sensitivity toward risk, the potential downside was enormous. And, as the authors contend, it is not surprising that the information was only slowly and grudgingly made public. The book makes a forceful case against voluntary compliance as a realistic regulatory tool; it is policy made plausible only by fears of civil liability.

The authors effectively dismiss voluntary compliance as an element in any viable solution, but it is not clear that they provide a blueprint for solving the human and policy dilemmas they describe so well. Is there any way to refine some objective and thus policy-defining truth from the process of its negotiation, dissemination, and social articulation? What is permissible or calculated risk? The problem is not only how one calculates such risk, but—the authors imply—who does the calculating. They charge, for example, that under Reagan "the chief criterion in standard setting was now industry's concern about the costs of regulations rather than ascertaining the lowest feasible level that would protect workers from toxic substances." But what does "feasible" mean? Is it not another way of specifying the costs of regulation? And does it not raise the specter of insoluble and incommensurate value conflicts: What is the worth of one life? Or a life shortened by a number of pain-filled years?

Or, as *Deceit and Denial* underlines, what of subclinical effects that might include emotional changes and lowered cognitive ability? How are such shadow effects to be monitored, judged, legitimated, meliorated? And how does one balance such injury to particular individuals against the effects of curtailing growth and inhibiting technological change? I do not have an answer, and neither, I suspect, do Markowitz and Rosner—or the economists, epidemiologists, and publicists who offer ad hoc if seemingly authoritative solutions. Writing equations balancing one risk against another is easy, at least as compared with reaching political consensus in the confrontational real world of institutional power and elusive perception.

All of which implies this book's strongest contribution, one implicit in but going beyond the events it describes in such revealing detail. This is the authors' emphasis on process and the way in which decision-making is contingent, the end-product of negotiations always in progress, with the actors changing over time. It is not only the actors who change, but the sets: Washington and state capitol committee rooms, management suites and union halls, newsrooms and television stations, cyberspace, law firms specializing in liability, and trade association conference rooms are all sites at which portions of this contested negotiation have taken and are taking place. And, as *Deceit and Denial* so powerfully demonstrates through its very existence, even academic departments and university presses contribute to what one must call a collective policy discourse. The world Markowitz and Rosner describe is more like rugby than econometrics.

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BOOKS: MOLECULAR BIOLOGY

Gender and Science in the DNA Story

Anne Fausto-Sterling

The 1968 publication of James Watson's two-part thriller, *The Double Helix*, in *The Atlantic Monthly* left both the scientific and literary worlds atwitter. I still have my tattered copies, bought on my salary as a genetics graduate student. But neither then nor later did I twitter. Instead, I raged and wondered—as I sometimes, although far less frequently, still do some 34 years later—whether I or any woman would ever be welcome in the world of science. What I did not know at the time, but have since learned from reading Brenda Maddox's able, balanced, and well-researched biography *Rosalind Franklin*, was that Watson's account was a scandal even before publication. In fact, it seems that the Harvard Board of Overseers refused to publish it in book form because of its self-aggrandizement and scurrilous portraits of all of the principals in the story.

Franklin, however, was the only woman in on the discovery of DNA's double helix, and, having died of ovarian cancer a decade before Watson's account was published, she was no longer around to defend herself. Worse yet—as I suspected even as a scientific youngster, and as Maddox persuasively confirms—the ugly, distorted picture of a shrill, frumpy, unimaginative scientist was a construction essential to Watson's depiction of himself as a prototype of the scientist hero. It was not carelessness that led Watson to attack Franklin, even ignoring his own friendly scientific interactions with her in the years after the elucidation of DNA structure. Rather, the narrative structure demanded that he distort her in order to remake himself as the hero of modern science.

