

## Science Laid Bare (by Its Ethnographers)

Essay Review of Recent Anthropology of Science

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Books discussed:

L. Nader (éd.), *Naked Science: Anthropological Inquiry into Boundaries, Power, and Knowledge*, Routledge, 1996 (318 pp.)

H. Gusterson, *Nuclear Rites: A Weapons Laboratory at the End of the Cold War*. University of California UP, 1998 (350 pp.)

P. Rabinow, *Le génome humain*, Odile Jacob, 2001 (Published in USA as *French DNA*).

R. Reid & S. Traweek (éds), *Doing Science + Culture*. Routledge, 2000 (339 pp.)

In the nineteen eighties and nineties, the discipline of anthropology subjected itself to an intense critical self-examination. It questioned the epistemological assumptions underlying its analyses of foreign cultures; it took itself to task for its complicity in the extension of empire and the domination of indigenous populations. In the same period— as both an outgrowth and a complement to this self-scrutiny— the subfield of anthropology of science took shape. Instead of asking to what extent anthropology lived up to an unexamined standard of objectivity set by a popular image of the natural sciences, ethnographers familiarized themselves with laboratories, lecture halls, clinics, committee rooms and corridors in order to find out what science looks like on the ground level. As Laura Nader's title suggests, the goal was a view of "naked science": direct observation of material and symbolic practices stripped of the protective cloak of abstractions like "the scientific method" and "universal norms of reason".

The anthropology of science thus presents a genuinely novelty. This is not because it has discovered a new object: on the contrary, whether we begin our genealogy with Comte's analysis of the progress of the human mind from mystic participation to positive science, Durkheim and

Mauss' depictions of primitive forms of knowledge at once natural, sociological, and religious, or Tylor and Frazer's magic-religion-science sequence, anthropology has persistently inquired about the relation between natural knowledge and social practices. This old topic, however, takes on a range of unprecedented forms when it is pursued in contemporary society: the techniques, facts, subject-positions and institutional arrangements of today's sciences are truly new. Furthermore, the anthropology of science is guided by new assumptions. Most significantly, anthropologists of science increasingly refuse their predecessors' unquestioning view of "Western science" and rationality. Like other approaches in the rich and varied landscape of "science studies"—notably the Edinburgh School of Sociology of Scientific Knowledge, the actor-network theory of Bruno Latour, and the cultural studies of science theorized and exemplified by Donna Haraway and Joseph Rouse—it sets aside the idea that beneath the variable forms taken by "cultures" and "concepts" there lies a single, unchanging realm of "natural", "scientific" causality. It studies in ethnographic detail the situations in which scientific facts, natural processes, and laws of nature are discovered, elaborated, and solidified.<sup>1</sup>

Beyond the fact that many anthropologists of science work or were trained in departments of anthropology, more fundamental distinctions stem from the intellectual tradition to which they are affiliated. While some schools of science studies emulate analytical philosophy, some adopt the rhetoric of scientific demonstration, and others apply a technological instrumentalism of means, ends, and interests, the anthropology of science takes its stylistic and thematic lead from the broad tradition of cultural anthropology. Its aims therefore include narration and evocation of experience as much as explanation and classification; it takes as its object the depth of imaginative, symbolic, and moral resonances of scientific discoveries, theories, and attitudes, as well as the range of influences that bear upon emergent understandings of self, society, and cosmos.

An article by Sharon Traweek, author of a landmark ethnography of American and Japanese physicists<sup>2</sup>, begins with a programmatic statement:

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<sup>1</sup> See discussions in *Critique* 2002, "Sciences dures?" n° 661-662, été 2002; Pickering, Andrew, ed. *Science as practice and culture*. Chicago: University of Chicago Press, 1992; Rouse, Joseph. *Knowledge and Power : Toward a Political Philosophy of science*. Ithaca: Cornell University Press, 1987.

<sup>2</sup> Traweek, Sharon. *Beamtimes and Lifetimes : The World of High Energy Physicists*. Cambridge, Mass.: Harvard University Press, 1988.

