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Acknowledgments


Without the steadfast encouragement and support of all the contributors, who patiently endured my editorial proddings and pleadings, this book would never have been completed. I count myself particularly fortunate to have been able to work with them; even more, to learn from them. I am also grateful to Nancy Grayson Holmes, Kelly Caudle, and Melinda Conner, my editors at the University of Georgia Press, and to the anonymous readers of my manuscript. Whatever faults remain in this book are certainly not theirs. Finally, I am indebted to the Faculty Research Committee at Tennessee Technological University, which provided a reduced teaching load in order for me to work on this book.
Introduction: Science in Culture

MURDO WILLIAM MCRAE

Nearly thirty years ago, C. P. Snow wrote The Two Cultures, the seminal meditation on the relationship between the literary and the scientific cultures, to express his fear that the two might never bridge their “gap of mutual incomprehension” (1964, 4). The linguistic, literary, and theoretical perspectives that today guide cultural analysis make Snow’s fear seem misplaced, however. These perspectives show us that science is situated in the culture that enables it, thus science should not be exalted over literature, history, philosophy, or other nonscientific cultural expressions. In the study of the nonscientific culture, critical relativism is more often the norm than not, with the consequence that few who study the nonscientific culture believe that multiple, partial, and conflicting perspectives involve the outright denial of truth.1 Surprisingly, however, even those who grant relativism value for the study of nonscientific culture find it at times valueless for the study of science. For them, the conviction remains that science is not a relative matter but a matter of unimpeachable fact and truth.

But science is a relative matter, in the sense that science must be related to the ideologies, values, habits of thought, and linguistic and rhetorical practices that shape our culture if we are to understand both its power and its limitations. Finding this kind of relativism hard to accept, many traditionalists seek comfort in Francis Bacon’s Magna Instauratio ([1620] 1937), often credited with being the philosophical origin of modern science. To read Bacon carefully, however, is to see that his arguments reveal something quite different from the traditional view that science escapes culture. Bacon thought that science must reign majestically over culture and that science was to have no master but nature, though even nature must finally submit to the power of science. Man may be “the servant and interpreter of Nature,” and “Nature to be commanded must be obeyed” (272) proclaim two of the aphorisms by which Bacon hoped to supplant medieval science and institute the modern empirical method. Bacon further insisted that
interpretable obedience of nature is the only legitimate route to “the most
general axioms” (275) because such obedience permits “human knowledge
and human power [to] meet in one” (272). But by making knowledge of
nature synonymous with human power, Bacon contributed to the wide-
spread belief that science might eventually master culture as it masters
nature.

As his essentially political concern with human power illustrates, Bacon
situated science in culture. This political emphasis also explains why Bacon
knelt to the political ideology of his day when he dedicated his work to
James I, submitting that “surely to the times of the wisest and most learned
of kings belongs of right the regeneration and restoration of the sciences”
(242). Perhaps the scientist must be dutiful to nature, but that duty must
itself first be dutiful to political reality. Nor is this all. Just as he linked
science to political authority, so Bacon hoped to draw authority from reli-
gion. This accounts for his doctrine of the “idols of the mind,” which prohibit
us from understanding how nature reveals the “ideas of the divine” (275):
science must never permit human nature (the idol of the tribe), individual
bias (the idol of the cave), language (the idol of the marketplace), or
specious philosophical systems (the idol of the theater) to impinge on its
business. Bacon’s doctrine is certainly a familiar one; even so, his reliance
on the force of religion to insulate science from mundane human culture
carries obvious political force. Only by rejecting all such false idols, Bacon
claimed, could “the entrance into the kingdom of man . . .
being not much other than the entrance into the kingdom of heaven” be
assured (294; emphasis added).

Regardless of the familiarity of his argument that science must detach
itself from the rest of culture, Bacon entangled science all the more force-
fully in culture. So also does his most recent embodiment, Paisley Living-
ston, whose Literary Knowledge: Humanistic Inquiry and the Philosophy
of Science (1988) takes issue with the view that cultural relativism has any
value for the study of science. Indeed, Livingston scorns what he calls the
“framework relativism” of recent literary and cultural theory, especially its
conviction that language, habits of thought, and cultural values limit what
scientists can think. The problem with that conviction, he claims, is that
it distorts science, fostering the belief “that there can be no correct episte-
ological demarcation between science and nonscience” (1988, 23). Like
Bacon, in other words, Livingston predicates his argument on something
like a doctrine of the idols—in his case, literary and cultural theories that
lead to the false belief that progress in scientific knowledge never occurs.

