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To all my companion species

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MODEST_WITNESS@SECOND_MILLENNIUM

A man whose narratives could be credited as mirrors of reality was a modest man: his reports ought to make that modesty visible.

—Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump*

MODEST WITNESS

The modest witness is the sender and receiver of messages in my e-mail address. So let us investigate how this subject position is woven into the nets traced here. The modest witness is a figure in the narrative net of this book, which works to *refigure* the subjects, objects, and communicative commerce of technoscience into different kinds of knots.[1] I am consumed by the project of materialized refiguration; I think that is what's happening in the worldly projects of technoscience and feminism. A figure collects up the people; a figure embodies shared meanings in stories that inhabit their audiences. I take the term *modest witness* from the important book by Steven Shapin and Simon Schaffer (1985), *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life.* In order for the modesty, referred to in the epigraph above, to be visible, the man—the witness whose accounts mirror reality—must be invisible, that is, an inhabitant of the potent "unmarked category," which is constructed by the extraordinary conventions of self-invisibility. In Sharon Traweek's wonderfully suggestive terms, such a man must inhabit the space perceived by its inhabitants to be the "culture of no culture"[2] (1988).

This is the culture within which contingent facts—the real case about the world—can be established with all the authority, but none of the considerable problems, of transcendental truth. This self-invisibility is the

specifically modern, European, masculine, scientific form of the virtue of modesty. This is the form of modesty that pays off its practitioners in the coin of epistemological and social power. This kind of modesty is one of the founding virtues of what we call modernity. This is the virtue that guarantees that the modest witness is the legitimate and authorized ventriloquist for the object world, adding nothing from his mere opinions, from his biasing embodiment. And so he is endowed with the remarkable power to establish the facts. He bears witness: he is objective; he guarantees the clarity and purity of objects. His subjectivity is his objectivity. His narratives have a magical power—they lose all trace of their history as stories, as products of partisan projects, as contestable representations, or as constructed documents in their potent capacity to define the facts.[3] The narratives become clear mirrors, fully magical mirrors, without once appealing to the transcendental or the magical. In what follows, I would like to queer the elaborately constructed and defended confidence of this civic man of reason in order to enable a more corporeal, inflected, and optically dense, if less elegant, kind of modest witness to matters of fact to emerge in the worlds of technoscience.

Robert Boyle (1627–1691) is memorialized in the narratives of the Scientific Revolution and of the Royal Society of London for Improving Natural Knowledge as the father of chemistry and, even more important, father of the experimental way of life. In a series of crucial developments in the 1650s and 1660s in post–civil war Restoration England, Boyle played a key role in forging the three constitutive technologies for such a new life form: "a *material technology* embedded in the construction and operation of the air-pump; a *literary technology* by means of which the phenomena produced by the pump were made known to those who were not direct witnesses; and a *social technology* that incorporated the conventions experimental philosophers should use in dealing with each other and considering knowledge-claims" (Shapin and Schaffer 1985:25).[4] Experimental philosophy—science—could only spread as its materialized practices spread. This was a question not of ideas but of the apparatus of production of what could count as knowledge.

At the center of this story is an instrument, the air-pump. Embedded in the social and literary technologies of proper witnessing, and sustained by the subterranean labor of its building, maintenance, and operation, the air-pump acquired the stunning power to establish matters of fact independent of the endless contentions of politics and religion. Such contingent matters of fact, such "situated knowledges," were constructed to have the earth-shaking capacity to ground social order *objectively*, literally. This separation of expert knowledge from mere opinion as the legitimating knowledge for ways of life, without appeal to transcendent

authority or to abstract certainty of any kind, is a founding gesture of what we call modernity. It is the founding gesture of the separation of the technical and the political. Much more than the existence or nonexistence of a vacuum was at stake in Boyle's demonstrations of the air-pump. As Shapin and Schaffer put it, "The matter of fact can serve as the foundation of knowledge and secure assent insofar as it is not regarded as man-made. Each of Boyle's three technologies worked to achieve the appearance of matters of fact as *given* items. That is to say, each technology functioned as an *objectifying resource*" (1985:77). The three technologies, metonymically integrated into the air-pump itself, the neutral instrument, factored out human agency from the product. The experimental philosopher could say, "It is not I who say this; it is the machine" (77). "It was to be nature, not man, that enforced assent" (79). The world of subjects and objects was in place, and scientists were on the side of the objects. Acting as objects' transparent spokesmen, the scientists had the most powerful allies. As men whose only visible trait was their limpid modesty, they inhabited the culture of no culture. Everybody else was left in the domain of culture and of society.

But there were conditions for being able to establish such facts credibly. To multiply its strength, witnessing should be public and collective. A public act must take place in a site that can be semiotically accepted as public, not private. But "public space" for the experimental way of life had to be rigorously defined; not everyone could come in, and not everyone could testify credibly. What counted as private and as public was very much in dispute in Boyle's society. His opponents, especially Thomas Hobbes (1588–1679), repudiated the experimental way of life precisely because its knowledge was dependent on a practice of *witnessing* by a special community, like that of clerics and lawyers. Hobbes saw the experimentalists as part of private, or even secret, and not civil, public space. Boyle's "open laboratory" and its offspring evolved as a most peculiar "public space," with elaborate constraints on who legitimately occupied it. "What in fact resulted was, so to speak, a public space with restricted access" (Shapin and Schaffer 1985:336).

Indeed, it is even possible today, in special circumstances, to be working in a top-secret defense lab, communicating only to those with similar security clearances, and to be *epistemologically* in public, doing leading-edge science, nicely cordoned off from the venereal infections of politics. Since Boyle's time, only those who could disappear "modestly" could really witness with authority rather than gawk curiously. The laboratory was to be open, to be a theater of persuasion, and at the same time it was constructed to be one of the "culture of no culture's" most highly regulated spaces. Managing the public/private distinction has been

critical to the credibility of the experimental way of life. This novel way of life *required* a special, bounded community. Restructuring that space—materially and epistemologically—is very much at the heart of late-twentieth-century reconsiderations of what will count as the best science.

Also, displaying the labor expended on stabilizing a matter of fact comprised its status. The men who worked the bellows in Boyle's home laboratory were *his* men; they sold their labor power to him; they were not independent. "As a free-acting gentleman, [Boyle] was the author of their work. He spoke for them and transformed their labor into his truth" (Shapin 1994:406). Unmasking this kind of credible, unified authorship of the labor required to produce a fact showed the possibility of a rival account of the matter of fact itself—a point not lost on Boyle's famous opponent, Thomas Hobbes. Furthermore, those actually physically present at a demonstration could never be as numerous as those virtually present by means of the presentation of the demonstration through the literary device of the written report. Thus, the rhetoric of the modest witness, the "naked way of writing," unadorned, factual, compelling, was crafted. Only through such naked writing could the facts shine through, unclouded by the flourishes of any human author. Both the facts and the witnesses inhabit the privileged zones of "objective" reality through a powerful writing technology. And, finally, only through the routinization and institutionalization of all three technologies for establishing matters of fact could the "transposition onto nature of experimental knowledge" be stably effected (Shapin and Schaffer 1985:79).

All of these criteria for credibility intersect with the question of modesty. Transparency is a peculiar sort of modesty. The philosopher of science Elizabeth Potter, of Mills College, gave me the key to this story in her paper "Making Gender/Making Science: Gender Ideology and Boyle's Experimental Philosophy"[5] (2001). Shapin and Schaffer attended to the submerging, literally, as represented by engravings of the regions under the room with the visible air-pump, of the labor of the crucial artisans who built and tended the pump—and without whom nothing happened—but they were silent on the structuring and meaning of the specific civil engineering of the modest witness. They took his masculine gender for granted without much comment. Like the stubbornly reproduced lacunae in the writing of many otherwise innovative science studies scholars, the gap in their analysis seems to depend on the unexamined assumption that gender is a preformed, functionalist category, merely a question of preconstituted "generic" men and women, beings resulting from either biological or social sexual difference and playing out roles, but otherwise of no interest.