Through the anthropological fieldwork method called participant-observation, I study the settings and events that the multinational high energy physics community physicists construct for themselves and observe the activities, formal and informal, they consider appropriate in those settings. I learn what they believe they need to know in order to act effectively and strategically, whether locally or globally; I then find the patterns in their actions and cosmologies and how all this shifts over time as the ecology of their community changes. (In Nader, p. 174).

Although clearly derived from the Boasian concept of culture as perceptual schemes housed in symbolic forms, language, and material artefacts—“community”, “cosmologies” and “patterns”—Traweek goes beyond the classic notion of “culture” with its implication of a limited, static, monolithic system of symbols uniting a geographically bound group of individuals. Like most anthropologists of science, she tends to apply a more fluid and open conception of human practice and meanings. Specific historical events are considered in relation to other patterns, “locally or globally”; power relations and international flows of cultural goods, including scientific knowledge and technologies, make up a Batesonian “ecology” of interlocking, multi-leveled local epistemologies in dynamic interaction.

We might further qualify the approach as “post-cultural”. Increasingly, a key topic is the way in which actors make reflexive use of the notion of “culture” to explain their actions, to differentiate themselves from other groups, and to distinguish among different fields of activity within their own worlds. “Culture” thus appears as an important tool in local and international strategies.<sup>3</sup> Further, like the ethnomethodological studies of scientific work of Michael Lynch, which describe “society”, “contexts”, and even “facts” as the accomplishment of local activities, in the anthropology of science the theoretical and conceptual order of natural science is traced back to specific material and symbolic practices. These include acts of negotiation and formulation, including representations of “what there is in the world” or of the cosmos as a whole; none of these “cosmograms” is granted finality or totality. Rather than a unified “scientific culture” accessing a “rational order of nature”, what emerges is a multiple, decentered

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<sup>3</sup> See Stefan Helmreich, “After Culture: Reflections on the Apparition of Anthropology in Artificial Life, a Science of Simulation.” *Cultural Anthropology* 16(4): 613-628. Also Wagner, Roy. *The Invention of Culture*. Chicago: University of Chicago Press, 1981. Strathern, Marilyn. *After Nature: English Kinship in the Late Twentieth Century*. Cambridge: Cambridge University Press, 1992.

cosmos in which the divide between nature and culture is constantly at issue and constantly revised.

### **From ethnoscience to science studies**

Another point that sets this approach apart from related disciplines is its access to a long tradition of studies of non-Western systems of knowledge. In the twentieth century, this included studies of the practical uses of magic à la Malinowski; developmental, economic, and materialist studies of resource exploitation and production; ecological studies of the adaptive benefits of cultural forms; and Levi-Strauss' analyses of the classification systems of *la pensée sauvage*. Attaining a certain prominence in the 1970s and 1980s and sharing aspects of this range of approaches was ethnoscience, the study of indigenous systems of knowledge—ethnobotany, ethnopsychology, medical anthropology, ethnolinguistics. One of the great strengths of Laura Nader's collection, *Naked Science*, is its inclusion of essays by major representatives of ethnoscience, making visible the connections and distinctions between it and more recent approaches in anthropology of science.

The article by Berlin, Berlin, et al, "The Scientific Basis of Gastrointestinal Herbal Medicine", takes aim at earlier "symbolic" studies of the highland Maya groups of Chiapas, Mexico. Symbolic anthropologists who place their main emphasis on the social function of herbal knowledge have reached

the conclusion that Highland Maya medicine incorporates a weak understanding of human anatomy, has but a weak relationship to physiological processes, and primarily satisfies psychosocial needs through magical principles. Since magical principles have little to do with science, a reading of these works supports a view that Maya ethnomedicine is anything but scientific and that the Maya themselves lack a scientific understanding of health and disease.<sup>4</sup>

Against this view, the researchers collected the plants consistently used for specific, recognized gastrointestinal symptoms and conditions—diarrhea, bloody stool, distended bowels, etc— and

