

he was displayed at the American Museum of Natural History and the Bronx Zoo until James H. Gordon, director of New York's Howard Colored Orphan Asylum, persuaded New York's cultural custodians to release Ota to his care. At the orphanage the conditions of Ota's life improved slightly, but when he was deemed a bad moral influence on other boys the orphanage, at Ota's request, sent him to a seminary in Lynchburg, Virginia—a seminary that served as an intellectual underwriter of pan-Africanism. For the last six years of his life, Ota "determined to translate an African lifestyle into an American context" (p. 208). He studied at the seminary and escaped when he could to the forests, where he tried to reconnect himself to a way of life he had left behind in Africa. One day, he carried a revolver with him, aimed it at his heart, and pulled the trigger.

Ota (or, as in the publisher's advertising, *Ota Benga*) tells several important stories. It details the intersection of turn-of-the-century anthropology, imperialism, and popular culture and underscores the centrality of race to the construction of American national identity. Though the authors do not emphasize sufficiently the long-standing importance of popular amusements for popularizing anthropology, dating at least to the exhibition in European capitals of the "Hottentot Venus" in the early 19th century, their attention to biographical detail is a notable contribution to this literature on science in the service of imperialism. More important, this book, by giving voice to Ota, raises issues that are only beginning to be explored in the scholarly literature, namely how individuals exhibited at fairs, zoos, and museums responded to efforts to degrade them. Ota, for instance, took matters into his own hands at a fund-raising dinner for the American Museum of Natural History. When the museum's director asked Ota to bring a chair for Florence Guggenheim, Ota lifted the chair and heaved it in Guggenheim's direction, barely missing her head. As this episode makes clear, Ota never stopped trying to give his own meaning to the conditions of his existence.

In sum, the authors have written a compelling book. Marred only—and this is a maddening omission—by the absence of footnotes, *Ota* is a revealing cultural biography that locates Joseph Conrad's "heart of darkness" in those persons who looked Ota square in the eyes and could never adequately respond to his question: "Who are you?" (p. 188).

**Robert W. Rydell**  
Department of History,  
Montana State University,  
Bozeman, MT 59717

## Products of Recombination

**Transgenic Animals.** F. GROSVELD and G. KOLLIAS, Eds. Academic Press, San Diego, CA, 1992. x, 277 pp., illus. \$37.50.

The term "transgenic," coined by Jon Gordon and Frank Ruddle in 1980, originally referred to animals whose genomes were modified by injecting recombinant DNA (genes or gene fragments) into pronuclei of fertilized eggs. The definition now appears to be expanding to include animals (and plants) into which recombinant DNA has been introduced by any available technique and even seems to embrace eukaryotic organisms that carry "foreign" DNA introduced into specific sets of cells, as exemplified by somatic cell engineering. To date, the term does not seem to have been applied to human gene-therapy patients. However, the inclusion of a chapter on gene therapy in this book may signal a further broadening of its definition.

Research involving transgenic animals is being published at an astonishing rate. Over 2000 such papers were published in 1992 alone. It would therefore seem appropriate for someone to try to summarize what is going on in the field. As one quickly finds by skimming the table of contents, however, the focus of this book is not transgenic animals *per se*. Rather, the book is a compilation of chapters loosely woven together by the common thread of transgenic animal technology. This is not a "how-to" book, and those who want to learn how to produce transgenic animals or how to produce them more efficiently should look elsewhere. But readers who are interested in learning how this powerful tool has been exploited to address a wide variety of contemporary biological questions will be well served.

Practitioners (and wannabe practitioners) of transgenic animal technology have often sold this technology to administrators and granting agencies as an investigative tool without peer that can be used to address previously impenetrable questions. Though there is some justification for that view, which is well represented in this book, cumulating experience dictates a more cautious outlook. It is becoming clear, for example, that fusion genes (regulatory elements from one gene ligated to the structural elements of another), which are used extensively to produce transgenic animals, can exhibit unpredicted results. Fusion genes are particularly popular because they can be used to direct gene expression to specific tissues at particular times during development. It is left to the investigator to determine whether the unexpected obser-

vations are a consequence of molecular biological artifacts or result from perturbation of some physiological system, which may or may not have been the one under study. One can only infer the existence of such problems by reading between the lines of this book. However, the chapter on embryology and development by Rosa S. P. Beddington provides a good example of cautious interpretation of the results of transgenic animal research based on functional (as opposed to molecular biological) considerations.