Livingston’s stress on progress rests on a political agenda for science,
however, thus indicating that his science is as culturally situated as Bacon’s.
Although Livingston writes somewhat critically of the separation between
the sciences and the humanities in the university, he nonetheless insists
that it would be naïve to question “the hegemonic scientific model,” for
to do so would be to ignore the enormous progress achieved by science
(1990, 26). “Contradicted by widespread beliefs in the superiority of the
scientific model of knowledge” (1990, 21), Livingston insists, cultural rela-
tivism in the humanities should defer to the truths that science reveals.
Hence, in the same way that Bacon linked arguments for power over nature
to the political authority of the monarchy and the church, so Livingston
links arguments about progress in scientific knowledge to the lineaments
of political power in the modern university. The players change, the argument
remains: political power is licensed by what Bacon would call axiomatic,
and Livingston hegemonic, knowledge of nature.2

I draw attention to Bacon and Livingston not to quibble with them but to
underscore the conviction that informs The Literature of Science: we must
be skeptical of any attempt to divorce science from the rest of culture. The
essays in this book have all been written in the belief that science must be
related to the values, ideologies, ways of thinking, and linguistic practices
that shape our culture. Although considerable diversity in approaches and
conclusions appears in what the contributors have to say about the litera-
ture of science, they all understand—whether they write about language
and rhetoric; history, myth, and narrative; or culture and ideology—how
inescapably science resides in the culture that enables it.

The first section, Language and Rhetoric, initially approaches the
question of science in culture by taking up the relationship between the dis-
course that defines the scientist’s professional role and the discourse he or
she employs when writing for a popular audience. For Jeanne Fahnestock
in “Accommodating Science: The Rhetorical Life of Scientific Facts,” the
relationship is problematic. Turning to the classical rhetorical tradition,
she argues that popular science writing is overwhelmingly epideemic
(concerned with praise), whereas professional science writing is dominantly
forensic (concerned with fact). Emphasizing uniqueness and rarity, popu-
lar scientific discourse foregrounds the results of scientific research rather
than the data on which they are based, often thereby removing the hedges
that qualify professional scientific writing and making emphatic assertions
which leave the popular impression that scientific truth is more certain than
it actually is. Fahnstock also concludes that changes in information as it moves from professional to popular expression can be explained by classical stasis theory, the rhetorical tradition that defines the sorts of questions appropriate for a legal setting.

In “Popularization and the Challenge to Science-Centrism in the 1930s,” Doug Russell offers a different account of what happens to professional discourse when it enters the public arena. Skeptical of strictly sociological and historical analyses of science popularization, Russell attends to the ways in which British and American scientists in the 1930s often espoused a science-centric belief in the superiority of science, even though their public statements about war, economic collapse, and political decay undercut that belief. Their popular expressions thus betray considerable “rhetorical strain,” a mark of discursive opportunity, as Russell sees it, in the transition from the scientific world to the public. Not surprisingly, then, the 1930s witnessed an effective challenge to strict science-centrism in the hands of the mathematician Lancelot Hogben, whose popular science writing is distrustful of the “educated elite’s linguistic exclusion of the common person from useful knowledge.”

Continuing the discussion of the relations between professional and popular discourse, the next two essays examine how certain scientists have managed to communicate with the public in ways that overcome the restraints imposed by professional discourse. In “Loren Eiseley’s Innumerable Journeys: The Making of a Literary Naturalist,” Andrew J. Angyal takes up Eiseley’s effort to think beyond a materialist vision of evolution in order to reflect on the ways cultural evolution has relied on human language. Eiseley’s meditations led him to the virtual invention of a new literary form, what he calls “the concealed essay.” Extending Montaigne’s personal and contemplative style and expanding “the personal essay for scientific purposes,” Eiseley’s essay form liberates him from the constraints of traditional scientific methods.