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<sup>4</sup> Berlin, Berlin, Lozoya, Meckes, Tororiello, and Villarreal, p.44, in Nader eds.; See Berlin, Brent and Paul Kay. *Basic Color Terms: Their Universality and Evolution*. Berkeley: University of California Press, 1969.

in laboratories “back at home” examined the effects of these species on the microbes that cause stomach illness or on its symptoms. The plants of the Maya shamans, they showed, were not chosen for mystical resemblances or affinities; instead they found a consistent correlation between the plants administered and the symptoms for which they are “prescribed”. Such a system, they claim, could only have been reached through an experimental method of some kind. Berlin was the co-author in the late 1960s of a controversial study which claimed the existence of cross-culturally universal “Basic color terms” against Whorfian claims about the linguistic determination of perception; the article on Maya medicine takes a similar horizon. The researchers use Western scientific methods to establish a baseline standard against which to check “culturally” variable terminology. Science “justifies” native systems of classification and medicine.

While this method appears to vindicate Mayan knowledge, in another sense it can be seen as relying upon the very opposition it purports to refute: Western science is brought in as the ultimate standard and judge. As suggested by Colin Scott’s title, “Science for the West, Myth for the Rest?”, such an image of science has just as often been a resource for dismissing and disqualifying other ways of knowing as “merely symbolic”.<sup>5</sup> His own study of James Bay Cree hunting knowledge insists that “our understanding of practical knowledge cannot be adequately formulated without reference to the root metaphors most vividly condensed in myth and ritual” (p.73), yet unlike Berlin et al., Scott submits Western science to a comparable analysis: the “root metaphor” of Western science entails a radical distinction between humanity and nature, as well as a centralized and hierarchical relation among natural domains— a perspective which contrasts with the Cree view of an implicit economy of reciprocal exchange between humans and their non-human “kin”.<sup>6</sup> Rather than claim the findings of Western science as the last word, Scott lays out the social and environmental consequences of the respective views. Similarly, Warren Goodenough, another major contributor to ethnoscience and cultural theory from the 1960s onward, details the difference between Melanesian navigation techniques and our own without holding one above the other<sup>7</sup>, while Ellen Bialewski shows the consequences of failures of

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<sup>5</sup> For a comparable critique of symbolic anthropology’s failure to grasp the disciplinary and dispositional effects of religion see Talal Asad, *Genealogies of Religion: Discipline and Reasons of Power in Christianity and Islam*. Baltimore: Johns Hopkins University Press, 1993.

<sup>6</sup> See Brightman, Robert. *Grateful Prey : Rock Cree Human-Animal Relationships*. Los Angeles, CA : University of California Press, 1993.

<sup>7</sup> See Hutchins, Edwin. *Cognition in the Wild*. Cambridge, Mass.: MIT Press, 1995.

communication between Canadian administrators and the ecological understandings of the Inuit. Bialewski shows how the rhetoric surrounding science— its purity, certainty, and universality, and the impartiality, objectivity, and expertise of its practitioners— has strengthened the perception of a distance between “us” and “them”.

It has also been an obstacle to a view of the actual conduct of science and the ways it consolidates its authority. In an influential essay from 1974, “Perspectives Gained from Studying Up”, Laura Nader encouraged anthropologists to “lift” their gaze from societies “outside of history” to bureaucratic and technical institutions “at home” and the ways they create and sustain systematic inequalities of information, power, and wealth.<sup>8</sup> The later articles of *Naked Science* take this recommendation as an invitation to study “universal”, “impersonal” science in its concrete, particular and idiosyncratic forms. Jean Lave’s intriguing article takes on the image of science as remote, abstruse, and unquestionable by juxtaposing the ways mathematicians portray non-mathematicians with studies of uses of mathematics in everyday settings. An article by Joan Fujimura and Michael Fortun on the computational methods used in the Human Genome Project concludes with a discussion of the ambivalent political implications of gene sequencing and wider arguments of “genetic determinism”— the scientifically-tinted “prism of heritability” that Troy Duster’s article shows as structuring and distorting debates about race in the USA.<sup>9</sup> The overall thrust of Nader’s collection is to place our knowledge on an analytical par with other ways of knowing about the world; the authors place science within wider moral, political, and cosmological setting, revealing contingency, cultural specificity, and uncertainty beneath the protective cover of the “pure” image of science.