In a later book, Shapin (1994) does look closely at the exclusion of women, as well as of other categories of nonindependent persons, from the preserves of gentlemanly truth-telling that characterized the relations of civility and science in seventeenth-century England. As "covered" persons, subsumed under their husbands or fathers, women could not have the necessary kind of honor at stake. As Shapin noted, the "covered" status of women was patently social, not "biological," and understood to be such, irrespective of whatever beliefs a seventeenth-century man or woman might also hold about natural differences between the sexes.[6] Shapin saw no reason to posit that gender was at stake, or remade, by any of the processes that came together as the experimental way of life. The preexisting dependent status of women simply precluded their epistemological, and for the most part their physical, presence in the most important scenes of action in that period in the history of science. The issue was not whether women were intelligent or not. Boyle, for example, regarded his aristocratic sisters as his equal in intellectually demanding religious discussions. The issue was whether women had the independent status to be modest witnesses, and they did not. Technicians, who were physically present, were also epistemologically invisible persons in the experimental way of life; women were invisible in both physical and epistemological senses.

Shapin's questions are different from mine. He notes exclusions, but his focus is on other matters. In contrast, my focus in this chapter is to ask if gender, with all its tangled knots with other systems of stratified relationships, was at stake in key reconfigurations of knowledge and practice that constituted modern science. If Shapin perhaps erred in seeing only conservation, my excesses will be in the other direction.

There are several ways to contest Shapin's judgment that gender was merely conserved, and not redone, or at least hardened in consequential ways, in the seventeenth-century meeting of science and civility. In this regard, historians emphasize the critical role of the defeat of the hermetic tradition in the establishment of scientific mechanistic orthodoxy and the correlated devaluation of much that was gendered feminine (which did not necessarily have to do with real women) in science. The virulence of the witch hunts in Europe in the sixteenth and seventeenth centuries, and the involvement of men who saw themselves as rationalist founders of the new philosophy, testifies to the crisis in gender in that molten period in both knowledge and religion.[7] David Noble (1992:205–43) points out that the "disorderly" public activities of women in the period of religious and political turmoil before the Restoration, as well as women's association with the alchemical tradition, made wise gentlemen scramble to dissociate themselves from all things feminine, including oxymoronic independent women, after mid-century, if not before.

Shapin (1994:xxii) is openly sympathetic to efforts to foreground the voices and agencies of the excluded and silenced in history, but he is

emphatic about the legitimacy of doing the history of what he only half jokingly calls "Dead White European Males" where their activities and ways of knowing are what mattered—and not just to themselves. I agree completely with Shapin's insistence on focusing on men, of whatever categories, when it is their doings that matter. Masculine authority, including the seventeenth-century gentlemanly culture of honor and truth, has been widely taken as legitimate by both men and women, across many kinds of social differentiation. It would not serve feminism to obscure this problem. I do not think Shapin or Shapin and Schaffer should have written their books about women; and besides, Shapin (1994) has a great deal that is interesting to say about the agencies of, among others, Boyle's aristocratic and pious sister in religious and domestic realms. Without focusing on "Dead White European Males" it would be impossible to understand gender at all, in science or elsewhere. However, what I think Shapin does not interrogate in his formulations was whether and how precisely the world of scientific gentlemen was *instrumental* in both sustaining old and in crafting new "gendered" ways of life. Insofar as the experimental way of life built the exclusion of actual women, as well as of cultural practices and symbols deemed feminine, into what could count as the truth in science, the air-pump was a technology of gender at the heart of scientific knowledge. It was the general absence, not the occasional presence, of women of whatever class or lineage/color—and the historically specific ways that the semiotics and psychodynamics of sexual difference worked—that gendered the experimental way of life in a particular way.

My question is, How did all this matter to what could count as knowledge in the rich tradition we know as science? Gender is always a relationship, not a preformed category of beings or a possession that one can have. Gender does not pertain more to women than to men. Gender is the relation between variously constituted categories of men and women (and variously arrayed tropes), differentiated by nation, generation, class, lineage, color, and much else. Shapin and Schaffer assembled all the elements to say something about how gender was one of the products of the air-pump; but the blind spot of seeing gender as women instead of as a relationship got in the way of the analysis. Perhaps Shapin in his later book is right that nothing very interesting happened to gender in the meeting of civility and science in the experimental way of life, with its practices of truth-telling. But I suspect that the way he asked his questions about excluded categories precluded having much to say about the two questions that vex me: (1) In what ways in the experimental way of life was gender in-the-making? (2) Did that matter or not, and how or how not, to what could count as reliable knowledge in science during

and after the seventeenth century? How did gender-in-the-making become part of negotiating the continually vexed boundary between the "inside" and the "outside" of science? How did gender-in-the-making relate to establishing what counted as objective and subjective, political and technical, abstract and concrete, credible and ridiculous?

The effect of the missing analysis is to treat race and gender, at best, as a question of empirical, preformed beings who are present or absent at the scene of action but are not generically constituted in the practices choreographed in the new theaters of persuasion. This is a strange analytical aberration, to say the least, in a community of scholars who play games of epistemological chicken trying to beat each other in the game of showing how all the entities in technoscience are constituted *in* the action of knowledge production, not *before* the action starts.[8] The aberration matters, for, as David Noble argues in his synthesis on the effect of Western Christian clerical culture on the culture and practice of science, "any genuine concern about the implications of such a culturally distorted science-based civilization, or about the role of women within it, demands an explanation. For the male identity of science is no mere artifact of sexist history; throughout most of its evolution, the culture of science has not simply excluded women, it has been defined in defiance of women and their absence.... How did so strange a scientific culture emerge, one that proclaimed so boldly the power of the species while at the same time shrinking in horror from half the species?" (1992:xiv).

Elizabeth Potter, however, has a keen eye for how men became man in the practice of modest witnessing. Men-in-the-making, not men, or women, already made, is her concern. Gender was *at stake* in the experimental way of life, she argues, not predetermined. To develop this suspicion, she turns to the early-seventeenth-century English debates on the proliferation of genders in the practice of sexual cross-dressing. In the context of anxieties over gender manifested by early modern writers, she asks how Robert Boyle—urbane, celibate, and civil—avoided the fate of being labeled a *haec vir*, a feminine man, in his insistence on the virtue of modesty? How did the masculine practice of modesty, by appropriately civil (gentle)men, enhance agency, epistemologically and socially, while modesty enforced on (or embraced by) women of the same social class simply removed them from the scene of action? How did some men become transparent, self-invisible, legitimate witnesses to matters of fact, while most men and all women were made simply invisible, removed from the scene of action, either below stage working the bellows that evacuated the pump or offstage entirely? Women lost their security clearances very early in the stories of leading-edge science.

