books

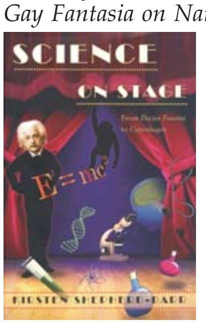
# When acting speaks louder than words

## Science on Stage
### From *Doctor Faustus* to *Copenhagen*

**Kirsten Shepherd-Barr**
*Princeton U. Press, Princeton, NJ, 2006. $29.95 (271 pp.).*
*ISBN 0-691-12150-8*

*Reviewed by Carl Djerassi*

Kirsten Shepherd-Barr's *Science on Stage: From "Doctor Faustus" to "Copenhagen"* misses a few hundred quotation marks—specifically each time the word *science* is used. The author's concept of science is, to put it mildly, idiosyncratic. For instance, Tony Kushner's deservedly famous *Angels in America: A Gay Fantasia on National Themes*, which debuted in 1991, is considered a "science play" because one of the characters suffers from AIDS. Shepherd-Barr focuses on what science can do for the theater and totally ignores the opposite proposition, which deserves equal attention: what the stage can do for science.




Shepherd-Barr not only uses the term "science on stage" to apply to any play that somehow features such names as Albert Einstein, Charles Darwin, Nikola Tesla, Richard Feynman, or Erwin Schrödinger but also goes so far as to state that "even the way in which theater scholars are trained to research and publish their work derives from and emulates the scientific model" (page 38). Her main argument, on page 4, is that science plays cannot be categorized according to content "because they fail to take theatricality into account."

But what is theatrical for some is kitsch or worse for others. The theatricality of any play is greatly affected by how the director and actors approach it, and Shepherd-Barr clearly has seen very few different productions of the same play. In fact, she probably has seen only a small percentage of the 122-odd plays listed in the appendix, "Four Centuries of Science Plays: An Annotated List." So many plays on that list had only a single run or, even more frequently, a single reading or workshop presentation. Clearly, her judgment could at best be based on textual scrutiny.

Yet let me take just one play as an example: Michael Frayn's 1998 *Copenhagen*, to which the author gives more attention than any other. According to Shepherd-Barr's genuinely thorough and sophisticated analysis, Frayn's is a science play par excellence, an opinion I share, and, according to her, superb in its theatricality. But her analysis is clearly based on a viewing of Michael Blakemore's brilliant original staging. What about the German production, with its typical example of Regietheater in which any modification of the playwright's text and directorial instructions is considered fair game and in which Werner Heisenberg is made to do somersaults? Some would call that "theatrical"; Frayn, on the other hand, used very different and rather pejorative terms.

Shepherd-Barr is so enamored by "theatricality" that she dedicates the entire last chapter, "Alternative Currents: New Trends in Science and Theater," to the concept. Actually, her wide-ranging generalities are based only on three theater directors: Luca Ronconi, who is Italian; Jean-François Peyret, who is French; and British director Simon McBurney. She ascribes to Anglo–Saxon backwardness the fact that neither Ronconi nor Peyret has ever been presented on the Anglo–American stage, but disregards that Ronconi's requirement for a five-story building set on stage or the need for a large repertoire-style theater group in staging Peyret's plays can hardly be accommodated by the commercial Anglo–American theater. Her ignoring practical considerations is typical of academic theater scholars unconcerned with the fact that, in the end, a play is only a play if it is performed on the stage on more than a single occasion or is at least widely disseminated in a book.

Such unconcern over the facts of theatrical life is illustrated by the author's dedicating six pages to the old 1948 play by Hallie Flanagan Davis, $E = mc^2$, which requires 75 actors and has not been staged for the past 40 years. But she provides only one sentence and no index entry for a modern and highly successful play like Hugh Whitemore's *Breaking the Code*, which is about the life of Alan Turing; moreover, she misattributes the work to the playwright Stephen Poliakoff. Yet she does not hesitate to emphasize approvingly on page 200 that the apparent wave of new theatricality about to engulf "traditional" theater is being "devised by contemporary theater practitioners . . . who present alternative approaches that try more directly to engage the audience with the ideas themselves."

Shepherd-Barr considers *Copenhagen* "conceptually quite traditional," and "heavily textural," using "science, biography, and history to frame its main concerns" (page 201). Direct citations of Ronconi and Peyret illustrate what these new "science theater directors" are after. The author writes on page 202 that Peyret calls *Copenhagen* "fake theater" that is "for the museum." She further adds that Ronconi, too, feels similarly about *Copenhagen*, "there being no question that the text drives these productions." (I can see Shakespeare rising from his grave!) According to Peyret (page 202), if audience members "want to know whether Heisenberg was good or bad, they have access to the scientific debates . . . they don't have to see a play." And, he adds (page 207), "We don't have to do night school. . . . We do not do scientific theater, we in fact do not even know what that means."

The final chapter is replete with such preposterously one-sided, black-and-white wisecracks. The theatrical science theater by the new directors is undoubtedly novel and on occasion very interesting. But whether that style, with its deliberate elimination of the scientist from the scientific discovery, represents a wave or a passing fad remains to be seen. In any event, it does little for science.

**Carl Djerassi** is a professor emeritus of chemistry at Stanford University in California. He has written five novels and eight plays, including *Calculus* and *Phallacy*, which is scheduled to debut in May 2007 at New York City's Cherry Lane Theatre.

