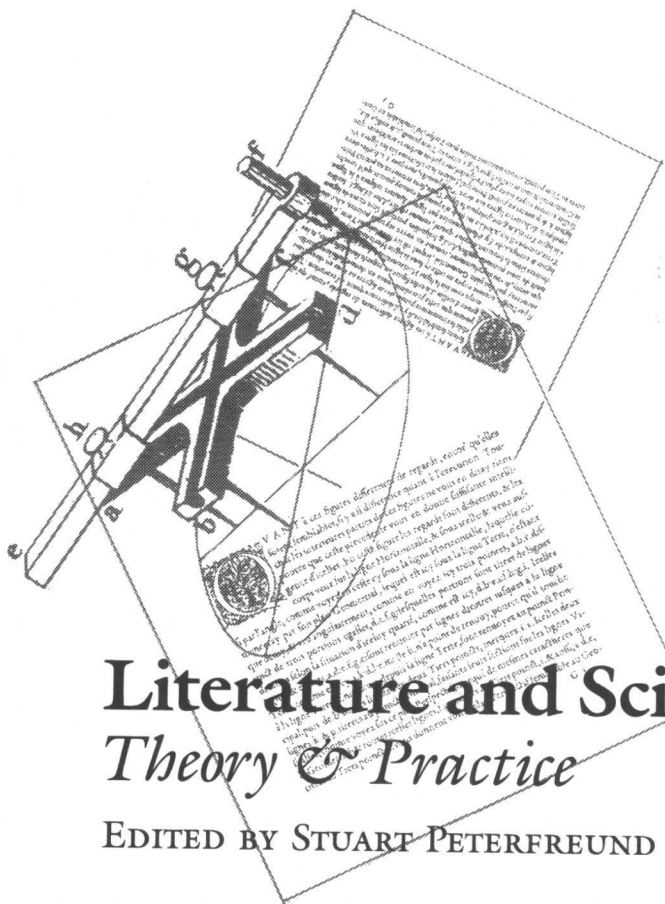


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# Literature and Science

## *Theory & Practice*

EDITED BY STUART PETERFREUND



# Literature and Science *Theory & Practice*

EDITED BY STUART PETERFREUND

NORTHEASTERN UNIVERSITY PRESS BOSTON

Northeastern University Press

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*Library of Congress Cataloging-in-Publication Data*

Literature and science / edited by Stuart Peterfreund.

p. cm.

Bibliography: p.

Includes index.

ISBN 1-55553-058-3 (alk. paper)

1. Literature and science. 2. Science in literature. 3. Critical theory.  
4. Literature, Modern—History and criticism.

I. Peterfreund, Stuart.

PN55.L5 1990 89-33905

801—dc20

CIP

Designed by Mike Fender

This book was composed in Galliard by The Composing Room of Michigan, Inc., in Grand Rapids, Michigan. It was printed and bound by Hamilton Printing Company, Rensselaer, New York. The paper is Miami Vellum, an acid-free sheet.

MANUFACTURED IN THE UNITED STATES OF AMERICA

94 93 92 91 90 5 4 3 2 1

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## Introduction

IN THE 1980s, we have witnessed a marked rise of interest in the study of the ideological, social, and cultural relations of science in general and in the study of literature and science in particular. The rising interest in literature and science has been signaled by a number of important book-length studies, among them Michel Serres's *Hermes*, Paisley Livingston's *Literary Knowledge*, Trevor H. Levere's *Poetry Realized in Nature*, Gillian Beer's *Darwin's Plots*, Sally Shuttleworth's *George Eliot and Science*, Ronald E. Martin's *American Literature and the Universe of Force*, and N. Katherine Hayles's *The Cosmic Web*.<sup>1</sup>

