Kristian Birkeland: The First Space Scientist FREE

Hans C. Stenbaek-Nielsen

Physics Today **59** (6), 65 (2006);
https://doi.org/10.1063/1.2218562

Zeiss projectors were relatively expensive at this period. It was the dream of American entrepreneur, educator, and astronomy enthusiast Armand N. Spitz to make planetarium projectors widely available around the world. Although he was not the first to conceive of or manufacture the so-called pinhole projector, Spitz successfully brought it to a broad audience after World War II. By 1945, he had built his model-A projector at his home; it projected about 1000 stars whose brightness extended down to the fourth magnitude. Eight years later, he had sold his 100th projector worldwide.

Although Spitz projectors fueled an increase in planetarium building, it was *Sputnik I* and *Sputnik II* that greatly expanded the market for his machines. The launch of those Soviet satellites prompted lawmakers to pour money into science education in unprecedented amounts. The planetarium, as Marché argues, acquired a novel and major significance in the US, and hundreds were built for schools and colleges. Planetaria were also put to new use in the 1960s—for example, as training aids for the Apollo astronauts.

But Marché does not focus on just the hardware and its builders. He also explores in detail the kinds of presentations visitors could experience in planetaria and the reasons for the shifts in their content over the years. A particularly interesting development was the first planetarium light show. As Marché recounts, the light shows grew out of a series of sound experiments in the late 1950s by composer Henry Jacobs and filmmaker Jordan Belson in San Francisco's Morrison Planetarium. The Vortex performances, as they were termed, soon became very controversial and sparked debate about the appropriate and inappropriate uses of planetaria. Marché also traces the establishment of a community of planetarium operators, lecturers, and managers and their attempts to develop professional standards and journals. He pays attention to the composition and nature of the workforce; in so doing, he demonstrates the field's depressing extent of discrimination against women, particularly in the 1930s and 1940s.

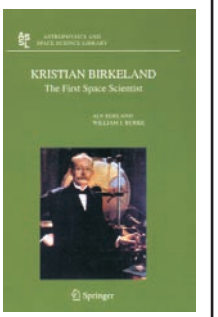
Although the prose in *Theaters of Time and Space* occasionally reflects the book's origins as a doctoral thesis, the author's arguments are clear and flow from a great deal of careful research that includes an impressive use of archives. Marché has written an original and significant study that sets the development of planetaria in a broad context. His book deserves a wide readership beyond planetarium specialists.

Robert W. Smith
University of Alberta
Edmonton, Canada

Kristian Birkeland: The First Space Scientist

Alv Egeland and William J. Burke
Springer, New York, 2005. $109.00 (221 pp.). ISBN 1-4020-3293-5

In the media the launch of *Sputnik I* often defines the beginning of the space age and the associated exploration of space beyond Earth. However, the roots of space physics itself go farther back. In *Kristian Birkeland: The First Space Scientist*, Alv Egeland and William Burke, both well-established space physicists, present the scientific work of the Norwegian physicist.



Birkeland (1867–1917) is a major figure in Norwegian science but is less well known outside Scandinavia. Although his insight and understanding of classical electromagnetic theory were remarkable—he provided one of the first general solutions to Maxwell's equations—he chose to apply his talents to experimental physics, and his primary interest was auroral research. He obtained significant funding from the Norwegian government for an ambitious observational program. At the time Norway was part of Sweden, and Birkeland, in his grant application, appealed in part to nationalistic feelings by arguing that it was important to show that Norwegian science was at the forefront internationally.

Birkeland was also an entrepreneur. He realized that additional income from applied projects was needed to support his basic research. He formed or participated in numerous enterprises, including the building of an electromagnetic rail gun that he tried to sell to the English and French governments, but it was his method for making fertilizer that brought him financial independence. His business ventures are interesting reading, and I found myself reflecting on the similarities between Birkeland's approach and how scientists today try to fund space research at universities.

new books

Biological and Medical Physics

Soft Condensed Matter Physics in Molecular and Cell Biology. W. C. K. Poon, D. Andelman. *Scottish Graduate Series 59*. Proc. lecture, Edinburgh, UK, Mar.–Apr. 2004. CRC Press/Taylor & Francis, Boca Raton, FL, 2006. $79.95 (325 pp.). ISBN 0-7503-1023-5

Chemical Physics

Group Theory with Applications in Chemical Physics. P. W. M. Jacobs. Cambridge U. Press, New York, 2005. $95.00 (485 pp.). ISBN 0-521-64250-7

Computers and Computational Physics

Computer Simulation Studies in Condensed-Matter Physics XVII. D. P. Landau, S. P. Lewis, H.-B. Schüttler, eds. *Springer Proceedings in Physics 103*. Proc. wksp., Athens, GA, Feb. 2004. Springer, New York, 2006. $179.00 (284 pp.). ISBN 3-540-26564-3

