
Introduction

Science Studies and Its Disciplinary Predicament

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The definition of science studies would appear to be a simple matter. On the face of it, science studies is about studying science, an enterprise that has succeeded at demarcating its own methodology, epistemological status, institutions, textual genres, and funding agencies. Unlike other academic fields, science studies does not have to define its subject matter in relation to its neighboring disciplines; over the years, the scientists have done much of that work. One might then assume that such a well-delineated object of research would have provided science studies with a unified disciplinary identity. However, quite the opposite has occurred. 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.¹

I. POWER DIFFERENTIALS

The fact that science is a well-delineated and established enterprise seems to have two opposite effects on science studies: it allows the field to be simultaneously unified (in terms of its object of study) and strongly disunified (in terms of its methodologies, research questions, and institutional locations). The fact that science itself is both very large (both in terms of practitioners and funding) and more influential than science studies makes their relationship not only symbiotic (or perhaps parasitic), but also structured by important power differentials. A few examples may tease out the peculiarity of science studies' predicament vis-à-vis that of other fields in the humanities and social sciences.

Academic fields may define their subject through methodological reflections or manifestos. More often, however, the question of what defines a field emerges in the mundane context of sorting out and demarcating the pool of acceptable research materials. For instance, in literary studies or art history and criticism the question of what literature or art is comes up in the con-

text of considering the inclusion or exclusion of a certain body of texts or artifacts from their subject matter. Does such and such a text qualify as “literature”? If so, is it canonical or not? If not, should one rearrange the canon (and, consequently, one’s disciplinary identity) so as to include this kind of text in the canon?

Historians have confronted similar scenarios. When they began to study popular culture, the legitimation of that subfield went hand in hand with discussions about what counted as culture, what boundaries (if any) one should draw between “high” and “low” culture, and how and why popular culture could be accepted as legitimate material for historiography. Similar questions about the definition of culture (or civilization) have reemerged on a grander scale during the debate on “world history” vis-à-vis “Western civilization,” or in discussions about the apparently boundless notion of culture put forward by cultural studies.

In all these examples, fields are proactively engaged in demarcating their subject matter. Depending on the disciplinary context in which it is played out, this process resembles either “land reclamation” or the “poaching” of objects and methodologies from other disciplines’ “reserves.” In either case, fields spend much energy maintaining and/or expanding their boundaries, or claiming that the very notion of disciplinary boundary is sterile.

But as disciplines struggle with each other to carve their fields of inquiry, they are only relatively constrained by their subject matter. Their subject is effectively cast in a passive role, as an object whose definition is a contestable matter to be resolved precisely through such interdisciplinary struggles. In some sense, subject matters are like lands being claimed by competing nations, but there is nothing written on those lands that would make them necessarily belong to one or the other faction. Cultural anthropologists may argue with cultural studies practitioners about what counts as appropriate fieldwork regarding objects that both camps could consider theirs, but the objects themselves cannot bind either camp to a clear-cut definition of what counts as “cultural.” Similarly, literary historians may argue against readings by philosophers, political theorists, or linguists of texts they consider “literary.” But a Rousseau or a Montaigne (or any other historical author of a text now deemed literary) wouldn’t have much to say about these debates not only because they are long gone, but because the disciplines that now claim their texts either did not exist or were radically different then when they were alive.

The problem that concerns me here is not the voicelessness of the interpreted, but the fact that such a voice, even if it were available or heard, would not necessarily seal the debate about what “literature,” “culture,” or “philosophy” might mean in the context of the contemporary taxonomy of academic disciplines. While contestable subject matters are inherently unstable and their maintenance is labor-intensive, competing disciplines are allowed to treat them as objects they can shape.

The case of science studies is, I think, quite different. Science studies does not define its subject matter because, in some significant way, its subject matter comes prepackaged. It is not that science studies practitioners are obliged to study only what scientists take to be the fundamental aspects of their enterprise (actually the opposite is often true), but simply that science—as the set of scientists’ practices, institutions, and so on—remains a socially delineated object no matter how you look at it. As a result, science studies tends not to ask what science is but rather how science works.

The boundary between asking the what and the how is not clear-cut. Some descriptions of the processes of science tend to have a normative ring to them. But the slippages between descriptive and normative registers are not, I believe, only a result of an author’s view of how

generalizable his or her interpretation or model of a specific scientific practice may be. They may also indicate the tensions inherent in the “author function” of science studies—a field that is cast as descriptive by its own relationship with an object of research stronger and more influential than itself.