Women were, of course, literally offstage in early modern English drama, and the presence of men acting women's roles was the occasion for more than a little exploring and resetting of sexual and gender boundaries in the foundational settings of English drama in the sixteenth and seventeenth centuries. As the African American literary scholar Margo Hendricks (1992, 1994 and 1996) tells us, Englishness was also at stake in this period, for example, in Shakespeare's *Midsummer Night's Dream*.[9] And, she notes, the story of Englishness was part of the story of modern gendered racial formations, rooted still in lineage, civility, and nation, rather than in color and physiognomy. But the discourses of "race" that were cooked in this cauldron, which melted nations and bodies together in discourses on lineage, were more than a little useful throughout the following centuries for demarcating the differentially sexualized bodies of "colored" peoples around the world, locally and globally, from the always unstably consolidated subject positions of self-invisible, civil inquirers.[10] Gender and race never existed separately and never were about preformed subjects endowed with funny genitals and curious colors. Race and gender are about entwined, barely analytically separable, highly protean, *relational* categories. Racial, class, sexual, and gender formations (not essences) were, from the start, dangerous and rickety machines for guarding the chief fictions and powers of European civil manhood. To be unmanly is to be uncivil, to be dark is to be unruly: Those metaphors have mattered enormously in the constitution of what may count as knowledge.

Let us attend more closely to Potter's story. Medieval secular masculine virtue—noble manly valor—required patently heroic words and deeds. The modest man was a problematic figure for early modern Europeans, who still thought of nobility in terms of warlike battles of weapons and words.[11] Potter argues that in his literary and social technologies, Boyle helped to construct the new man and woman appropriate to the experimental way of life and its production of matters of fact. "The new man of science had to be a chaste, modest, heterosexual man who desires yet eschews a sexually dangerous yet chaste and modest woman" (2001).[12] Female modesty was of the body; the new masculine virtue had to be of the mind. This modesty was to be the key to the gentleman-scientist's trustworthiness; he reported on the world, not on himself. Unadorned "masculine style" became English national style, a mark of the growing hegemony of the rising English nation. An unmarried man in Puritan England, which valued marriage highly, Boyle pursued his discourse on modesty in the context of the vexed *hic mulier/haec vir* (masculine woman/feminine man) controversies of the late sixteenth and early seventeenth centuries. In that anxious discourse, when gender

characteristics were transferred from one sex to another, writers worried that third and fourth sexual kinds were created, proliferating outside all bounds of God and Nature. Boyle could not risk his modest witness's being *a haec vir*. God forbid the experimental way of life have queer foundations.

Two additional taproots for the masculinity of Boyle's brand of modesty exist: the King Arthur narratives and the clerical monastic Christian tradition. Bonnie Wheeler (1992) argues that the first reference to the Arthur figure in the sixth century referred to him as a *vir modestus*, and the qualifier followed Arthur through his many literary incarnations. This tradition was probably culturally available to Boyle and his peers looking for effective new models of masculine reason. *Modestus* and *modestia* referred to measure, moderation, solicitude, studied equilibrium, and reticence in command. This constellation moves counter to the dominant strand of Western heroism, which emphasizes self-glorification by the warrior hero. The *vir modestus* was a man characterized by high status and disciplined ethical restraint. *Modestia* linked high class, effective power, and masculine gender. Wheeler finds in the King Arthur figure "one alternative norm of empowered masculinity for post-heroic culture" (1992:1).

David Noble emphasizes the reappropriation of clerical discourse in a Royal Society sanctioned by crown and church. "As an exclusively male retreat, the Royal Society represented the continuation of the clerical culture, now reinforced by what may be called a scientific asceticism" (Noble 1992:231). The kind of gendered self-renunciation practiced in this masculine domain was precisely the kind that enhanced epistemological-spiritual potency. Despite the importance of marriage in the Protestant Reformation's attack on the Catholic church, even celibacy in the experimental way of life was praised by lay Puritans of the early Restoration, and especially by Robert Boyle, who served as a model of the new scientist. Potter quotes Boyle's praise of male chastity in the context of man's right to a priesthood rooted in reason and knowledge of the natural world. As Potter puts it, female chastity served male chastity, which allowed men to serve God undistractedly through experimental science. For Boyle, "the laboratory has become the place of worship; the scientist, the priest; the experiment, a religious rite" (Potter 2001).

Within the conventions of modest truth-telling, women might watch a demonstration; they could not witness it. The definitive demonstrations of the working of the air-pump had to take place in proper civil public space, even if that meant holding a serious demonstration late at night to exclude women of his class, as Boyle did. For example, reading Boyle's *New Experiments Physico-Mechanical Touching the Spring of the*

Air, which describes experiments with the air-pump, Potter recounts a demonstration attended by high-born women at which small birds were suffocated by the evacuation of the chamber in which the animals were held. The ladies interrupted the experiments by demanding that air be let in to rescue a struggling bird. Boyle reports that to avoid such difficulties, the men later assembled at night to conduct the procedure and attest to the results. Potter notes that women's names were never listed among those attesting the veracity of experimental reports, whether they were present or not. Several historians describe the tumult caused in 1667 at the Royal Society when Margaret Cavendish (1623–1673), Duchess of Newcastle, generous patron of Cambridge University, and a substantive writer on natural philosophy who intended to be taken seriously, requested permission to visit a working session of the all-male society.[13] Not wanting to offend an important personage, "the leaders of the society ultimately acceded to her request, arranging for her to visit several scientific demonstrations by, among others, Hooke and Boyle" (Noble 1992:231). There was no return visit, and the first women admitted to the Royal Society, after lawyers' advice made it clear that continued exclusion of women would be illegal, entered in 1945, almost 300 years after Cavendish's unwelcome appearance.[14]

Enhancing their agency through their masculine virtue exercised in carefully regulated "public" spaces, modest men were to be self-invisible, transparent, so that their reports would not be polluted by the body. Only in that way could they give credibility to their descriptions of other bodies and minimize critical attention to their own. This is a crucial epistemological move in the grounding of several centuries of race, sex, and class discourses as objective scientific reports.[15]

All of these highly usable discourses feed into the conventions of masculine scientific modesty, whose gendering came to be more and more invisible (transparent) as its masculinity seemed more and more simply the nature of any non-dependent, disinterested truth-telling. The new science redeemed Boyle's celibate, sacred-secular, and nonmartial man from any gender confusion or multiplicity and made him a modest witness as the type specimen of modern heroic, masculine action—of the mind. Depleted of epistemological agency, modest women were to be invisible to others in the experimental way of life. The kind of visibility—the body—that women retained glides into being perceived as "subjective," that is, reporting only on the self, biased, opaque, not objective. Gentlemen's epistmological agency involved a special kind of transparency. Colored, sexed, and laboring persons still have to do a lot of work to become similarly transparent to count as objective, modest witnesses to the world rather than to their "bias" or "special interest." To

be the object of vision, rather than the "modest," self-invisible source of vision, is to be evacuated of agency.[16]

The self-invisibility and transparency of Boyle's version of the modest witness—that is, the "independence" based on power and on the invisibility of others who actually sustain one's life and knowledge—are precisely the focus of late-twentieth-century feminist and multiculutural critique of the limited, biased forms of "objectivity" in technoscientific practice, insofar as it produces itself as "the culture of no culture." Antiracist feminist science studies revisit what it meant, and means, to be "covered" by the modest witnessing of others who, because of their special virtue, are themselves transparent. "In the beginning," the exclusion of women and laboring men was instrumental to managing a critical boundary between watching and witnessing, between who is a scientist and who is not, and between popular culture and scientific fact. I am not arguing that the doings of Boyle and the Royal Society are the whole story in crafting modern experimental and theoretical science; that would be ridiculous. Also, I am at least as invested in the continuing need for stabilizing contingent matters of fact to ground serious claims on each other as any child of the Scientific Revolution could be. I am using the story of Boyle and the experimental way of life as a figure for technoscience; the story stands for more than itself. My claim is double: (1) There have been practical inheritances, which have undergone many reconfigurations but which remain potent; and (2) the stories of the Scientific Revolution set up a narrative about "objectivity" that continues to get in the way of a more adequate, self-critical technoscience committed to situated knowledges. The important practice of credible witnessing is still at stake.