The chapters in the book are of two sorts. The majority (seven of the 11) have a biological-system orientation and include topics such as gene domain organization, gene regulation, imprinting, immunology, neurobiology, and oncogenesis. These reviews generally provide an introduction to the system under consideration, an overview of past and present experimental strategies, with specific examples of the application of transgenic animal models, and a brief look toward the future. The other chapters focus on techniques such as homologous recombination (with an emphasis on its application to genetic engineering of stem cells), cell ablation, retroviral gene vectors (for use in human gene therapy), and application of gene transfer technology to livestock. As a result of the incorporation of these two approaches, there is some overlap in coverage.

The editors set out to compile a book that would give the reader a sense of the broad applicability of transgenic animal technology to addressing biological questions, and they have achieved their goal. The authors have made their topics accessible to the non-specialist without making the treatment superficial, and specialists are likely to find their subjects treated in adequate detail to make the book a useful resource.

**Robert J. Wall**

Gene Evaluation and Mapping Laboratory,  
Agricultural Research Service,  
U.S. Department of Agriculture,  
Beltsville, MD 20705

## Medical Excesses

**Spare Parts.** Organ Replacement in American Society. RENÉE C. FOX and JUDITH P. SWAZEY. Oxford University Press, New York, 1992. xviii, 254 pp., illus. \$29.95.

Transplantation of hearts, livers, and kidneys is now accepted therapy for a variety of end-stage organ diseases. Over 16,000 solid-organ transplants occur annually in the

United States, and bone-marrow and other tissue transplants are routine. With one-year survival rates over 90% and five-year rates over 50%, there are few patients in need of transplants who do not opt for this remedy.

Despite its successes, many people remain deeply troubled by organ transplantation. Obtaining organs from brain-dead cadavers whose hearts are still beating and from patients' consenting living relatives (who provide a third of transplanted kidneys) is still ethically problematic. Organ transplantation is also expensive and represents an allocation of scarce medical resources to a small number of patients when thousands of persons have no health care at all. Moreover, transplants are not a therapeutic panacea but come with the threat of graft rejection or infection from the massive doses of immunosuppressive drugs necessary to prevent it. The chronic scarcity of organs also leads to difficult selection problems, with some patients living while others die for want of an organ.

Renée C. Fox and Judith P. Swazey express these concerns and others in *Spare Parts: Organ Replacement in American Society*, a follow-up to their influential 1974 book *The Courage to Fail: A Social View of Organ Transplants and Dialysis*. It is refreshing to see a book that cuts through the perfervid media attention that often surrounds organ transplantation and challeng-

es us to assess the practice more realistically.

Fox and Swazey criticize both the process of developing artificial organ technologies and the use of organ replacement as routine therapy. Half of the book is devoted to a detailed consideration of the Jarvik-7 artificial heart experiment that captured the world's attention in the mid-1980s. Based on hundreds of hours of participant-observation and interviews with the major participants, Fox and Swazey's description of how this experiment was conceived and then carried out first at the University of Utah and then at Humana Hospital in Louisville, Kentucky, reveals shocking lapses in both the scientific and the ethical review of a major "experiment perilous"—an issue that the army of journalists covering the story missed.

Fox and Swazey are persuasive in showing that the decision to implant the artificial heart in four patients was premature because of insufficient testing in animals and the inadequate experience of William DeVries, the principal investigator. As a senior surgeon put it, "Bill DeVries was technically good at putting the artificial heart in calves, but he didn't have much training in scientific methods and clinical research." In addition, at the time of the experiment, the University of Utah Medical School's department of surgery lacked a chairperson who could have exercised more supervision over DeVries's conduct of the project.

Nor did the elaborate process of institutional review and ethics consultation imposed through the federal regulatory system prove adequate to ferret out these defects. These proceedings notwithstanding, neither the institutional review board at the University of Utah nor the one at Humana Hospital saw fit to stop the research. Nor did the FDA or senior physicians who were aware of research deficiencies step into the breach. Not until four patients who had spent many stuporous days tethered to the mechanical heart had died was the research halted. The authors suggest many reasons for these lapses, from the inexperience of a non-university-based review board in Louisville to the optimistic faith of the Mormon participants in Salt Lake City (who included DeVries, Barney Clark, the first recipient, and Chase Peterson, the university's vice-president for health sciences and main contact with the media, among others) that hard work in tackling the unknown would produce good results.

