II and good teaching itself is notoriously hard to define. Was the balance among disciplines altered by external patronage? Of course. But universities were adapting to changing social demands long before the era of large-scale federal contracts. This is how institutions invented in the Middle Ages have managed to survive for so long. Lowen argues, with good cause, that the links between the academy and institutions of power became much thicker after World War II and that some of the natural insulation enjoyed by universities from external pressures was lost. She also goes on to suggest, however, that the effect was to impoverish the university intellectually. Here we enter a realm of "what ifs," where judgments depend upon our understanding of the "natural" course that disciplines might have taken in the absence of outside forces. Was the academy impoverished when resources were shifted from geomorphology to geophysics or from classics to the sciences? The answer, of course, depends on time, place, and the values of the observer. Lowen, to her credit, uncovers much evidence to indicate that some faculty during the Terman era themselves felt the university was being skewed toward goals extraneous to the best interests of science and scholarship. But even here it is a fine call to distinguish between farsighted critics and carpers who defined "balance" as the comfortable status quo ante.

Lowen might have been somewhat more critical of the defenders of autonomy and balance and somewhat more generous to Terman and his allies, whose efforts, after all, yielded more than just weapons, particle accelerators, and silicon millionaires. She might, that is, have worked a bit harder to extricate her analysis from the either/ors. Stanford had never been an ivory tower; it never became purely a service institution; it had never enjoyed complete autonomy and never became completely dependent upon external sponsors. The patrons it served, even at the height of the Cold War, were not so monolithic in their goals as to draw the university along a singular path that was consistently inimical to institutional or disciplinary interests. At her best, which is very good indeed, Lowen takes us past the binary options and illuminates the interplay of the multiple interests and traditions that constitute a complex institution. Even when this complexity is missing, she sustains interest with a narrative alive to the dilemmas of joining knowledge and power. This provocative and illuminating book merits wide attention.

John W. Servos
Department of History,
Amherst College,
Amherst, MA 01002–5000, USA

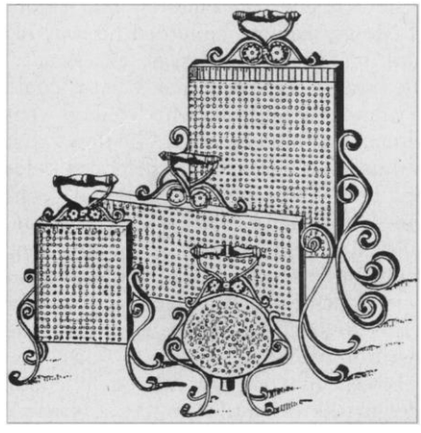
Marvels on Display

Exhibiting Electricity. K. G. BEAUCHAMP. Institution of Electrical Engineers, Stevenage, Herts, U.K., 1997 (U.S. distributor, IEE/INSPEC, Piscataway, NJ). xiv, 338 pp., illus. $85 or £45. ISBN 0-85296-895-7. IEE History of Technology, 21.

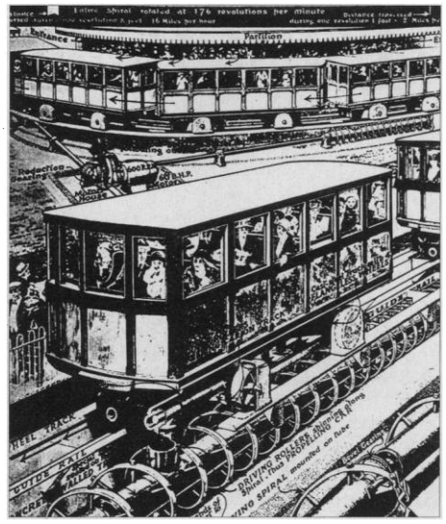
On 9 July 1851 Queen Victoria visited the fantastically popular "Great Exhibition" in London's Hyde Park. As she noted in her diary, "We went to the Exhibition and had the electric telegraph show explained and demonstrated before us. It is the most wonderful thing and the boy who works it does so with the greatest of ease and rapidity. Messages were sent out to Manchester, Edinburgh etc. and answers received in a few seconds—truly marvellous!"

