BOOK REVIEWS

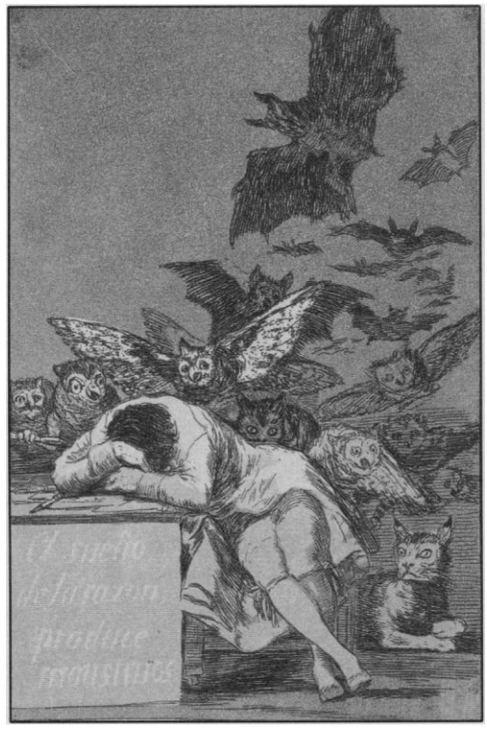
Assailing the Seasons

The Flight from Science and Reason. PAUL R. GROSS, NORMAN LEVITT, and MARTIN W. LEWIS, Eds. xii, 593 pp. New York Academy of Sciences, New York, 1996; $95, ISBN 1-57331-002-6. Paperback edition, Johns Hopkins University Press, Baltimore, MD, 1997; paper, $19.95, ISBN 0-8018-5676-0. Annals of the New York Academy of Sciences, vol. 775. From a conference, New York, May–June 1995.

Two years ago an exceptionally diverse crowd of conferees gathered on the premises of the New York Academy of Sciences to examine and refute—and to raise alarm at—"a new onslaught against science and reason" that "is now a pattern to be found in most branches of scholarship and in all the learned professions." The prime movers were biochemist Paul Gross and mathematician Norman Levitt, whose 1994 book *Higher Superstition: The Academic Left and Its Quarrels with Science* was drawing wide attention with its "bestiary" of postmodernists, feminists, relativists, "perspectivists," social constructivists, and other breachers of the wall between science and culture. The present volume of proceedings (including some papers not presented at the conference) appeared last summer just as the hoax perpetrated by physicist Alan Sokal upon the editors of *Social Text*, such a bestial organ, was reverberating (as it continues to do) through corridors academic and anti-academic. With interest so sustained, the volume is now being issued in a new paperback edition for a broader market by the publisher of *Higher Superstition*. As the organization, sponsorship, and oral transactions of this conference have already been much written about—here Gross and Levitt, while acknowledging its support by the John M. Olin Foundation, the Lynde and Helen Bradley Foundation, and the National Association of Scholars, each deny vehemently that it fell in any particular place on the political spectrum—this review will consider, rather, what these 40-odd papers contribute toward the organizers' aim of placing science back on its pre-postmodern pedestal.

In what, then, does this "new and more systematic flight from science and reason" consist? Gross identifies "the flight from—the 'demythologizing' of—science and reason" with "antirealism" as an epistemological position, with its attendant "oxymoronic multiplication of 'knowledges,' " and most especially with the related postmodern disposition to view knowledge as "a social construction, whose content flows from, and is designed to support, the elites of power." Epithet and innuendo apart, Gross is right: these are indeed pieces of a pattern now to be found in most areas of scholarship. But are these postmodern dispositions simply erroneous? and, more to the point, are they demonstrated to be so by this collection of papers?