Like Eiseley, Richard Selzer also feels the constraints of scientific tradition; in his case, the tradition of the physician’s seemingly necessary emotional detachment from his patient’s suffering. Selzer was thus drawn to writing as a way of healing himself emotionally, writes Charles M. Anderson in his “In Search of the Exact Location of the Soul: Richard Selzer and the Rhetoric of Surgery.” Powerfully imaginative and emotionally unsettling, Selzer’s language seeks “to disturb and unsettle his readers” so that they “may move beyond the ‘facts’ of surgery toward its meaning.” Selzer consequently eschews the vertical rhetoric of traditional medicine, which favors a hierarchical relationship between surgeon and patient. He favors instead a horizontal rhetoric of identification both informed by Emerson’s conviction that the only true doctor is the poet and enriched by meditation on the ambiguous and multivalent meanings of words such as wonderment, ecstasy, and grace.

In “Oliver Sacks’s Neurology of Identity,” the final essay on language and rhetoric, I take up another physician’s struggle with the constraints of a particular medical tradition. Sacks’s sophisticated, even audacious, rhetoric appeals because it supports his argument for reforming the ways in which traditional neurology conceives the patient. Sacks maintains that the reductive and mechanistic neurological tradition fails to respect each patient’s irreplaceable individuality. Even so, Sacks’s own Leibnizian and Pythagorean thought leads him to conceive the patient in equally reductive ways. For Sacks, as for the neurological tradition, each patient becomes a synecdoche for the patterns of disease and suffering replicated in every other patient. Sacks should not be faulted for bad faith, however. As we learn from what Michel Serres and Mikhail Bakhtin have to say about dialogue, empirical science requires the individual datum to be conceived synecdochically, as a replicable instance of the abstract patterns that formalize all the data.

The second section—History, Myth, and Narrative—departs from a primary focus on language and rhetoric, turning instead to how our culture’s view of history, as well as our narrative and mythic practices, profoundly shape the literature of science. In “Stephen Jay Gould’s Vision of History,” Louis P. Masur observes that no other popular science writer has thought more deeply on these subjects than Gould. Contingency, not predictability, is the hallmark of history for Gould, the originator of the evolutionary theory of “punctuated equilibrium,” which claims that long periods of evolutionary stability are disrupted by sudden, unexpected moments of change. Our culture’s prevalent, essentially Darwinian, belief in gradual, predictable historical progress consequently troubles Gould, who is dedicated to the principles of democratic socialism, recognizing that too often a belief in predictability and progress has supported oppressive, even racist, social practices. Although he criticizes Darwinian notions of gradual evolution, Gould does not therefore subscribe to creationism, another challenge to Darwinian orthodoxy; as he has testified in recent court cases, creationism is nothing more than religion masquerading as science. Gould’s scientific, political, and social views thus rest on his conviction that “scien-
Discussion of narrative practice in the literature of science continues with the next essay, Bruce Clarke's "Aspects of the Daemonic in Primo Levi's Periodic Table." Levi's semi-autobiographical narrative of his life as a chemist. Levi invokes the mythic narratives of daemonic intermediaries such as Eros, Hermes, Proteus, Hyperion, and Apollo in his meditations on the metamorphic exchanges among sexual desire, commerce, theft, rhetoric, and science. These daemonic presences explain Levi's Oedipal desire as a chemist to overcome a feminized Matter in the pursuit of a masculine Spirit, a daemonic story further played out in his personal adolescent sexual crises. These presences also illuminate Levi's ambivalent struggle as a writer to identify himself with the daemonic, a struggle resolved in his final chapter, the tale of a carbon atom undergoing the complex transformations of photosynthesis and eventual metabolism in Levi's brain. Evocative of the quest romance, the story of carbon reveals that just "as the world of romance arises out of the anthropomorphic promotion of inert terms into animated figures, so life arises with the promotion of carbon from a chemical compound to a biological participant."

Paying attention to narrative and mythic practices is the business of hermeneutics, or the interpretation of "difficult linguistic or symbolic messages coming from remote or unfamiliar sources," as Martin Eger defines it in "Hermeneutics and the New Epic of Science." Eger takes exception with Gyorgy Markus and Jurgen Habermas, who insist that science has totally closed itself off from contact with everyday experience. Range across works by scientists as diverse as Jacques Monod, Douglas Hofstadter, Steven Weinberg, and E. O. Wilson, among others, Eger maintains that a new epic of science has emerged in the last twenty-five years. The epic is being told by visionary scientists convinced that there now exists "a truly seamless, thoroughly convincing, all-inclusive science of development," which brings unified scientific knowledge to bear on enduring cultural issues such as purposiveness and self-consciousness. If Markus and Habermas are right that scientific knowledge as such is no longer widely accessible, the new epic of science still functions as a hermeneutics of our culture's "cognitive ecology."