In describing these events Fox and Swazey are implicitly critical of both the willingness of transplant surgeons to try everything to keep patients alive and the adequacy of the processes put in place to prevent abuses in human experimentation. They show that patient consent alone cannot justify all forms of research, particularly when patients who have no alternative means of survival are offered novel remedies. In such situations, researchers' zeal and institutional interests in wealth and glory can dwarf the substantive protections of formal review processes. Years after Tuskegee, Willowbrook, and other classic instances of unethical experimentation, the Jarvik-7 experiment shows the need for continued vigilance in the operation of the review boards designed to protect the subjects of human research.

Fox and Swazey also criticize the use of organ replacement in the many nonexperimental settings in which it is now used. They believe that this therapy "has become an overly zealous medical and societal commitment to the endless perpetuation of life," the excesses of which cause human suffering and "social, cultural, and spiritual harm." They fear that the view of organs as "spare parts" and the willingness of doctors to "slash and suture our way to eternal life" will deny human dignity by coldly reducing people to their constituent parts. The practice of eviscerating cadavers and doling their organs and tissues out to multiple recipients is also often less beneficial to recipients than expected and wasteful of resources that could be better spent on prenatal and preventive health care.

Fox and Swazey make their case against organ replacement by a survey of "patterns and issues" in organ transplantation in the



## Vignettes: Marking Time

It was 12 cycles, 18 katuns, 16 tuns, 0 uinals, and 16 kins since the beginning of the Great Cycle. The day was 12 Cib 14 Uno, and was ruled by the seventh Lord of the Night. The moon was nine days old. Precisely 5,101 of our years and 235 days had passed since the creation of this universe, and only 23 years and 22 days yet remained until the final cataclysm that would destroy it. So the ancient Maya scribes and astronomers would have calculated, for the day was 14 May 1989, and we were in Leningrad.

—Michael D. Coe, in *Breaking the Maya Code* (Thames and Hudson)

The general disruption associated with World War I brought the Gregorian calendar to Eastern Europe, including Bulgaria, Lithuania, Latvia, Estonia, Russia, Yugoslavia, and Romania. Calendar reform came last to Greece; the Greek adoption followed a congress of the Eastern Orthodox Church in Constantinople in May, 1923. It is fascinating to learn that this last calendar improves upon the year length of the Gregorian scheme, so that leap years will include 2000, 2400 (as in the Gregorian calendar), but also 2900 and 3300 instead of 2800 and 3200. Thus, all the dominions of the Eastern Orthodox Church will differ by a day from the rest of the world in the twenty-ninth century, provided tendentious civilizations can last that long!

—Owen Gingerich, in *The Great Copernicus Chase and Other Adventures in Astronomical History* (Sky Publishing Corporation and Cambridge University Press)

1980s. They discuss developments in immunosuppressive drugs, the psychological complexities of organs as gifts, the emergence of cluster or multiorgan transplants, the use of living related and nonrelated donors, and market efforts to increase organ supply. The strength of this part of the book is its moving reminder of the emotional complexity of the giving and receiving of organs and of how great technological promises are usually followed by dashed hopes, which they illustrate with the shifting fortunes of the immunosuppressive drug cyclosporine, key to the 1980s increase in transplantation. They also are good at showing how transplant practices blur the line between research and therapy and how periodic moratoria on clinical use of a transplant procedure are essential social control mechanisms.

In this part of the book, however, persons who have followed organ transplantation during this period will find little that is new, and there is little analysis or reasoned argumentation about the significance of the material the authors have gleaned from the literature. Missing are the participant-observer insights that so enrich the authors' earlier book and their account of the Jarvik-7 experiment. Missing too is a reasoned argument considering organ transplantation in relation to other life-extending technologies that now constitute mainstream medical practice.