Even turning quickly over the pages of



"The Sleep of Reason Produces Monsters," from Francisco Goya's *Los Caprichos*, 1799, used as the cover illustration on the New York Academy of Sciences edition of *The Flight from Science and Reason*. [© Indianapolis Museum of Art, Daniel P. Erwin, Jacob Metzger, Grace Miller Memorial, Delavan Smith and James V. Sweetser Funds]

invective written by certain rabid rationalists and incidental soreheads attracted to this outlet for outrage and considering only the papers providing reasoned arguments and reasonable polemics, a critical reader will find at best equivocal the contribution of these proceedings to the defense of scientific certitude and reified reason independent of human volition and social practice. Indeed, I surmise that somewhere on the way to or from this conference, Paul Gross, who is sufficiently acquainted with the German language to quote Goethe in the original, began repeating to himself the old German saying, "God preserve me from my friends; my enemies I can take care of myself." But it comes as no surprise to this reviewer—nor should it to any historian (see P. Forman, "Recent science: late-modern and post-modern," in *The Historiography of Contemporary Science and Technology*, T. Søderqvist, Ed.; Harwood, 1997)—that when discoursing on the nature of knowledge even those rallying to the battle flag of "science and reason" incline today toward market metaphors rather than religious rhetoric, thus giving evidence of their participation too in our contemporary end-of-the-century—call it postmodern—utilitarian, instrumentalist, and consequently pluralist perspective.

Reaching the reader ahead even of Gross's combative introduction are the introductory remarks headed "Medicine took an earlier flight" by the New York Academy of Sciences' president, Henry Greenberg. Rightly seeing the wide adoption of the term "health care provider" and "the HMO's, with their ten-million dollar CEOs, paying out sixty-eight cents on the dollar for care" as examples of "the social construction of reality," Greenberg shows no recognition that he is providing forceful counterexamples to the thesis of these proceedings, namely that socially constructed reality is oxymoronic (and consequently, in the minds of these rationalists, fictive and nugatory). Rather, as Greenberg's examples show so well, it is beyond all doubting that matters of life and death are daily decided by socially constructed realities, even while the modus operandi of every other sort of reality lies open to some serious question.

It is then not long into these self-refuting proceedings, apropos "conduct and misconduct in science," that Caltech physicist David Goodstein takes up from another angle this same matter of the implications for "science and reason" of the staggering growth in recent decades of the institutions and populations engaged in the production and utilization of knowledge. Speaking as if to Greenberg himself:

Many of us in my generation wish to believe that nothing important has changed in the way we conduct the business of doing science. We are wrong. Business as usual is no longer a real option for how we conduct the enterprise of science.

And as if to Gross himself:

I believe we scientists are responsible for complicity in presenting to the public a false image of how science works . . . . I like to call it the Myth of the Noble Scientist. . . . Scientists are not disinterested truth seekers; they are more like players in an intense, winner-take-all competition for scientific prestige, or perhaps merchants in a no-holds-barred marketplace of ideas. The sooner we learn to admit to those facts . . . the better off we will be.

Goodstein's essay in realism ("antirealism," on Gross's definition) comes after, and is a welcome antidote to, that of Harvard chemical physicist and Nobelist Dudley Herschbach. Herschbach undertakes to present the history of experiments on molecular beams in magnetic fields as "an exemplary saga of science," which, he promises, will "clearly show how myopic is the view of the cultural constructivists." He rightly points out that the originator of this technique, Otto Stern, "did not want to accept the quantum picture" of atoms in magnetic fields being restricted to just a few discrete orientations and had hoped his 1922 experiment would contradict this picture rather than confirming it, as it did. This indeed is a point for the existence of a real world that may manifest itself in ways that discord with our preferences. But does it count at all in favor of epistemological realism (that is, real, transcendent, sempiternal, "god-given" laws for our experiential world), or against a view of physical theories as cultural constructs? Herschbach concedes that those early versions of the quantum theory and conceptions of atomic structure that motivated Stern and interpreted his experiment were "not correct." But no problem! Such earlier conceptions, Herschbach assures us, were "not 'fiction' but rather scaffolding for the emergent [correct] quantum theory."

