

tion by allowing terminally ill patients to ask their physicians for "medication" to end life. If Ballot Measure 16 withstands all court challenges, Oregon will go beyond the precedent set by the Netherlands, where doctors may assist death with impunity (under guidelines) but without explicit legal sanction.

Among the 18 pointed essays collected here, readers will find fair and intelligent representation of both sides in the debate over assisted suicide and other forms of euthanasia. A few contributors, such as legal

theorist Ronald Dworkin, try to straddle the issue. (After asserting the sacredness of human life, he defends "choice" in interpreting what that means.)

But the thrust of this volume, whose contributors include physicians, medical ethicists, philosophers, and columnists, will not bring great comfort to supporters of the Hemlock Society. As Dr. Richard Selzer shows in a disturbing personal essay, the patient who begs for a lethal injection one day may ask for his life to be prolonged on the next.

—Jay Tolson

Science & Technology

ENGINEERS OF DREAMS: Great Bridge Builders and the Spanning of America.

By Henry Petroski.

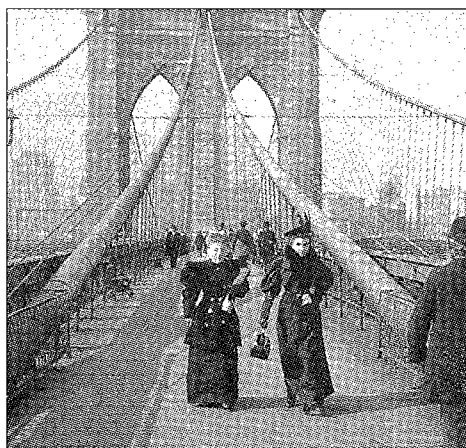
Knopf. 479 pp. \$30

"Structural art" is what Petroski calls bridge design, and here he offers a spirited account of the lives and work of some of its leading practitioners. To earlier generations, the builders of great public structures were technological heroes, literally forging the unity of the nation. Petroski, a professor of engineering at Duke University, combines this half-forgotten sense of wonder with a keen analysis of the aesthetic, scientific, economic, and political choices facing his predecessors.

Focusing on five master engineers—James Eads, Theodore Cooper, Gustav Lindenthal, Othmar Ammann, and David Steinman—Petroski demonstrates that behind successful bridges lie both aesthetic vision and gritty financial and political skills. Unlike even the most ambitious buildings, bridges require agreements among municipal, state, and even national governments. For every site, there may be several plausible technologies. New designs appear, more attractive or economical, but not necessarily more durable. The imponderables include earthquake risk, future loads, and long-term maintenance. There are ugly surprises, such as the sudden collapse, in 1967, of the eye-bar suspension bridge in Point Pleasant, Ohio. And there are also unanticipated delights, including the lasting beauty, utility, and profitability of San Francisco's Golden Gate.

If graceful and economical design assured success, then bridge architecture would be a search for Platonic forms. Unfortunately, as Petroski shows, some solutions can be too elegant for their own good. Thanks to the deflection theory of the Latvian-born engineer Leon Moisseiff, the builder of the George Washington Bridge (Othmar Ammann) saved millions of dollars on steel. Yet the same slender-deck design has caused bridges to sway in crosswinds. In some cases, such as the Bronx-Whitestone Bridge, the only damage was to trusses, which ultimately had to be replaced. In others, such as the Tacoma-Narrows Bridge, the swaying caused the bridge to twist apart spectacularly.

Petroski cites research suggesting that bridge disasters occur in 30-year cycles. Each collapse promotes a new dominant design, which in turn encourages a new cadre of professionals, complete with interlocking consultantships, to grow in confidence and boldness until they lose touch



with their predecessors' insights. These innovators may prize the forms of older bridges, but they never read the fine print involved in their creation. Accordingly, Petroski suggests that we may be due for another debacle by the end of this century, as today's engineering elite keeps building ever-longer versions of cable-stayed bridges.

Despite its technical depth, this book is not just for admirers and protectors of our great bridges. It is also for men and women in every profession. By linking the widely publicized needs of the "physical infrastructure"—the ravages of neglect and deferred maintenance—with the more subtle but equally urgent demands of the "engineering-design infrastructure," Petroski shows how "neglected patterns from the past become unconscious patterns for the future." To engineers, the message is that they are "reinventing, albeit with faster and more powerful tools, the bridges of the past and of different cultures." To the general reader, it is that technological sophistication can promote a fatal illusion of discontinuity with the past. The profound contribution of *Engineers of Dreams* is to remind us that communication across generations may be the most important bridge of all.