### **A total institution in a compartmentalized world**

Hugh Gusterson’s *Nuclear Rites* also traces the ways in which the rhetoric of science prohibits a clear apprehension of the real stakes of research; he lays bare a science rich in symbol and meaning, in which collective ritual and personal narrative shape the experience of research and technical innovation. His study centers on nuclear weapons research at Livermore

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<sup>8</sup> The article appeared in *Reinventing Anthropology* (ed. Dell Hymes), a book that marked a turning point in US anthropology towards a critical concern with political and economic histories; Nader’s research program is not without affinities with the consumer advocacy work of her brother, Ralph, who ran on an anti-corporate platform as Green Party candidate for US President in 2000. Hymes, Dell, ed. *Reinventing Anthropology*. New York: Pantheon Books, 1972.

<sup>9</sup> See Troy Duster., *Backdoor to Eugenics*. New York: Routledge, 1990.

Laboratory in Northern California, the sister institution to Los Alamos, setting the lab within several overlapping frames of reference: a local community including researchers, their families, ministers and priests; a national political space in which research is opposed by anti-nuclear protestors; and, finally, a space of international politics underwritten by the competitive Cold War logic of Mutually Assured Destruction [MAD]. The book's inclusive view contrasts with the scientists' strategies of compartmentalization and exclusion.

Gusterson details the social technologies and ways of speaking and acting that make the daily effort of building weapons that can bring the instantaneous death of hundreds of thousands of human beings appear as a reasonable, desirable, and even morally praiseworthy way of earning a living. The high-security laboratory is "an enormous grid of tabooed spaces and tabooed topics" (p.70); the purportedly panoptic system of surveillance in place around the lab—different colored badges determining access to various hierarchized spaces, the requirement for national security clearance for both employees and visitors, random checks of employees' cars in the parking lot— contributes to a sense of importance and exclusivity for the work done there. The lab is a bureaucratic, "high-tech version of the secret societies that anthropologists have traditionally studied" (p.80). Engineers' comments about the technologies which surround them suggest a conceptual and practical merging with machines, a human-machine or "cyborg" subjectivity in which the feelings and fragility of the human body are transcended.<sup>10</sup> Images of the disfigured bodies of victims of nuclear explosions in Hiroshima and Nagasaki are kept out of circulation, and the abstract and numerical terms in which all aspects of the research are reckoned—including the bombs' destructive capacities— keep the idea of the physical pain of a nuclear attack at a safe distance. Further, a consequentialist ethics is shared among members of the community. Although the weapons are built to be as destructive as possible, the work is justified by the end it achieves. The threat of retaliation deters the Soviet Union from using its own weapons; because effective weapons exist they will never have to be put into effect. According to this logic, the certainty of war is a guarantee of peace.

In a thought-provoking application of traditional concerns of cultural anthropology to modern technoscience, the book analyzes the test explosion of a nuclear weapon as a "secular

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<sup>10</sup> On cyborgs, see Haraway, Donna. *Simians, Cyborgs, and Women : The Reinvention of Nature*. New York: Routledge, 1991. Downey, Gary and Joseph Dumit, eds., *Cyborgs and Citadels: Anthropological Interventions in Emerging Sciences and Technologies*. Santa Fe, N.M.: School of American Research Press, 1997.