Who then is "myopic," the so-called social constructivists who see the inadequacy of the metaphor of "scaffolding" to support the realists' faith in a transcendent world of scientific laws, or the epistemological realists who take the conceptions now lying immediately in front of their noses to be real and take all displaced conceptions to be "scaffolding"? It is, further, an irony of such epistemological realism that its hortatory spokesmen, because confident in their connection to that transcendent world of scientific truths—seeing themselves as its showmen in a Platonic shadow play, interposed between the pure light of certain knowledge and the popular mind—typically wave their hands carelessly about when addressing lay audiences. Of this freedom of parabolic invention scientific realist Herschbach avails himself fully, in respect of the physics as well as the history, as his brief account of molecular beams continues on from Otto Stern to the work of I. I. Rabi.

But this is not all there is to Herschbach's exposition. In it is also revealed a postmodern-despite-himself Herschbach, who takes a cure for AIDS, rather than knowledge for its own sake, as a prototypical goal of his "saga of science"; who regards "the enormous scope of our ignorance" as "the most important aspect of the scientific 'world view' "; who takes the title of his essay from the poet Marianne Moore and concludes with Rabi's call for "the fusion of science and the humanities." These commitments all reflect our contemporary, pragmatic, fallibilist, morality-based rather than truth-based *Weltgefühl*; they do not serve the "science and reason" crusade.

A similar "deconstruction" is possible for the majority of contributions to these proceedings: anthropologist Robin Fox affirms that scientific truths are "totally independent of social and cultural context" and on his next page writes that "Scientific 'truth' is indeed not fixed and absolute 'out there' in the world waiting to be discovered, but is a *special kind of relationship between the knower and the known*." He is followed by political scientist Simon Jackman, who affirms that in the liberal tradition "science for the most part does not turn on a notion of 'reality' . . . liberals find contingency at the root of scientific method." And Jackman is followed by a group of women against "feminist epistemology" (philosophers Janet Radcliffe Richards and Noretta Koertge, sometime molecular biologist Meera Nanda, and mathematician Mary Beth Ruskai), every one of whom offers as her last and presumably weightiest counterargument her judgment that the affirmation of a distinctive feminist epistemology is not an *effective* way to achieve female liberation—that is, the issue is not, after all, one of truth but (this being postmodernity) one of tactics and strategy.

Of particular interest to this reviewer is the section Foundations of Physics. Here theorist Sheldon Goldstein, showing no interest in the designated targets, wheels his guns around and fires on his colleagues:

It is not at all unusual, when it comes to quantum philosophy, to find the very best physicists and mathematicians making sharp emphatic claims, almost of a mathematical character, that are trivially false and profoundly ignorant.

Goldstein is followed by the distinguished experimentalist Daniel Kleppner, who starts out in the approved, traditional, Platonic realist mode, extolling quantum mechanics as the transcendent reality of which we see only the shadows—"To the generous eye, the world as we see it is a gift of quantum mechanics"—until acknowledgment of Goldstein's challenge obliges him to call a halt to "this accolade." Kleppner then admits that he himself is, rather, worried "that the theory works too well," that with his

Vignettes: Standards of Judgment

We must stand resolutely against an unintended cruelty of the "positive attitude" movement—insidious slippage into a rhetoric of blame for those who cannot overcome their personal despair and call up positivity from some internal depth. We build our personalities laboriously and through many years, and we cannot order fundamental changes just because we might value their utility: no button reading "positive attitude" protrudes from our hearts, and no finger can coerce positivity into immediate action by a single and painless pressing. How dare we blame someone for the long-standing constitution of their tendencies and temperament if, in an uninvited and unwelcome episode of life, another persona might have coped better?

—*Stephen Jay Gould*, in *Full House: The Spread of Excellence from Plato to Darwin* (Harmony)

If it seems we are being told from all sides today that man is a failure, it is, ironically enough, because we are being judged in terms of a whole new set of standards in a world where almost everything seems possible, and now almost every want, every injustice and every wrong seems unbearable.