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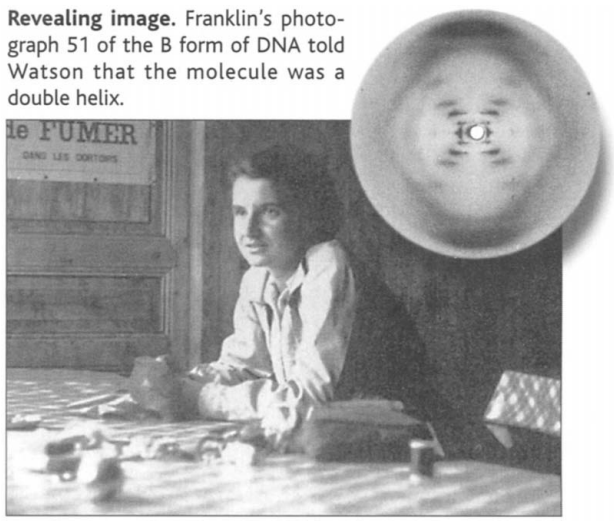
Maddox's book restores some of what Watson robbed from us. We now have answers to a range of questions about science, politics, women, and ethics. Questions such as: (i) What was it like to be both a woman and a Jew devoted to science in England in the 1940s? An answer by way of some examples: When Franklin entered the women's arm of Cambridge University, women were not accepted as "members of the university" and not entitled to earn a degree, but only something called a "decree titular." When she, already an accomplished scientist, later joined the staff at King's College, she learned that women were not allowed to lunch in the senior common room. (ii) Did Watson steal Franklin's data (the crucial diffraction photograph of DNA)? The answer: "Not exactly." Maddox offers a careful assessment of this question and lets Watson off the hook, sort of. (iii) Did Maurice Wilkins share Franklin's data without her knowledge or permission and, after her death, fail to give her proper credit? The answer: "Yes." Maddox's consideration of this issue leads me to think that the book should be used as a case study for graduate training in research ethics. (iv) What was Rosalind Franklin really like? Answer: She was lively, vivacious, defensive, energetic, an outdoors enthusiast, private and scared of intimacy, determined, fierce, and in love with science. In short, she was as complicated as any man, but her professional life was forever a struggle because of her sex.

Rosalind Franklin Dark Lady of DNA
by Brenda Maddox
HarperCollins, London and New York, 2002. 400 pp. £20. ISBN 0-00-257149-8. $29.95, C$44.95. ISBN 0-06-018407-8.



Revealing image. Franklin's photograph 51 of the B form of DNA told Watson that the molecule was a double helix.

On holiday. Franklin enjoyed several vacations in the Alps during the years she worked in Paris.

Who then, is the real hero of science—a woman with cancer, crawling in pain up

long flights of stairs to keep working so that she could provide co-workers, who depended on her, a position even after she died? Or a man who used her data without full authorization or an offer of credit, and who then sullied her reputation after her death? In her answers to these questions, Maddox is never simplistic. She uses Franklin's newly available personal letters and papers as well as interviews and careful study of previously published accounts to provide a nuanced rendering of this important scientist.

Many introductory biology courses still use the DNA story, as told by Watson, to exemplify the glory and excitement of scientific discovery. I plead with the teachers of such courses to read Maddox's book. Then they need to ask themselves, when they use *The Double Helix*, what message do they send to young women who might have the talent and interest to become scientists? And what message do they send to all future scientists—male and female alike—about research ethics and the value of generous collaboration? Indeed, in choosing a narrative of individual glory developed at the expense of a pioneer woman scientist, what message have they sent to all future citizens who take a biology course in college about the ethical status and trustworthiness of science? Isn't now the moment to switch to a careful, well-documented account of scientific practice? Why not assign Maddox's *Dark Lady*, and consign *The Double Helix* to a dark backshelf of history?

BOOKS: COSMOLOGY

Lucifer in the Sky with Dinosaurs

Marcia L. Triunfol

Contrary to a common belief, science is not immune to influence by other views or trends. In *The Prophet and the Astronomer*, Marcelo Gleiser, a professor of physics and astronomy at Dartmouth College, argues that from pre-Socratic philosophers to contemporary cosmologists, our scientific understanding of the cosmos has been greatly influenced by religion. Gleiser shows us that whereas most people have accepted that science can explain how nature works, many continue to believe that only God can tell us why.

The Prophet and the Astronomer
A Scientific Journey to the End of Time
by Marcelo Gleiser

Norton, New York, 2002. 272 pp. $26.95, C$38.99. ISBN 0-393-04987-6.