To examine the differences between professional and popular scientific language, or to show how science involves our culture's narrative and mythic practices, is also to raise questions about the ideological power that a Francis Bacon or a Paisley Livingston would confer on science. The refusals to grant validity to that referral, as well as the sometimes disas-
tros consequences of accepting it, are the principal concerns of the last section, Ideology and Culture.

The section begins with Barry Pegg’s “Nature and Nation in Popular Scientific Narratives of Polar Exploration.” Pegg adopts a social-constructivist perspective when reading the popular scientific narratives of polar explorers such as Fridtjof Nansen, Roald Amundsen, Robert Peary, and Robert Scott. A careful reading of these narratives demonstrates how the failures of certain expeditions (Scott’s, for example) can be traced to the explorers’ “linguistic, institutional, commercial, geographical, ecological, and imperialistic” resistance to indigenous material nature and culture, as well as linguistic condescension toward other explorers’ nationalistic popular narratives, which often contained essential scientific and technological information. Even when, as in Peary’s case, there was acceptance of indigenous culture, the Eurocentrism evident in his popular scientific writing still distorted his view of what Eskimo cultures had to offer. Only in Amundsen’s popular narratives can we see a less than hostile or condescending stance toward indigenous culture, something approaching what Donna Haraway sees as essential for a reformation of the “traffic” between nature and culture.

Shifting to the contemporary scene and what may come to replace it, Alan G. Wasserstein’s “Aggression and Power: The R-complex and Nuclear Blackmail” calls on what Michel Foucault has taught us about the relationship between power and knowledge. Wasserstein maintains that aggression names one kind of knowledge that scientific power creates in order to disguise itself. For popular writers such as J. D. Bernal, Arthur Koestler, Carl Sagan, and J. D. Franklin, Wasserstein shows us, aggression is known by virtue of its location in the primitive, reptilian midbrain, the R-complex. The task of science thus seems to be to control, even to eliminate, the savage effects of the R-complex, which now threaten us with nuclear annihilation. But when science proposes to overcome this threat through drugs, for example, or genetic engineering, Wasserstein perceives scientific and technological blackmail, not liberation. In the name of supplanting the supposed effects of aggression, of one kind of scientific knowledge, scientific power would merely create other kinds of knowledge, which would “paradoxically return us to a scene of magnified power.” For Wasserstein, there is no universal liberation from scientific power; the best one can do is to ceaselessly interrogate it without succumbing to the delusion that it can be mastered: “Calling power relations into question does not abolish them; it realigns such relations, and hopes to do so without increasing them.”

Although Mary Ellen Pitts shares Wasserstein’s concerns about the power of scientific knowledge, she is more optimistic about the possibility of overcoming it. Her essay, “Reflective Scientists and the Critique of Mechanistic Metaphor,” details how Eiseley, Sacks, Fritjof Capra, and the Russian polymath V. V. Nalimov are committed to overturning the metaphor, which dominates Western science. For Eiseley, mechanistic metaphor eradicates humankind’s contact with nature, but contact can be restored through poetic knowledge, through projections of ourselves beyond the apparent boundary of our species. For Capra, the Cartesian dualism that underwrites the metaphor must be replaced by a Taoist awareness of the dynamic and nonlocal interconnection of things. For Sacks, reconceiving medicine as music and narrative can overcome the mechanistic reduction of the patient to a mathematical function. And for V. V. Nalimov, who fuses a sophisticated knowledge of the mathematics of probability with Saussurian perspectives on language, the metaphor can be displaced by visualizing the world not as a machine but “as a textual web of determinacies and indeterminacies.”

Pitts’s essay emphasizes the need to replace analytic tendencies in science, which separate and categorize, with synthesizing ones which value connection and unification. In “Contemporary Ecophilosophy in David Quammen’s Popular Natural Histories,” Allison Bulsterbaum Wallace examines how the same emphasis shapes Quammen’s ecological thought. Skeptical of the anthropocentrism of Western thought and its theo-logic of human mastery over nature, Quammen’s ecophilosophy insists on viewing “humankind as part of the biotic community, not a species removed from or superior to it.” This skepticism, however, does not lead Quammen to advocate the Gaia hypothesis or to support the animal rights movement, ways in which anthropocentrism has otherwise been recently challenged. In fact, Quammen does not entirely relinquish anthropocentric thought, for in his ironic and self-reflective arguments he attempts to overcome anthropocentrism through individual acts of anthropocentric projection: by imagining how other creatures imagine us. In this respect, Quammen’s work extends what Arne Naess calls “deep ecology,” a way of seeing nature as a field, a set of relations, in which “each [creature] holds the other in special poise.”

