rent status of the field of quantum information theory, and attempts to bridge the quantum–classical divide. For the most part, they avoid equations. Nevertheless, the arguments require some prior knowledge of quantum theory. Each chapter offers many references to the relevant literature that will help students read further.

The reappraisal suggested in the book provides a fresh perspective on Einstein's work in light of researchers' current best understanding of quantum physics. It also justifies the authors' passionate plea for an "open spirit of tolerance." With their goals set between a rock and a hard place, between history and ongoing science, the authors have won my full support. I recommend *Einstein's Struggles with Quantum Theory* to physicists who are interested in their past and to historians and philosophers who are curious about today's quantum physics.

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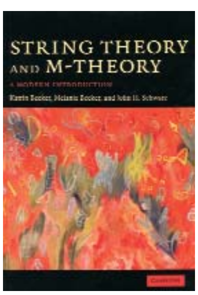
String Theory and M-Theory

A Modern Introduction

Katrin Becker, Melanie Becker, and John H. Schwarz
Cambridge U. Press, New York, 2007. $80.00 (739 pp.). ISBN 978-0-521-86069-7

It has been 40 years since Gabriele Veneziano wrote his celebrated scattering amplitude, which marked the beginning of string theory. In the intervening years, the theory has morphed into one of the most interesting fields of scientific study, providing new theoretical vistas in mathematics, quantum field theory, and the nature of black holes, and possible guideposts for physics beyond the standard model, such as supersymmetry and extra space dimensions. Those events were described in their masterful two volumes of *Superstring Theory* (Cambridge University Press, 1987) by Michael Green, John Schwarz, and Edward Witten. In 1998, Joseph Polchinski's *String Theory*, also a two-volume presentation from the same publisher, included the latest breakthroughs.



Today, Katrin Becker, Melanie Becker, and Schwarz have written *String Theory and M-Theory: A Modern Introduction*, a one-volume textbook that covers not only earlier progress in string theory but also the mind-boggling developments of the last decade: the emergence of 11-dimensional M-theory; the AdS/CFT (anti-de Sitter/conformal field theory) correspondence; flux compactification and moduli stabilization; black hole statistical mechanics; and the beginnings of string-based cosmologies. The work teams up one of the celebrated founding fathers of modern superstring theory with two much younger authors who have also contributed much to the field. The Beckers, sisters who are both physics professors at Texas A&M University, and Schwarz, the Harold Brown Professor of Theoretical Physics at Caltech, are eminently competent to present the complicated subjects. *String Theory and M-Theory* promises to become the new standard text.

The book is well written and covers a set of judiciously chosen topics. Compared with its predecessors, it has more pedagogical value. Each of its 12 chapters begins with a descriptive introduction, which is bound to be useful to those students and researchers, such as string phenomenologists, who need to understand the concepts without being burdened by technical details. Those preambles provide a road map for the sometimes confusing topics and give some sense of perspective to the necessarily technical presentations that follow. More significant, the technical material is supplemented by exercises that are well chosen to illustrate the most difficult concepts; though many have accompanying solutions, the more dedicated students will eagerly work through those that do not.

Graduate students with some training in mathematics and a degree of familiarity with quantum field theory will enjoy *String Theory and M-Theory*. In writing a self-contained text for the enormous and still-evolving subject area, the authors had to make compromises. One volume may not have sufficed to cover the developments of the past decade. Thus, important subjects, such as M-theory and the profound AdS/CFT connection, are not treated with a level of detail that will satisfy the most inquisitive readers. Explicit calculations, absent except in the exercises, would have further enhanced the pedagogical value of the book. Nevertheless, it is a welcome addition to the literature and will most likely be the required text for those physicists who intend to study the many facets of this fascinating subject. Further understanding of string theory is bound to produce more surprises. In the meantime, *String Theory and M-Theory* is *the* string textbook—at least until the next string revolution.

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Don't Try This at Home!

The Physics of Hollywood Movies

Adam Weiner
Kaplan, New York, 2007. $17.95 paper (264 pp.). ISBN 978-1-4195-9406-9

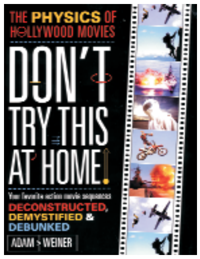
If there is one thing Adam Weiner's *Don't Try This at Home! The Physics of Hollywood Movies* has in abundance, it is style. Like an Indiana Jones movie, Weiner's prose moves at high speed from the very start, where he introduces for dissection the first cinematographic corpus, a well-known 2002 action film:

> In *XXX*, Xander Cage (how's that for a name?), played by Vin Diesel (how's that for a name?), is an extreme counter-culture rebel looking for adrenaline thrills while sticking it to "the man" whenever he can. He's tattooed, tough, and fearless.

Weiner later describes a particularly exciting section of the film:

> In *XXX*'s climactic scenes 25 and 27, Yorgi has just released the automated boat containing the toxic gas containers onto the Danube. It is traveling "80 mph at least" according to Vin Diesel, as he and Yelena frantically try to stay parallel with it while driving on the road adjacent to the river in their specially outfitted GTO. . . . Fortunately the car has been equipped with rocket launchers that the two heroes use to blast wooden crates and bales of hay out of their way so that they don't have to slow down much.