Marvelous, indeed. Though initially dismissed by some exhibition organizers as mere philosophical instruments or toys, electrical technologies soon would command the respect of engineers and inspire the awe and delight of Queen Victoria and millions of lay persons. Beauchamp's book provides a lovingly detailed catalogue of the electrical wonders displayed at the hundreds of expositions, exhibitions, world's fairs, and trade fairs held in Europe, the British Empire, and the United States from the late 18th century to the present.

The marvels on display ranged from the time-honored "sparks and shocks" (including the suspect but popular family medical coil), to huge electrical generators like Thomas Edison's famous "Jumbo," displayed at the 1881 Paris Centennial Exposition and named after a popular elephant from the London Zoo, to a plethora of consumer devices—electric cigar lighters, irons, pens, hair curlers, pianos, and even an "electrochemical bath."



"Portable generator at the Frankfurt Electrotechnical Exhibition, 1891." [From *Exhibiting Electricity*; "Allgemeiner Berichte über die internationale Elektrotechnische Ausstellung in Frankfurt am Main, 1891"]



"The 'never-stop railway' at the British Empire Exhibition at Wembley, 1925." The railway consisted of 88 cars "driven by a spiral shaft acting on rubber guide wheels, the mechanism of which can be seen" in this illustration. The train slowed down at stations to allow passengers to board, with the variation in speed achieved by altering the pitch of the spiral. [From *Exhibiting Electricity*; *Scientific American*, 1924]

The expositions were not just technological sideshows; they hosted the debuts of many history-making inventions. Alexander Graham Bell first publicly demonstrated the telephone at Philadelphia's Centennial Exposition in 1876. The "Edison effect" was first shown at the 1884 International Electrical Exposition in Philadelphia. Edison also arranged the first public display of the x-ray tube at an 1896 exposition. Some expositions provided occasions for early professional meetings of electrical engineers, leading to the founding of societies such as the Institute of Electrical and Electronic Engineers and the establishment of international electrical standards.

Electrical technologies also transformed the very processes of mass display. Spectacular nighttime illuminations, often combined with fountains, music, and fireworks, drew huge crowds and threatened to overwhelm the educational aspects of some expositions. Electric trams, "moving pavements" (first used in 1893 at the World's Columbian Exposition in Chicago), sound-equipped "chairveyors" (used in General Motors' "Futurama" at the New York World's Fair of 1939–40), and the more recent monorail and mag-lev transportation systems proved indispensable in

moving millions of people through acres of exhibits. The electrical infrastructure of the expositions became as interesting as the exhibits themselves.

Indeed, Beauchamp notes that electricity became so fundamental to the technologies of display (and so seamlessly integrated into the processes of life in general, for that matter) that it has more or less disappeared as a featured element of more recent expositions. "Electrical technology," he concludes, "has now become, in a real sense, the fair itself."

Some readers may find Beauchamp's meticulous attention to kilowatts and candlepower a bit tedious. Others might wish for a broader cultural analysis. Nevertheless, *Exhibiting Electricity* offers a fascinating and often amusing perspective on the modern world's love affair with the electron.

David Rhees
Bakken Library and Museum, Minneapolis, MN 55416, USA

Vignette: Editing

The writing and public relations skills required at a museum differ sharply from those needed at research institutes. I was recently reminded of how different these jobs are when Sci-Trek, Atlanta's science and technology museum, asked me to provide a draft text for a display on the scanning electron microscope.

