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Composition has long held conflicting and ambivalent views of science, on the one hand aspiring to the status of a science and on the other rejecting it as positivist and foundationalist, or (recently) tainted by association with government, business, and other institutions of a capitalist, technocratic society. This schizophrenia between idolizing and scorning science as a possible model for knowledge-making in composition has discouraged theoretically sophisticated examination of science as a rhetorical activity and tended to marginalize the study of scientific and technical communication as a specialized subfield.

Charles Bazerman's important new book on shaping written knowledge in science demonstrates the fallacy of these choices by seriously and patiently examining the relations between scientific activity and scientific communication as a lens on the nature of rhetoric itself. While alert to both ideological and territorial motives in the rhetoric of science, Bazerman is not engaged in critique; nor is he trying to hold up physics as an ideal model for other disciplines. Instead, he studies the historical development of the sciences contrastively, viewing each as a particular, situated form of rhetorical activity. His refreshing fair-mindedness, intellectual curiosity, respect for his subject, and sheer scholarly competence are admirable—and rare in composition studies to date.

It would be easy for the general reader in composition and rhetoric to overlook this book, or even to misread its purpose and scope, on the basis of its apparently specialized, narrow topic: the genre and activity of the experimental report in physics. Alan Gross makes this mistake in his Fall/Winter 1988 Pre/Text essay, where he contrasts his own effort to create a new rhetoric of science with what he supposes to be Bazerman's more limited purpose: "Bazerman wants to increase scientists' awareness of the rhetorical component of their communicative practices; I want to open up an intellectual space for a new subdiscipline, the rhetoric of science" ("The Rhetorical Analysis of Scientific Texts" 184). The implications of this contrast are that Bazerman speaks for the sake of science and scientists rather than rhetoric and understands science as only partially and not constitutively rhetorical. As I read his book, however, the contrary is true: he identifies himself as a composition teacher treating science as a writing practice, studying scientific communication for the sake of broadly understanding the nature of rhetoric. Unlike Gross, who attacks the realism of science, Bazerman develops a rhetorical
theory in which science is radically rhetorical not instead of empirical, but by virtue of the practical social activity by which scientists interact with the facticity of nature to produce and constrain communal knowledge statements.

Bazerman begins his book by identifying clearly his base in composition as a discipline: "As a university teacher of writing I was charged with preparing students to write academic essays for their courses in all disciplines." This practical problem motivates, perhaps mandates for the discipline, a comprehensive examination of writing practices in different disciplines, which for Bazerman here means knowledge-making practices based primarily in the academy.

Bazerman explains that to begin his participation in this project, he narrowed his focus to science as a particularly fascinating exemplar of disciplinary rhetoric because it is at once extraordinarily successful and apparently transparent, using the denial and suppression of rhetoricity as a rhetorical strategy. (He does not treat this strategy as either simple naivete or nefarious plot, but as a historical solution to the problems of making science work as a cooperative and competitive social activity.) Bazerman thus constructs his object of inquiry not as scientific or technical communication per se, but as knowledge-making in its rhetorical aspect, and then he uses science, specifically the development of experimentation as an activity and a genre, to probe the issues and develop the tools for this broader rhetorical project.

In an exemplary fashion throughout this book, Bazerman makes visible his process as a scholar in ways that are illuminating to thinkers in composition and rhetoric who are undertaking complementary projects. One aspect of this self-reflection is his explanation of how he turns to a broader interdisciplinary base for needed conceptual tools, drawing especially on the sociology and philosophy of science. As he points out, he had to narrow the focus of his object of study in exactly the degree that he invoked larger and larger contexts and multiplied perspectives to understand that object as dynamic and rich. Scholarship in composition, invariably multidisciplinary in provenance, must always be judged in part for the way it handles its sources. We must ask how aptly they are chosen for the author's purpose; how clearly and accurately he or she "translates" them into composition and rhetoric; how fertile they are found to be as resources for others in the field; and, finally, how honestly the scholar reveals his or her own relation to those sources—their influence on him or her, the limits of his or her knowledge. Bazerman is a model scholar in all these respects, and his readings in the sociology of science promise to be novel and provocative resources for many in composition.

Bazerman defines rhetoric as "the study of how people use language and other symbols to realize human goals and carry out human activities" (6). As we have seen, he pursues the study of rhetoric for the ultimate teacherly goal
of giving people the possibility of more control over their own symbolic action. This goal involves him in challenging language theories that assume or foster separation or incompatibility between language systems and the world as material, empirical, practical reality. The way he addresses this problem is to focus on activity as a common element between language (viewed as symbolic action) and empirical nature (viewed as the site and medium of human practical activity). His is, as he describes it, a "praxis-oriented constructivist study" that rejects two extremes: the view that language is all, that meaning is enclosed in texts and sign systems without reference; and the view that physical reality is foundational, that language merely expresses and corresponds to a pre-existing, presymbolic empirical meaning. Instead, he views language as dialectically interconnected with context in that rhetoric is itself a socially constructed praxis infusing and entwined with material, corporeal action and its natural and social objects. We need, and he seeks in the work of Vygotsky particularly, "a unitary concept of signifying events simultaneously contextualized within and realizing linguistic code, social relations, psychological cognition, and perception of the ambient world" (295).

Experimental science, here represented by optics, is a particularly focused and transparent instance whereby one may study this relationship. Bazerman explains his view and his aims in the book most fully in Chapter 11, "How Language Realizes the Work of Science: Science as a Naturally Situated, Social Semiotic System." He is studying language as the praxis (rhetoric) whereby science is carried out, and the ways in which science chooses to constrain that rhetoric by making it responsible to nature (through the practical activity of experimentation, which is itself semiotic as well as empirical).