A further central issue requires compressed comment: the structure of heroic action in science. Several scholars have commented on the proliferation of violent, misogynist imagery in many of the chief documents of the Scientific Revolution.[17] The modest man had at least a tropic taste for the rape of nature. Science made was nature undone, to embroider on Bruno Latour's (1987) metaphors in his important *Science in Action*. Nature's coy resistance was part of the story, and getting nature to reveal her secrets was the prize for manly valor—all, of course, merely valor of the mind. At the very least, the encounter of the modest witness with the world was a great trial of strength. In disrupting many conventional accounts of scientific objectivity, Latour and others have masterfully unveiled the self-invisible modest man. At the least, that is a nice twist on the usual direction of discursive unveiling and heterosexual epistemological erotics.[18] In *Science, the Very Idea!* Steve Woolgar (1988) keeps the light relentlessly on this modest being, the "hardest case" or

"hardened self" that covertly guarantees the truth of a representation, which ceases magically to have the status of a representation and emerges simply as the fact of the matter. That crucial emergence depends on many kinds of transparency in the grand narratives of the experimental way of life. Latour and others eschew Woolgar's relentless insistence on reflexivity, which seems not to be able to get beyond self-vision as the cure for self-invisibility. The disease and the cure seem to be practically the same thing, if what you are after is another kind of world and worldliness. Diffraction, the production of difference patterns, might be a more useful metaphor for the needed work than reflexivity.

Latour is generally less interested than his colleague in forcing the Wizard of Oz to see himself as the linchpin in the technology of scientific representation. Latour wants to follow the action in science-in-the-making. Perversely, however, the structure of heroic action is only intensified in this project—both in the narrative of science and in the discourse of the science studies scholar. For the Latour of *Science in Action*, technoscience itself is war, the demiurge that makes and unmakes worlds.[19] Privileging the younger face as science-in-the-making, Latour adopts as the figure of his argument the double-faced Roman god, Janus, who, seeing both ways, presides over the beginnings of things. Janus is the doorkeeper of the gate of heaven, and the gates to his temple in the Roman Forum were always open in time of war and closed in times of peace. War is the great creator and destroyer of worlds, the womb for the masculine birth of time. The action in science-in-the-making is all trials and feats of strength, amassing of allies, forging of worlds in the strength and numbers of forced allies. All action is agonistic; the creative abstraction is both breathtaking and numbingly conventional. Trials of strength decide whether a representation holds or not. Period. To compete, one must either have a counterlaboratory capable of winning in these high-stakes trials of force or give up dreams of making worlds. Victories and performances are the action sketched in this seminal book. "The list of trials becomes a thing; it is literally reified" (Latour 1987:92).

This powerful tropic system is like quicksand. *Science in Action* works by relentless, recursive mimesis. The story told is told by the same story. The object studied and the method of study mime each other. The analyst and the analysand all do the same thing, and the reader is sucked into the game. It is the only game imagined. The goal of the book is "penetrating science from the outside, following controversies and accompanying scientists up to the end, being slowly led out of science in the making" (15). The reader is taught how to resist both the scientist's and the false science studies scholar's recruiting pitches. The prize is not getting stuck in the maze but exiting the space of technoscience a victor, with the

strongest story. No wonder Steven Shapin began his review of this book with the gladiator's salute: "Ave, Bruno, morituri te salutant" (1988:533).

So, from the point of view of some of the best work in mainstream science studies of the late 1980s, "nature" is multiply the feat of the hero, more than it ever was for Boyle. First, nature is a materialized fantasy, a projection whose solidity is guaranteed by the self-invisible representor. Unmasking this figure, s/he who would not be hoodwinked by the claims of philosophical realism and the ideologies of disembodied scientific objectivity fears to "go back" to nature, which was never anything but a projection in the first place. The projection nonetheless tropically works as a dangerous female threatening manly knowers. Then, another kind of nature is the result of trials of strength, also the fruit of the hero's action. Finally, the scholar too must work as a warrior, testing the strength of foes and forging bonds among allies, human and nonhuman, just as the scientist-hero does. The self-contained quality of all this is stunning. It is the self-contained power of the culture of no culture itself, where all the world is in the sacred image of the Same. This narrative structure is at the heart of the potent modern story of European autochthony.[20]

What accounts for this intensified commitment to virile modesty? I have two suggestions. First, failing to draw from the understandings of semiotics, visual culture, and narrative practice coming specifically from feminist, post-colonial, and multicultural oppositional theory, many science studies scholars insufficiently examine their basic narratives and tropes. In particular, the "self-birthing of man," "war as his reproductive organ," and "the optics of self-origination" narratives that are so deep in Western philosophy and science have been left in place, though so much else has been fruitfully scrutinized. Second, many science studies scholars, like Latour, in their energizing refusal to appeal to society to explain nature, or vice versa, have mistaken other narratives of action about scientific knowledge production as functionalist accounts appealing in the tired old way to preformed categories of the social, such as gender, race, and class. Either critical scholars in antiracist, feminist cultural studies of science and technology have not been clear enough about racial formation, gender-in-the-making, the forging of class, and the discursive production of sexuality *through the constitutive practices of technoscience production themselves*, or the science studies scholars aren't reading or listening—or both. For the oppositional critical theorists, both the facts and the witnesses are constituted in the encounters that are technoscientific practice. Both the subjects and objects of technoscience are forged and branded in the crucible of specific, located practices, some of which are global in their location. In the intensity of the fire, the subjects and objects regularly melt into each other. It is past time to end the failure

of mainstream and oppositional science studies scholars to engage each other's work. Immodestly, I think the failure to engage has not been symmetrical.

Let me close this meditation on figures who can give credible testimony to matters of fact by asking how to queer the modest witness this time around so that s/he is constituted in the furnace of technoscientific practice as a self-aware, accountable, anti-racist FemaleMan, one of the proliferating, uncivil, late-twentieth-century children of the early modern *haec vir* and *hic mulier*. Like Latour, the feminist philosopher of science Sandra Harding is concerned with strength, but of a different order and in a different story. Harding (1992) develops an argument for what she calls "strong objectivity" to replace the flaccid standards for establishing matters of fact instaurated by the literary, social, and material technologies inherited from Boyle. Scrutiny of what constitutes "independence" is fundamental. "A stronger, more adequate notion of objectivity would require methods for systematically examining all of the social values shaping a particular research process, not just those that happen to differ between members of a scientific community. Social communities, not either individuals, or 'no one at all,' should be conceptualized as the 'knowers' of scientific knowledge claims. Culture-wide beliefs that are not critically examined within scientific processes end up functioning as evidence for or against hypotheses" (Harding 1993:18).

Harding maintains that democracy-enhancing projects and questions are most likely to meet the strongest criteria for reliable scientific knowledge-production, with built-in critical reflexivity. That is a hope in the face of, at best, ambiguous evidence. It is a hope that needs to be made into a fact by practical work. Such labor would reconstitute the relationships we call gender, race, nation, species, and class in unpredictable ways. Such reformed semiotic, technical, and social practice might be called, after Deborah Heath's term for promising changes in standards for building knowledge in a molecular biology she studies ethnographically, "modest interventions" (1997).

