BOOK REVIEWS

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Just in Time Teaching. Gregor M. Novak, Evelyn T. Patterson, Andrew D. Gavrin, and Wolfgang Christian. 208 pp. Prentice–Hall, Upper Saddle River, NJ, 1999. Price: $22.00 ISBN 0-13-085034-9. (Kyle Forinash, Reviewer.)

Finally someone has begun to figure out an effective way to use computers and the Internet constructively in the undergraduate curriculum. Until recently I've been really dissatisfied with the available computer software for the classroom and the ways most people seemed to be using the Internet for educational purposes. Just in Time Teaching (JiTT) is a series of essays based on classroom experience advocating an ''Active Learning'' method for the use of computers and the Internet in the introductory physics course. The authors also offer a collection of free software to supplement their approach. The book is certainly not the last word in this rapidly developing field but I do believe Novak and collaborators provide a first step in the right direction.

One component of the JiTT approach which is a nice contrast to commercial software is a collection of simulation JAVA applet programs called ''Physlets.'' Physlets have many benefits over commercially available software. First, the simulations are platform independent, since they run from a browser. Each Physlet is independent of the others, so you can use as many or as few as you like in your course, you don't have to buy into the whole package at once. They are freely downloadable so you (or your tech people) can put them on your own server. (In response to a question at the Winter AAPT meeting, W. Christian, who wrote many of the Physlets, publicly announced that he intends to maintain this policy in the future, in spite of the fact that the Physlets are currently being used by Prentice–Hall in conjunction with Giancoli's algebra-based physics text.) Christian has also indicated that he intends to keep updating and adding to the collection of available Physlets.

But the real genius of the 24 Physlets currently available is that they are scriptable. What does this mean and why is it important? If you dabble at all in html and Java you probably have become aware that there is a significant difference between JavaScript and JAVA. JAVA is a full featured programming language (similar to C++ but with a few restrictions having to do mainly with Internet security) that has to be compiled before the files can be downloaded to your browser. JavaScript is an interpreted language; the code is embedded in the web page and interpreted when the page is loaded and is much easier to work with than a compiled language (like JAVA) because you can easily debug it line by line. This allows you to ''learn as you go,'' which is more difficult with compiled languages.

So what does JavaScript have to do with the Physlets? The Physlets created by the JiTT team are full JAVA programs but they have been written so that many of the parameters and even the behavior of the applets can be modified by using JavaScript. For example, there is a projectile applet program with many nice features. Suppose you would like to modify the program to treat a simple falling body. You can easily do this with appropriate JavaScript commands, hiding buttons and text which are not needed for the particular example you wish to demonstrate. This is a very nice solution to the problem presented by many commercial software simulations, which so often don't do quite what you want them to. Many examples are given in the book and the associated web pages, which make modifying the available Physlets relatively straightforward.

Contrary to the expectations (and earnest hopes) of many administrators, the Internet is *not* going make it possible to teach thousands of students with only one faculty member. And anyone who has put up a web page for students knows that, without significant motivation, students will very rarely look more than once at what you post on your site (with the possible exception of grades), no matter how flashy it is. How then can we use the Internet effectively in physics education? Novak *et al.* again have come up with a very reasonable set of suggestions for making the Internet useful in a pedagogically sound way. For example, we all wish students would come to class better prepared, having read the chapter or maybe even having attempted the homework. The JiTT approach uses the Internet to promote that goal. Students are required to submit some homework (the Warm Up exercises) via the Internet, proving they have actually read the material before the class where the material will be discussed. The instructor gets these answers before preparing his/her lecture, and can therefore tailor the lecture to fit the existing knowledge level of the students. This is a marvelous idea; why not find out what the students already know before deciding what needs to be covered? As the authors point out, the Internet is a perfect tool for delivering material to students outside of the classroom, and this is a great application of that tool.

Some readers will be disappointed in the sparsity of technical details in the book, but there are other excellent books already on the market, many of them referenced in Just in Time Teaching, which supply the necessary detail for those who aren't yet sufficiently knowledgeable about html, JavaScript, and the like. The book is clear about the kinds of resources needed to support the JiTT approach, and I would advise anyone who wants to apply these techniques to get their administration to provide the proper technical support.