One can agree with Fox and Swazey that the emotional complexities of organ donation need more attention and that persons facing transplantation need more information about the therapeutic roller-coaster ride that even successful transplants usually bring. One can also share the authors' doubts that the xenografts and multiorgan transplants that now define the cutting edge of transplantation should be so aggressively pursued as a last resort for dying patients.

But the authors never combine their observations and questions into a coherent argument about what the limits of transplantation should be or, indeed, ever state explicitly what they would or would not accept. A reader of their jeremiad against aggressive transplantation could conclude that they favor discontinuing certain kinds of transplants or even organ transplantation altogether in order to avoid the spiritual and cultural harm that they think transplantation inevitably brings. If so, a stronger argument is needed than they provide, or at least some basis for distinguishing acceptable from unacceptable kinds of transplants.

Constructing an argument is not easily done without calling the entire modern medical enterprise into question. Expense and intrusiveness characterize many other medical interventions, and compared to

some of these organ transplantation has a lot going for it. It is more effective than treatments for many forms of cancer, for HIV, or for extreme prematurity and is not self-evidently the first candidate for cuts in an age of health care rationing. Nor does its basis in the eagerness of families and doctors for hope in the midst of tragedy in itself disqualify transplantation as a remedy that society should support. Despite its novel features, organ replacement is but another example of the instrumental approach to disease and illness that characterizes our highly technologized medical care system, and it should be given no less respect than other such procedures get.

In the end, Fox and Swazey provide valuable insights into the abuses that can occur in the process of technological innovation and identify many of the problematics of solid-organ transplantation. However, beyond reminding us that there are important psychological, social, and cultural issues at stake, they do not help us to sort out the acceptable from the unacceptable in organ transplantation or in medicine generally.

John A. Robertson

School of Law,  
University of Texas,  
Austin, TX 78705-3299

## Books Received

**Atmospheric Ultraviolet Remote Sensing.** Robert E. Huffman. Academic Press, San Diego, CA, 1992. x, 317 pp., illus. \$59.95. International Geophysics Series, vol. 52.

**Containing the Atom.** Nuclear Regulation in a Changing Environment, 1963-1971. J. Samuel Walker. University of California Press, Berkeley, 1992. xiv, 533 pp., illus. \$50.

**Control and Dynamic Systems.** Advances in Theory and Applications. Vol. 52. Integrated Technology Methods and Applications in Aerospace Systems Design. C. T. Leondes, Ed. Academic Press, San Diego, CA, 1992. xii, 550 pp., illus. \$79.95.

**Crowds, Psychology, and Politics, 1871-1899.** Jaap van Ginneken. Cambridge University Press, New York, 1992. xii, 269 pp., illus. \$59.95. Cambridge Studies in the History of Psychology.

**The Ethics of Aid and Trade.** U.S. Food Policy, Foreign Competition, and the Social Contract. Paul B. Thompson. Cambridge University Press, New York, 1992. x, 233 pp. \$49.95. Cambridge Studies in Philosophy and Public Policy.

**The Evolution of Consciousness.** Of Darwin, Freud, and Cranial Fire. The Origins of the Way We Think. Robert Ornstein. Simon and Schuster, New York, 1992. xiv, 305 pp., illus. Paper, \$14.

**Excitatory Amino Acid Receptors.** Design of Agonists and Antagonists. P. Krogsgaard-Larsen and J. J. Hansen, Eds. Horwood (Prentice Hall), Englewood Cliffs, NJ, 1992. 382 pp., illus., + plates. \$74. Horwood Series in Pharmaceutical Technology.

**Free Radicals and Aging.** Ingrid Emerit and Britton Chance, Eds. Birkhäuser Boston, Cambridge, MA, 1992 (U.S. distributor, Springer-Verlag, New York). x, 440 pp., illus. DM 238. From a conference, Paris, Sept. 1991.

**Freeing the Goose in the Bottle.** Discovering Zen through Science, Understanding Science through Zen. Debra Jan Bibel. Elie Metchnikoff Memorial Li-

brary, Oakland, CA, 1992. xviii, 325 pp., illus. Paper, \$16.95.

**From Machine Shop to Industrial Laboratory.** Telegraphy and the Changing Context of American Invention, 1830-1920. Paul Israel. Johns Hopkins University Press, Baltimore, MD, 1992. x, 251 pp., illus. \$38.50. Johns Hopkins Studies in the History of Technology.

