

Hodgkin–Huxley equations that model the ionic currents that trigger electrical pulses in neurons, and various simplifications, such as the FitzHugh–Nagumo equations. Schiff shows that such simplified models often lead to effective controls of neuronal activity.

Chapter 6 deals with a population model of large-scale neuronal activity, the Wilson–Cowan equations, which Hugh Wilson and I developed in the early 1970s. That model is essentially a spatiotemporal extension of equations like FitzHugh–Nagumo, and Schiff shows how a Kalman filter approach can be efficiently used to control the dynamics of circuits described by FitzHugh–Nagumo type equations. Chapters 7 and 8 deal with the construction of ab initio models and filters based directly on data assimilation and with model inadequacies. Chapter 7 discusses the utility of techniques that take data and abstract from it uncorrelated, linear sets that carry the essential information in the original data; those sets can then be used in a Kalman filter approach. Included examples illustrate applications to image analysis, both static and dynamic, and to the analysis of spatiotemporal brain activity.

I found *Neural Control Engineering* to be extremely interesting and well written. I have only two minor caveats. There is too little about the Wiener–Kolmogorov filters. And in chapter 11, the technique of reducing the resistive tree structure of a neural dendrite to an equivalent cylinder is introduced with no citation of Wilfrid Rall’s 1950s introduction of the method—Rall’s approach is based on impedance matching. Apart from those caveats, the book is a gold mine for anyone interested in learning how to model—and control—brain activity.

Jack Cowan
University of Chicago
Illinois

Physics Around Us How and Why Things Work

Ernest M. Henley and
J. Gregory Dash
World Scientific, Hackensack, NJ,
2012. \$34.00 (384 pp.).
ISBN 978-981-4350-63-1

The Transition School at the University of Washington each year offers courses to as many as 16 talented middle school students to prepare them for direct entry into university classes. Among those offerings is a one-year, algebra-based, introductory physics course

that was taught by Ernest Henley and the late J. Gregory Dash. The contents of that course now appear as a short textbook, *Physics Around Us: How and Why Things Work*.

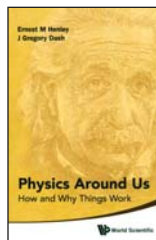
When compared with most introductory texts covering the same subject, *Physics Around Us* has two big pluses: Listed at \$34, it is cheap; coming in under 400 pages, it is short. The widely used algebra-based text *College Physics* (eighth edition, Brooks/Cole, 2009) by Raymond Serway, Chris Vuille, and Jerry Faughn is more than 1100 pages long and is listed at \$285. A large market probably exists for short, inexpensive textbooks such as *Physics Around Us*.

Unfortunately, though, as much as I wanted to like the book, I cannot recommend it. *Physics Around Us* has a lot of errors. Most of them are small, but they are troublesome nonetheless. The worst error appears early in the book, on pages 47–48, in the discussion of an object falling through a fluid. The authors write, “A falling body is acted on by both gravity and air resistance, so the acceleration a is given by $ma = mg - kv$. Since $v = at$, we have: $ma = mg - kat$.”

As PHYSICS TODAY readers will realize, that is wrong. The authors assume a formula for velocity that is correct only for constant-acceleration motion. They use the incorrect expression for velocity to derive an incorrect formula for acceleration as a function of time. I realize that the textbook is for students who haven’t taken calculus, but it would be much better to simply state the correct result without proof than to use faulty mathematics to get the wrong one.

In the same discussion, the authors state that at very low speeds, the resistance of an object in a fluid is proportional to the velocity. That is the form of drag force that they consider in the text. While that is true in the low Reynolds number regime, in most real-world cases the drag force is proportional to velocity squared. If you take that more realistic approach, you can derive the correct expression for terminal velocity without using calculus by equating the drag force with the weight of the falling body. The bonus is that it also shows how terminal velocity depends on fluid density, mass, and surface area. There’s a lot more physics in that approach than the approach taken by the authors.

