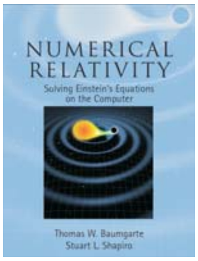
methods have perhaps had their greatest impact in simulations of binary systems of such compact objects as neutron stars and black holes and in models of the gravitational waves such systems produce as they spiral toward a collision.

Colliding binary systems are expected to be major sources of gravitational waves that could be detected and analyzed with ground-based interferometric detectors including LIGO in the US and VIRGO in Europe. Gravitational waves that result from the collision of supermassive black holes might be detected by the space-based LISA observatory, a joint proposal of NASA and the European Space Agency. Detailed models of the gravitational waveforms not only will aid in their initial detection but, perhaps more importantly, will be vital to establishing the field of gravitational-wave astronomy as wave detection becomes routine and wave detectors are used alongside ordinary telescopes to survey the sky.

A large community of researchers worldwide has been working in numerical relativity since the late 1980s. For a long time, it faced serious challenges in simulating stable evolutions of binary systems. That task is subtle because the binaries lose a very small fraction of energy in the emission of gravitational waves; as a result, their separation decreases on a time scale much greater than one orbital period. In 2005, however, a series of breakthroughs led to computer programs that have successfully evolved binary systems. And now that the field has matured, books on the subject are starting to appear.

Thomas Baumgarte and Stuart Shapiro have been collaborating on several frontline topics since 1996 and are major players in the field. Their book, *Numerical Relativity: Solving Einstein's Equations on the Computer*, is a well-written overview that includes a brief introduction to general relativity, a primer on setting up initial data from the theory, and tips on dealing with matter sources of a gravitational field. The authors also introduce the most commonly used numerical-relativity tools, including spectral methods and the mesh refinement techniques used to normalize the many scales involved in relativistic simulations. They particularly address the issue of how to cast the Einstein equations in manifestly hyperbolic form, which would make them treatable by well-established mathematical and numerical techniques.



Numerical Relativity starts with a review of general relativity and Einstein's field equations, including an introduction to gravitational waves and black holes, which both receive their own chapters later in the book. After a brief detour to discuss rotating stars and spherically and cylindrically symmetric collisionless clusters, the book moves on to discuss the central topics of binary black hole and neutron-star evolution. By including exercises, the authors aim to make *Numerical Relativity* useful as a graduate-level textbook and not just a reference. That feature, and the text's coverage of neutron stars, distinguishes it from the other comprehensive treatments of the subject, including *Introduction to 3 + 1 Numerical Relativity* (Oxford University Press, 2008) by Miguel Alcubierre and *Elements of Numerical Relativity and Relativistic Hydrodynamics: From Einstein's Equations to Astrophysical Simulations* (Springer, 2009) by Carles Bona, Carlos Palenzuela-Luque, and Carles Bona-Casas.

The text assumes that the reader has a solid understanding of general relativity, but in their preface, the authors wonder whether their book would also be useful to readers—mathematicians or computer scientists, for example—who might be interested in numerical relativity but who don't have a solid grounding in Einstein's theory. It is difficult to imagine that a book covering a field at the intersection of multiple disciplines could please all possible audiences. Nonetheless, *Numerical Relativity* hits the mark in its quite comprehensive coverage; it will be useful to practitioners in the field and especially to graduate students wishing to join them in this active and exciting area of research.

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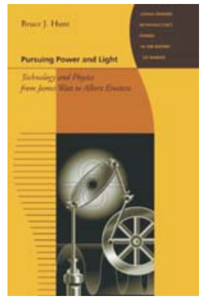
Pursuing Power and Light

Technology and Physics from James Watt to Albert Einstein

Bruce J. Hunt
Johns Hopkins U. Press, Baltimore, MD, 2010. $45.00 (182 pp.). ISBN 978-0-8018-9358-2

Bruce Hunt's fine introduction to the history of physics in the 19th century is couched in a long tradition of studies linking science and technology. As is common in this tradition, science and scientists are more central to *Pursuing Power and Light: Technology and Physics from James Watt to Albert Einstein* than are technology, engineers, or inventors. The book's strong treatment of thermodynamics, kinetic theory, and electromagnetism befits the author of *The Maxwellians* (Cornell University Press, 1991) and one of the foremost authorities on James Clerk Maxwell and his followers.