So, agreeing that science is the result of located practices at all levels, Harding concurs with Woolgar that reflexivity is a virtue the modest witness needs to cultivate. But her sense of reflexivity is closer to my sense of diffraction and to Heath's modest interventions than it is to Woolgar's rigorous resistance to making strong knowledge claims. The point is to make a difference in the world, to cast our lot for some ways of life and not others. To do that, one must be in the action, be finite and dirty, not transcendent and clean. Knowledge-making technologies, including crafting subject positions and ways of inhabiting such positions, must be made relentlessly visible and open to critical intervention. Like Latour,

Harding is committed to science-in-the-making. Unlike the Latour of *Science in Action*, she does not mistake the constituted and constitutive practices that generate and reproduce systems of stratified inequality—and that issue in the protean, historically specific, marked bodies of race, sex, and class—for preformed, functionalist categories. I do not share her occasional terminology of macrosociology and her all-too-self-evident identification of the social. But I think her basic argument is fundamental to a different kind of strong program in science studies, one that really does not flinch from an ambitious project of symmetry that is committed as much to knowing about the people and positions from which knowledge can come and to which it is targeted as to dissecting the status of knowledge made.

Critical reflexivity, or strong objectivity, does not dodge the world-making practices of forging knowledges with different chances of life and death built into them. All that critical reflexivity, diffraction, situated knowledges, modest interventions, or strong objectivity "dodge" is the double-faced, self-identical god of transcendent cultures of no culture, on the one hand, and of subjects and objects exempt from the permanent finitude of engaged interpretation, on the other. No layer of the onion of practice that is technoscience is outside the reach of technologies of critical interpretation and critical inquiry about positioning and location; that is the condition of articulation, embodiment, and mortality. The technical and the political are like the abstract and the concrete, the foreground and the background, the text and the context, the subject and the object. As Katie King (1993) reminds us, following Gregory Bateson, these are questions of pattern, not of ontological difference. The terms pass into each other; they are shifting sedimentations of the one fundamental thing about the world—relationality. Oddly, embedded relationality is the prophylaxis for both relativism and transcendence. Nothing comes without its world, so trying to know those worlds is crucial. From the point of view of the culture of no culture, where the wall between the political and the technical is maintained at all costs, and interpretation is assigned to one side and facts to the other, such worlds can never be investigated. Strong objectivity insists that both the objects and the subjects of knowledge-making practices must be located. Location is not a listing of adjectives or assigning of labels such as race, sex, and class. Location is not the concrete to the abstract of decontextualization. Location is the always partial, always finite, always fraught play of foreground and background, text and context, that constitutes critical inquiry. Above all, location is not self-evident or transparent.

Location is also partial in the sense of being *for* some worlds and not others. There is no way around this polluting criterion for strong

objectivity. Sociologist and ethnographer Susan Leigh Star (1991) explores taking sides in a way that is perhaps more readily heard by science studies scholars than Harding's more conventional philosophical vocabulary. Star is interested in taking sides with some people or other actors in the enrollments and alliance formations that constitute so much of technoscientific action. Her points of departure are feminist and symbolic interactionist modes of inquiry that privilege the kind of witness possible from the point of view of those who suffer the trauma of not fitting into the standard. Not to fit the standard is another kind of oxymoronically opaque transparency or invisibility: Star would like to see if this kind is conducive to crafting a better modest witness. Not fitting a standard is not the same thing as existing in a world without that standard. Instructed by the kinds of multiplicity that result from exposure to violence, from being outside a powerful norm, rather than from positions of independence and power, Star is compelled by the starting point of the monster, of what is exiled from the clean and light self. And so she suspects that the "voices of those suffering from the abuses of technological power are among the most powerful analytically" (Star 1991:30).

Star's own annoying but persistent allergy to onions, and the revealing difficulty of convincing service people in restaurants that such a condition is real, is her narrative wedge into the question of standardization. In order to address questions about power in science and technology, Star looks at how standards produce invisible work for some while clearing the way for others, and at how consolidated identities for some produce marginalized locations for others. She adopts what she calls a kind of "cyborg" point of view: Her "cyborg" is the "relationship between standardized technologies and local experience," where one falls "between the categories, yet in relationship to them" (39).

Star thinks "that it is both more analytically interesting and more politically just to begin with the question *cui bono*, than to begin with a celebration of the fact of human/non-human mingling" (43). She does not question the fact of the implosion of categorical opposites; she is interested in who lives and dies in the force fields generated. "Public" stability for some is "private" suffering for others; self-invisibility for some comes at the cost of public invisibility for others. They are "covered" by what is conventionally made to be the case about the world. I think that such coverings reveal the grammatical structure of "gender," "race," "class," and similar clumsy categorical attempts to name how the world is experienced by the nonstandard, who nonetheless are crucial to the technologies of standardization and others' ease of fitting.

In Star's account, we are all members of many communities of practice. Multiplicity is in play with questions of standardization, and no one is standard or ill-fitted in all communities of practice. Some kinds of

Fig. 7.1. Millennial Children, Lynn Randolph, oil on canvas, 58″ × 72″, 1992.

Stalked by hyenas and mocked by a dancing clown-devil with a leering face mask for a stomach, two embracing girls kneel on the flaming ground outside the burning city of Houston on the banks of an oil-polluted bayou. Facing the viewer, these millennial children ask if there can still be a future on this earth. Vultures perch on the limbs of a blasted tree, its roots miming the bird feet of the cavorting demon, whose stomach is a portrait of George Bush. Smoking towers of a nuclear power plant loom in the background and a Stealth bomber dives toward the ground out of a lightning-scorched sky. Reds, blacks, and slashing yellows dominate the large canvas, relieved by the sepia flesh and pastel dresses of the children and the greens of the not-yet-burned bushes. The girls are whole, firm, and flanked by diminutive guardian angels. Sober in their regard the children are not destroyed, but they are menaced by the apocalypse that engulfs the world. They are in the dangerous borderlands between reality and nightmare, between the comprehensive futurelessness that is only a dire possibility and the blasted futures of hundreds of millions of children that are a fierce reality now. These are the children whose witness calls the viewer to account for both the stories and the actualities of the millennium.

standardization matter more than others, but all forms work by producing those that do not fit as well as those who do. Inquiry about technoscience from the point of view of Star's monsters does not necessarily focus on those who do not fit, but rather on the contingent material-semiotic articulations that bring such ill-fitting positions into being and

sustain them. Star's monsters also ask rather uncivilly how much it costs, and who pays, for some to be modest witnesses in a regime of knowledge-production while others get to watch. And monsters in one setting set the norm in others; innocence and transparency are not available to feminist modest witnesses.

Double vision is crucial to inquiring into the relations of power and standards that are at the heart of the subject- and object-making processes of technoscience. Where to begin and where to be based are the fundamental questions in a world in which "power is about *whose* metaphor brings worlds together" (Star 1991:52). Metaphors are tools and tropes. The point is to learn to remember that we might have been otherwise, and might yet be, as a matter of embodied fact. Being allergic to onions is a niggling tropic irritant to the scholarly temptation to forget one's own complicity in apparatuses of exclusion that are constitutive to what may count as knowledge. Fever, nausea, and a rash can foster a keen appreciation of located knowledges.

So I close this evocation of the figure of the modest witness in the narrative of science with the hope that the technologies for establishing what may count as the case about the world may be rebuilt to bring the technical and the political back into realignment so that questions about possible livable worlds lie visibly at the heart of our best science.

