

## MEDICINE

### A Yankee in King Gustav's Court

Sydney Brenner

When I was elected a fellow of a Cambridge College, it took me a short time to realize that I might have also been endowed with a gift of knowledge. Judging by my colleagues, I too should be able to discourse on an enormous range of arcane subjects—15th-century ecclesiastical history, the politics of the Weimar Republic, cobbled paving, Baroque art, modal logic, black holes—easily dwarfing my modest knowledge of genetics and molecular biology. And so it is, we learn from this delightful book, with the Nobel Prize, although the author claims he was never asked to display this rich source of expertise. This is not an innocent remark, as the reader will soon learn that J. Michael Bishop is a man of discerning erudition lightly concealed behind a thin veil of the sim-

#### How to Win the Nobel Prize An Unexpected Life in Science

by J. Michael Bishop

Harvard University Press, Cambridge, MA, 2003. 287 pp., illus. \$27.95, £18.50, €27.95. ISBN 0-674-00880-4.

ple country boy who, through a series of accidents, made it in the select world of high scientific achievement. Notwithstanding its title, the book does not instruct us on how to win the Prize, an ennoblement sought by many but achieved by few. If it is a recipe, it is only one in the sense that one way of doing it is to live the life of Michael Bishop.

Bishop shared the 1989 Nobel Prize for Physiology or Medicine with his colleague, Harold Varmus for their “discovery of the cellular origin of retroviral oncogenes.” Their critical finding was that DNA sequences corresponding to *SRC* (“sark”), the gene in Rous sarcoma virus that is required for the transformation of normal cells into tumor cells, were present in the genome of normal chickens. Similar sequences are found in mammalian genomes, and *SRC* was the first of a long list of genes that have been shown to produce cancer after their activity was modified by a mutation.

Today we all accept that cancer is a genetic disease, and the history of this research, in which Bishop played an important role, is the book's centerpiece. Bishop begins with the telephone call. The Prize is announced in Stockholm at about 11 a.m., thus

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#### *Epidemic* by Alfred Kubin (1900–1901).

the news reaches California around 2 a.m. There cannot be too many people who sit up all night waiting for such a call, and so it generally comes as a surprise to those who can be found at all. The author's account of the phone call and the subsequent events culminating in the award week in Stockholm has many comic moments, and his studied comparison of the Nobel Prize to what appears to be a minor achievement in a baseball game sets the tone of the book. Of course, I know absolutely nothing about baseball (having never distinguished between Willie Mays and Willie Sutton) and I may have misunderstood the significance of “hitting a baseball ‘from behind in the count,’” but the comparison is part of the homespun American guise of the author.

Indeed, if we were to provide a Polonian classification of the book, it is decidedly comical-historical in both the autobiography and the historical accounts of microbiology and cancer research. For those, like myself, who read Paul de Kruif's *Microbe Hunters* (Harcourt, Brace, New York, 1926) many years ago and remember the protagonists as great heroic figures, what Bishop reports about their lives comes as an interesting surprise. John Hunter was said to have given himself venereal disease, and Ignaz Semmelweis, who showed that puerperal fever was caused by doctors failing to wash their hands, ended up in lunatic asylum where he was beaten to death by the attendants. The stern Robert Koch, at the age of 47, fell in love with 17-year-old Hedwig Freiberg. They married 3 years later, and she survived until 1945, developing an interest

in Eastern religions. Such Waughian interjections made me wonder whether the rural Pennsylvanian had wandered into his present position of chancellor of the University of California, San Francisco, by some comic accident. But once we get to the last chapter, where Bishop gives us many insights into the nature of the scientific enterprise and where he reveals his leadership roles in the fields of university education and research, we realize that he is a deeply knowledgeable and serious man who has brought to his intellectual work a responsible humanity.

I urge every student to read *How to Win the Nobel Prize*. They will learn that even if one needs luck to succeed, one can develop a sensitivity to lucky situations and have both the courage and the humility to give back to science and to other people the fruits of achievement.

## SCIENCE POLICY

### Which Future for Humanity?

Roger A. Pielke Jr.

In the movie *The Matrix*, Morpheus offers Neo a choice between a red pill and a blue pill: “You take the blue pill and the story ends. You wake in your bed and you believe whatever you want to believe. You take the red pill and you stay in Wonderland and I show you how deep the rabbit hole goes.”

