



Review Essay

Why Modernist Studies and Science Studies Need Each Other

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***Energy Forms: Allegory and Science in the Era of Classical Thermodynamics.* Bruce Clarke. Ann Arbor: University of Michigan Press, 2001. Pp. x + 278. \$59.50 (cloth).**

***From Energy to Information: Representation in Science and Technology, Art, and Literature.* Bruce Clarke and Linda Dalrymple Henderson, eds. Stanford: Stanford University Press, 2002. Pp. xx + 444. \$70.00 (cloth); \$35.95 (paper).**

***Max Ernst and Alchemy: A Magician in Search of Myth.* M. E. Warlick. Foreword by Franklin Rosemont. Austin: University of Texas Press, 2001. Pp. xxiv + 309. \$50.00 (cloth); \$24.95 (paper).**

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In 1913 Ezra Pound famously wrote, “Bad art is inaccurate art. It is art that makes false reports. If a scientist falsifies a report either deliberately or through negligence we consider him as either a criminal or a bad scientist according to the enormity of his offence, and he is punished or despised accordingly.”¹ Pound went on to castigate the artist who “falsifies his report,” arguing instead for “art that is most precise.”² Exploring efforts like Pound’s to align art with the rigors and prestige of science in a scientific age, scholars of modernism began long ago to acknowledge the debt of many modernist authors and artists to particular scientific notions. Yet such approaches to science, however insightful, have often been rather asymmetrical as well, taking science as a stable and completed given and a background to the creative and shifting modernist cultural responses to it. As modernist studies have recently started to pay more serious attention to modernity itself, it is time for scholars to move away from a model that assigns science a privileged position of autonomy and purity. Scholars of modernism must



676 instead work toward a richer and more dynamic understanding not only of how science influences the culture of modernity, but also of how the culture of science itself functions *within* that larger culture. The methodologies and critical goals pursued by what can loosely be called “science studies” provide ready tools to open up this territory.

Science studies is something of an umbrella term, not a specific methodological program. One might broadly say that science studies takes as its subject how science actually works.³ Not surprisingly, this field has in the past largely encompassed research programs originating in the social sciences, with frequent input from the philosophy of science. Anthropologist David J. Hess’s useful and highly readable *Science Studies: An Advanced Introduction* offers a road map to several decades of the academic study of how science works.⁴ Covering territory likely to be more familiar to social scientists (sociologists and anthropologists in particular) than humanities scholars, Hess looks back to Robert Merton’s institutional sociology of science and to Thomas Kuhn’s arguments with Karl Popper in the philosophy of science. Much of the book, though, is devoted to recent research paradigms. Hess traces the emergence of “the sociology of scientific knowledge,” or SSK, from the disciplines of philosophy of science and sociology of science. He further examines such programs as productivity studies, “Edinburgh school” interests analysis, the “Bath School,” laboratory studies, actor-network theory, Science, Technology, and Society or Science and Technology Studies (both familiar as the STS programs that thrive in many American universities), and others.

Science studies is interdisciplinary at its core, and Hess ends his book by looking at the more recent inroads made into science studies by cultural studies, feminism, and critical studies of the function of ideology in science—fields immediately recognizable to contemporary scholars in the humanities, and, of course, to modernists. Though social scientists doing science studies have had to contend with the fact that their object of study enjoys more prestige and power in the university and in society as a whole than does their corner of the social sciences (and indeed the advent of cultural studies in science studies has led to complaints by some scientists), the so-called science wars and the “Sokal hoax” may in fact demonstrate that the recent influence of the humanities on science studies has reinvigorated the field and helped shift the work of science studies further into the public arena.⁵ My point is that the interdisciplinarity of science studies has now come to include the humanities in a fruitful way. The interest shown by humanities professors in the actor-network theory of Bruno Latour and Michel Callon, for instance, suggests the growing influence of micro-sociological approaches to the workings of science.⁶ But humanities scholars are not simply poaching in scientific and social scientific forests. Cultural studies in the U.S. has found a fairly secure home in humanities programs, and the traditional work of textual and aesthetic scholarship in, say, literature, art history, and music departments has much to offer science studies.