The only flaw I could find in the book has to do with verification of the effectiveness of the JiTT method. As the authors point out, a great deal is now known about how students learn physics. They include a nice discussion in the form of separate essays by each author with references to recent results from the Physics Education Research (PER) community, and they apply these concepts in the JiTT approach. Novak and colleagues are very well informed of the new approaches in active learning and have made these central in JiTT, undoubtedly to very good effect. Still, it would have been helpful if they had supplied some test scores from the Force Concept Inventory test, for example, so that readers could evaluate the effectiveness of their methods as compared, for instance, to the interactive lecture methods of Sokoloff and Thornton.[1] To their credit the authors indicate they intend to do a formal evaluation in the near future. In addition, many of the concepts they use are clearly imple-

mentations of methods already verified by others, so the core of the JiTT will undoubtedly survive any amount of fine tuning.

Readers should be aware that the authors make no attempt to address the question of laboratory use of computers. The book points out the utility of using the same delivery methods to ask prelaboratory questions, so that students are better prepared when they enter the lab, but a discussion of computerized data collection and analysis is not included.

Although this is clearly a work in progress, Just in Time Teaching is already a great resource to have on the shelf. There is a wealth of ideas on applications of computers and the Internet in an introductory physics class, and constructive hints on how best to use the software (which the authors are providing for free). You can use as much or as little as you wish of their method, since it lends itself easily to partial adoption. I recommend the book to anyone hoping to use technology more effectively in the classroom.

[1]D. R. Sokoloff and R. K. Thornton, ''Using Interactive Lecture Demonstrations to Create an Active Learning Environment,'' Phys. Teach. **35**, 340–347 (1997).

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BOOKS RECEIVED

Biomedical Uses of Radiation: Part A—Diagnostic Applications; Part B—Therapeutic Applications. Edited by William R. Hendee. 1358 pp. (2 vols). Wiley, New York, 1999. Price not given ISBN 3-527-29668-9.

Biomembrane Transport. Lon J. Van Winkle. 397 pp. Academic, San Diego, CA, 1999. Price: $99.95 ISBN 0-12-714510-9.

Conceptual Developments of 20th Century Field Theories (paperback edition). Tian Yu Cao. 434 pp. Cambridge U.P., New York, 1997, 1998. Price: $59.95 (cloth) ISBN 0-521-43178-6; $39.95 (paper) ISBN 0-521-63420-2. (Reviewed **65**, 804, 1997.)

Conceptual Foundations of Quantum Field Theory. Edited by Tian Yu Cao. 399 pp. Cambridge U.P., New York, 1999. Price: $100.00 ISBN 0-521-63152-1.

Cosmology and Particle Astrophysics. Lars Bergström and Ariel Goodbar. 344 pp. Wiley, New York, 1999. Price: $49.95 (paper) ISBN 0-471-97042-5.

Coulomb Screening by Mobile Charges: Applications to Materials Science, Chemistry, and Biology. Jean-Noël Chazalviel. 355 pp. Birkhäuser, Boston, MA, 1999. Price: $69.95 ISBN 0-8176-3950-0.

Extended Electromagnetic Theory: Space-Charge in Vacuo and the Rest Mass of the Photon. B. Lehnert and S. Roy. 160 pp. World Scientific, River Edge, NJ, 1998. Price: $32.00 ISBN 981-02-3395-7.

The Fire Within the Eye: A Historical Essay on the Nature and Meaning of Light (paperback edition). David Park, 377 pp. Princeton U.P., Princeton, NJ, 1997, 1999. Price: $16.95 ISBN 0-691-05051-1. (Reviewed **66**, 262, 1998.)

The Five Ages of the Universe: Inside the Physics of Eternity. Fred Adams and Greg Laughlin. 251 pp. Free Press, New York, 1999. Price: $25.00 ISBN 0-684-85422-8.

Fluid Metals: The Liquid-Vapor Transition of Metals. Friedrich Hensel and William W. Warren, Jr. 243 pp. Princeton U.P., Princeton, NJ, 1999. Price: $69.50 ISBN 0-691-05830-X.

Fluorescent and Luminescent Probes for Biological Activity: A Practical Guide to Technology for Quantitative Real-Time Analysis, 2nd ed. Edited by W. T. Mason. 647 pp. Academic, San Diego, CA, 1993, 1999. Price not given (paper) ISBN 0-12-447836-0.

Fundamentals in Chemical Physics (translation). Franco Battaglia and Thomas F. George. 315 pp. Kluwer, Norwell, MA, 1997, 1998. Price: $154.00 ISBN 0-7923-5214-9.