—*Glenn T. Seaborg*, in *A Scientist Speaks Out: A Personal Perspective on Science, Society and Change* (World Scientific)

own, genuine, positivist-empiricist commitments—it would not be wrong to describe them as constructivist—he finds it unsettling that the scope of quantum mechanics seems to be so much wider than the observations it correlates. Finally, Jean Bricmont, theorist at Louvain, offers by far the longest and most extensively documented (45 pages and 145 notes) paper in this volume, "Science of chaos or chaos in science?" As his title telegraphs, Bricmont, like Goldstein, is concerned chiefly with willful worldview implications of physical theory propagandized by acclaimed scientists—here specifically Nobelist Ilya Prigogine: "It is a sad fact that those ideas that were so nicely explained by Boltzmann a century ago have to be reexplained over and over again." In sum, these papers, each with its well-taken points, are an embarrassment to the organizers' hordes-without-the-gates thesis.

Finally, some words on the concluding section of papers, Education. Here one finds Ivy-disparaging physicist/popularizer James ("grew up on the wrong side of the tracks") Trefil confidently hawking his snake-oil cure for scientific illiteracy, flanked by Harvard economist/historian/administrator Henry ("I accepted the invitation . . . with great hesitation") Rosovsky and Harvard physicist/philosopher/historian Gerald ("I too do not advise throwing furniture") Holton, member of the conference's organizing committee. Holton, like several others central to this enterprise (Levitt and philosophers Susan Haack, Oscar Kenshur, and Noretta Koertge—each of the last three has two papers in the volume), is sufficiently attuned to postmodern critiques and criteria, and to the normative order of our postmodern world, that he frames the issue not primarily as the truth of science but as "the moral authority of science"—"the moral" being indeed the dimension of our intellectual lives rediscovered in postmodernity. After expressing his dismay that "the constructivist point of view had found its way" into early drafts of the National Science Education Standards "prepared under such high auspices" (no irony *intended*) as the National Academy of Sciences, the National Research Council, and the National Science Foundation and then, on better grounds, deploring the negligible role accorded to science and technology in the since-revised National Standards for United States History, Holton concludes with

> a third example where an enterprise with national scope, distinguished patronage, and years of labor resulted in a severely flawed educational presentation of science and technology in our time. This is of course the exhibit "Science in American Life," now showing as a permanent installation at the National Museum of American History of the Smithsonian Institution in Washington (not to be confused with the plans for the Enola Gay exhibition at the National Air and Space Museum).

But,

> There is, after all, hope that the prejudicial and unbalanced representation of science for the education of a national audience is going to be corrected. The main reason for this rethinking is that . . . at last a scientific society—specifically the American Physical Society—blew the whistle loudly . . . . The chairman of the Board of Directors of the American Chemical Society also made the principal concerns of his society known to the Smithsonian. . . . As a result of these communications, the Smithsonian has promised to revise at least the most egregious parts of the "Science in American Life" exhibit. When that actually happens, the principle I am advocating will have been demonstrated again: *The moral authority of science, as of any professional field, depends importantly on asserting its sense of self.*

This was written in the summer of 1995. But now, if, as has proved to be the case, the changes actually made in the "Science in American Life" exhibit are few and insubstantial, even while the Smithsonian was quick to make drastic changes in its Enola Gay exhibition, would we not have to conclude that the moral authority of the American physicists and chemists is greatly inferior to that of the members of the Veterans of Foreign Wars and the Air Force Association? But can it be in the interest of science and reason so to confuse "moral authority" with political muscle? Is it not, indeed, a betrayal of modernity and its project of enlightenment so to couple "the moral" with "authority"?

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Browsings

Behavioral Neurology and the Legacy of Norman Geschwind. Steven C. Schachter and Orrin Devinshy, Eds. Lippincott-Raven, Philadelphia, 1997. xvi, 304 pp., illus. $110. ISBN 0-397-51631-2.