For historians of science and technology, *Pursuing Power and Light* breaks no new ground. Hunt takes us through such familiar territory as the problems posed by steam engines and the search for increased fuel efficiency; the construction of new theories of heat and the emergence of the kinetic theory of gases; the successive formulations of what would become the first and second laws of thermodynamics; and the lengthy campaign to integrate new discoveries about magnetism and electricity into the classical worldview. Most of the usual suspects show up: Sadi Carnot, James P. Joule, Pierre Simon Laplace, Maxwell, William Thomson (Lord Kelvin), Hermann von Helmholtz, and others. The book is an excellent guide to this well-trodden terrain, particularly for students who will have heard the names in passing but have little sense of how they relate to one another or to the larger structure of physical theory.



Throughout the book, technology and engineering are used to stir the physicists to action, but are not examined or explained on their own merits. In that way, Hunt unfortunately follows many of the historians of physics before him. His attempts to highlight technology and engineering, with such chapters as "Steam and Work" and "Electric Power and Light," fall short. For example, sidebars embedded in the text serve to sketch out the workings of the three basic models of 18th-century steam engines, but readers are left with the impression that nothing important happens in steam-engine design after James Watt's condenser and Richard Trevithick's high-pressure engines. The reader never learns that, thanks in no small part to the thermodynamics that emerged from the efforts to improve them, the steam engines of the middle and late 19th century barely resembled those of earlier generations.

The situation gets a bit more complicated when Hunt links electrical theory to practice, first in telegraphy and then in light and power systems. But there too, his sure-footed and sometimes even elegant exposition of theory gives way to rather spotty and arbitrary discussions of the technical challenges that remade communications and light in the second half of the 19th century. Telegraphy, because of Thomson's central role in it, does not fare too badly, although telephony—and the wonderful linkage between acoustics and electricity that it represents—is ignored altogether.

The chapter on electric light and power is surprisingly out of focus. For example, we learn about electric chairs and some of the messier public battles between advocates of DC and AC electric systems, but remarkably little about how the hard problems of power transmission, load balancing, and generator design were solved. There is a nice discussion of how electrical engineering education in some countries originated in physics departments, but almost nothing about electrical engineering as a discipline. Readers will look in vain for the name of Charles P. Steinmetz in the book's index, despite his standing as the archetypal and most famous electrical engineer of the first professional generation.

These shortcomings do not detract from the book's core value—*Pursuing Power and Light* is the best and most up-to-date treatment, especially for undergraduates, of the key concepts and figures of 19th-century physics. Hunt's writing style is very readable, his explanations are clear without being condescending, and when he is on comfortable ground, as when discussing Maxwell and his followers, there is no one better.

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new books

acoustics

Shallow-Water Acoustics. J. Simmen et al., eds. *AIP Conference Proceedings 1272*. Proc. conf., Shanghai, China, Sept. 2009. AIP, Melville, NY, 2010. $248.00 (475 pp.). ISBN 978-0-7354-0822-7

astronomy and astrophysics

Annual Review of Astronomy and Astrophysics. Vol. 48. R. Blandford, S. M. Faber, E. van Dishoeck, J. Kormendy, eds. Annual Reviews, Palo Alto, CA, 2010. $84.00 (723 pp.). ISBN 978-0-8243-0948-0

Astronomy with Radioactivities. R. Diehl, D. H. Hartmann, N. Prantzos, eds. *Lecture Notes in Physics 812*. Springer, Berlin, 2011. $119.00 *paper* (564 pp.). ISBN 978-3-642-12697-0

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Deciphering the Ancient Universe with Gamma-Ray Bursts. N. Kawai, S. Nagataki, eds. *AIP Conference Proceedings 1279*. Proc. symp., Kyoto, Japan, Apr. 2010. AIP, Melville, NY, 2010. $279.00 *paper* (514 pp.). ISBN 978-0-7354-0829-6

Galaxy Formation and Evolution. H. Mo, F. van den Bosch, S. White. Cambridge U. Press, New York, 2010. $85.00 (820 pp.). ISBN 978-0-521-85793-2

Go-To Telescopes Under Suburban Skies. N. Monks. *Patrick Moore's Practical Astronomy Series*. Springer, New York, 2010. $34.95 *paper* (260 pp.). ISBN 978-1-4419-6850-0

Graduate School in Astronomy. R. A. Dupke, S. Daflon, J. Alcaniz, R. de la Reza, eds. *AIP Conference Proceedings 1268*. Proc.