In order to understand science in this formulation, Bazerman has organized the book around three approaches, each a case study that looks at the relationship differently: (1) a narrative of rhetorical moments, where he looks at linguistic inventions (texts) as individual scientists' "creative responses to their situations, investigations, and goals"; (2) a developmental study of an individual's rhetorical process (in creating a socially effective text, or in Newton's case a genre); and (3) cultural history, where he examines the way a community develops as a rhetorical domain of written knowledge (here, experimentation and reports of it). Each of these types of interwoven case studies comprises a level of history, the encompassing perspective in which Bazerman wants to understand semiotic activity as the interaction of microevents (where individuals make choices) and macrostructures (the gelled social forms created by and helping to shape such choices). This rhetorically specified, particularized account of the dialectic between micro- and macro-levels of social and semiotic action (a concept he draws from Merton, but is elsewhere called "structuration") is one of the most valuable contributions of the book.
Another happy translation of a sociological concept into rhetorical
terms is Bazerman's notion of active and passive "constraints" (the source is
Ludwig Fleck). In Bazerman's scheme, science's willingness to be answer­
able to nature is a rhetorical feature of its discourse, which (according to
Fleck) "is marked by the active pursuit of passive constraint. That is, the
thought style of science actively seeks to increase the relationship between
representations and empirical experience" (313). As Bazerman points out,
other discourse communities appeal to different constraints (for instance,
sacred texts) as touchstones for negotiating meanings. Besides passive
constraints, the semiotic processes exhibited in genre (as typical social
action) represent active constraints that shape what Bazerman is careful to
point out is written knowledge, radically textual. This is indeed a much more
sophisticated and rhetoricized notion of empiricism than we are accustomed
to seeing in composition; and it is highly suggestive for examining other
discourses, including that of composition itself, to see what kinds of con­
straints are operative.

The structure of Bazerman's book is designed to express the relationship
between these goals and the case studies by which he pursues them. Parts I
and V, which frame the argument theoretically, bracket chapters that specify
and exemplify it. Parts II and III are case studies in physics, early modern and
twentieth century. Of particular interest is the chapter on Compton's writing
process (presented as a search for the rhetorical solution to the problem of
making reference) and a chapter detailing the processes by which different
kinds of physicists search the literature and read it for their own research
purposes. Part IV extends the schema of analysis to the social sciences. Part
V, besides re-articulating the goals and framework of the book, returns to the
practical motive of Bazerman's project and offers a rhetorical guide to
writing science, easily extended to other disciplines.

Bazerman's approach, so lovingly developed for physics, falters a bit
when he applies it to other disciplines. It was wise, indeed essential, for him
to establish (in Chapter 2) that science is just one form of disciplinary
discourse calling for contrastive analysis. To do so, he briefly analyzes three
cases: articles by Watson and Crick (molecular biology), Merton (sociology),
and Hartmann (literary criticism). But Hartmann's article seems ill-chosen
because it leads Bazerman to characterize the humanities as essentially
expressive rhetoric, begging the question of the status, as discourse, of
literary and cultural theories.

Part IV, on the social sciences, should perhaps have been omitted from
the book because this section seems premature and underdeveloped in
relation to the rest. Its descriptively excellent chapter on the APA style is the
only place where Bazerman's stance of respect for the internal integrity of
discursive formations in science becomes problematic. He pointedly fails to
state the obvious conclusion of his analysis: that the prescriptive rhetoric of
behaviorism disadvantages the social sciences by limiting inventiveness and
innovation. Finally, it is surprising, given his self-conscious and insightful
descriptions of his own scholarly process, that Bazerman says so little about
composition and rhetoric as a knowledge-making discipline. His theories
and analytical techniques beg to be applied to our own discourse.

It strikes me that the book’s structure—broad theoretical statements
setting the parameters of a project, framing a group of essentially discrete
essays that test out the theory as a conceptual tool—is characteristic of recent
single-authored books now beginning to appear in composition (this is
precisely the organization of my own Composition as a Human Science).
Perhaps this structure reflects rhetorically the stage our scholarship has now
reached, where individual researchers introduce powerful concepts and
comprehensive frameworks as agendas for future research that no single
scholar could fulfill. These proposals depend on a research community to
elaborate, instantiate, and test their fruitfulness. Such initiatives create the
demand for exactly the historical process of genre creation and community
formation that Bazerman describes for science.

In this light it is not surprising that the most weakly articulated rhetorical
element in this work is Bazerman’s own sense of his audience. I suspect (as
a fellow writer) that he is writing in the hope, rather than the knowledge or
even faith, of a scholarly audience broader than a small circle of specialists in
technical communication or the few scientists who take an active interest in
rhetorical studies. Bazerman’s leadership in the CCCC Research Network
suggests that he is silent on audience because he realizes we have yet to solve
the problem of constructing written genres that will shape and be shaped by
domains of shared practical activity comparable to experimentation in
science. He cannot count on, or even envisage at present, a research
community forming a receptive audience for his and other multidisciplinary
scholarship in composition. Bazerman’s book, however, speaks to our
shared dilemma by showing how another community learned to make (and
to fight over) broadly intelligible meanings: “research communication re-
quires practical social understanding of cooperative endeavor, aggressive
assertion, and agonistic competition” (296). For this, Bazerman’s book
deserves to have fellow scholars engage his ideas in a sustained dialogue that
will constructively criticize, supplement, appropriate, and build on his work.

The Rhetorical Tradition: Readings from Classical Times to the Present, ed.
Patricia Bizzell and Bruce Herzberg (Boston: Bedford, 1990, 1282 pages).

Reviewed by Virginia Allen, Iowa State University

It used to be assumed that when a work of literature achieved canoniza-
tion, it had by definition withstood the test of time, as if somehow time were
the agent while the producers of canonical texts were mere instruments. But