Three recently published works demonstrate the rewards of exploring science studies methodologies in a modernist context. Bruce Clarke, Director of Texas Tech University’s Center for the Interaction of the Arts and Sciences, is probably familiar to most readers of *Modernism/Modernity* as the author of *Dora Marsden and Early Modernism: Gender, Individualism, Science* (1996), published in association with the Society for Literature and Science (SLS) in the University of Michigan Press’s excellent series *Studies in Literature and Science*.⁷ In his new volume, *Energy Forms: Allegory and Science in the Era of Classical Thermodynamics*, Clarke expands his work on allegory and thermodynamics.⁸ Though *Energy Forms* includes readings of modernist writers such as D. H. Lawrence and Yevgeny Zamyatin, and of figures important to modernists (such as Edward Carpenter, Dora Marsden, and H. P. Blavatsky), modernism is only one part of a much larger picture. Clarke combines readings of modernist texts with a science studies emphasis on the way in which scientific facts are constructed. *Energy Forms* addresses developments in the history of nineteenth- and early-twentieth-century science from the inception of the First and Second Laws of Thermodynamics in the mid-nineteenth century through debates about the existence and properties of the ether, advances in non-Euclidean geometries, and theories of both a spatial and a temporal fourth dimension. Along the way, beyond extended readings of Zamyatin’s fascinating dystopian novel, *We*, and several fictional and nonfictional works by Lawrence, Clarke probes the ideological and cultural maneuvering of texts that have long been ignored or considered merely scientific curiosities—such as Camille Flammarion’s

thermodynamic tale, *La Fin du Monde*, which is discussed alongside Wells's *The Time Machine*; Charles Howard Hinton's fourth-dimensional explorations, *Fourth Dimension* and *The Persian King*; and Edwin Abbott's *Flatland: A Romance of Many Dimensions*.

Clarke's fertile study shows not only how modernists used concepts from the sciences (a method typical of most works exploring science in modernism) but also how scientists frequently employed allegorical and analogical thinking to construct scientific facts. He argues convincingly that "modern physics gained conceptual and technological purchase on the imponderable forms and phenomena of heat, light, gravity, and electromagnetism not by seizing reality barehanded but, to a significant extent, through *scientific* allegories, that is, by constructing and investigating as factual fictions increasingly workable models of energy" (EF, 18). "Energy" itself had only recently become a modern physical term, primarily through the work of natural philosophers from north Britain, such as James Prescott Joule, William Thomson, Macquorn Rankine, James Clerk Maxwell, and Peter Guthrie Tate. Clarke pays special attention to the writings of Maxwell, Tate, Balfour Stewart, and John Tyndall.

Exploring Maxwell's literary background, his and others' interest in classical allegories such as Plato's allegory of the cave, and even some of Maxwell's poetry on energy and thermodynamic issues, Clarke reveals how much Maxwell relied upon allegorical thinking to *advance* his own scientific hypotheses—not simply to argue for them before others. Moreover, Clarke analyzes the ideological and cultural work that scientific allegory performed in society at large. For instance, he argues that "thermodynamic entropy became cultural allegory by unveiling a scientifically plausible version of last things. In some circles the second law was interpreted as God's withdrawal from the material universe. Operating in parallel with the theological doctrines of the Fall and the promised end, entropy became *the* cosmic metonymy for a God that has abandoned from the physical world" (EF, 27).

Each of the scientific hypotheses Clarke explores assumed a variety of scientific and cultural meanings, and it takes a book-length analysis of scientific writing, popular science writing, popular fiction, modernist literature, and journalism to develop a broad understanding of those meanings. The Second Law of Thermodynamics, for instance, led to religious visions of the end of the world as well as to psychological and physiological concerns about personal vitality—and even to social commentary via science fiction novels. In another example, Clarke investigates how the theory of a universal yet imperceptible medium that would allow wave propagation of light, gravity, and electricity—the ether—could be used in the field of classical mechanics *and* by theosophists, spiritualists, and even theorists of the spatial fourth dimension.

To draw together the many different cultural strands *Energy Forms* picks up, Clarke coins the term "technoscience." "Scientism" has long been used to dismiss extensions of the trappings of science into areas deemed essentially unscientific. But Clarke's concept builds on Bruno Latour's use of "technoscience" to indicate the merging of science and technology and to highlight the deep embeddedness of both in broader social arenas. Clarke notes that his own term, technoscience, "resituates scientific discourses within the total cultural field of technoscience. It implies further that the structures and processes of allegory have operated and are continuing to operate throughout the modern and postmodern cultural fields to provide formal shape, rhetorical texture, and ideological force to the circulation of scientific and technological discourses" (EF, 7).

