consequently gives primary attention to the competing endeavors by groups in NASA, the Departments of Defense, the Interior, and Agriculture, and the Bureau of the Budget to shape the Landsat satellite system in accord with their respective interests.

Just how far Mack can go with this approach is suggested by her handling of NASA-DOD conflicts over Landsat technology. It was in 1963-64, she reports, that geologists associated with NASA's lunar program initiated an earth resources program. By 1968 NASA's planning for an earth resources satellite had progressed to the point that the agency sought partial access to the military's relatively advanced technology for reconnaissance satellites. Refusing to cooperate, the Pentagon urged NASA to drop the earth resources program on the grounds that success was bound to bring unwanted attention to space-based reconnaissance. NASA decided to go ahead on its own. DOD countered by blocking significant funding for Landsat until the space agency quietly agreed not to develop earth resources sensors having a resolution better than 20 meters. Soon NASA officials, scientists, and engineers were telling potential users that Landsat images would, at best, have a 30-meter resolution. In supporting this limit, they made little or no reference to the political compromise with DOD but rather, according to Mack, emphasized the technical difficulties of developing sensors with higher resolution, the technical and financial difficulties of coping with all the data that a high-resolution system would yield, and the technical suitability of the 30-meter scale for assessing many earth resources. These were good arguments. Indeed, without much closer attention to their origins and influence than Mack provides, one is left wondering about the relative roles of political and technical considerations in limiting the resolution of Landsat's sensors.

Though Mack quite possibly underestimates the role of technical considerations in the shaping of Landsat, her approach does much to illuminate the federal government's inability to embed this innovative technology in a viable operational system. There were, her history suggests, four main reasons why the United States failed to capitalize on its head start in remote-sensing earth resources technology, a failure that gave France the opportunity to seize leadership in this arena during the 1980s with the SPOT satellite system. First, NASA was not very successful in building a broad-based coalition of Landsat data users. The space agency was so keen to continue research and devel-

opment on the Landsat system and so reluctant to guarantee the ongoing availability of standard data that many medium-sized and small users shied away from the requisite investments in equipment and training. Second, the two largest users—the Departments of the Interior and Agriculture—were continually struggling with NASA and one another over the shape, operation, and future of the Landsat system. Each bureaucracy was so wed to its own vision of the system that politically effective cooperation was impossible. Third, the benefits of the Landsat system—for geology and other earth sciences, oil and mineral exploration, agricultural forecasting and disease control, and management of natural resources—did not result in sufficient savings or revenues to turn Landsat into a potentially profitable undertaking. And fourth, the Office of Management and Budget acted on behalf of a string of administrations that were opposed to any expansion of federal services by steadfastly thwarting all efforts in the 1970s and early 1980s to put Landsat on a solid operational footing. The denouement came in the mid-1980s with the privatization of the Landsat system.

Throughout her thought-provoking analysis of the development of Landsat satellites and early applications of Landsat images, Mack makes effective use of interviews and archival holdings as well as published materials. Her book does a fine job of helping inaugurate the Inside Technology series that MIT Press is devoting to studies of the social construction of technology.

KARL HUFBAUER
Department of History,
University of California,
Irvine, CA 92717

Physics in Canada

Physics and the Rise of Scientific Research In Canada. YVES GINGRAS. McGill-Queen's University Press, Buffalo, NY, 1991. xii, 203 pp., illus. \$37.50. Translated from the French edition by Peter Keating.

How did the Canadian physics community grow from the small, fragmented group of teachers it was in the 1850s to the large, cohesive body of researchers recognized and supported by society that it had become by the 1960s? To answer this question of institutional development, Yves Gingras combines historical and sociological perspectives.

Though a research ethic surfaced in universities during the decades around 1900, Gingras explains, it was the involvement of physicists in World War I that established