A number of book-length essay collections devoted wholly or in part to literature and science have also appeared in this decade. They include Roy Porter and G. S. Rousseau's *The Ferment of Knowledge*; James Paradis and Thomas Postlewait's *Victorian Science and Victorian Values*; Ludmilla Jordanova's *Languages of Nature*; Frederick Burwick's *Approaches to Organic Form*; Andrew E. Benjamin, Geoffrey N. Cantor, and John R. R. Christie's *The Figural and the Literal*; and George Levine's *One Culture*.<sup>2</sup> Journals such as *Annals of Scholarship* and *University of Hartford Studies in Literature* have brought out special is-

sues devoted to literature and science.<sup>3</sup> In addition, the study of literature and science is served by a newsletter—*PSLS*, established by the Society for Literature and Science (SLS) at its founding in 1985—as well as by an annual bibliography (formerly published in *Clio*, now in *PSLS*) and a one-hundred-year (1880–1980) cumulated bibliography recently published by the Modern Language Association of America (MLA).<sup>4</sup>

Organizationally, the study of literature and science has also flourished. The Division on Literature and Science of the MLA has long conducted sessions in this interest area at the annual national convention, and they have become increasingly prominent in meetings of MLA's regional affiliates, as well as in meetings of the American Society for Eighteenth-Century Studies and of the International Association for Philosophy and Literature. Founded at the 1985 meeting of the International Congress of History of Science (ICHS), SLS currently boasts an international membership approaching five hundred. At a meeting of the Anglo-American Conference of the History of Science Society and the British Society for the History of Science, in 1988 the panel discussion of literature and science proved both provocative and informative and was warmly received by historians and philosophers of science. There is every indication that one or more sessions at the next quadrennial meeting in 1992 will also be devoted to literature and science.

The flourishing of interest in literature and science constitutes a rousing affirmation of a field of inquiry that, in the late 1970s, had a questionable future, according to one of its foremost scholars and advocates, G. S. Rousseau.<sup>5</sup> The affirmation is due to several factors, among them a calling into question of previous methods of historical scholarship and interpretation, "externalist" accounts as well as "internalist" accounts as they pertain to cultural institutions such as science, and a questioning of previous methods of close literary analysis—the New Criticism to be sure, but also philology—as they pertain to our understanding of literary texts.

These callings into question are, in turn, situated in a larger context of cultural self-interrogation directed at bracketing operative notions such as those of the "natural," the "correct," and the "canonical"—indeed, the very notion of the academic "discipline" itself and the enabling assumptions and methodologies one mobilizes to produce meaning—toward the end of redescribing and reanalyzing the ideological horizons of scholarly praxis in particular and of western culture in general. In terms of this redescription and reanalysis, literature and science are two discourses among other discourses contained, if not con-

strained, by those ideological horizons. Understood as such, literature and science may be reassimilated in the creation of a new cosmology or, if that claim is too grandiose, may at least be understood as framed discourses, bearing in common the mark of some culturally authorized third term that frames or informs both. If this self-interrogation manifests or implies a politics of discourse, it is the feminist or Marxist discursive politics of scholars such as Sandra Harding or Fredric Jameson,<sup>6</sup> not the hegemonic conservative politics of scholars such as Allan Bloom or E. D. Hirsch.<sup>7</sup>

Flourishing interest and propitious politics notwithstanding, much of what is understood to be the discourse of literature and science has, historically, manifested an egregious lack of ideological, critical, and/or methodological self-consciousness. Given its roots in philology and the history of ideas, the study of literature and science has all too often been, especially prior to the 1980s, a matter of "finding" scientific ideas "in" literature and literary ideas "in" science, in order to demonstrate, in the service of an ideal of cultural unity, that writers have not been hermetic, anachronistic curmudgeons for their part and that scientists have not been illiterate laboratory spooks hovering exclusively over their air pumps and galvanic piles for theirs.<sup>8</sup> The work of such pioneers as Jacob Bronowski, Walter Clyde Curry, Herbert J. Muller, and Marjorie Hope Nicolson is important for establishing the discursive space necessary for "doing" literature and science,<sup>9</sup> but that work never did—indeed, never could—venture meaningful commentary on the foundational assumptions and methodologies used to study literature and science or on the ideological dimension of the resulting discourse. Those who did pay attention to questions of methodology and ideology—usually social historians of the discourse of science such as Boris Hessen and Robert Merton, not those studying the discourse of literature and science—were often as reductive in their application of genetic models of cause and effect as those responsible for the *Quellenforschungen* detailing the scientific "sources" of a major literary figure or work.<sup>10</sup>