Moreover, science studies practitioners do not necessarily agree about how science works. As shown by the essays in this volume, one can choose many different aspects of science, and represent them as relevant or even exemplary. And it would be very difficult, perhaps impossible, to argue that all these different dimensions and interpretations could be woven into a unified picture of science. In this sense, then, there are probably as many ways to study science as there are to study literature. But the fundamental difference is that, in the case of science studies, methodological disunity does not disunify its subject matter. Its subject matter has become a historical fact and not the product of disciplinary definition.

With this predicament comes an interesting power reversal. Science studies does not colonize its field but, in many ways, is colonized *by* it. This can be illustrated by contrasting science studies with ethnography. One could think of traditional ethnography (the kind that looks at geographically contained cultures) as the field whose relationship with its subject is closest to that of science studies. Ethnographers, like science studies practitioners, deal with research material that appears to be actually circumscribed by the history and practices of that given culture and not by the interpreters’ choices. This analogy is not arbitrary; laboratories are routinely pictured as sorts of scientific “tribes.” Even if we set aside the important question of how really circumscribed or “authentic” these cultures are, the predicaments of anthropology and science studies are very different because of the different power relationships between the observer and the observed.

Current anthropology has grown reflexive about its own predicament, its colonial past, and the problems of projecting Western notions of culture onto non-Western actors. These political and methodological problems are usually alien to science studies, at least in so far as science studies limits its analyses to Western materials. This is not because science studies is more “politically correct” than anthropology, but because it has never had a chance to develop a “colonial” relationship with its subject. Ethnographers used to have little difficulty “visiting” other cultures and writing whatever they wished about them. Now, contemporary ethnographers of science have to ask permission to enter laboratories, interview scientists, and cite their documents, memos, and E-mails. And as recently shown by the so-called science wars, scientists can be quite forthcoming in voicing their displeasure with some of science studies’ views about them.²

“Criticism” assumes a peculiar meaning in science studies. The word “criticism” in literature or art has traditionally meant something like “critical appreciation.” A critic is someone credited with the skills and sensibility to understand a certain object or text and the process through which it was produced. The outcome of such critical appraisal may not be unconditional praise, but it is not seen as a critique or a debunking of either art or literature in general. Things are different in science studies. Though it does not usually use “criticism” to describe its relationship to science, recently science studies’ analyses have been seen by some scientists not as an act of critical appreciation, but as negative attacks on their enterprise as a whole—a general indictment of its epistemological status. These different meanings assumed by “criticism” do not necessarily follow from the content of these interpretations, but are framed by differences in scale, social prestige, and academic clout between the fields.

The effect of these differentials is made clear by a stark comparison. Members of some Native American cultures like the Navajo and the Pueblo have taken exception to the ways West-

ern anthropologists picture them. Consequently, they have tried to control the ethnographers' access to their communities by "screening" them and, in some cases, developing their own ethnographic traditions. But these are responses to perceived denigrations of specific cultures, not to Western anthropologists' misrepresentations of non-Western cultures in general. Like the scientists, these cultures react to perceived misrepresentations but, unlike the scientists, they don't seem to generalize the scope of their claims. Such a difference may be the result of the scale and interconnectedness of science relative to these cultures. For instance, a biologist considers him or herself a biologist *and* a scientist; that is, a member not only of a specific and usually small working group but also of a very large, nationally and internationally connected community. It may be the structure, scale, and social robustness of the scientific community that makes some of its members read local critiques as general ones. Perhaps, if there were a powerful international federation of non-Western communities, the Navajo and Pueblo too might think that the ethnographers who misrepresent them were trying to undermine non-Western culture in general.

Although science studies cannot "control" its subject matter, it can pick its methodologies and research questions very broadly and yet remain a recognizable field. As science studies produces more empirical work, it further "disunifies" itself methodologically while producing increasingly complex and "disunified" pictures of science,³ *a double trend toward disunity that dissolves neither the field nor its subject matter.*

2. INSTRUCTIONS TO THE READER

If we turn from the general predicament of science studies to that of its texts, it becomes evident that no collection of essays can declare the canon of this field—a field simultaneously bound by its object and proliferating in various interpretative directions. This volume can cast itself only as a sampler (though a large and rich one), not a canonical text. This collection presents thirty-six contributions from contemporary history, sociology, gender studies, anthropology, and cultural studies of science that identify various research questions and directions that are likely to remain active in the near future.