initiation”<sup>11</sup>, a *rite de passage* in the life cycle of the weapons scientist. The moral and psychological intensity of the procedure is heightened by the formation of a liminal group of initiates which will emerge as a newly hierarchized community at the ritual’s close. This experience affirms and internalizes the community’s values and outlook through recurrent metaphors of birth and creation and through concerted collective action: the weapons designers live the more than sacred risk of this moment as a more than ordinary reality in which their very identity as competent members of the group is at stake. This portrayal of the ritual, cosmological, and experiential dimension of physicists’ “rational” activities suggests a stimulating juxtaposition with the studies of the efficacy of “magical” rites which have been a constant object for ethnographers in “pre-rational” societies.<sup>12</sup>

Gusterson balances this presentation of the researchers’ community with an analysis of the shared experiences that help constitute the community of anti-nuclear protestors— those “on the other side of the barbed wire” at Livermore. The profound identification of many protestors with the pain of nuclear victims—encouraged by films such as “The Day After” and graphic public simulations of the extent of the damage from nuclear war— diametrically contrasts with the weapons scientists’ strategies for distancing themselves from the bodily consequences of a nuclear explosion. Published after the collapse of the Soviet Union, Gusterson’s book recounts an historical situation that had radically changed even as he wrote. Yet since the book’s publication, the extreme faction of the military-industrial elite that has taken control of the United States government has made clear its intention to make aggressive use of its military power— including a new generation of “mini-nukes” and “tactical nuclear weapons”— as a means of dictating world policy. As the warlords of Washington seek to lower the threshold for the use of nuclear weapons, it is apparent that Livermore is in no immediate danger of going out of business. Although some targets may have changed, Gusterson’s analyses remain frighteningly pertinent.

Meanwhile, the collective nightmare image of a nuclear explosion which animated the anti-nuclear movement has lost some of its imaginative force; the US public appears to have “unlearned” its horror of nuclear war. What will be the arguments, images, and emotional identifications that can re-educate a cowed US public to counter the “rational” program of

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<sup>11</sup> A version of this argument is published in Nader’s collection.

<sup>12</sup> The chapter can be usefully compared to Turner in *The Ritual Process* or *The Forest of Symbols*, with the crucial distinction that the efficacy of the symbolic manipulations is not limited to psychological and sociological

relentless techno-war waged by its leaders?<sup>13</sup> The book clearly delineates the banality of the means by which those involved in building tools of death are spared the necessity of speaking out about or reflecting negatively on their own place in the system: open assent is not required to maintain its smooth functioning. Another clear implication of Gusterson's even-handed study is that for critical "points d'appui" to have a hold, a larger vision incorporating shared experiences but not necessarily identities — something like a "culture" of dissent— must take root.

### **"Life" outside the iron cage: a new *zoe*-ology?**

According to Paul Rabinow, the nation-state after WWII is "increasingly a congeries of institutions devoted to war and welfare, or as some prefer, defense and social health" (p.9). While *Nuclear Rites* examined the creation of tools of death, Rabinow's *Le génome humain* interrogates new techniques for making and making sense of life. His English title, *French DNA*, recalls a recent past in which "French blood" served an ambiguous function of articulating the individual within a collective moral unity. Influenced by Foucault's notion of biopower and taking a systematic interest in the ways discursive and institutional forms forge subjectivities, Rabinow's study nevertheless hints at a return to classic anthropological questions of the symbolic and even "spiritual" significance of rational activities.<sup>14</sup> One claim is that the new junctures of biotechnology force a reconsideration of Weber's view of a dominant, irresistible rationality and its alleged "demagification" of the world: new institutional relations and imaginative fusions suggest a blurring of 19<sup>th</sup> century distinctions between the facts of science and moral, humane, and religious values.

The book recounts, in effect, a property dispute. Who "owns" the DNA in the supply of blood collected from "bénévoles" who "freely sacrificed" their blood for the good of others? Originally collected during WWII for transfusions for the Resistance, this rare and valuable resource for genetic research is now in the possession of a semi-independent research association, CEPH. In 1994 public attention was drawn to its potential business partnership with an American biotech firm which would provide the business plan and funding for new genetic

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adaptation; misconduct during the rite of a weapons test risks disasters of a different order. Turner, Victor. *The Ritual Process: Structure and Anti-Structure*. New York : Aldine de Gruyter, 1995.