SECOND MILLENNIUM

> They did not know for sure, but they suspected that the dances were beyond nasty because the music was getting worse and worse with each passing season the Lord waited to make Himself known.
>
> —Toni Morrison, *Jazz*

> I have not written a narrative Leviathan. Did you really want another one?
>
> —Sharon Traweek, "Border Crossings"

From a millennarian perspective, things are always getting worse. Evidence of decay is exhilarating and mobilizing. Oddly, belief in advancing disaster is actually part of a trust in salvation, whether deliverance is expected by sacred or profane revelations, through revolution, dramatic scientific breakthroughs, or religious rapture. For example, for radical science activists like me, the capitalist commodification of the dance of life is always advancing ominously; there is always evidence of nastier and nastier technoscience dominations. An emergency is always at hand, calling for the need for transformative politics. For my twins, the true believers in the church of science, a cure for the trouble at hand is always promised. That promise justifies the sacred status of scientists,

even, or especially, outside their domains of practical expertise. Indeed, the *promise* of technoscience is, arguably, its principal social weight. Dazzling promise has always been the underside of the deceptively sober pose of scientific rationality and modern progress within the culture of no culture. Whether unlimited clean energy through the peaceful atom, artificial intelligence surpassing the merely human, an impenetrable shield from the enemy within or without, or the prevention of aging ever materializes is vastly less important than always living in the time zone of amazing promises. In relation to such dreams, the impossibility of ordinary materialization is intrinsic to the potency of the promise. Disaster feeds radiant hope and bottomless despair, and I, for one, am satiated. We pay dearly for living within the chronotope of ultimate threats and promises.

Literally, *chronotope* means topical time, or a *topos* through which temporality is organized. A topic is a commonplace, a rhetorical site. Like both place and space, time is never "literal," just there; *chronos* always intertwines with *topos*, a point richly theorized by Bakhtin (1981) in his concept of the chronotope as a figure that organizes temporality. Time and space organize each other in variable relationships that show any claim to totality, be it the New World Order, Inc., the Second Millennium, or the modern world, to be an ideological gambit linked to struggles to impose bodily / spatial / temporal organization. Bakhtin's concept requires us to enter the contingency, thickness, inequality, incommensurability, and dynamism of cultural systems of reference through which people enroll each other in their realities. Bristling with ultimate threats and promises, drenched with the tones of the apocalyptic and the comic, the gene and the computer both work as chronotopes throughout *Modest_Witness@Second_Millennium.*

So, replete with such costs, the Second Millennium is this book's space-time machine; it is the machine that circulates the figures of the modest witness, the FemaleMan, and OncoMouse in a common story. The air-pump is itself a chronotope closely related to my mechanical-millennial address. Both machines have to do with a narrative space-time frame associated with millennarian hopes for new foundations. The air-pump was an actor in the drama of the Scientific Revolution. The device's potent agency in civil matters and its capacity to bear witness exceeded that of most of the humans who attended its performances and looked after its functioning. Those humans to whom could be attributed a power of agency approaching that of the air-pump and its progeny over the next centuries had to disguise themselves as its ventriloquists. Their subjectivity had to become their objectivity, guaranteed by their close kinship with their machines. Inhabiting the culture of no culture, these modest witnesses were transparent spokesmen, pure mediums transmitting

the objective word made flesh as facts. These humans were self-invisible witnesses to matters of fact, the new world's guarantors of objectivity. The narrative frames of the Scientific Revolution were a kind of time machine that situated subjects and objects into dramatic pasts, presents, and futures.

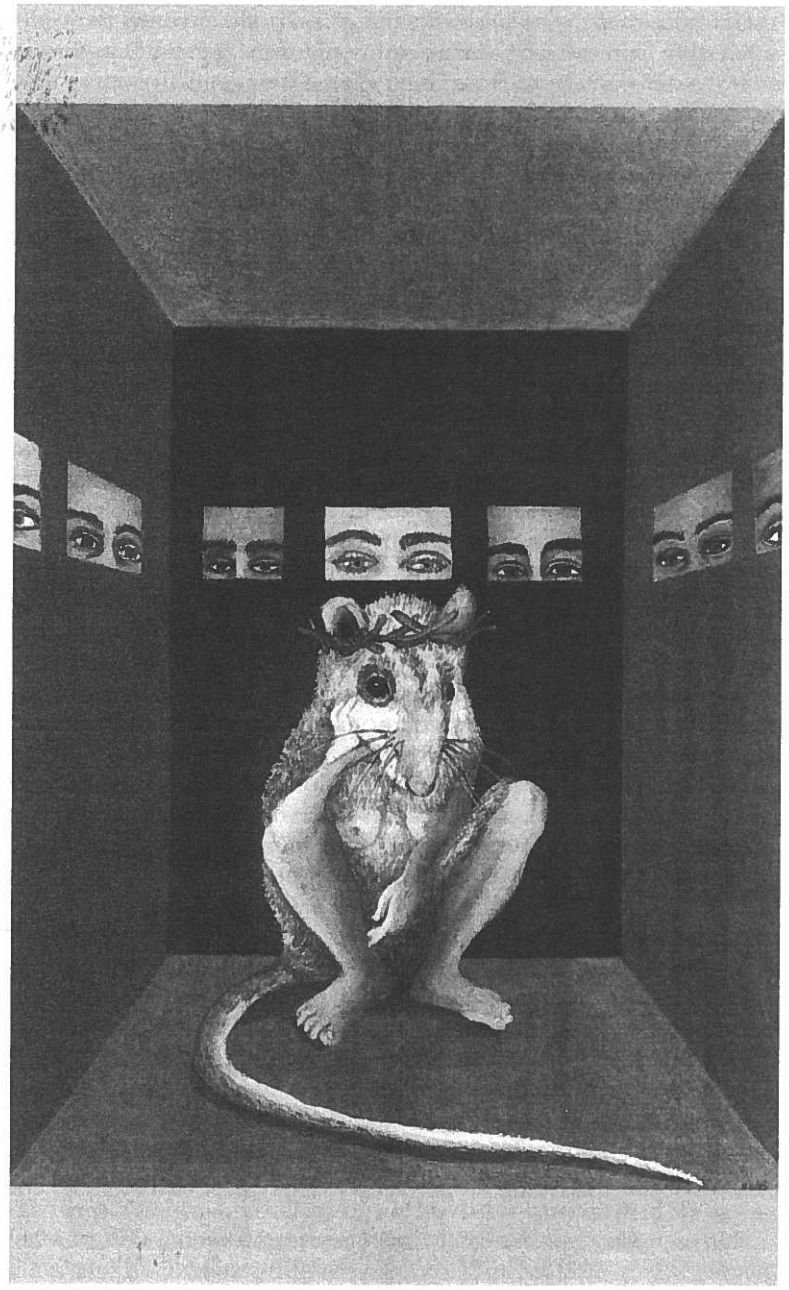
If belief in the stable separation of subjects and objects in the experimental way of life was one of the defining stigmata of modernity, the implosion of subjects and objects in the entities populating the world at the end of the Second Millennium—and the broad recognition of this implosion in both technical and popular cultures—are stigmata of another historical configuration. Many have called this configuration "postmodern." Suggesting instead the notion of the "metamodern" for the current moment, Paul Rabinow (1992) rejects the "postmodern" label for two main reasons: (1) Foucault's three axes of the modern episteme—life, labor, and language—are all still very much in play in current knowledge-power configurations; and (2) the collapse of metanarratives that is supposed to be diagnostic of postmodernism is nowhere in evidence in either technoscience or transnational capitalism. Rabinow is correct about both of these important points, but for my taste he does not pay enough attention to the implosion of subjects and objects, culture and nature, in the warp fields of current biotechnology and communications and computer sciences as well as in other leading domains of technoscience. This implosion issuing in a wonderful bestiary of cyborgs is different from the *cordon sanitaire* erected between subjects and objects by Boyle and reinforced by Kant. It is not just that objects, and nature, have been shown to be full of labor, an insight insisted on most powerfully in the last century by Marx, even if many current science studies scholars have forgotten his priority here. More pregnantly, in the wombs of technoscience, as well as of postfetal science studies, chimeras of humans and nonhumans, machines and organisms, subjects and objects, are the obligatory passage points, the embodiments and articulations, through which travelers must pass to get much of anywhere in the world. The chip, gene, bomb, fetus, seed, brain, ecosystem, and database are the wormholes that dump contemporary travelers out into contemporary worlds. These chimeras are not close cousins of the air-pump, although the air-pump is one of their distant ancestors.