Space prevents me from discussing all the errors, but there are enough that



Charge Sensitive Preamplifiers

CoolFET®



Noise @ 0 pF: 670 eV FWHM (Si)
~76 electrons RMS

Noise Slope: 13 eV/pF with Low C_{iss} FET
11.5 eV/pF with high C_{iss} FET

Fast Rise Time: 2.5 ns

FEATURES

- Thermoelectrically Cooled FET
- 3 internal FETs to match detector
- Lowest Noise and Noise Slope
- AC or DC coupling to the detector
- Both Energy and Timing outputs
- Optional input protection
- Easy to use

STATE-OF-THE-ART A250



External FET

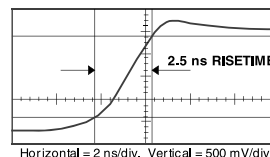
FET can be cooled

Noise: <100 e⁻ RMS (Room Temp.)
<20 e⁻ RMS (Cooled FET)

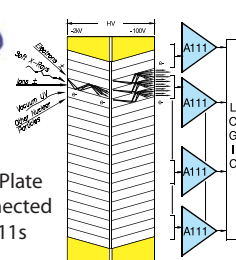
Gain-Bandwidth $f_c > 1.5$ GHz

Power: 19 mW typical

Slew rate: >475 V/μs



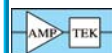
THE INDUSTRY STANDARD A111



A Microchannel Plate
(MCP) Array Connected
to Multiple A111s

AMPTeK - Your complete
source for high performance
preamplifiers and amplifiers

Visit Us Now
www.amptek.com



AMPTeK INC.

sales@amptek.com www.amptek.com

I would think twice before using the book. Examples of simple mistakes include incorrect values listed for the lowest temperature ever achieved and for the proton-to-electron mass ratio. Two other issues are that many of the qualitative questions are poorly worded and their sample solutions are sometimes wrong or highly misleading. Those errors point to a lack of attention to detail and to poor editing.

After reading the book, I got a new appreciation for just how well written and well edited the large, expensive textbooks are. Yes, the prices are high, but you're paying for the work of authors vetted by a large publishing house and its problem writers, photographers, numerous editors, and several reviewers. But, you might say, \$200 is a lot to spend on a textbook, no matter how well written. The teacher can do much to compensate for the problems with a book like *Physics Around Us*, so why not use it when cost is an issue?

There are better options. OpenStax College offers *College Physics*, a free online textbook at the same level; readers have the option to pay roughly \$50 to get a bound copy. That book is 1270 pages long and devotes lots of space to real-world examples, problem-solving tactics, and links to Web-based applications. It also includes good illustrations. And the section on the drag force—or any other comparable section—is much better written and more accurate than the discussion in *Physics Around Us*. There is no question which book I would choose to use.

Charles Adler
Saint Mary's College of Maryland
Saint Mary's City

new books

astronomy and astrophysics

From Black Clouds to Black Holes. 3rd ed. J. V. Narlikar. *World Scientific Series in Astronomy and Astrophysics* 13. World Scientific, Hackensack, NJ, 2012 [1995]. \$58.00 (202 pp.). ISBN 978-981-4350-37-2

The Ninth Pacific Rim Conference on Stellar Astrophysics. S. Qian, K.-C. Leung, L. Zhu, S. Kwok, eds. *Astronomical Society of the Pacific Conference Series* 451. Proc. conf., Lijiang, China, Apr. 2011. Astronomical Society of the Pacific, San Francisco, 2012. \$77.00 (360 pp.). ISBN 978-1-58381-784-1

One-Shot Color Astronomical Imaging: In Less Time, for Less Money! L. A. Kennedy. *Patrick Moore's Practical Astronomy Series*. Springer, New York, 2012. \$39.95 paper (191 pp.). ISBN 978-1-4614-3246-3

Planetary Systems Beyond the Main Sequence. S. Schuh, H. Drechsel, U. Heber, eds. *AIP Conference Proceedings* 1331. Proc. conf., Bamberg, Germany, Aug. 2010. AIP, Melville, NY, 2011. \$146.00 paper (359 pp.). ISBN 978-0-7354-0886-9

The Star Atlas Companion: What You Need to Know About the Constellations. P. M. Bagnall. *Springer-Praxis Books in Popular Astronomy*. Praxis/Springer, New York, 2012. \$44.95 paper (486 pp.). ISBN 978-1-4614-0829-1

The Synthesis of the Elements: The Astrophysical Quest for Nucleosynthesis and What It Can Tell Us About the Universe. G. Shaviv. *Astrophysics and Space Science Library* 387. Springer, Berlin, 2012. \$229.00 (684 pp.). ISBN 978-3-642-28384-0

atomic and molecular physics

Processes in Isotopes and Molecules (PIM 2011). M. D. Lazar, ed. *AIP Conference Proceedings* 1425. Proc. conf., Cluj-Napoca, Romania, Oct. 2011. AIP, Melville, NY, 2012. \$140.00 paper (195 pp.). ISBN 978-0-7354-1005-3

biological and medical physics

Annual Review of Biophysics. Vol. 41. D. C. Rees, K. A. Dill, J. R. Williamson, eds. Annual Reviews, Palo Alto, CA, 2012. \$89.00 (613 pp.). ISBN 978-0-8243-1841-3