Despite the recent flourishing of ideological, critical, and methodological self-scrutiny, most recent essay collections (*The Figural and the Literal* is the notable exception) have not strongly reflected this change of intellectual climate. These volumes have tended to be collections of essays by several hands and little more than that unless, like *Approaches to Organic Form*, they had a common subject. The present volume attempts to retain the synoptic breadth characteristic of the best of these collections while demonstrating the sort of self-scrutiny that has in several instances been wanting. All the contributors make a start



out of the assumption that, typically, the discourse of literature and science, like any other discourse of a given culture, is language-bound—logocircumferential, not logocentric—and that language itself is the repository of ideological values and critical and methodological praxis, as well as the boundary between the operational (“doing” science or “doing” literature) and the valuative (“discovering” scientific laws and theories or “arriving at” literary insights or truths). Within this literature and science seek to confront the indeterminacies that lie beyond, although without any false hope of reducing, let alone totalizing, those indeterminacies.

The boundary between the valuative and the operational is the focus of the present volume. Each of the essays identifies its subject: a problem, topic, or issue in one of the boundary areas of literary-scientific relations. Each essay then proceeds to specify the methodology used to approach its subject. Once specified, the methodology is discussed for the purpose of reaching at least a preliminary understanding of what sort of interpretation its ideological, critical, and/or methodological presuppositions may be expected to generate. The interpretation follows.

The essays themselves are divided into two somewhat arbitrary sections. The essays by Edward Davenport, Charles Anderson, James J. Bono, and Eric C. White, which comprise the first group, all in their various ways address the problem of literary-scientific relations by examining the ideological presuppositions of literature and science as discrete discourses and then proposing models of literary-scientific relations calculated to transcend the disciplinary boundaries posed by those presuppositions. Because they approach the question of literary-scientific relations from a perspective that is specifically historical as well as theoretical, the essays by Mark L. Greenberg, Frederick Burwick, N. Katherine Hayles, and my own essay, which form the second group, complement the essays of the first group by demonstrating the manner in which the theory-and-practice approach can pay scholarly dividends through its reformulation of problems considered “merely” historical (rather than theoretical).

In “The Devils of Positivism,” Edward Davenport’s purpose, by his own admission, is “to bury positivism, not to praise it.” According to Davenport, it is a demotic positivism, wielded by those who would maintain the boundaries between *Naturwissenschaft* and *Geisteswissenschaft*, that prevents “any attempt to pursue literary theory in a scientific spirit.” Such a spirit does not lead one to attempt “to escape metaphysics,” for, properly understood, science itself makes no such attempt. Instead, the pursuit of “literary theory in a scientific spir-

it" entails recognizing the influence positivism has already had on the development of literary criticism, from the time of Spinoza onward, and bracketing that positivist strain and its product, if not putting them under erasure outright. As for boundaries, whether between the natural and human sciences or between other entities: Davenport sees as the underlying agenda of positivism a strong program of social control, a program aimed at putting things in their always discretely separate places. Whether these places are ordained by the ideal of organic unity, as is the case for Comte, or by the ideal of use value, as is the case for Mill, they are ultimately reflexive to the sociopolitical concerns of the individual who bespeaks them. To come to terms with positivism is, for Davenport, to own its influence, transfigured by revisionary ratio to that of Bloom's *apophades* (day of the dead): "we need to reclaim our positivist heritage, while rejecting that positivist hostility to metaphysics . . . which leads only into the cul de sac of Pragmatism. A more sophisticated assessment of positivism will make it easier to begin . . . developing a scientific . . . literary criticism."