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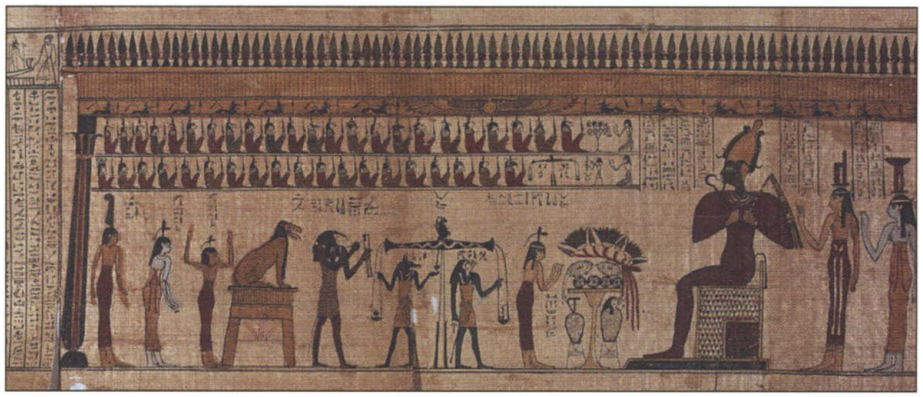

Judgment circa 1025 B.C. Before the dead were admitted to his kingdom of the afterlife (which some accounts placed in the Milky Way), Osiris presided over a trial of how virtuous they had been.

Gleiser claims that our struggle against death in addition to the inescapable reality that our lives are limited by space and time have driven us to a desperate search for answers to the meaning of our brief tenure of existence as well as our purpose in the cosmos. Science and religion can play different but complementary roles in this search for understanding and in the persistent dream of eternal life. Pursuit of immortality has produced paintings, books, offspring, theorems, songs, and ideas—anything that can remain after we die. The author believes that it is the hope that we can create the infinite and the eternal that has inspired painters and writers, philosophers and priests, and the rest of us as well. He leaves us with the impression that religion, science, philosophy, and popular culture are different but real manifestations of this hope.

And, he senses, the sky seems to be where all our fears and dreams come together. The sky is the place where God writes messages of doom and inspiration through stars and comets. Newton had seen comets as God's tools for creating and destroying worlds in the universe. Kant believed only God could have given order to that same universe. At present, God has faded from the heavens and been replaced in modern pop culture by E.T., who returns to worlds unknown to us after performing countless miracles on Earth (such as bringing the dead back to life and allowing kids to fly on their bikes). And the reader may remember other less wholesome "things" that, according to pop culture, can come from the skies. Whereas E.T. is an emissary of love, frightening aliens and other unpleasant cosmic figures reflect our fear of the skies. This contradiction of looking to and shying away from the sky illustrates why, in our human consciousness, Lucifer can be either the terrifying devil or the brilliant morning star. As scientific progress shifts our ignorance to different areas of nature, our fears shift as well, Gleiser says.

In popular lore, modern science was born in an attempt to answer the question "How does an apple fall?" An immense amount of scientific knowledge has been produced since Newton's time. Yet, the author observes, we still hold in awe and fear the sky above us. We still speak of eternal salvation and damnation. We still worry that, as the apocalyptic texts have prophesied, a cosmic cataclysm will condemn us to the fate of the dinosaurs. Gleiser claims that our collective eschatological imagination mixes science and religion and is as active as ever. To reinforce his point, he cites three polls conducted over the last 20 years in the United States and Canada. In each of these polls, the majority of the respondents believed that Christ would come back and his return to Earth would be followed by cataclysmic events.

Along with its discussions of the interactions between the scientific and the spiritual, the book continues Gleiser's efforts at popularizing science, as in his earlier *The Dancing Universe* (Dutton, New York, 1997). Using examples such as the demonstration of angular momentum by spinning on a rotating stool, the author explains the physics behind our limited scientific understanding of the cosmos with charm and ease.

Over all, *The Prophet and the Astronomer* offers a well-written and interesting account of how humans, inspired by a mix of fear and fascination with the sky, have tried to defy our time-bound existence. Gleiser is equally comfortable describing apocalyptic accounts such as the Revelation to John and explaining Einstein's general theory of relativity while paraphrasing John Lennon. He provides a careful and pleasant blend of philosophy, astronomy, and religion along with a seasoning of literature and pop culture.