Correction Techniques in Emission Tomography. M. Dawood, X. Jiang, K. Schäfers, eds. *Series in Medical Physics and Biomedical Engineering*. CRC Press/Taylor & Francis, Boca Raton, FL, 2012. \$119.95 (265 pp.). ISBN 978-1-4398-1298-3

Migration on Wings: Aerodynamics and Energetics. L. Kantha. *Springer Briefs in Applied Sciences and Technology*. Springer, Heidelberg, 2012. \$49.95 paper (83 pp.). ISBN 978-3-642-27924-9

Molecular Theory of the Living Cell: Concepts, Molecular Mechanisms, and Biomedical Applications. S. Ji. Springer, New York, 2012. \$219.00 (748 pp.). ISBN 978-1-4614-2151-1

Patch Clamp Techniques: From Beginning to Advanced Protocols. Y. Okada, ed. *Springer Protocols Handbooks*. Springer, Tokyo, 2012. \$139.00 (439 pp.). ISBN 978-4-431-53992-6

Principles of Diffuse Light Propagation: Light Propagation in Tissues with Applications in Biology and Medicine. J. R. Lorenzo. World Scientific, Hackensack, NJ, 2012. \$118.00 (336 pp.). ISBN 978-981-4293-76-1

computers and computational physics

2nd International Conference on Methods and Models in Science and Technology (ICM2ST-11). R. B. Patel, B. P. Singh,

eds. *AIP Conference Proceedings* 1414. Proc. conf., Jaipur, India, Nov. 2011. AIP, Melville, NY, 2011. \$151.00 paper (272 pp.). ISBN 978-0-7354-0991-0

Advances in Mathematical and Computational Methods: Addressing Modern Challenges of Science, Technology, and Society. I. Kotsireas, R. Melnik, B. West, eds. *AIP Conference Proceedings* 1368. Proc. conf., Waterloo, Canada, July 2011. AIP, Melville, NY, 2011. \$169.00 (333 pp.). ISBN 978-0-7354-0928-6

Linear-Scaling Techniques in Computational Chemistry and Physics: Methods and Applications. R. Zalesny, M. G. Papadopoulos, P. G. Mezey, J. Leszczynski, eds. *Challenges and Advances in Computational Chemistry and Physics* 13. Springer, New York, 2011. \$309.00 (513 pp.). ISBN 978-90-481-2852-5

condensed-matter physics

15th International Conference on Narrow Gap Systems (NGS15). G. A. Khodaparast, M. B. Santos, C. J. Stanton, eds. *AIP Conference Proceedings* 1416. Proc. conf., Blacksburg, VA, Aug. 2011. AIP, Melville, NY, 2011. \$133.00 paper (200 pp.). ISBN 978-0-7354-0993-4

Exciton Polaritons in Microcavities: New Frontiers. D. Sanvitto, V. Timofeev, eds. *Springer Series in Solid-State Sciences* 172. Springer, Berlin, 2012. \$179.00 (401 pp.). ISBN 978-3-642-24185-7

Lectures on the Physics of Strongly Correlated Systems XV. A. Avella, F. Mancini, eds. *AIP Conference Proceedings* 1419. Proc. course, Vietri sul Mare, Italy, Oct. 2010. AIP, Melville, NY, 2011. \$150.00 (277 pp.). ISBN 978-0-7354-0996-5

Modern Theories of Many-Particle Systems in Condensed Matter Physics. D. C. Cabra, A. Honecker, P. Pujol, eds. *Lectures Notes in Physics* 843. Springer, Berlin, 2012. \$89.95 paper (368 pp.). ISBN 978-3-642-10448-0

Quantum Dissipative Systems. 4th ed. U. Weiss. World Scientific, Hackensack, NJ, 2012 [2008]. \$84.00 paper (566 pp.). ISBN 978-981-4374-91-0

cosmology and relativity

3+1 Formalism in General Relativity: Bases of Numerical Relativity. É. Gourgoulhon. *Lecture Notes in Physics* 846. Springer, Berlin, 2012. \$59.95 paper (294 pp.). ISBN 978-3-642-24524-4

VIII Workshop of the Gravitation and Mathematical Physics Division of the Mexican Physical Society. L. A. Ureña-López et al., eds. *AIP Conference Proceedings* 1396. Proc. wksp., Tuxtla Gutiérrez, Mexico, Nov. 2010. AIP, Melville, NY, 2011. \$135.00 paper (220 pp.). ISBN 978-0-7354-0969-9

The Twelfth Marcel Grossmann Meeting. Parts A–C. T. Damour, R. T. Jantzen,