Ultimately, Clarke provides a multidimensional picture of the transition from classical mechanics to relativity and quantum mechanics and the gradual, uneven collapse of the ether hypothesis. But it is more than another history of nineteenth- and early-twentieth-century science. *Energy Forms* offers an account of the ideological and cultural work of allegory and technoscience in both the production and reception of scientific fact. The modernist texts discussed in *Energy Forms* are greatly enriched by being set into such a complex and fascinating context, but they also highlight the significant tensions in a transitional moment in science. Indeed, if science studies helps modernist studies complicate its own understanding of modernity, modernist studies helps open new areas of cultural exploration in science studies, promoting a complex sense of the importance of textuality in the production of scientific fact.

Another kind of work important to the articulation of science in modernism and modernity is the study of "occult sciences" (a phrase that speaks to the self-legitimizing aspirations of occult-

678 ists). In the philosophy of science, work on occultism has tended to theorize demarcation issues: where does science end and “pseudoscience” begin?⁹ But science studies has instead tended to explore how occultism or alternative beliefs function socially or culturally. Roy Wallis, for instance, sees pseudosciences such as parapsychology, creationism, and alchemy not as practices that “arose to fill any gap between the science of the time and traditional religion” but rather as “precisely that form of belief system which survives to assert its claim to scientific status despite rejection by orthodox science, and which, if it is to maintain its existence, must preserve or locate an alternative base.”¹⁰ He thus explores the strategic goals and social maneuvering involved in pseudosciences’ self-positioning in relationship to legitimated science.¹¹ David J. Hess’s work, to take another example, examines the cultural and ideological functioning of Spiritism in Brazilian middle-class culture. More recently, he has investigated the cultural politics of New Age thought and the role of skepticism in contemporary American culture.¹² The work of Wallis, Hess, and others has raised questions that may indeed look familiar to scholars in the humanities.

A recent noteworthy book that illustrates one path for scholars pursuing the relationship of occultism or pseudoscience to modernism is M. E. Warlick’s engaging new study, *Max Ernst and Alchemy: A Magician in Search of Myth*, published in Franklin Rosemont’s *The Surrealist Revolution* series by the University of Texas Press. Certainly scholars have noted the modernist fascination with alchemy (dozens of poems with “alchemy” or “alchemist” in their titles appeared during the period, and alchemical tropes and visual alchemical images emerged in other modernist writings and paintings). Yet too often alchemy is simply taken as a metaphor for the process of artistic creation; a facile and ahistorical knowledge of alchemy itself does not bring any complexity to the analysis of particular modernist works. Warlick draws together an impressive knowledge of Max Ernst’s oeuvre with a fluent understanding of both medieval alchemy and the alchemical revival of the late nineteenth and early twentieth centuries. *Max Ernst and Alchemy* puts forward a fascinating examination of Ernst’s use of alchemical imagery and alchemical thinking. It also provides a model of historical scholarship that others might productively follow.

Warlick’s approach is partially biographical: she traces the lifelong use of alchemical allusion in Ernst’s painting. She scrutinizes the young Ernst’s contacts with hermetic texts in his Cologne Dada period and the intensification of his interest in alchemy and in Parisian sites connected with alchemists—especially Paris’s most famous alchemist, Nicolas Flamel. (These sites became stops on the surrealists’ walking tours in the 1920s.) Beginning around 1923, Ernst exerted an alchemical influence on surrealists who had begun to explore occultism through seances and automatic writing in the early 1920s. Breton, in particular, began to incorporate more alchemical references in his work and manifestoes—most famously in the *Second Manifesto*. Warlick contextualizes early Dada and Surrealism in terms of increasing commitments to occultism and to alchemy in particular, and she examines specific Ernst paintings (and some of his recurring figures, like Loplop, the bird-human hybrid, and La femme 100 têtes) in terms of an alchemical interpretation of personal experience and autobiographical reference. As Warlick puts it: “For Ernst, alchemy provided a metaphor, and more than a purely poetic one, for the creative process and for the self-revelation that came from making art. Not only did he consistently incorporate alchemical symbolism and create androgynous figures in his collages, paintings, and sculptures, but he also typically conflated alchemical imagery with autobiographical references. His combinations of male and female figures and sexual symbols created hybrids of unified androgynous imagery” (*MEAA*, 135).