An Introduction to Programming with IDL®: Interactive Data Language. K. P. Bowman. Academic Press/Elsevier, Burlington, MA, 2006. $49.95 *paper* (286 pp.). ISBN 0-12-088559-X

Numerical Solution of Partial Differential Equations on Parallel Computers. A. M. Bruaset, A. Tveito, eds. *Lecture Notes in Computational Science and Engineering 51*. Springer, New York, 2006. $89.95 *paper* (482 pp.). ISBN 3-540-29076-1

Quantum Annealing and Related Optimization Methods. A. Das, B. K. Chakrabarti, eds. *Lecture Notes in Physics 679*. Springer, New York, 2005. $79.95 (376 pp.). ISBN 3-540-27987-3

Solving PDEs in C++: Numerical Methods in a Unified Object-Oriented Approach. Y. Shapira. *Computational Science and Engineering*. SIAM, Philadelphia, 2006. $125.00 *paper* (500 pp.). ISBN 0-89871-601-2

Condensed Matter Physics

Decoherence, Entanglement, and Information Protection in Complex Quantum Systems. V. M. Akulin, A. Sarfati, G. Kurizki, S. Pellegrin, eds. *NATO Science Series 2: Mathematics, Physics, and Chemistry 189*. Proc. wksp., Les Houches, France, Apr. 2004. Springer, Dordrecht, the Netherlands, 2005. $259.00 (703 pp.). ISBN 1-4020-3281-1

Defects in High-κ Gate Dielectric Stacks: Nano-Electronic Semiconductor Devices. E. Gusev, ed. *NATO Science Series 2: Mathematics, Physics, and Chemistry 220*. Springer, Dordrecht, the Netherlands, 2006. $209.00 (492 pp.). ISBN 1-4020-4365-1

Local-Moment Ferromagnets: Unique Properties for Modern Applications. M. Donath, W. Nolting, eds. *Lecture Notes in Physics 678*. Springer, New York, 2005. $79.95 (329 pp.). ISBN 3-540-27286-0

Quantum Dots: Research Developments. P. A. Ling, ed. *Horizons in World Physics 251*. Nova Science, Hauppauge, NY, 2005. $129.00 (261 pp.). ISBN 1-59454-406-9

Semiconductor Macroatoms: Basic Physics and Quantum-Device Applications. F. Rossi, ed. Imperial College Press, London, 2005. $58.00 (319 pp.). ISBN 1-86094-608-9

Cosmology and Relativity

100 Years of Relativity: Space-Time Structure: Einstein and Beyond. A. Ashtekar, ed. World Scientific, Hackensack, NJ, 2005. $88.00 (510 pp.). ISBN 981-256-394-6

Einstein, 1905–2005: Poincaré Seminar 2005. T. Damour, O. Darrigol, B. Duplantier, V. Rivasseau, eds. *Progress in Mathematical Physics 47*. Birkhäuser, Boston, 2006. $99.00 (293 pp.). ISBN 3-7643-7435-7

Physical Foundations of Cosmology. V. Mukhanov. Cambridge U. Press, New York, 2005. $70.00 (421 pp.). ISBN 0-521-56398-4

Statistical Physics for Cosmic Structures. A. Gabrielli, F. Sylos Labini, M. Joyce, L. Pietronero. Springer, New York, 2005. $89.95 (424 pp.). ISBN 3-540-40745-6

Device Physics

Continuous-Time Sigma-Delta A/D Conversion: Fundamentals, Performance Limits, and Robust Implementations. M. Ortmanns, F. Gerfers. *Springer Series in Advanced Microelectronics 21*. Springer, New York, 2006. $149.00 (242 pp.). ISBN 3-540-28406-0

High Energy Density and High Power RF. D. K. Abe, G. S. Nusinovich, eds. *AIP Conference Proceedings 807*. Proc. wksp., Kalamata, Greece, June 2005. AIP, Melville, NY, 2006. $175.00 (504 pp.). ISBN 0-7354-0298-1, *CD-ROM*

Microfluidics for Biotechnology. J. Berthier, P. Silberzan. *Microelectromechanical Systems Series.* Artech House, Norwood, MA, 2006. $109.00 (345 pp.). ISBN 1-58053-961-0

Nanoelectronics: Principles and Devices. M. Dragoman, D. Dragoman. *Nanotechnology Series*. Artech House, Norwood, MA, 2006. $89.00 (426 pp.). ISBN 1-58053-694-8

Optical Imaging Sensors and Systems for Homeland Security Applications. B. Javidi, ed. *Advanced Sciences and Technologies for Security Applications 2*. Springer, New York, 2006. $149.00 (416 pp.). ISBN 0-387-26170-2

Energy and Environment

Coal Combustion Byproducts and Environmental Issues. K. S. Sajwan,