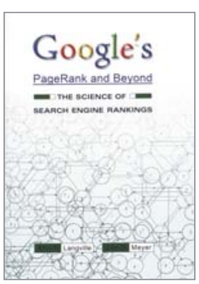
So, what is good about *Science on Stage*? It represents a well-written and super-detailed account of a handful of "science" plays from *Doctor Faustus* and *The Alchemist*, written centuries ago, to *Galileo*, *The Physicists*, and other plays of the first half of the 20th century. The book also contains excellent analyses of some contemporary science plays such as *Copenhagen* and *Arcadia* to provide, as the author writes, "a sense, through specific examples, of what I judge to be core science plays." Her comment is fair enough, provided that her subjectivity and bias are recognized. But I worry when Shepherd-Barr concludes that her book should "help teachers design and implement courses on science plays." Her definition of science plays is idiosyncratic, and teachers ought to cover all views of how science on stage can be presented, not just Shepherd-Barr's.

## Google's PageRank and Beyond

### The Science of Search Engine Rankings

**Amy N. Langville and Carl D. Meyer**
*Princeton U. Press, Princeton, NJ, 2006. $35.00 (224 pp.). ISBN 0-691-12202-4*

Suppose you have some time to kill and decide to spend it surfing the Web. You point your cursor at whatever page comes up in your browser, and pick a link to click at random. You click again at the page you've reached, and again, several more times. What is the probability that you will end up looking at the Web page of PHYSICS TODAY? Obviously, the chances can't be too high, because about 10 billion pages exist on the open Web, and you've just been searching at random. One would think that the chances would be about one in 10 billion. It's obvious, right?




No, not really. Think about it. To get to http://www.physicstoday.org you must be on a page that points to it. If that page points to a small number of pages, you will be more likely to get to PHYSICS TODAY. Furthermore, your chances of having gotten to that page are higher if more pages point to it. So the distribution is not really random at all. Your chances of landing on a particular page are influenced by the graph of the network—that is, the graph created by the hypertext links on the Web. In fact, currently the graph of the network puts PHYSICS TODAY somewhere around the 90th percentile of likelihood, meaning your chances of landing on the link are closer to one in a billion—still not very high, but an order of magnitude better than random.

How the Web graph affects the likelihood that a user will find a particular page and the mathematics of computing the probabilities for webpages combine to form the basis of one of the most successful algorithms in the history of computing: PageRank. The algorithm is at the heart of the Google search engine. When you type a search query to Google, it retrieves the list of pages that contain your search words—a computing feat in itself—but more important, it sorts those pages according to their "page rank," the outcome of the algorithm applied to the many billions of Web pages. So understanding the algorithm is the key to understanding how search engines work and to the many other derivative industries based on them. In fact, developing the first practical commercial version of the algorithm made Google's founders Sergey Brin and Larry Page, who developed PageRank at Stanford University, two of the richest men in America.

In *Google's PageRank and Beyond: The Science of Search Engine Rankings*, Amy Langville and Carl Meyer use the PageRank algorithm as the unifying theme to discuss the mathematics underlying search engines. Langville is an assistant professor of mathematics at the College of Charleston in South Carolina, and Meyer is a professor of mathematics at North Carolina State University in Raleigh. As easy as it is to explain the behavior of randomly surfing the Web, the actual mathematics of the Web graph involves Markov chains and the eigenvectors of extremely large graphs. Langville and Meyer present the mathematics in all its detail, which would make for a dry book if that was all they presented. But they vary the math with discussions of the many issues involved in building search engines, the "wars" between search engine developers and those trying to artificially inflate the position of their pages, and the future of search-engine development. The authors also include a number of asides and boxes that discuss amusing anecdotes and interesting issues that arise in the search-engine world.

Last year, I taught a course on Web architecture and programming in which one of the primary topics was PageRank and search-engine algorithms. While looking for a text to use for the course, I found several books on trying to improve the page rank of websites, and *Google for Dummies* (Wiley, 2003) by Brad Hill. But I found nothing that was appropriate for a graduate or advanced undergraduate course. Langville and Meyer's book neatly fits that bill.

Although not a textbook, *Google's PageRank and Beyond* makes good reading for anyone, student or professional, who wants to understand the details of search engines. For those interested in trying to implement search engines, the book can be invaluable. The authors, however, could have covered some additional search-related topics. For example, Langville and Meyer do provide Matlab code for many of their algorithms, but they could also have introduced Lucene, the open-source search engine. Their chapter on the future of search engines already seems a bit dated because they leave out such topics as Web 2.0, the Semantic Web, social networks, and multimedia search engines, all now starting to loom large on the ever-expanding search-engine horizon. But it seems unfair to criticize the authors for omissions in such a rapidly changing field as the science of the search engine, in which any book is doomed to need updating before it hits the market.

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## Broken Genius

### The Rise and Fall of William Shockley, Creator of the Electronic Age

**Joel N. Shurkin**
*Macmillan, New York, 2006. $27.95 (297 pp.). ISBN 1-4039-8815-3*

Few physicists have been as controversial as William Shockley (1910–89), and few have been as influential in defining the contours of the electronics industry. Shockley headed the team that made the first point-contact transistor at the Bell Telephone Laboratories in New Jersey. Shockley later invented the bipolar transistor and seeded the semiconductor industry in California's Silicon Valley. But he was also known for his racist theories of intelligence. Because of his views, he became a reviled public figure and a pariah in the US scientific establishment.

In *Broken Genius: The Rise and Fall of William Shockley, Creator of the Electronic*