Warlick’s precise and rigorous historicizing of the sources of Ernst’s alchemical knowledge distinguishes her readings of his alchemical images from those of earlier scholars and avoids the myopia of some overly narrow biographical approaches. Warlick shows us what Ernst was reading and viewing and when, and she provides impressive alchemical readings of many of Ernst’s most famous paintings and collages (for instance, *Rendezvous of Friends* [1922], *Men Shall Know Nothing of This* [1923], *The Robing of the Bride* [1940], and *The Antipope* [1941–1942]). She even shows persuasively that his landscape paintings—including his *Microbes* from the 1950s, inspired by his residence in the American Southwest, and his French paintings of the 1960s, such as *The Garden of France* (1962)—were pervaded by alchemical symbols and images of alchemical transformation.

Of the books reviewed in this essay, Warlick's may at first look the most like an older version of modernist studies of science in a particular artist's work. However, it does not present science as the stable given, the pure realm unconnected to social and cultural antecedents outside of science. Her study of Ernst gives an admirably complex historical account of developments and tensions within the alchemical revival and of the dynamic relations among occultists, scientists, and artists. The chapter on the history of alchemy and the alchemical revival offers a lucid and useful account of the major symbols and concepts in alchemy as well as a concise history of the alchemical revival in Western Europe and the United States. (She even provides a glossary of alchemical images and terms.) Warlick parses varying interpretations of alchemy as (1) a physical pursuit involved in the transmutation of elements, (2) a spiritual process concerning the transmutation and purification of the soul of the alchemist, and finally (3) a psychological process. In her account, Ernst and other surrealists were much less engaged by the physical interpretation of alchemy than by the spiritual, and, above all, the psychological interpretation. Jung, whom many of the surrealists disdained, would make a psychoanalytic interpretation of alchemy central to his later work, but Warlick turns instead to seminal psychoanalytic interpretations of alchemy like Herbert Silberer's *Probleme der Mystik und Ihrer Symbolik* (1914)—the first major psychoanalytic equation between alchemy and human psychological development.

Because so much of Ernst's art and his appropriations from alchemical texts and images involve sexuality, it is fitting that Warlick devotes a long chapter to the women with whom Ernst had significant relationships, most of whom were accomplished and inventive painters in their own right. In "The Alchemical Androgyne: Ernst and the Women in his Life," she explores the fertile interchange in Ernst's relationships with Luise Straus (his first wife, who later died at Auschwitz), Gala Eluard (Paul Eluard's wife), Marie-Berthe Aurenche (his second wife), Leonora Carrington, Peggy Guggenheim, and Dorothea Tanning (his last wife). Here, Warlick exposes the alchemical and occult imagery through which Ernst filtered his psychological relationships with women. Her book will surely be the standard work on Ernst and alchemy for years to come.

Finally, I would like to turn to a new volume of essays—one that amply demonstrates the strengths of a number of different approaches, via the humanities, to science studies of the modernist and postmodernist eras. Bruce Clarke and Linda Dalrymple Henderson have assembled *From Energy to Information: Representation in Science and Technology, Art, and Literature* for another major series in science studies, Stanford University Press's *Writing Science*, edited by Timothy Lenoir and Hans Ulrich Gumbrecht.¹³ At over 430 pages with sixteen essays—as well as a significant introduction by Clarke and Henderson and introductions to each section—*From Energy to Information* makes a convincing case for the productive interaction of a range of humanities and science studies approaches to various components of what Clarke and Henderson see as a shift from a culture dominated by concerns about energy to one structured by information technologies.

The scholars whose work appears in *From Energy to Information* come from diverse academic disciplines, including literature, art history, history and philosophy of science, computer science, and media studies. While other collections have tried to foster interdisciplinary approaches to the relationships between science and the arts, this volume achieves a remarkable coherence by tightly focusing the subject of inquiry on major themes in the shift from energy to information. The book is divided into six parts reflecting these themes: "The Cultures of Thermodynamics," "Ether and Electromagnetism: Capturing the Invisible," "Traces and Inscriptions: Diagramming Forces," "Representing Information," "Voxels and Senses: Bodies in Virtual Space," and "Representation from Pre- to Post-Modernity." Each section begins with an introduction by the editors situating its key issues, and the section then proceeds from essays explicitly on the history of science and technology (many of which follow the kinds of methodologies elaborated in David J. Hess's science studies primer, investigating inscriptions, the functioning of devices and labs, and issues of authorship and representation in science) to essays bringing literature, art, and music into productive dialogues with science and technology.