General Relativity: A Geometric Approach. Malcolm Ludvigsen. 217 pp. Cambridge U.P., New York, 1999. Price: $74.95 (cloth) ISBN 0-521-63019-3; $27.95 (paper) ISBN 0-521-63976-X.

Gnomon: From Pharaohs to Fractals. Midhat J. Gazalé. 259 pp. Princeton U.P., Princeton, NJ, 1999. Price: $29.95 ISBN 0-691-00514-1.

Inside Modernism: Relativity Theory, Cubism, Narrative. Thomas Vargish and Delo E. Mook. 185 pp. Yale U.P., New Haven, CT, 1999. Price: $30.00 ISBN 0-300-07613-4.

An Introduction to Semilinear Evolution Equations. Thierry Cazenave and Alain Haraux. 186 pp. Oxford U.P., New York, 1998. Price: $75.00 ISBN 0-19-850277-X.

Just-in-Time Teaching: Blending Active Learning with Web Technology. Gregor M. Novak *et al.* 188 pp. Prentice–Hall, Upper Saddle River, NJ, 1999. Price not given (paper) ISBN 0-13-085034-9.

Natural Focusing and the Fine Structure of Light: Caustics and Wave Dislocations. J. F. Nye. 328 pp. Institute of Physics, Philadelphia, PA, 1999. Price: $45.00 ISBN 0-7503-0610-6.

Nonlinear Optics in Metals. Edited by K. H. Bennemann. 486 pp. Oxford U.P., New York, 1998. Price: $155.00 ISBN 0-19-851893-5.

Optics of Light Scattering Media: Problems and Solutions. Alexander Kokhanovsky. 217 pp. Wiley, New York, 1999. Price: $149.00 ISBN 0-471-97260-6.

PCR Applications: Protocols for Functional Genomics. Edited by Michael A. Innis *et al.* 566 pp. Academic, San Diego, CA, 1999. Price: $59.95 (paper) ISBN 0-12-372186-5.

The Physics of Block Copolymers. Ian W. Hamley. 424 pp. Oxford U.P., New York, 1998. Price: $150.00 ISBN 0-19-850218-4.

The Physics of Stars, 2nd ed. A. C. Phillips. 246 pp. Wiley, New York, 1994, 1999. Price not given (paper) ISBN 0-471-98798-0.

Polymers at Surfaces and Interfaces. Richard A. L. Jones and Randal W. Richards. 377 pp. Cambridge U.P., New York, 1999. Price: $90.00 (cloth) ISBN 0-521-47440-X; $39.95 (paper) ISBN 0-521-47965-7.

Principles of Nonlinear Optical Spectroscopy (paperback edition). Shaul Mukamel. 543 pp. Oxford U.P., New York, 1995, 1999. Price: $55.00 (paper) ISBN 0-19-513291-2.

Quantum Philosophy: Understanding and Interpreting Contemporary Science. Roland Omnès. 296 pp. Princeton U.P., Princeton, NJ, 1999. Price: $29.95 ISBN 0-691-02787-0.

Quasars and Active Galactic Nuclei: An Introduction. Ajit K. Kembhavi and Jayant V. Narlikar. 463 pp. Cambridge U.P., New York, 1999. Price: $80.00 (cloth) ISBN 0-521-47477-9; $34.95 (paper) ISBN 0-521-47989-4.

Science Without Laws. Ronald N. Giere. 285 pp. University of Chicago Press, Chicago, 1999. Price: $25.00 ISBN 0-226-29208-8.

Spectral/*hp* Element Methods for CFD. George Em Karniadakis and Spencer J. Sherwin. 390 pp. Oxford U.P., New York, 1999. Price: $75.00 ISBN 0-19-510226-6.

Testing Quantum Mechanics on New Ground. Partha Ghose. 208 pp. Cambridge U.P., New York, 1999. Price: $64.95 ISBN 0-521-55463-2.

The Topology of Fibre Bundles (paperback edition). Norman Steenrod, 229 pp. Princeton U.P., Princeton, NJ, 1951, 1999. Price: $19.95 ISBN 0-691-00548-6.

The Victorian Amateur Astronomer: Independent Astronomical Research in Britain, 1820–1920. Allan Chapman. 428 pp. Wiley, New York, 1998. Price not given ISBN 0-471-96257-0.