Most science studies practitioners have shown a strong concern with methodological issues. Many of these debates are as yet unresolved. Readers of this volume will be able to pick up the main methodological congruences and fault lines dispersed throughout the several essays contained within, and will find references to more in-depth discussions that, for reasons of space, could not be represented here.⁴

The volume has been designed with various audiences and uses in mind. Because of the wide range of materials and approaches it presents, *The Science Studies Reader* can be used as the core text in introductory courses in science studies at the graduate and advanced undergraduate level. Instructors and students will find many of the "classic" essays used in this kind of course, but also more recent contributions and essays. Additionally, the Reader includes a number of methodologically oriented pieces and critiques, making it suitable for more advanced "methods" courses. Many of the articles have been revised and condensed by the authors specially for this Reader, while other pieces have been written specifically for this volume to provide synthetic essay-length treatments of longer arguments. Due to space limitations, the footnote apparatuses

have been often reduced, but the interested reader can easily access that information in the original publications—whose location is always given at the beginning of each essay.

This volume is also aimed at those who have an interest in science studies but are not pursuing it within specialized academic courses and programs. A map of some of the clusterings of essays and topics may help these readers tailor this volume's heterogeneous table of contents to their specific interests.

The epistemological deadlocks associated with the dichotomy between realism and constructivism (or, much more broadly, between "nature" and "culture") are an ongoing concern for much of contemporary science studies. Several contributions to this volume (especially those by Barad, Callon, Fox Keller, Galison, Haraway, Latour, Pickering, Rabinow, Rheinberger, and Rouse) propose alternative frameworks aimed at solving or bypassing these dichotomies while analyzing their genealogies. The essays by Cohen and Lenoir offer critical readings of some of these proposals.

Many of the articles are also informed by the questioning of how different cognitive styles emerge in different disciplines, national cultures, and historical periods, often in connection to the use of specific technologies, instruments, and techniques. The essays by Daston, Davidson, Galison, Hacking, Hughes, Kay, Kohler, Lloyd, Lynch and Law, Martin, Porter, Rabinow, Star and Griesemer, Traweek, Turkle, and Wylie exemplify this literature.

The study of the gender dimensions of science has become an important focus of recent science studies. This broad topic has been often subdivided into a number of interrelated issues: the analysis of the role (and more often the marginalization) of women in science, the critique of science's representation of sexual differences and sexualities, the development of feminist epistemologies, and the study of the pervasively gendered nature of scientific knowledge.⁵ The work by Barad, Fox Keller, Haraway, Martin, Traweek, and Wylie focuses primarily on the two last questions, but resonates with the others as well.

As a result of a widespread shift in focus from scientific theory to scientific practices, the study of instruments, experiments, and replication has become one of the most practiced areas of science studies. Many of the essays in this volume gravitate around these questions, but with different emphases. Notions of practice, technique, and skill (not necessarily limited to experimental contexts) are central to the work of Brain and Wise, Collins, Galison, Lynch and Law, MacKenzie, Pickering, Rheinberger, Rotman, Rouse, Schaffer, and Turkle. As practices are inherently tied to bodies and spaces (as distinct from theories, which are more easily associated with minds and mental states), a number of articles (especially those by Callon, Galison, Kohler, Latour, Lynch and Law, Schaffer, Shapin, and Star and Griesemer) focus specifically on the sites of science (laboratories, museums, fields, and fisheries). The different professional cultures, moral economies, forms of initiation, collaboration, and negotiation that develop in these sites (and some of the technologies to make knowledge travel from the place of production) are discussed by Biagioli, Bourdieu, Daston, Galison, Hughes, Kohler, MacKenzie, Pickering, Porter, Schaffer, Shapin, and Traweek. Finally, how instruments migrate across disciplines and mediate the interaction between different socio-professional groups are issues that characterize the essays by Brain and Wise, Galison, and Schaffer. While not limited to the context of instrumental inscriptions, the role of imaging techniques in science is a topic that is closely associated with it. The reader can develop a good sense of the contours of this discussion by looking at the essays by Brain and Wise, Lynch and Law, and Rotman.

