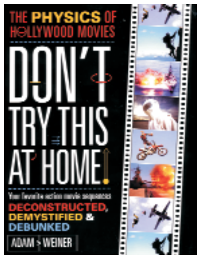
a year-long introductory physics class. In fact, *Don't Try This at Home!* does skip right along from kinematics to quantum mechanics while, in more than 250 pages and eight chapters, the author mostly savages 10 films that violate physical laws by wide margins. They include *Spider-Man* (2002), covered 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.

Bradford Halfpap
The University of Montana
Missoula

Structures of Scientific Collaboration

Wesley Shrum, Joel Genuth, and Ivan Chompalov
MIT Press, Cambridge, MA, 2007. $35.00 (280 pp.).
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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 to any really strong conclusions. For example, researchers have found that highly bureaucratic collaborations have a rather even mix of principal-investigator-controlled data analysis and publication, versus open data analysis and publication, while "democratic" projects have much more of the latter.

One interesting conclusion, which would perhaps be thought obvious, is that the amount of conflict in a collaboration decreases as the level of perceived trust among the collaborators increases. The authors do attempt to measure the success of collaborations by asking the participants in the study to estimate their success both subjectively, that is, by their own estimation, and objectively by reference to their peers. The subjective measure identifies the most successful projects as those for which funding was uncertain at the beginning and data were not shared outside the collaboration. The objective measure identifies successful projects as those that had numerous organizations involved, international teamwork, and a strong hierarchical structure. These conclusions probably say more

about human nature than about the actual success of the collaborations.

At the beginning of the study, Shrum, Genuth, and Chompalov identify two areas of significant interest to any scientist thinking about large-scale collaboration, and, disappointingly, they do not clearly evaluate them. The first is the interaction between the bureaucracy necessary for a large collaboration and the central role of new technology; this interaction is the defining characteristic of large scientific collaborations. Bureaucracy appears everywhere in modern life and is only rarely confronted with technology as the driving force of an endeavor. In scientific collaboration the two are intertwined, and the authors identify that relationship as unique; however, they reach no conclusions about it. The second factor is reward. A scientist who gives up his or her autonomy, and possibly many years of scientific productivity, must be rewarded with data, observation time, or other access to the products of the collaboration. Again, that issue is identified but not given any extensive coverage, nor are any conclusions drawn from it.

Despite some caviling, I believe that *Structures of Scientific Collaboration* has significant value. It tackles in a rigorous way an important and difficult subject and, eschewing the anecdotal, succeeds in at least identifying and labeling the different types of collaboration and exploring in detail their nature and outcomes. The conclusions, though weak, are entirely consistent with the data; they simply reflect the complexity of scientific collaboration. I believe the book is illuminating, and it may well form the basis for future studies. It will be useful as a reference and handbook to the people who make and execute science policy.

Martin J. L. Turner
University of Leicester
Leicester, United Kingdom

new books — history and philosophy

Yoshio Nishina: Father of Modern Physics in Japan. D.-W. Kim. Taylor & Francis, New York, 2007. $69.95 (195 pp.). ISBN 978-0-7503-0755-0