In *Our Final Hour*, Martin Rees eloquently describes a real-world choice now facing contemporary society: Do we follow science and technology where it takes us, hope for the best, and deal with the consequences? Or, instead, do we believe that the risks to humanity presented by advances in science and technology require a fundamental rethinking of the governance of the research and development enterprise?

With horrifying descriptions of the threats to humanity posed by 21st-century science and technology, the first half of the book is all red pill. Rees's survey of perils includes the terror and error of nuclear bombs, bioweapons, and laboratory mistakes; the relatively pedestrian—by contrast—Earth-threatening asteroid and human (or nonhuman)-caused climate change;

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and the fanciful, nanotechnology-spawned “gray goo” and particle physics experiments with the potential to rip apart the space-time fabric of our universe. Each of these phenomena has the potential to threaten human civilization on Earth. In Rees’s view, the risk of such a catastrophic end is higher today than ever before and is still growing.

What could have been highly complex and arcane descriptions of threats are extremely accessible, to a large degree because of Rees’s adept and frequent allusions to popular culture’s catastrophist movies and books. The author’s success reminds us of the critical lens that thoughtful fiction provides for comprehending novel policy issues related to science and technology.

After reviewing the various perils facing humanity, Rees observes that “the surest safeguard against a new danger would be to deny the world the basic science that underpins it.” Placing the responsibility for making such decisions on groups “far beyond the scientific community,” he asks whether such dangers might be “reduced by putting the brakes on potentially threatening science and technology and even renouncing some areas of scientific research completely?”

Rees does not seem entirely comfortable with a direct answer to this question. Before reaching the Epilogue, he seems to have forgotten his earlier call for the public to restrain science, and he instead places responsibility with the scientific community alone: “Experimenters should be cautious in ‘pushing the envelope’ of science; even if there were a case for putting the brakes on some research, a moratorium could never be effectively enforced worldwide.”

Rees’s argument takes a sharp turn (toward the blue pill) when he asserts that “the quest for alien life is perhaps the most fascinating challenge for twenty-first-century science” and shifts his focus to the need for humans to move beyond our earthly confines. A solution to the threat of humanity’s extinction, he suggests, will result “once self-sustaining communities exist away from earth—on the Moon, on Mars, or freely floating in space—our species would be invulnerable to even the worst global disasters.”

Humanity survived the 20th century without nuclear Armageddon, in part due to good fortune (as Rees reminds us), but in no small part because of governance processes employed, decisions made, and leaders empowered. How might we now marshal policies, decisions, and leaders to

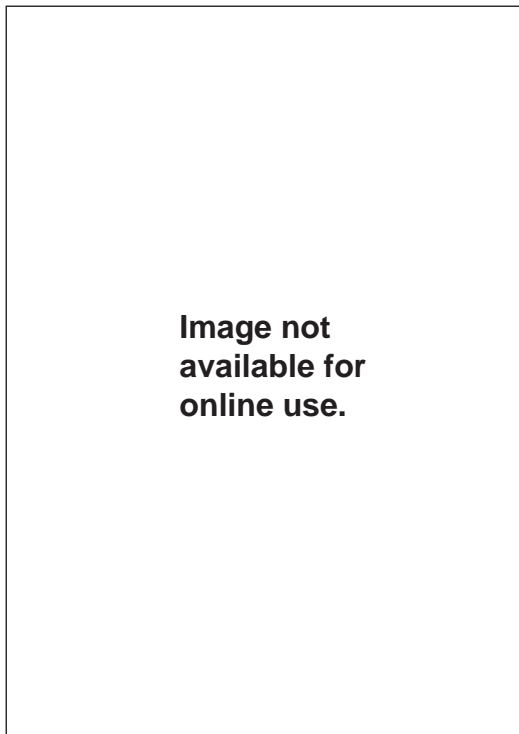


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**Escaped so far.**

increase the chances of avoiding global catastrophe? If we wanted to slow science and technology down how would we do it? Who would decide? How might governance of the science and technology enterprise evolve in ways that favor desired outcomes and reduce the prospects of catastrophe?

Serious discussion about such questions would seem a logical response to the conclusion that human society faces real risks to its sustainability. But exploring these questions would take us further down the rabbit hole than Rees goes in *Our Final Hour*. Thus the book offers very little for those who hope to enhance our collective ability to grapple with the risks facing us in the 21st century. There seem to be three reasons why he avoids uncomfortable questions about the governance of science

and technology and makes the giant leap to space colonization as a response to the potential for global catastrophe.