In "Literature and Medicine: Why Should the Physician Read . . . or Write?" Charles Anderson undertakes to answer this question by describing "a theory of symbolic interaction which explains, in relatively uncomplicated terms, why patients and physicians seem to speak about such different things when they address the events of sickness." The communication problem to which Anderson alludes "arise[s] directly from conflicts among discursive relationships implied by" the evolving role of the physician throughout the history of medicine. That history is characterized by the physician's withdrawal from dialogue with the patient as medicine moved from a religious and mystical orientation to a scientific one. Implied in the establishment by medicine of "discretionary space, room for exploration, speculation, and even some experimentation" is the onset of a silence between patient and physician and the growth of a "terministic screen" between the two, whose concerns and modes of participation in the life-world of the hospital or clinic have become essentially alienated from one another. The physician should read, then, as the first step in overcoming this alienation. It is, after all, relatively easier for physicians to "learn to come to the medical event both as scientists . . . and as symbolic spectators working with patients to convert scientific facts into human meaning" than it is to train all patients as doctors. The goal, as Anderson sees it, is doctors who are "fully humanized persons" working with "fully humanized patients to heal both the body and the spirit and to bring about the wholeness necessary to health."

In "Science, Discourse, and Literature: The Role/Rule of Metaphor

in Science,” James J. Bono returns to the much-discussed issue of conceptual change in science to argue that the use of metaphor in science, far from being merely illustrative or ornamental, is fundamentally constitutive of scientific discourse. Moreover, the

metaphorical aspects of language are essential to understanding the dynamic of conceptual change in science precisely because they ground complex scientific texts and discourses in other social, political, religious, or “cultural” texts and discourses. Rather than mirroring the “legible face” of a reality envisioned by scientists and “deciphered” within a single, dominant paradigm, complex scientific texts and discourses constitute themselves through their intersection with other multiple discourses.

Bono, in other words, proposes situating science in a metaphorically constituted “archaeology of knowledge” of the sort envisioned by Michel Foucault, whose influence Bono freely acknowledges. In framing his argument, Bono questions the strict limits imposed on the constitutive aspect of metaphor in science by Richard Boyd, as well as the attempt to distinguish between the constitutive properties of literary and scientific metaphors undertaken by W. H. Leatherdale. Instead, Bono follows the lead of Mary Hesse and Michael Arbib, who argue that “the development of science and philosophy since the seventeenth century has conspired ‘to direct attention away from the concrete facts of ambiguity and change in language,’” especially metaphorical language. Bono concludes by considering “metaphor as a medium of exchange,” that is, “as both the site and means for exchanges among not only words or phrases, but also theories, frameworks, and, most significantly, discourses.” Exchange implies value, and value in its turn implies an agency to ordain value, which is characteristic of metaphor in science no less than in other discourses. Accordingly, Bono ends with the hope that “science . . . may suffer the rule of its own metaphors and thereby exhibit a genuinely dialogical relationship with literature.”

In “Contemporary Cosmology and Narrative Theory,” Eric Charles White engages the problematics of narrativity as it applies to the production of cosmological accounts of the origins of the universe. Conceding the validity of the critique of historical narrative of any sort advanced by the likes of Hayden White and Fredric Jameson, Eric White is nevertheless troubled by the implications of that critique for a critical stance and evaluative standards. Accordingly, he attempts “to mediate the dispute concerning the legitimacy of narrative history by turning to a particular case”—natural history in general and cosmology in particular. In so doing, White sees cosmology as a test case for the dispute laid out above, with important implications for how a lay au-

dience should respond to "the tales of cosmic evolution told by the physicists." Faced with "the desire for representational closure" and the imperative of conceiving the unimaginable, the contemporary cosmologist finds himself or herself engaged in an ironic pursuit. The emplotment of the resulting narrative, then, is "a satiric emplotment of cosmic evolution as farce or picaresque. Alone among the traditional armory of narrative forms, farce offers a vision of history that remains cognizant of the sublime unrepresentability of cosmic evolution, a form of narrativity consistent with relativity theory . . . and chaos theory." If there is a narrative strategy that offers the means of moving beyond "a romantic emplotment of history as progressive," it is the picaresque, which allows for a skeptical stance yet eschews the temptation of "plotting the history of reality" as one with either a poetically triumphal or tragic closure. White's picaresque returns its narrator and audience to a world whose history is "a process without a *telos* or goal in which promise and possibility oscillate interminably with the prospect of devolution."