The construction of scientific credit, priority, and authorship is a question that is often touched upon within analyses of the establishment of scientific consensus and authority—a

topic that weaves through much of this volume—but is dealt with more specifically in the articles by Biagioli, Bourdieu, Kohler, Latour (“Give me a Laboratory . . .”), and Shapin. As scientific credit is inherently tied to publications, the reader interested in these issues as well as in the modalities of signification of scientific texts is referred to the essays by Biagioli, Kay, Rheinberger, and Rotman.

Questions about how non-Western cultures have understood and conceptualized nature, and how these interpretations compare to those of Western science, are part of the long, grand debate about the relationship between the “West” and the “rest.” Anthropologists have addressed some of these questions (both ethnographically and philosophically), but science studies too has played a role in the discussion (especially through the history of Islamic and Chinese science and Indian mathematics). While Hart’s and Lloyd’s revisions of the debate on the relationship of Chinese and Western science presented here cover only a specific aspect of this discussion, they provide a window on some of the conditions of possibility (and structural limitations) of the general debate on Western and non-Western conceptualizations of nature.

Two bibliographies have been added at the end of the volume to provide references for further readings. The first catalogs five items for each contributor. These are texts that the contributors themselves have identified as most representative of their work in science studies. The second, longer bibliography has been compiled by adding together short bibliographies provided by each contributor. These lists represent what they take to be the “must read” texts in science studies today. The bibliography, therefore, does not represent a comprehensive or exhaustive list of works in science studies, but a collective snapshot of the contributors’ orientations.

Having addressed what is included in the Reader, let me discuss what has been left out, as drastic selection procedures had to be adopted to compress an entire field between two covers.

With a few exceptions, all the essays focus on modern and contemporary science, mostly physical and biological—a distribution that reflects the field’s own chronological focus. Then, having decided to center the volume around current research questions rather than intellectual genealogies, I have not included the work of such classic authors as Fleck, Kuhn, Feyerabend, Merton, Canguilhem, Foucault, Barnes, Bloor, and Bachelard. However, readers are strongly encouraged to familiarize themselves with this literature as it is very relevant to understanding the intellectual genealogies of the essays presented here.⁷

Other selections reflect a blend of intellectual and pragmatic considerations. For instance, philosophical questions are conspicuously present in this volume and some of its contributors are philosophers, but philosophy of science per se is largely absent from this collection. This does not reflect on the quality of current philosophy of science, but an acknowledgment that—after a period in which history and philosophy of science seemed to be the best potential partners in the analysis of science—the lines of inquiry pursued by philosophy of science have become much less central to the field that science studies has become.⁸

The almost total exclusion of materials from medicine and technology reflects the fact that history, sociology, and anthropology of medicine and technology are large and actively practiced fields whose literature is as sizeable as that of science studies itself.⁹ And, ever-changing a field as cultural studies, could not be adequately represented in this collection.¹⁰

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This volume is dedicated to the memory of Paul Feyerabend, friend and teacher, who did not believe in disciplinary fields (and a few other things).

NOTES

1. The list is so extreme in its length and range as to be arresting: departments of history, history of science, science studies, philosophy, sociology, anthropology, literature, and art history; programs in cultural studies, gender studies, and history of consciousness; medical and law schools, science departments, art schools, policy institutes, science museums, and even mining schools.

2. The texts that are most frequently referred to in this debate include: Paul R. Gross, Norman Levitt, *Higher Superstition: The Academic Left and Its Quarrels with Science* (Baltimore: Johns Hopkins University Press, 1994); *Social Text*, 46–47 (1996), special issue on "Science Wars"; Paul R. Gross, Norman Levitt, Martin Lewis (eds), *The Flight from Science and Reason* (Baltimore: Johns Hopkins University Press, 1997); Andrew Ross (ed), *Science Wars* (Durham, NC: Duke University Press, 1996); Alan Sokal, "A Physicist Experiments with Cultural Studies," *Lingua Franca*, May/June, 1996, and the responses to it in the July/August issue of *Lingua Franca*.

3. For a discussion of the trend from unity to disunity of science see, Peter Galison, "The Context of Disunity," in *The Disunity of Science: Boundaries, Contexts, and Power*, (Stanford: Stanford University Press, 1996), pp. 1–33.