After a page of setting up the movie, Weiner, a physics teacher at the Bishop's School, a college preparatory school in La Jolla, California, moves on to a four-page exposition of one-dimensional kinematics, which can be used to judge the likelihood that the car will catch up to the boat. According to the blurb on its back cover, the book is supposed to teach film buffs and physics students alike the major topics found in



a year-long introductory physics class. In fact, *Don't Try This at Home!* does skip right along from kinematics to quantum mechanics while, in more than 250 pages and eight chapters, the author mostly savages 10 films that violate physical laws by wide margins. They include *Spider-Man* (2002), covered in "Newton's Laws"; *Mission: Impossible* (1996), in "Conservation of Momentum and Energy (with special guest appearances by Heat and Thermodynamics)"; *Willy Wonka and the Chocolate Factory* (1971), in "Fluids, Gases, and Thermodynamics"; *The Core* (2003), in "Electrostatics, Electricity, and Magnetism"; and *Event Horizon* (1997), in "Modern Physics in Modern Films."

Typically, about half of each chapter is exposition of physics and the other half cinematic description and analysis. An amazing amount of that analysis is quantitative. Either from the film's dialog or from careful examination of the scenes, Weiner has extracted sufficient information to allow for computation. For example, in discussing Spider-Man's wall-climbing ability, he writes, "If you look at the close-up of Spidey's fingers in scene 8 and make an approximate count of his fingertip hairs, you might estimate he has about 300." The result of the computation turns out to be quite at odds with what is depicted in the movie. Each hair would need to support about 0.25 N, the weight of a large marble, without flexing if Spider-Man were to climb a wall. As a quick experiment with one of your own hairs will show, even a short strand will bend under a far smaller force than this.

So, how well would Weiner's book serve the average action-film aficionado or physics student? The answer, I'm afraid: not well. If you haven't already acquired the requisite knowledge of elementary physics, you won't be able to develop it on your own with the few pages the book offers on any given topic. There is also the strong motivation to just skip ahead and see how badly the film writers screwed up a particular scene in terms of what is physically possible. If you're a film buff or a pre-med student, Weiner's book is not the one from which to learn introductory physics. Even as a light read, its good parts are annoyingly interrupted by the author's expositions of physics.

Perhaps *Don't Try This at Home!* could be a supplement to a standard introductory physics sequence. Yet, even in that role the book fails in a pragmatic sense. If the reader is already learning the material from another venue, then the half of the book presenting a "CliffsNotes" version of introductory physics, although surely comprehensible, becomes boring. Once more, I suspect the typical student would only read half the book.

Yet a perfect audience does exist for Weiner's book. Many colleges and universities offer some form of a liberal-arts physics course for students who will have no need to apply physics content knowledge in any other arena. Those courses are supposed to communicate the idea of what physics is and offer a sense of what the discipline has accomplished. The mathematical expectations are typically low but not vanishing; Weiner's book could be the heart of such a course. The level of explanation, the mathematical detail, and the examples are just right. It even has half a dozen problems at the end of each chapter that are a perfect mix of conceptual and computational. Lectures—with the instructor's liberal use of clips from the movies—would nearly write themselves. By hooking students with almost daily peeks at movie screwups, the instructor could maintain class interest and morale at a much higher level than is the norm today. At the same time, the classroom setting would provide motivation for those students who actually want to engage in the physics. I intend to suggest just such a class to my department.

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Structures of Scientific Collaboration

Wesley Shrum, Joel Genuth, and Ivan Chompalov
MIT Press, Cambridge, MA, 2007. $35.00 (280 pp.). ISBN 978-0-262-19559-1

Structures of Scientific Collaboration by Wesley Shrum, Joel Genuth, and Ivan Chompalov is not a conventional physicist's book: It is written by sociologists, mainly for sociologists. The perceived truth of the oft-quoted dictum, "There are no sciences like sociology," is not perhaps the fault of sociologists but more of society, which does not conform to the processes of scientific investigation. Still less does a society of scientists conform to such processes. This observation is the burden of the book, which attempts to identify the common factors in big science collaborations and to codify the results as a guide to "science policy makers, project managers, and economists . . . [who] legitimize and aid in directing large expenditures for scientific research." The authors characterize their effort as partially successful, and I agree with them.

Structures of Scientific Collaboration is without doubt a thoroughgoing piece of sociological research, with a vast amount of data collected and analyzed. Shrum is a professor of sociology at Louisiana State University in Baton Rouge, Genuth was a project historian at the American Institute of Physics and now teaches mathematics at the Hampshire Educational Collaborative in Massachusetts, and Chompalov is an assistant professor of sociology at Edinboro University of Pennsylvania. The authors studied 53 projects and interviewed 600 participants to acquire the data for their study. The collaborations covered many disciplines, including the fields of space science, particle physics, geophysics, and astronomy. The authors identify five patterns of collaboration formation and define four organizational species of collaboration, ranging from the highly organized and hierarchical to what they call the "Athenian democracy" indulged in by particle physicists. Their analysis is undeniably interesting to a scientist, and one can easily recognize, from one's own experience, examples that fit the categories.

Most people would agree with the authors that a scientist joins or forms a collaboration because he or she can gain access to a resource, such as a telescope, database, or space vehicle, that would otherwise be out of reach. The scientist sacrifices autonomy to achieve or share in a major step forward in the discipline. Some collaborations are initiated and driven by individuals who have a strong research drive and a concept; others are created by powerful organizations, like NASA, that disburse funding to achieve nationally important goals and coerce and coax institutions and scientists to work together to achieve them. Some collaborations have memoranda of understanding or indeed contracts among the participants, while others rely almost entirely on verbal agreements.

In analyzing their results, the authors use some eye-watering statistical sociological analysis, which I had to trust. The results, displayed in charts with annoyingly obscure labeling, do not lead