In "Eighteenth-Century Poetry Represents Moments of Scientific Discovery: Appropriation and Generic Transformation," Mark L. Greenberg brings the analysis of literary-scientific relations in the 1700s to a high order of delicacy in demonstrating that the "struggle between 'science,' or natural philosophy, and 'literature' as competing . . . social institutions" was both "fierce" and "encoded," the latter circumstance tending to obscure the former. Rejecting the view that literature and science coexisted easily as different but fully legitimated pursuits in the republic of letters ordained by the classical and humanistic traditions, Greenberg argues that "the language of many eighteenth-century poems devoted to science tropes for poetry and the poet—captures for writing—key instances of scientific discovery while it struggles to represent linguistically that which equations or other purely rational systems can never communicate." As his principal cases in point, Greenberg explores the tropaic moves of John Hughes's "The Ecstasy," James Thomson's "To the Memory of Sir Isaac Newton," Richard Glover's "Poem on Sir Isaac Newton," and Mark Akenside's *Pleasures of the Imagination*; he then turns to "the divergent or contrasting figurations of moments of scientific discovery in the works of such romantic writers as Blake, Coleridge, Wordsworth, and Shelley." In all instances, as Greenberg argues, the tensions between poetry and science seem most fascinating when they appear in poetry considered generally to be supportive of science and scientists.

In my essay, entitled "Blake, Priestley, and the 'Gnostic Moment,'" I attempt to demonstrate how, at one particular instant in the late eigh-

teenth century, a poet and a scientist articulated a response that went beyond the boundaries of their respective discourses to the end of issuing a critique of authority within those discourses and the mechanisms of empowerment leading to such authority. From at least the time of the pre-Nicene Church, gnosticism has been the not-always-loyal opposition, offering a critique of the manner in which established power is promulgated and the epistemological and truth claims that it can legitimately make for how and what it knows. From the start, gnosticism has cast a cold eye on the tropological move in which one who claims "to speak for" some higher authority reifies its own authority through a strategy of metonymic characterization. Following the lead of Elaine Pagels, for example, I should argue that, in the hands of an established Church claiming *ex cathedra* authority to pronounce on the truth of scripture and dogma alike, the creed that endorses as its first principle a belief in "God the Father" becomes the efficient cause of setting in place a patriarchal clergy that relegates women to secondary roles in the practice and promulgation of interpretive and disciplinary authority. Similar moves may be observed in Newtonian scholia on the "true nature" of matter (and the God who, as a transcendent albeit absconded first cause, sets it in motion) and Augustan pronouncements about poetry's imperative to "follow nature." For Blake, who proclaimed his gnostic loyalties, and for Priestley, who was at least superficially far more critical of it, then, gnosticism provides the point of view from which to reveal and criticize the strategy of reification-by-metonymy, as well as the visionary means to present alternative imaginative, cosmological, and scientific accounts of how (and why) "things happen" in the world of human existence.