My draft began:

> Using a computerized digital light microscope, Rob Apkarian of the Yerkes Primate Research Center of Emory University was able to detect evidence of atherosclerosis (blockage of the vessels that can lead to heart attacks and strokes) in the inside wall of a human blood vessel. The two dimensional image, shown on the video screen and in the photograph at right, magnifies the surface of the wall 1,200 times. The image shows early atherosclerosis—as indicated by the white blood cells (dark colored pimple-like structures) stuck to the wall of the vessel.

The Sci-Trek writers changed my text, making it more dramatic and fun to read:

> THE CRIME—TRESPASSING IN THE BLOODSTREAM. A mob of trespassers have clogged a major artery, blocking the flow of important traffic. This dangerous condition, called atherosclerosis, may lead to heart attack or stroke.
>
> THE DETECTIVE: THE GAME IS AFOOT! Rob Apkarian uses a computer-controlled light microscope to examine the scene of the crime: the inside wall of a human blood vessel.

Mary Miller, at San Francisco's user-friendly science museum, the Exploratorium, explained that museum science writers must always remember that people read their work while standing up.

—*Cathy Yarbrough*, in *A Field Guide for Science Writers: The Official Guide of the National Association of Science Writers*, Deborah Blum, Ed. (Oxford University Press)

Other Books Received

A Field Guide for Science Writers. The Official Guide of the National Association of Science Writers. Deborah Blum and Mary Knudson, Eds. Oxford University Press, New York, 1997. xiv, 287 pp. $25. ISBN 0-19-510068-9.

Fingerprinting Methods Based on Arbitrarily Primed PCR. Maria R. Micheli and Rudolfo Bova, Eds. Springer, New York, 1997. xvi, 441 pp., illus. Spiralbound, $99.50. ISBN 3-540-61229-7.

A Guide to the Birds of the Galápagos Islands. Isabel Castro and Antonia Phillips. Princeton University Press, Princeton, NJ, 1997. 144 pp., illus. $24.95 or £15.95. ISBN 0-691-01225-3.

Handbook of the History of General Topology. Vol. 1. C. E. Aull and R. Lowen, Eds. Kluwer, Norwell, MA, 1997. x, 397 pp., illus. $183 or £109 or Dfl. 295. ISBN 0-7923-4479-0.

The Ice-Age History of Southwestern National Parks. Scott A. Elias. Smithsonian Institution Press, Washington, DC, 1997. xvi, 200 pp., illus. Paper, $16.95. ISBN 1-56098-679-4.

II-VI Blue-Green Light Emitters. Device Physics and Epitaxial Growth. R. L. Gunshor and A. V. Nurmikko, Eds. Academic Press, San Diego, 1997. xiv, 338 pp., illus. $119. ISBN 0-12-752144-5. Semiconductors and Semimetals, vol. 44.

Impossible Minds. My Neurons, My Consciousness. Igor Aleksander. Imperial College Press, London, 1996 (U. S. distributor, World Scientific, River Edge, NJ). xvi, 347 pp., illus. $25. ISBN 1-86094-030-7.

The Kingdon Field Guide to African Mammals. Jonathan Kingdon. AP Natural World (Academic Press), San Diego, 1997. xviii, 464 pp., illus. Paper, $39.95 or £29.95. ISBN 0-12-408355-2.

Learning More Biochemistry. 100 New Case-Oriented Problems. Richard F. Ludueña. Wiley-Liss, New York, 1997. xxviii, 303 pp., Paper, $39.95. ISBN 0-471-17054-2.

Loops, Knots, Gauge Theories and Quantum Gravity. Rodolfo Gambini and Jorge Pullin. Cambridge University Press, New York, 1996. xvi, 321 pp., illus. $75. ISBN 0-521-47332-2. Cambridge Monographs on Mathematical Physics.

A Mathematical Introduction to Wavelets. P. Wojtaszczyk. Cambridge University Press, New York, 1997. xii, 261 pp., illus. $59.95, ISBN 0-521-57020-4; paper, $21.95, ISBN 0-521-57894-9. London Mathematical Society Student Texts 37.