—Edward Tenner

THE SAME AND NOT THE SAME.

By Roald Hoffmann. Columbia Univ. Press. 294 pp. \$34.95

Goethe modeled his novel *Elective Affinities* (1809) on a theory about the spiritual origins of chemistry. In a similar vein, Hoffmann—chemist, poet, and Nobel laureate—wishes to show how the activities of molecules "parallel deep avenues in our psyche."

The book's allure is based on metaphor, as Hoffmann draws a parallel between the oppositional properties of molecules and the dualities of human relationships: bonding and separation, continuity and change, the natural and the unnatural. Playfully, he explores the fact that some molecules are mirror images of one another, "the same and not the same," like the molecules creating the smells of spearmint and caraway. More ominously, the disastrous sedative thalidomide is deceptively similar to two other successful compounds.

Hoffmann's evident ambition is to make a

case for chemistry to supplant physics as the philosophical model for all the sciences. His arguments are that chemistry is creative as well as analytic, and that, compared with physics, chemistry deals more interestingly with conflict and ambiguity.

Evident also is the author's hope that his book will do for chemistry what Stephen Hawking's wildly successful *Brief History of Time* did for astronomy. But Hawking's book, for all its difficulties, has a clear narrative line leading from the early development of astronomy to its later achievements and ultimate speculations.

Hoffmann's book, by contrast, mixes lucid explication with a great many fragmentary jottings that lead nowhere. Such open-endedness may be helpful when examining molecules, but in writing it defeats coherence.

—Susan Ginsburg

LIFE ON THE SCREEN:

Identity in the Age of the Internet.

By Sherry Turkle. Simon & Schuster. 347 pp. \$25

The wonders of cyberspace have made a believer of Turkle, a social scientist at MIT and a practicing psychotherapist. Yet despite her affinity for the net-surfing world view, she has lost neither her "real-life bias" nor her ability to communicate with those too uninformed, or skeptical, to take life at interface value.

In nontechnical language, she describes how the Internet has transformed the computer screen into a gateway, a beckoning path to virtual worlds in which people may play at identity, freely altering their personality, status, vocation, and sex.

For Turkle, the promise of such "Internet experiences" is that they can "help us to develop models of psychological well-being." "Like the anthropologist returning home from a foreign culture," she writes, "the voyager in virtuality can return home to a real world better equipped to understand its artifices."

Yet Turkle also describes the danger: that the boundary between real life and simulation will be blurred or erased. Her book is a Baedeker less to the bizarre electronic landscapes of cyberspace than to the minds of those who wander through them. As such, it is instructive, amusing, and chilling.

—James Morris

Perhaps it is because of these high expectations that I was so disappointed by *Engineers of Dreams: Great Bridge Builders and the Spanning of America*. In the end, Petroski seems much better at writing about engineering artifacts - pencils, paper clips, or, in this book, bridges - than the makers of those artifacts. Much of Petroski's "biography" here seemed nothing less than mere formula: you could almost see him filling in his computer template for "name, date and place of birth, school, mentor, etc." each time a new engineer was introduced. Further, he did not even at The great era of American bridge building - which from the 1870s through the 1930s gave us such landmarks as the Eads Bridge across the Mississippi, the Hell Gate Bridge across the East River, the George Washington Bridge across the Hudson, and the Golden Gate Bridge at the mouth of San Francisco Bay - called for a special breed of engineer: equal parts dreamer, inventor, and entrepreneur. In his previous books, Henry Petroski has initiated us into the hidden mysteries of such everyday artifacts as the lead pencil, the paper clip, the zipper, and the Post-it note. Download for offline reading, highlight, bookmark or take notes while you read *Engineers of Dreams: Great Bridge Builders and the Spanning of America*. Petroski reveals the science and engineering--not to mention the politics, egotism, and sheer magic--behind America's great bridges, particularly those constructed during the great bridge-building era starting in the 1870s and continuing through the 1930s. It is the story of the men and women who built the St. Louis, the George Washington, and the Golden Gate bridges, drawing not only on their mastery of numbers but on their gifts for persuasion and self-promotion. It is an account of triumphs and ignominious disasters (including the Tacoma Narrows Bridge, which literally twisted itself a