In "Romantic Drama: From Optics to Illusion," Frederick Burwick explores the development of illusionary stagecraft during the last quarter of the eighteenth century and first half of the nineteenth. Despite resistance from some—Coleridge and Lamb, for example—on the basis of the argument that "stage illusion . . . is not dramatic illusion," the former affecting merely the eye, the latter the imagination, "the acute attention of playwrights and producers to the developments in physical and physiological optics and to experiments in visual perception makes the drama of the period . . . the most intense arena of interaction between aesthetic and scientific concerns." Burwick divides his attention between the techniques of illusion, such as backlighting, forelighting, and projection, and the technology of illusion. As technology improved, progressing from simple oil lamps and mirrors to the magic lantern and limelight, the scale and effectiveness of stage illusion was greatly enhanced. In his conclusion Burwick returns to the objections

of Coleridge and Lamb: "What is the nature of dramatic illusion? The answer requires attention to the lambent nature of visual images and the tenuous trust in perception. In exploring the physics of light and the physiology of sight, science has provided new means to challenge both perception and imagination." Seen in a broader context, Burwick's point is that since the late eighteenth century it has not been possible to talk of imaginative activity as the product of scientific or technological thought, or of scientific or technological thought as the product of imaginative activity; rather, the two become a self-sustaining dyad, interdependent modes of thought that have worked in the past and may work in the future each to broaden the horizons of the other.

In "Self-Reflexive Metaphors in Maxwell's Demon and Shannon's Choice: Finding the Passages," N. Katherine Hayles begins with the assumptions that language is ineluctably metaphoric and that the essence of metaphor is in its establishing of relations between words and, ultimately, what those words are taken to signify. As long as metaphor maintains a "twist," that is, a tension compounded of similarity and difference, between the words it relates, a metaphor is considered "live." With the disappearance of such a twist, the metaphor becomes "dead." But this very metaphor equating the mortality of metaphors with that of living creatures is itself an exemplar of how the twist operates, "for metaphors that appear dead may be brought back to active tension again through their interplay with the surrounding context, as the split writing of deconstruction has taught us." Not only "may be brought back to active tension again" but are: Hayles's is "a narrative of metaphors . . . being tightened into tension by changing cultural contexts in interplay with disciplinary traditions." Specifically, Hayles undertakes to trace the manner in which a heuristic metaphor in thermodynamics—that of Maxwell's Demon—having lost its twist with the development (and normalization) of thermodynamics, regains that twist at a "self-reflexive moment" (a "point where the heuristic becomes a metaphor for itself") in information theory. As a metaphor devised to help explain entropy in kinetic systems and to offer some alternative to the specter of universal heat-death (entropy), Maxwell's Demon raised as many questions as it helped answer; as a heuristic, in other words, it demarcated the grounds of disagreement, not the solution to prevent it. So, too, when Leon Brillouin and Claude Shannon revived this heuristic in the discursive context of information theory, it offered grounds for disagreement. Brillouin argues that "information and entropy are opposites and should have opposite signs," denominating information "negentropy," whereas Shannon maintains that information and entropy are identical. Shannon's view has carried the day, but the

triumph owes more to his hermeneutical ability to "read" the metaphor convincingly than to his capacity to reduce it to an invariant truth.

The essence of the argument—Maxwell's Brillouin's, Shannon's, and, ultimately, Hayles's and that of the other contributors to this volume—is the interplay between theory and practice, part and whole. Hayles freely owns that she has been talking in circles, hermeneutic circles that are as indispensable to the discourse of science as they are to the discourse of literature (and the discourse of literature and science). Hayles's concluding hope is one that I and, I suspect, most if not all of the other contributors share: to acknowledge the twist, both observed and enacted, to put a torque on that circle that will deform it enough to make its presence visible, and reinforce it enough to demonstrate its inevitability.

### Notes

1. Michel Serres, *Hermes: Literature, Science, Philosophy*, ed. Josué V. Harrari and David Bell (Baltimore: Johns Hopkins Univ. Press, 1982); Paisley Livingston, *Literary Knowledge: Humanistic Inquiry and the Philosophy of Science* (Ithaca: Cornell Univ. Press, 1988); Trevor H. Levere, *Poetry Realized in Nature: Samuel Taylor Coleridge and Early Nineteenth-Century Science* (New York: Cambridge Univ. Press, 1981); Gillian Beer, *Darwin's Plots* (London: Methuen, 1983); Sally Shuttleworth, *George Eliot and Science: The Make-believe of a Beginning* (New York: Cambridge Univ. Press, 1984); Ronald E. Martin, *American Literature and the Universe of Force* (Durham: Duke Univ. Press, 1981); N. Katherine Hayles, *The Cosmic Web: Scientific Field Models and Narrative Strategies in the Twentieth Century* (Ithaca: Cornell Univ. Press, 1984).