A memorial volume in which 31 associates of the late neurologist, who died in 1984, offer "personal perspectives" and accounts of his work on disorders of language and other higher cortical function, epilepsy, and handedness and cerebral asymmetry.

The Cambridge Illustrated History of Astronomy. Michael Hoskin, Ed. Cambridge University Press, New York, 1997. ix, 392 pp., illus. $39.95 or £24.95. ISBN 0-521-41158-0. Cambridge Illustrated Histories.

Accounts by Hoskin, Owen Gingerich, and several others covering astronomy from prehistory to the mid-20th century, with color and black-and-white illustrations showing heavenly bodies and their movements, instruments used to observe them, and some of the observers.

Dreams, Stars, and Electrons. Selected Writings of Lyman Spitzer, Jr. Lyman Spitzer, Jr., and Jeremiah P. Ostriker, Eds. Princeton University Press, Princeton, NJ, 1997. xvi, 537 pp., illus. $99.50 or £75, ISBN 0-691-03702-7; paper, $39.59 or £30, ISBN 0-691-02797-8.

Thirty-two reprinted papers on interstellar matter, stellar dynamics, space science, plasma physics, and other topics by the Princeton astrophysicist, who died 31 March.

A History of Chemistry. Bernadette Bensaude-Vincent and Isabelle Stengers. Harvard University Press, Cambridge, MA, 1996. 305 pp., illus. $35 or £25. ISBN 0-674-39659-6. Translated from the French edition (1993) by Deborah van Dam.

A French work reviewed in *Science* **264,** 997 (1994) now appears in English.

Unsolved Problems in Astrophysics. John N. Bahcall and Jeremiah P. Ostriker, Eds. Princeton University Press, Princeton, NJ, 1997. xvi, 377 pp., illus. $69.50 or £55, ISBN 0-691-01607-0; paper, $24.95 or £19.95, ISBN 0-691-01606-2. Princeton Series in Astrophysics. From a conference, Princeton, NJ, April 1995.

Expositions by "leading astrophysical researchers" of 18 problems (six having to do with cosmology and large-scale structure, three with galaxies and quasars, and nine with "astrophysical laboratories"), prepared with the needs of a second-year graduate student looking for a thesis topic in mind.

The Westerbork Observatory, Continuing Adventure in Radio Astronomy. Ernst Raimond and René Genee, Eds. Kluwer, Norwell, MA, 1996. x, 266 pp., illus. $95, £64, or Dfl. 145. ISBN 0-7923-4150-3. Astrophysics and Space Science Library, vol. 207.

Twelve essays bearing on past, present, and future work at a Netherlands facility celebrating its 25th anniversary.

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Other Books Received

Atlas of the Oceans. Wind and Wave Climate. Ian R. Young and Greg J. Holland. Pergamon (Elsevier Science), Tarrytown, NY, 1996. xvi, 241 pp., illus. $265 or NLG 420. ISBN 0-08-042519-4.

Chaos. An Introduction to Dynamical Systems. Kathleen T. Alligood, Tim D. Sauer, and James A. Yorke. Springer-Verlag, New York, 1996. xviii, 603 pp., illus., + plates. Paper, $39. ISBN 0-387-94677-2. Textbooks in Mathematical Science.

The Chemistry Maths Book. Erich Steiner. Oxford University Press, New York, 1996. xii, 542 pp., illus. $80, ISBN 0-19-855914-3; paper, $29.95, ISBN 0-19-855913-5.

The Ethics of Human Gene Therapy. LeRoy Walters and Julie Gage Palmer. Oxford University Press, New York, 1996. xviii, 209 pp., illus. $27.95. ISBN 0-19-505955-7.

Ethics on the Ark. Zoos, Animal Welfare, and Wildlife Conservation. Bryan G. Norton *et al.*, Eds. Smithsonian Institution Press, Washington, DC, 1996. xxviii, 330 pp., illus. Paper, $16.95. ISBN 1-56098-689-1. Zoo and Aquarium Biology and Conservation.