<sup>13</sup> See Gusterson's response to the discourses legitimating the invasion of Afghanistan in "The McNamara Complex", *Anthropological Quarterly* 75 (1), Winter 2002, pp. 171-177

research in exchange for use of the blood supply. A nasty exposé in *Le Canard Enchaîné* turned a potential symbiotic exchange of strengths— French research acumen and collective pooling of resources, American innovation and venture capital— into a scandal. CEPH was accused of using “French DNA” to feed American corporate vampires.

Following Arendt’s terminology, brought recently into general circulation by Giorgio Agamben, Rabinow sees the genetic administration of humans as a new articulation of *zoe* or “bare life” — life outside of the bounds of law, custom, or rite. For Agamben (whose analysis of “Homo Sacer” is informed by a re-reading of Frazer’s *Golden Bough*), *zoe* is life as it is captured by the sovereign, a condition to which citizens return when, in a state of emergency, ordinary civil law is suspended. Agamben contrasts this “bare life” with *bios*, life as “form of life”: the shared elements of a communal existence, as in Aristotle’s “good life”. According to Rabinow, the “genomic assemblage”— the machines, concepts, and practices by which knowledge of human genes is created and applied to individuals and populations— is poised “to bring *bios* and *zoe* together into a common “genomic” form” (p.17). One might ask whether a computer sequence mapping human genes has anything in common with Agamben’s quite physical, embodied conception of “bare life”. Even so, for Rabinow what is at stake is a new material and at the same time symbolic form of “life as we know it”. Where blood once was, there DNA now is:

If there ever was an example of brute life, the minimalist essence of things, it is genomics. The blood taken from donors for transfusion is still a sacred substance, life-giving to another. Genomic information has none of this archaic symbolism, even though efforts are certainly being made to invest it with a profound and persuasive aura of spirituality. What form could be given to this state of *zoe* that would transform it within a transnational realm, without any articulated sovereignty, whose driving forces are money, technical and scientific research, biosocial interest groups, and ethics committees? (p.89).

Rabinow further asks how diverse conceptualizations of the social and the individual might accommodate these new technologies for seizing “the minimalist essence of things”— Kant’s

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<sup>14</sup> Rabinow’s early studies of Morocco interrogated the role of the fieldworker in the interpretation of cultures, while in the 1980s and 90s he was, along with Hubert Dreyfus, a key interpreter of Foucault’s works in the USA. See his

notions of autonomy and dignity, Rousseauian and republican expectations that “each give himself to the others”, and Durkheim’s *homo duplex*. Also in play in this new mode of “biosociality” are nationally variable and unresolved issues of ownership of genetic and medical information and materials. Rabinow’s text is at its most specific and illuminating when it compares the legal conceptions of property and bodies and their implications for biotechnology in France and the USA. Deregulation and business-friendly patent laws in the USA under Reagan led to patents for genes, medical procedures, and genetic information, encouraging the growth of the biotech industry and the rise of capital-intensive technology start-ups in the 1980s and 90s. A more profound contrast is in the French law’s prohibition on the sale of one’s own genetic material; the state may demand blood samples, administer vaccines, and of course imprison its citizens, but alienation of parts of one’s own body for profit remains illegal.

What is the basis for society’s ultimate claim to own this “French DNA”? What are the limits of this claim? How does this new configuration of “life” reshape the individual’s relation to the state, medical authorities, and the market, as well as, to raise another Foucauldian question, the self’s relation to itself? Rabinow’s book succeeds in raising these questions while postponing definitive answers, perhaps awaiting some later synthesis of “genomic biosociality”. As an update of Foucault’s “history of the present”, the book pursues an “ethnography of the contemporary”: the in-depth study of forms of life which are just now coming into existence. It demonstrates the importance of acquiring a familiarity with the vocabularies and methods of experts on the cutting edge of knowledge in order to grasp the forms of life— both *zoe* and *bios* — only now taking shape.