Instead, entities like the chip, gene, bomb, fetus, seed, brain, ecosystem, and database are more like OncoMouse™. And those who attest to matters of fact are less like Boyle's modest man than they are like the FemaleMan© . We will meet both of these genetically strange, inflected, proprietary beings soon, as they are made to encounter each other and discover their kinship. Bruno Latour (1993) suggested the

useful notion of the *amodern* for the netherlands in which the really interesting chimeras of humans and nonhumans gestate. But, for my taste, he still sees too much continuity in the late twentieth century with Boyle's practice. I think something is going on in the world vastly different from the constitutional arrangements that established the separations of nature and society proper to "modernity," as early modern Europeans and their offspring understood that historical configuration; and recent technoscience is at the heart of the difference. Instead of naming this difference—postmodern, metamodern, amodern, late modern, hypermodern, or just plain generic Wonder Bread modern—I give the reader an e-mail address, if not a password, to situate things in the net.

But, obviously, I did not name my e-mail address innocently. I am appealing to the disreputable history of Christian realism and its practices of figuration; and I am appealing to the love/hate relation with apocalyptic disaster-and-salvation stories maintained by people who have inherited the practices of Christian realism, not all of whom are Christian, to say the least. Like people allergic to onions eating at McDonald's, we are forced to live, at least in part, in the material-semiotic system of measure connoted by the Second Millennium, whether or not we fit that story. Following Eric Auerbach's arguments in *Mimesis* (1953), I consider figures to be potent, embodied—incarnated, if you will—fictions that collect up the people in a story that tends to fulfillment, to an ending that redeems and restores meaning in a salvation history. After the wounding, after the disaster, comes the fulfillment, at least for the elect; God's scapegoat has promised as much. I think contemporary technoscience in the United States is deeply engaged in producing such stories, slightly modified to fit the conventions of secular realism.

In that sense the "human genome" in current biotechnical narratives regularly functions as a figure in a salvation drama that promises the fulfillment and restoration of human nature. As a symptomatic example, consider a short list of titles of articles, books, and television programs in the popular and official science press about the Human Genome Project to map and sequence all of the genes on the 46 human chromosomes: "Falling Asleep over the Book of Life," "Genetic Ark," "Gene Screening: A Chance to Map our Body's Future," "Genesis, the Sequel," "James Watson and the Search for the Holy Grail," "A Guide to Being Human," "Thumbprints in Our Clay," "In the Beginning Was the Genome," "A Worm at the Heart of the Genome Project," "Genetics and Theology: A Complementarity?" "Huge Undertaking—Goal: Ourselves," "The Genome Initiative: How to Spell 'Human,' " "Blueprint for a Human," *The Code of Codes, Gene Dreams, Generation Games, Mapping the Code, Genome,* and, finally, on the BBC and NOVA television,



"Decoding the Book of Life." Genes are a bit like the Eucharist of biotechnology. Perhaps that insight will make me feel more reverent about genetically engineered food.

Instrinsic to placing my modest witnesses in a conventional millennarian machine is the evocation of the impending time of tribulations. There is no shortage of such narratives of disasters in the technical and popular cultures of technoscience. The time machine of the Second Millennium churns out expectations of nuclear catastrophe, global economic collapse, planetary pandemics, ecosystem destruction, the end of nurturing families, private ownership of the commons of the human genome, and many other kinds of silent springs. Of course, just as within any other belief system, all these things look eminently real, eminently possible, perhaps even inevitable, once we inhabit the chronotope that tells the

Fig. 7.2. The Laboratory, or The Passion of OncoMouse, Lynn Randolph, oil on masonite, 10″ × 7″, 1994.

Modest_Witness@Second_Millennium FemaleMan©_Meets_OncoMouse™ was revised, literally, under the portrait of The Laboratory, or The Passion of OncoMouse. Set in the simultaneously globally distributed and parochial timescape of the end of the Second Christian Millennium, this is a book about the figurations, tools, tropes, and articulations of technoscience as I have lived it in the United States in the 1990s. The biotechnical, biomedical laboratory animal is one of the key figures inhabiting my book, world, and body. Figures cohabit with subjects and objects inside stories. Figures take up and transform selves. Lynn Randolph painted her transspecific human-mouse hybrid in response to the first draft of "Mice into Wormholes." That paper examines sticky threads extruding from the natural-technical body of the world's first patented animal—OncoMouse™, a breast cancer research model produced by genetic engineering. As a model, the transgenic mouse is both a trope and a tool that reconfigures biological knowledge, laboratory practice, property law, economic fortunes, and collective and personal hopes and fears. In Randolph's rendering, the white, female, breast-endowed, transspecific, cyborg creature is crowned with thorns. She is a Christ figure, and her story is that of the passion. She is a figure in the sacred-secular dramas of technoscientific salvation history, with all of the disavowed links to Christian narrative that pervade U.S. scientific discourse. The laboratory animal is sacrificed: her suffering promises to relieve our own; she is a scapegoat and a surrogate. She is the object of transnational technoscientific surveillance and scrutiny, the center of a multicolored optical drama. Her passion transpires in a box that mimes the chamber of the air-pump in Robert Boyle's house in seventeenth-century England. Small animals expired in that experimental chamber to show to credible witnesses the workings of the vacuum air-pump so that contingent matters of fact might ground less deadly social orders. This mouse is a figure in secularized Christian salvation history and in the linked narratives of the Scientific Revolution and the New World Order—with their promises of progress; cures; profit; and, if not of eternal life, then at least of life itself. Randolph's OncoMouse invites reflection on the terms and mechanism of these noninnocent genetic stories. Her figure invites those who inhabit this book to take up and reconfigure technoscientific tools and tropes in order to practice the grammar of a mutated experimental way of life that does not issue in the New World Order, Inc.

story of the world that way. I am not arguing that such threats aren't threatening. I am simply trying to locate the potency of such "facts" about the contemporary world, which is so enmeshed in technoscience, with its threats and its promises. There is no way to rationality—to actually existing worlds—outside stories, not for our species, anyway. This book, like all of my writing, is anxious much more than it is optimistic. I am not arguing for complacency when I list the narrative setup of threats and promises, only for taking seriously that no one exists in a culture of no culture, including the critics and prophets as well as the technicians. We might profitably learn to doubt our fears and certainties of disasters as much as our dreams of progress. We might learn to live without the bracing discourses of salvation history. We exist in a sea of powerful stories: They are the condition of finite rationality and personal and collective life histories. There is no way out of stories; but no matter what the One-Eyed Father says, there are many possible structures, not to mention contents, of narration. Changing the stories, in both material and semiotic senses, is a modest intervention worth making. Getting out of the Second Millennium to another e-mail address is very much what I want for all mutated modest witnesses.