There is not room in a short review essay to examine all the contributions to this volume—and indeed it is their totality that truly reveals the possibilities for science studies in modernism. But several essays stand out immediately and relate to issues brought up in the other books

680 under review here. Linda Dalrymple Henderson, a well-known Duchamp scholar and author of groundbreaking work on the fourth dimension, ether physics, and occultism in modern art, contributes a fine piece entitled “Vibratory Modernism: Boccioni, Kupka, and the Ether of Space.” In the essay, she explores some of the territory traversed in Bruce Clarke’s *Energy Forms*, but with a different focus. Henderson explores aesthetic and occult responses to the ether hypothesis, focusing in particular on Boccioni’s 1912 painting *Matter* and his 1913 sculpture, *Unique Forms of Continuity in Space* as well as Kupka’s paintings *Amorpha, Fugue in Two Colors* (1912), and *Planes by Colors* (1911–1912), and his illustration *Fantaisie physiologique* (1923). Henderson argues that “the artistic response to the ether generally took two distinct forms, and the paintings of Boccioni and Kupka are emblematic of that contrast” (*FETI*, 126–28). Boccioni, she argues, “sought to give physical form to the ether as a space-filling medium” (*FETI*, 128), and “by late 1912 [Kupka] had come to think of his paintings as vehicles for telepathic, vibratory transfer of thought, a view shared by the Russian-born German Expressionist Wassily Kandinsky” (*FETI*, 128–29). To make this argument, Henderson works through the science and occult writings of such figures as Sir Oliver Lodge, Sir William Crookes, Gustave Le Bon, Albert de Rochas, Annie Besant and C. W. Leadbeater, Balfour Stewart and P. G. Tait, and Charles Howard Hinton.

Equally noteworthy are David Tomas’s “On the Imagination’s Horizon Line: Uchronic Histories, Protocybernetic Contact, and Charles Babbage’s Calculating Engines,” and N. Katherine Hayles’ fascinating essay, “Escape and Constraint: Three Fictions Dream of Moving from Energy to Information,” in which she discusses Henry James’ “In the Cage,” Philip K. Dick’s *The Three Stigmata of Palmer Eldritch*, and James J. Tiptree’s “The Girl Who Was Plugged In.” Modernist scholars will also find of particular interest Ian F. A. Bell’s “The Real and the Ethereal: Modernist Energies in Eliot and Pound” and Robert Brain’s “Representation on the Line: Graphic Recording Instruments and Scientific Modernism.”¹⁴ Brain, who is a professor of the history of science at Harvard, explores the development of graphic recording instruments, beginning with James Watt’s indicator diagram, which recorded the power of an engine. (Brain proclaims it “one of the first devices to rely upon a graphic copying process to record on one surface the memory of the actions of another” [*FETI*, 162].) But he focuses primarily on instruments of the later nineteenth century through the Second World War. Exploring the history of analog devices, he notes that “the technological crossover from energy to information was accomplished in an analog format” (*FETI*, 177). Brain investigates the important example of Vannevar Bush’s differential analyzer and the electrical methods used by his associate H. L. Hazen: “Not only would the new servomechanisms yield a welter of industrial and technological applications, from factory automation to steering ships and controlling guns, they would begin a new theoretical reflection on the nature of servomechanisms that would stand at the center of cybernetics under the rubric of feedback” (*FETI*, 176–77). Yet, as Brain notes, much of the inspiration for these new information technologies looked back to the disk-globe-and-cylinder integrator of James Thomson (the brother of physicist William Thomson) in the nineteenth century.

Beyond the intrinsic merit of the essays in *From Energy to Information*, the collection also demonstrates the payoff of such work for our understanding of major issues in modernism and postmodernism. As Clarke and Henderson note in their introduction to the collection, “relating developments in literature and the plastic arts to significant phases in the transition from the era of energy to the information age allows unexpected resonances to emerge among materials not previously brought into juxtaposition. In particular, the essays collected here demonstrate the centrality of the theme of energy in modernist discourse. From this vantage the volume develops the scientific and technological side of the historical and cultural shift from modernity to postmodernity in terms of the conceptual crossover from energy to information” (*FETI*, 1).

Collectively, the books reviewed in this essay help illustrate the need in modernist studies to avoid seeing science as a given, a backdrop against which the real objects of interest—poems, paintings, and novels—can be explored. But they also demonstrate the complex cultural weave of science during the dizzying scientific paradigm shifts of the nineteenth and twentieth centuries, and they reveal what modernist studies can offer science studies: a keen eye for the cultural tensions, imaginative possibilities, and the powers of language and image that went along with

or even preceded scientific paradigm shifts. Together, modernist studies and science studies approaches could greatly enhance the project that each has aimed at independently—a more complex understanding of modernity itself.