First, Rees apparently discounts society’s ability to forestall the inevitable global catastrophe. He has predicted, through the Long Bets Foundation ([www.longbets.org](http://www.longbets.org)), that “by 2020, bioterror or bioerror will lead to one million casualties in a single event.” Such a fatalistic view of our future on Earth undoubtedly elevates

one’s perception of the importance of space colonization for preserving humanity.

Second, trying to “slow science down” may simply be folly. Invoking Freeman Dyson, Rees implies that the costs of “saying no” to science would greatly exceed the benefits of doing so, because we would have to forgo many wonderful positive contributions society receives from research. From this perspective, instead of taking action to slow down science and technology, we should instead learn to deal better with their consequences. In several places, Rees suggests that the favored course of many basic researchers (perhaps including himself), would not be to “say no” to science but to depend on a “special responsibility” of scientists. This is perhaps one reason why he earlier argued for the opposite position: decisions about the governance of science and technology should not be left solely in the hands of a research community hungry for resources and focused on advancing knowledge.

Last, the book is centered not on alternative responses to the potential for global catastrophe but on developing a justification for space colonization. In an earlier book, Rees wrote that reducing the vulnerability of humans to catastrophe provides “the strongest motive for pursuing a program of manned space flight” (1), and *Our Final Hour* develops this theme. It is thus no surprise that he reserves some of the book’s strongest language for his critique of the International Space Station, which he calls the “most expensive artifact ever constructed” and a “turkey in the sky.”

Although *Our Final Hour* would have been more satisfying had Rees engaged some of the profoundly perplexing policy challenges facing the governance of science and technology, Rees is not alone in calling attention to the consequences of the potential for catastrophe in the 21st century (2). In *The Matrix*, as Neo considers the red and blue pills Morpheus warns him: “This is your last chance. After this, there is no going back.” Rees concludes on a similar note. Of the prospects for humanity’s survival into the distant future or sudden extinction, he suggests “the choice may depend on us, this century.” Thanks to *Our Final Hour* we are now more aware that we are confronted by such a choice. Do we take the red or blue pill?

**References**

1. M. Rees, *Our Cosmic Habitat* (Princeton Univ. Press, Princeton, NJ, 2001).
2. A. Lightman, D. Sarewitz, C. Desser, Eds., *Living with the Genie: Essays on Technology and the Quest for Human Mastery* (Island Press, Washington, DC, in press).

**Our Final Hour**  
**A Scientist’s Warning; How Terror, Error, and Environmental Disaster Threaten Humankind’s Future in This Century—On Earth and Beyond**  
 by Martin Rees  
 Basic Books (Perseus), New York, 2003. 238 pp. \$25, C\$39. ISBN 0-465-06862-6.

**Our Final Century**  
**The 50/50 Threat to Humanity’s Survival**  
 William Heinemann, London, 2003. 238 pp. £17.99. ISBN 0-434-00809-5.

A Connecticut Yankee in King Arthur's Court is an 1889 novel by American humorist and writer Mark Twain. The book was originally titled A Yankee in King Arthur's Court. Some early editions are titled A Yankee at the Court of King Arthur. In the book, a Yankee engineer from Connecticut named Hank Morgan receives a severe blow to the head and is somehow transported in time and space to England during the reign of King Arthur. After some initial confusion and his capture by one of Arthur's knights, Hank The King's court is balanced atop an unjust social system that ignores the rights of the working people and confers divine rights upon nobles who, having been born to wealth and power, have no idea of justice. The book's protagonist makes himself more powerful than the legendary magician Merlin by performing tricks that are simple for a man with contemporary knowledge. Twain has been faulted for the structure, or lack of structure, of A Connecticut Yankee in King Arthur's Court. In the broadest term, the story has a clear structure, beginning and ending with the speaker, Twain, visiting England, then introducing the character of the Yankee, and then settling into the story that the Yankee has written out, which takes up most of the book. Essays for Connecticut Yankee in King Arthur's Court. Connecticut Yankee in King Arthur's Court literature essays are academic essays for citation. These papers were written primarily by students and provide critical analysis of Connecticut Yankee in King Arthur's Court. Twain's Women. The Unities in "Connecticut Yankee". Mark Twain's A Connecticut Yankee in King Arthur's Court: Arthurian Legend, Armour, Slavery and Catholicism. Marxist Criticism of A Connecticut Yankee at King Arthur's Court. Lesson Plan for Connecticut Yankee in King Arthur's Court. About the Au