NOTES

1. Commerce is a variant of conversation, communication, intercourse, passage. As any good economist will tell you, commerce is a procreative act.
2. Traweek was studying the legitimate sons of Robert Boyle; her physicists' detector devices are the mechanical descendants of his air-pump as well. Humans and nonhumans have progeny in the odd all-masculine reproductive practices of technoscience. "I have presented an account of how high energy physicists construct their world and represent it to themselves as free of their own agency, a description, as thick as I could make it, of an extreme culture of objectivity: a culture of no culture, which longs passionately for a world without loose ends, without temperament, gender, nationalism, or other sources of disorder—for a world outside human space and time" (Traweek 1988:162).
3. Of course, what counts as a warrant for disinterestedness, or lack of bias, changes historically. Shapin (1994:409–17) stresses the difference between the face-to-face, gentlemanly standards for assessing truth telling in seventeenth-century England and the anonymous, institutionally and professionally warranted practices of science in the twentieth century. Inside concrete laboratories, however, Shapin suggests that members of the community based on face-to-face interactions continue to assess credibility in ways Robert Boyle would have understood. Part of the problem scientists face today is legitimation of their criteria in the eyes of "outsiders." One of my goals in this book is to trouble what counts as insiders and outsiders in setting standards of credibility and objectivity. "Disinterested" cannot be allowed to mean "dislocated"; i.e., unaccountable for, or unconscious of, complex layers of one's personal collective historical situatedness in the apparatuses for the production of knowledge. Nor can "politically committed" be allowed to mean "biased." It is a delicate distinction, but one fundamental to hopes for democratic and credible science. Etzkowitz and Webster (1995) discuss how the "norms of science," and so of what counts as objective, have changed during the twentieth century in the United States. For example, in molecular biology university-based investigators formerly doing tax- and foundation-supported "pure science," which semiotically warranted their credibility and disinterestedness, as the grants economy eroded became much more closely tied to corporations, where intellectual property and science implode. Perhaps some of the anxiety about objectivity in the "science wars"—in which science studies scholars, feminist theorists, and the like are seen as threatening broad-based belief in scientific credibility and objectivity through their irresponsible "perspectivalism" and "relativism"—should really be traced to transformed standards of disinterestedness among scientists themselves. See especially the attacks by Gross and Levitt (1994).
4. Shapin (1994) writes almost exclusively about the social technology for warranting credibility. He analyzes the transfer of the code of gentlemanly honor, based on the *independence* of the gentleman, that man of means who owes no one anything but the truth, from established social regions to a new set of practices—experimental science. The most original contribution of Shapin and Schaffer (1985) is their analysis of the weave of all three technologies, and especially of the heart of the experimental life form—the sociotechnical apparatus that built and sustained the air-pump, which I take to be metonymic for the technoscientific instrument in general.
5. Potter (2001). In writing this chapter, I worked from an earlier manuscript version of Potter's paper in which she discussed the *hic mulier/haec vir* controversy from the 1570s through 1620 in the context of gender anxieties evident in English Renaissance writers, and extending to Boyle and other post-Restoration authors. Therefore, I do not give page numbers. Potter relied on Woodbridge (1984).
6. On that topic, see Schiebinger (1989) and Laqueur (1990). "Biological" sexual difference is my own anachronistic adjective in this sentence.
7. See Merchant and Easlea (1980).
8. See the series of essays and counteressays that begins with Collins and Yearley's (1992:301–26) "Epistemological Chicken." Bruno Latour, Steve Woolgar, and Michel Callon were the other combatants, some better humored than others. The stakes were what got to count as the really real.
9. Hendricks (1996 and 1994). *A Midsummer Night's Dream* was composed about 1600.
10. Exploring how "race" was constructed in early modern England, Boose (1994) cautions against hearing twentieth-century meanings of color in sixteenth- and seventeenth-century writing. Boose argues that the almost unrepresentable narrative of love and sexual union between a dark African woman and an English man, tied to European patriarchal questions about lineage and the fidelity of transmission of the image of the father; was an important node in the production of modern race discourse. Inflected also by discourse on Jews and on the Irish, English constitutions of race were changing across the seventeenth century, not unlinked to the fact that by mid-century, "England would be competing with the Dutch for the dubious distinction of being the world's largest slave trader" (1994:40). These issues are vastly understudied in accounting for the shapes taken by early modern science.
11. The ambiguities and tensions between the two chief aristocratic and gentlemanly qualities, civility and heroic virtue, should be examined in the context of the experimental way of life in this period. Shapin (1994) assembles compelling evidence about the nature and importance of civility for establishing truth-telling.
12. Because the published page numbers will differ, I omit page references to both Potter's manuscript and forthcoming paper.
13. Schiebinger (1989:25–26); Noble (1992:230–31); Potter (2001).
14. See Rose (1994:115–35) for the story of women in England's Royal Society.

15. "From this perspective the proper subject of gender and science thus becomes the analysis of the web of forces that supports the historic conjunction of science and masculinity, and the equally historic disjunction between science and femininity. It is, in a word, the conjoint making of 'men,' 'women,' and 'science' " (Keller 1990:74). If "gender" here means "kind," and thus includes *constitutively* the complex lineages of racial, sexual, class, and national formations in the production of differentiated men, women, and science, I could not agree more.
16. Recall the trope of the eye of God in Linnaeus's vision of the second Adam as the authorized namer of the new plants and animals revealed by eighteenth-century explorations. Nature can be seen and warranted; it is not the witness to itself. This narrative epistemological point is part of the apparatus for the repeated placing of "white" women and people of "color" in nature. Only as objects can they enter science; their only subjectivity in science is called bias and special interest unless they become honorary honorable men. This is an ethnospecific story of representation, requiring surrogacy and ventriloquism as part of its technology. The self-acting agent who is the modest witness is also "agent" in another sense—as the delegate for the thing represented, as its spokesperson and representative. Agency, optics, and recording technologies are old bedfellows.
17. Merchant (1980); Easlea (1980); Keller (1985); Jordanova (1989); Noble (1992); Schiebinger (1989).
18. The veil is the chief epistemological element in Orientalist systems of representation, including much of technoscience. The point of the veil is to promise that something is behind it. The veil guarantees the worth of the quest more than what is found. The metaphoric system of discovery that is so crucial to the discourse about science depends on there being things hidden to be discovered. How can one have breakthroughs if there is no resistance, no trial of the hero's resolve and virtue? The explorer is a hero, another aspect of epistemological manly valor in technoscience narratives. See Yegenoglu (1993). Feminist narratologists have spent a lot of time on these issues. Science studies scholars should spend a little more time with feminist and postcolonial narratology and film theory.
19. Remember that the author is a fiction, a position, and an ascribed function. And writing is dynamic; positions change. There are other Latours, in and out of print, who offer a much richer tropic tool kit than that in *Science in Action*. In particular, in writing and speaking in the mid-1990s, Latour, as well as Woolgar and several other scholars, evidence serious, nondefensive interest in feminist science studies, including the criticism of their own rhetorical and research strategies in the 1980s. I focus on *Science in Action* in this chapter because that book was taken up so widely in science studies. But see Woolgar (1995); Latour (1996).

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8

RACE: UNIVERSAL DONORS IN A VAMPIRE CULTURE. IT'S ALL IN THE FAMILY: BIOLOGICAL KINSHIP CATEGORIES IN THE TWENTIETH-CENTURY UNITED STATES

RACE

The starting point for my story is the racial discourse in place at the end of the nineteenth century in Europe and the United States. As the historian George Stocking put it, "'blood' was for many a solvent in which all problems were dissolved and processes commingled." "Race" meant the "accumulated cultural differences carried somehow in the blood" (Stocking 1993:6). The emphasis was on "somehow," for blood proved a very expansible and inclusive fluid. Four major discursive streams poured into the cauldron in which racial discourse simmered well into the early decades of the twentieth century, including the ethnological, Lamarckian, polygenist, and evolutionist traditions. For each approach, the essential idea was the linkages of lineage and kinship. No great distinction could be maintained between linguistic, national, familial, and physical resonances implied by the terms *kinship* and *race.* Blood ties were the proteinaceous threads extruded by the physical and historical passage of substance from one generation to the next, forming the great nested, organic collectives of the human family. In that process, where race was, sex was also. And where race and sex were, worries about hygiene, decadence, health, and organic efficiency occupied the best of minds of the age, or at least the best published.