Notes

1. Ezra Pound, “The Serious Artist,” *Literary Essays of Ezra Pound* (New York: New Directions, 1968), 43.

2. Pound, “The Serious Artist,” 43–44.

3. Mario Biagioli’s introduction to his edited collection, *The Science Studies Reader* (New York: Routledge, 1999), posits this baseline definition, but notes that “it is difficult to draw the boundaries of contemporary science studies or to trace its internal subdivisions, cultural genealogies, and sociopolitical valences. And it is no easier to map science studies’ institutional ecologies, as its practitioners are dispersed over the widest range of departments and programs” (xi).

4. David J. Hess, *Science Studies: An Advanced Introduction* (New York: New York University Press, 1997).

5. See Biagioli, xi–xii, for discussion of the power differentials involved in science studies.

6. For a thoughtful discussion of Latour’s work in the context of literary studies, see Susan Squier, “From Omega to Mr. Adam: The Importance of Literature for Feminist Science Studies,” *Science, Technology & Human Values* 24.1 (Winter 1999): 132–58.

7. The SLS has been the major organizational site at which scholars from the humanities can meet with scientists and social scientists to chart the interdisciplinary paths of much American science studies. (The SLS has recently begun to hold international conferences outside of the United States as well.) The *Studies in Literature and Science* series, whose editorial board is co-chaired by N. Katherine Hayles and Stephanie A. Smith (and includes on its editorial board James J. Bono, Clifford Geertz, Mark L. Greenberg, Evelyn Fox Keller, Bruno Latour, and Stephen J. Weininger), should be of interest to modernist scholars. The widely ranging series includes Michael Joyce’s *Of Two Minds: Hypertext Pedagogy and Poetics* (1995), Michel Serres with Bruno Latour’s *Conversations on Science, Culture, and Time* (1995), David N. Cassuto’s *Dripping Dry: Literature, Politics and Water in the Desert Southwest* (2001), as well as Valerie D. Greenberg’s *Transgressive Readings: The Texts of Franz Kafka and Max Planck* (1990) and Clare’s Dora Marsden book, the first book-length study of Marsden’s relationship to modernism.

8. See Clarke’s *Allegories of Writing: The Subject of Metamorphosis* (Albany, NY: State University of New York Press, 1995) and his *Dora Marsden and Early Modernism* (Ann Arbor: University of Michigan Press, 1996).

9. For a range of philosophy of science approaches to occultism, see, for example, the essays in *Philosophy of Science and the Occult*, 2nd edition, ed. Patrick Grim (Albany: SUNI Press, 1990).

10. Roy Wallis, “Science and Pseudo-Science,” *Social Science Information* 24.3 (1985), 595.

11. A key strategy that Wallis analyzes is what he calls “a policy of sanitization, by means of which there is a concerted attempt to distance the theory and practice from its more notorious proponents by means of professional associations, membership in which requires high academic credentials; incorporation of the methodology of accepted scientific disciplines; direction of funds to activities which may legitimize the knowledge claim, such as endowment of research institutes or chairs in established universities etc., in order to secure legitimacy and acceptance.” (Wallis, “Science and Pseudo-Science,” 589)

12. See David J. Hess, *Spirits and Scientists: Ideology, Spiritism, and Brazilian Culture* (University Park: Penn State University Press, 1991), and *Science in the New Age: The Paranormal, Its Defenders and Debunkers, and American Culture* (Madison: University of Wisconsin Press, 1993).

13. The *Writing Science* series includes over thirty titles, covering a wide range of subjects and approaches, including works by Niklas Luhmann, science studies work on the role of instruments in science like Nicolas Rasmussen’s *Picture Control: The Electron Microscope and the Transformation of Biology in America, 1940–1960* (1997), a volume by Lenoir himself, *Instituting Science: The Cul-*

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682 *tural Production of Scientific Disciplines* (1997), and works on the rhetoric of science, such as Richard Doyle's *On Beyond Living: Rhetorical Transformations of the Life Sciences* (1997). The series also includes titles that would be directly relevant to scholars of modernism, such as Steven Meyer's *Irresistible Dictation: Gertrude Stein and the Correlations of Writing and Science*, Friedrich A. Kittler's *Gramophone, Film, Typewriter*, and Flora Süssekind's *Cinematograph of Words: Literature, Technique, and Modernization in Brazil*.

14. Bell's book, *Critic as Scientist: The Modernist Poetics of Ezra Pound* (London: Methuen, 1981), broke much new ground in the study of science and modernist poetry.