2. *The Ferment of Knowledge: Studies in the Historiography of Science*, ed. Roy Porter and G. S. Rousseau (New York: Cambridge Univ. Press, 1980); *Victorian Science and Victorian Values*, ed. James Paradis and Thomas Postlewait (1981; rpt. New Brunswick: Rutgers Univ. Press, 1985); *Languages of Nature*, ed. Ludmilla Jordanova (New Brunswick: Rutgers Univ. Press, 1986); *Approaches to Organic Form*, ed. Frederick Burwick (Boston: Reidel, 1987); *The Figural and the Literal: Problems of Language in the History of Science and Philosophy, 1630–1800*, ed. Andrew E. Benjamin, Geoffrey N. Cantor, and John R. R. Christie (Manchester: Manchester Univ. Press, 1987); *One Culture: Essays in Science and Literature*, ed. George Levine (Madison: Univ. of Wisconsin Press, 1987). The Levine volume, it should be noted, is planned as the first in a University of Wisconsin Press series of books on literature and science, a project much like the one on science and the humanities undertaken by David Hull for the University of Chicago Press. A number of other volumes are forthcoming, including a selection of papers from the first annual meeting of the Society for Literature and Science (SLS), to be published by Reidel, and a collection under the editorship of Paul Privateer and G. S. Rousseau, to be published by Cambridge University Press.

3. *Annals of Scholarship* 4,1 (1986); *University of Hartford Studies in Literature*

19,1 (1987). Other journals, including *Studies in the Literary Imagination* and *The Missouri Review*, are planning to do the same.

4. *The Relations of Literature and Science: An Annotated Bibliography of Scholarship, 1880-1980*, ed. Walter Schatzberg, Ronald A. Waite, Jonathan K. Jackson (New York: Modern Language Association of America, 1987).

5. See G. S. Rousseau, "Literature and Science: The State of the Field," *Isis* 69 (1978): 583-91. Rousseau also questioned the future of literature and science in a 1978 MLA convention paper entitled, "Literature and Science: Decoding the State of the Field" (session 553), which itself became the basis of further discussion (session 625).

6. In *The Science Question in Feminism* (Ithaca: Cornell Univ. Press, 1986) and *Fiction and the Political Unconscious* (Ithaca: Cornell Univ. Press, 1981), respectively.

7. In *The Closing of the American Mind: Education and the Crisis of Reason* (New York: Simon and Schuster, 1987) and *Cultural Literacy: What Every American Needs To Know* (Boston: Houghton Mifflin, 1987), respectively.

8. These comments and some that follow draw, in a general sense, on my "Literature and Science: The Present State of the Field," *University of Hartford Studies in Literature* 19,1 (1987): 25-34.

9. See, for example, Jacob Bronowski, *Science and Human Values*, rev. ed. (1965; rpt. New York: Harper & Row, 1972); Walter Clyde Curry, *Chaucer and the Medieval Sciences* (New York: Oxford Univ. Press, 1926); Herbert J. Muller, *Science and Criticism: The Humanistic Tradition in Contemporary Thought* (New Haven: Yale Univ. Press, 1943); and Marjorie Hope Nicolson, *Newton Demands the Muse: Newton's Opticks and the Eighteenth-Century Poets* (Princeton: Princeton Univ. Press, 1946).

10. See, for example, Boris Hessen, *The Social and Economic Roots of Newton's Principia* (1931; rpt. New York: Howard Fertig, 1971); and Robert Merton, *Science, Technology, and Society in Seventeenth-Century England* (1938; rpt. Atlantic Highlands: Humanities Press, 1978).