Melatonin. A Universal Photoperiodic Signal with Diverse Actions. P. L. Tang, S. F. Pang, and R. J. Reiter, Eds. Karger, Farmington, CT, 1997. viii, 208 pp., illus. $198.25 or CHF 228 or DEM 273. ISBN 3-8055-6344-2. Frontiers of Hormone Research, vol. 21. From a symposium, Hong Kong, Sept. 1995.

Nonequilibrium Statistical Mechanics in One Dimension. Vladimir Privman, Ed. Cambridge University Press, New York, 1997. xviii, 470 pp., illus. $100. ISBN 0-521-55974-x.

Opportunities in Chemistry Careers. John H. Woodburn. VGM Career Horizons (NTC Publishing Group), Lincolnwood, IL, 1997. xvi, 144 pp. $14.95, ISBN 0-8442-4653-0; paper, $11.95, ISBN 0-8442-4654-9. VGM Career Opportunities.

The Origins and Consequences of Obesity. Derek J. Chadwick and Gail Cardew, Eds. Wiley, New York, 1997. x, 278 pp., illus. $84.95. ISBN 0-471-96506-5. Ciba Foundation Symposium 201. From a symposium, Kingston, Jamaica, Nov. 1995.

PCR. Essential Techniques. J. F. Burke, Ed. Wiley, New York, 1997. xiv, 153 pp., illus. Spiralbound, $23.95. ISBN 0-471-95697-x.

Plant Dormancy. Physiology, Biochemistry, and Molecular Biology. G. A. Lang, Ed. CAB International, Oxford, UK, 1997. xx, 386 pp., illus. $100. ISBN 0-85198-978-0. Based on a symposium, Corvallis, OR.

Possible Health Effects of Exposure to Residential Electric and Magnetic Fields. Committee on the Possible Effects of Electromagnetic Fields and Magnetic Fields, National Research Council. National Academy Press, Washington, DC, 1997. xxii, 356 pp., illus. $39.95. ISBN 0-309-05447-8.

Protein Folding. C. M. Dobson and A. R. Fersht, Eds. Cambridge University Press, New York, 1996. iv, 119 pp., illus. Paper, $27.95. ISBN 0-521-57636-9. Reprinted from the Philosophical Transactions of the Royal Society of London, series B, vol. 348, no. 1323 (1995). From a discussion, Oct. 1994.

QCD and Collider Physics. R. K. Ellis. W. J. Stirling, and B. R. Weber. Cambridge University Press, New York, 1997. xiv, 435 pp., illus. $49.95. ISBN 0-521-58189-3. Cambridge Monographs on Particle Physics, Nuclear Physics and Cosmology, 8.

The Recovery of Unconscious Memories. Hypermnesia and Reminiscence. Matthew Hugh Erdelyi. University of Chicago Press, Chicago, 1997. xx, 243 pp., illus. $28.95 or £23.25. ISBN 0-226-21660-8. John D. and Catherine T. MacArthur Foundation Series on Mental Health and Development.

Semiclassical Physics. Matthias Brack and Rajat K. Bhaduri. Addison-Wesley, Reading, MA, 1997. xviii, 443 pp., illus. $89.95. ISBN 0-201-48351-3. Frontiers in Physics, vol. 96.

2025. Scenarios of US and Global Society Reshaped by Science and Technology. Joseph F. Coates, John B. Mahaffie, and Andy Hines. Published for Coates and Jarratt by Oakhill Press, Greensboro, NC, 1997. viii, 517 pp., illus. $27.95. ISBN 1-886939-09-8.

Why Aren't Black Holes Black? The Unanswered Questions at the Frontiers of Science. Robert Hazen, with Maxine Singer. Anchor (Doubleday), New York, 1997. xxii, 313 pp. Paper, $12.95 or C$17.95. ISBN 0-385-48014-8.