**Frontiers in Cosmic Physics.** Rosalind B. Mendell and Allen I. Mincer, Eds. New York Academy of Sciences, New York, 1992. xiv, 365 pp., illus. \$60. Annals of the New York Academy of Sciences, vol. 655. From a symposium, New York, Sept. 1990.

**Frontiers in Social Movement Theory.** Aldon D. Morris and Carol McClurg Mueller, Eds. Yale University Press, New Haven, CT, 1992. xii, 382 pp. \$45; paper, \$20. From a conference, Ann Arbor, MI, June 1988.

**The Frontiers of Modern Statistical Inference Procedures, II.** Eve Bofinger *et al.*, Eds. American Sciences Press, Columbus, OH, 1992. xii, 498 pp., illus. Paper, \$98.75. American Sciences Press Series in Mathematical and Management Sciences, vol. 28. From a conference, Sydney, Australia, Aug. 1987.

**The Geometry of Algebraic Fermi Curves.** D. Gieseke, H. Knörrer, and E. Trubowitz. Academic Press, San Diego, CA, 1993. viii, 236 pp., illus. \$49.95. Perspectives in Mathematics, vol. 14.

**High-Tech Europe.** The Politics of International Cooperation. Wayne Sandholtz. University of California Press, Berkeley, 1992. xx, 340 pp. \$39.95. Studies in International Political Economy, vol. 24.

**Himalayan Seismicity.** G. D. Gupta. Geological Society of India, Bangalore, 1992. viii, 334 pp., illus. \$45. Memoir 23.

**The History and Development of Human Genetics.** Progress in Different Countries. Krishna R. Dronamraju, Ed. World Scientific, River Edge, NJ, 1992. xii, 303 pp., illus. \$86. Based on a symposium, Washington, DC, Oct. 1991.

**A History of the Mind.** Nicholas Humphrey. Simon and Schuster, New York, 1992. 239 pp., illus. \$22.

**Homogeneous Transition Metal Catalyzed Reactions.** William R. Moser and Donald W. Slocum, Eds. American Chemical Society, Washington, DC, 1992. xiv, 625 pp., illus. \$139.95. Advances in Chemistry Series, 230. From a symposium, Boston, April 1990.

**Horse Power.** A History of the Horse and the Donkey in Human Societies. Juliet Clutton-Brock. Harvard University Press, Cambridge, MA, 1992. 192 pp., illus. \$29.95.

**Human Embryology and Teratology.** Ronan O'Rahilly and Fabiola Müller. Wiley-Liss, New York, 1992. x, 330 pp., illus. \$159.95.

**Human Geography in Eastern Europe and the Former Soviet Union.** Ludwik Mazurkiewicz. Belhaven, London, and Wiley, New York, 1992. vi, 163 pp. \$49.95.

**Human-Robot Interaction.** Mansour Rahimi and Waldemar Karwowski, Eds. Taylor and Francis, Philadelphia, 1992. viii, 378 pp., illus. \$99.

**In Service to American Pharmacy.** The Professional Life of William Procter, Jr. Gregory J. Higby. University of Alabama Press, Tuscaloosa, 1992. xviii, 270 pp., illus. \$34.95. History of American Science and Technology Series.

**Individual Differences in Cardiovascular Response to Stress.** J. Rick Turner, Andrew Sherwood, and Kathleen C. Light, Eds. Plenum, New York, 1992. xviii, 301 pp., illus. \$49.50. Perspectives on Individual Differences.

**Inflammation.** Basic Principles and Clinical Correlates. John I. Gallin, Ira M. Goldstein, and Ralph Snyderman, Eds. 2nd ed. Raven, New York, 1992. xx, 1186 pp., illus. \$185.

**Insects of Panama and Mesoamerica.** Selected Studies. Diomedes Quintero and Annette Aiello, Eds. Oxford University Press, New York, 1992. xxii, 692 pp., illus. \$195.

**Instrumentation in High Energy Physics.** Fabio Sauli, Ed. World Scientific, River Edge, NJ, 1992. xiv, 585 pp., illus. \$103. Advanced Series on Directions in High Energy Physics, vol. 9.

**The International Politics of the Environment.** Actors, Interests, and Institutions. Andrew Hurrell and