4. A fundamental text in these debates is Andrew Pickering (ed), *Science as Practice and Culture* (Chicago: University of Chicago Press, 1992). For more recent developments, see Malcolm Ashmore and Eveleen Richards (eds), "The Politics of SSK," special issue of *Social Studies of Science*, 26 (1996), no. 2.

5. See, for instance, Evelyn Fox Keller and Helen Longino (eds), *Feminism and Science* (Oxford: Oxford University Press, 1996), and Linda Alcoff and Elizabeth Porter (eds), *Feminist Epistemologies* (New York: Routledge, 1993).

6. Other surveys of the field and copious bibliographies can be found in Sheila Jasanoff, Gerald Markle, James Petersen, Trevor Pinch (eds), *Handbook of Science and Technology Studies* (Thousand Oaks, CA: Sage, 1994). R. C. Olby, G. N. Cantor, J. R. R. Christie, M. J. S. Hodge (eds), *Companion to the History of Modern Science* (London: Routledge, 1990); and David Hess, *Science Studies: An Advanced Introduction* (New York: NYU Press, 1997).

7. Ludwik Fleck, *Genesis and Development of a Scientific Fact* (Chicago: University of Chicago Press, 1979); Thomas Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1962), and *The Essential Tension* (Chicago: University of Chicago Press, 1977); Paul K. Feyerabend, *Against Method* (London: NLB, 1975), and *Science in Free Society* (London: NLB, 1978); Robert K. Merton, *The Sociology of Science: Theoretical and Empirical Investigations* (Chicago: University of Chicago Press, 1973); Georges Canguilhem, *The Normal and the Pathological* (New York: Zone Books, 1989); Barry Barnes, *Scientific Knowledge and Sociological Theory* (London: RKP, 1974), and *T. S. Kuhn and Social Science* (New York: Columbia University Press, 1982); David Bloor, *Knowledge and Social Imagery* (London: RKP, 1976), and *Wittgenstein: A Social Theory of Knowledge*, (New York: Columbia University Press, 1983); Gaston Bachelard, *La formation de l'esprit scientifique* (Paris: Vrin, 1986); Michel Foucault, *The Order of Things* (New York: Vintage, 1970), and *Birth of the Clinic* (New York: Pantheon, 1973).

8. A comprehensive survey of recent work in philosophy of science is presented in Richard Boyd, Philip Gasper, J. D. Trout (eds), *The Philosophy of Science* (Cambridge, Mass.: MIT Press, 1991).

9. Readers in the anthropology and history of medicine include: Shirley Lindebaum and Margaret Lock (eds), *Knowledge, Power, and Practice: The Anthropology of Medicine and Everyday Life* (Berkeley: University of California Press, 1993); Carolyn F. Sargent and Thomas M. Johnson, *Medical Anthropology: Contemporary Theory and Method* (Westport, Conn.: Praeger, 1996); Judith Leavitt and Ronald Numbers (eds), *Sickness and Health in America: Readings in the History of Medicine and Public Health* (Madison: University of Wisconsin Press, 1997); Andrew Wear (ed), *Medicine in Society: Historical Essays* (Cambridge: Cambridge University Press, 1992); Peter Wright and Andrew Treacher (eds), *The Problem of Medical Knowledge: Examining the Social Construction of Medicine* (Edinburgh: Edinburgh University Press, 1982).

For the history and sociology of technology, see Donald MacKenzie and Judy Wajcman (eds), *The Social Shaping of Technology* (Milton Keynes: Open University Press, 1985, second edition 1998); Wiebe E. Bijker and John Law (eds),

Shaping Technology/Building Society: Studies in Sociotechnical Change (Cambridge, Mass.: MIT Press, 1992); Wiebe E. Bijker, Thomas P. Hughes, Trevor J. Pinch (eds), *The Social Construction of Technological Systems* (Cambridge, Mass.: MIT Press, 1987).

10. As a starting point, see George Marcus (ed), *Technoscientific Imaginaries* (Chicago: University of Chicago Press, 1995), and Mario Biagioli, Roddey Reid, Sharon Traweek (eds), *Located Knowledges: Intersections Between Science, Gender, and Cultural Studies*, a special issue of *Configurations*, 2 (1994).