From the point of view of Baconian presumptions about the power of science and its detachment from the rest of culture, there is the tendency to insist that the popular culture simply cannot measure up to the superiority of scientific culture. In “Omni Meets Feynman: The Interaction Between
Popular and Scientific Cultures,” however, David A. Stone concedes superiority to neither culture, arguing instead that a rapprochement between the two is not only possible but necessary. His comparison of texts by Nobel laureate Richard Feynman and Omni magazine writer Jessica Maxwell turns upon his insight that what fundamentally differentiates the two cultures is the way each organizes knowledge. “There is no ‘natural’ way to codify knowledge,” Stone writes. “We learn to do so within our native culture.” Hence there exists no superior way to organize what we know: popular culture relies on emotional response and a sense of community; scientific culture rests on a “schizophrenic split” between the abstract and the practical. True, popular culture defers to scientific authority, and scientific culture fosters its authority through a mythologized view of its own history. Even so, Stone concludes, the scientific and the popular cultures can speak to each other because both share traces of medieval culture. But science must jettison its mythologized history, recognize in its empiricism a link with the popular culture’s valuation of the senses, and, in a spirit of scientific egalitarianism, reject the socioeconomic abuses that often attend scientific progress.

If there were somehow only one conclusion to be drawn from the essays collected in this book, it would be that science popularizations are anything but intellectually jejune. While it is true that science popularizations appear in a variety of sources, ranging from news-rack publications to university and learned society presses, it is precisely this range that should caution us about transporting the usual connotations of “popular” to a reading of what is often, and unwisely, characterized as the “popular scientific essay.” That label unfortunately connotes what Richard Whitley rejects in the usual attitudes about science popularizations, namely, a demarcation between “a structured intellectual elite of knowledge producers” and a “diffuse mass of ignorant knowledge consumers” (1985, 6). That sort of distinction trivializes the reader of science popularizations as much as it demeans their authors.1

There are good reasons, then, for the term literature of science. By replicating the names of certain already well-established subdisciplines—history of science, philosophy of science, sociology of science—the term suggests a particular way of asking questions about the field of popular science writing. The term also indicates that the sorts of popular texts examined here are open to as full a range of contemporary interpretive techniques as any other works of literature. Finally, it emphasizes that the literature of science must be read not as mere popular transmission of superior scientific knowledge but as sophisticated production of knowledge in its own right.

The literature of science deserves respect equal to what is conventionally granted to professional scientific discourse. In one way or another, the contributors to this book grant that respect, even if they differ in their approaches and conclusions. But such differences, after all, are in keeping with the critical pluralism that has shaped this book. The Literature of Science in a sense, then, does return us to Bacon—not to his conviction that empirical science majestically commands all other knowledge, but to his desire to overcome the inertia of an ossified worldview: in his case, medieval Scholasticism; in ours, the monistic belief that science bears no relationship to our culture’s values, ideologies, habits of thought, and linguistic practices.

NOTES


2. Livingston presents another, somewhat more technical argument for scientific progress. He asks us to think of two knowledge states, k1 and k2, representing medical knowledge immediately before and after Harvey. For framework relativism, according to Livingston, k2 is no closer than k1 to K, or “the ideal of a perfect and total knowledge” of the human body. The meaning of scientific progress, Livingston continues, “resides not in the ideal as such but in the approximation of that goal, and it is in regard to this approximation that k2 amounts to real progress over k1, for k2 is in fact a better approximation of the truth than was k1” (1988, 28). There is at least one problem with Livingston’s position, however. Since approximations presume a fixed point or known quantity (an approximation to, or of), they also presume complete, not ideal, knowledge of that which they less than
completely approximate. Livingston’s idea of progress founders on a paradox, in other words: if one knows already what one approximates, how can one speak, as Livingston suggests, of not knowing it?

3. In Bully for Brontosaurus, S. J. Gould makes much the same point, contrasting the French attitude toward popular science writing (culprigionation) with the American: the former “ranks within the highest traditions of humanism,” while the latter “lies immured in deprecations” (1991, 11).

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