### **Tracing new faultlines**

Rabinow claimed that a range of unresolved legal, moral, and spiritual issues place those who work in the biosciences in a kind of “purgatory”, “a common place where diversely stratified and partially incompatible histories temporarily and uneasily come together” (p.23). Such a “purgatorial” condition could be said to hold in the anthropology of science in general: in its shifting sites, new relations and new phenomena constantly emerge. Kuhnian “normal science” and “puzzle solving” thus appear as the exception and not the rule.

Sharon Traweek and Roddey Reid's collection of essays, *Doing Science + Culture*, suggests some of the directions that anthropology of science will follow as it explores these fluid spaces into the new millennium. In a demonstration of the ways that the study of science can benefit from a more active engagement with history and especially history of science, Traweek's introductory article argues that since the 1970s we find ourselves in the midst of a structural transformation in the world economy and modes of production on a scale comparable to the transformations of the late 17<sup>th</sup> and early 19<sup>th</sup> centuries. This seismic shift— along the “Faultlines” of her title— will have a major impact on the kinds of questions that are interesting to researchers and the ways they go about answering them. The essays that follow suggest the expanding circles levels within which these changes will be felt. One set of essays concentrates on the identities and subjectivities that emerge in new technological, political, and economic situations: for example, Emily Martin, author of influential studies of gender metaphors in the biological sciences, argues that the “unstable self” of modernist fiction and the bipolar personality addressed by psychopharmacology, though once seen as abnormal, are increasingly perceived as useful adaptations to the demands of accelerated capitalism.<sup>15</sup> Another group of essays investigates changes in institutions of teaching and research, including the shift away from the massively-funded specialities that emerged after WWII toward new interdisciplinary programs and centers. Karen Barad describes an innovative course for encouraging science majors to reflect on the ethics and meaning of their future professions while *Anthropology as Cultural Critique* co-author Michael Fischer devotes a chapter to the challenges of establishing a program for Science and Technology Studies at the contested intersection of the humanities and the hard sciences at the Massachusetts Institute of Technology.

Finally, other chapters consider the role of science and technology in international relations. Recently, Arjun Appadurai's terminology of experiential “scapes” has provided a way of thinking about the flow of commodities, people, and concepts outside of the limits of traditional national boundaries<sup>16</sup>; nevertheless, phenomena studied by the anthropology of science suggest that nation and state remain indispensable frameworks for understanding global interactions. The language of “center” and “periphery”, for example, continues to inform local actors' own understandings of their actions, as Itty Abraham shows in his discussion of the way

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<sup>15</sup> See Emily Martin, *The Woman in the Body: A Cultural Analysis of Reproduction*. Boston: Beacon Press, 1989.

an Indian national physics research project in the self-consciously “undeveloped” context of Bhopal positioned itself in relation to the “big science” of “metropolitan” nations. *Doing Science + Culture* suggests that the anthropology of science stands to contribute a great deal to the discipline’s growing interest in the situation of cultures and nations in a global system. Teams of several nations undertake collaborative research, though not without difficulties of translation and communication. The international system of trade relies upon and exchanges new technologies and techniques of production; tariffs and international agreements heighten asymmetries in the availability of medicines, knowledge, and methods. Patent laws and trade secrets set new obstacles for the circulation of knowledge and new points of application for rival strategies. Questions of ownership and access spill over into questions of sovereignty, with national systems of property law jockeying for leverage within an emerging international order. Wars are waged with the confidence of an extreme technological supremacy ensured by an unequal distribution of wealth and knowledge— inequalities heightened by the very destruction they permit.

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The present system of global exchanges is a system of global inequalities; the image of science and the reality of technology play crucial roles in determining access to resources, wealth, and power. The books above trace some of the threads in the skein of practices by which the sciences shape the ways we are born and the ways we die— and the meaning we give to what happens in between. Working at a personal scale and in colorful, nuanced detail, the anthropology of science follows the creation and extension of knowledge and technique as they give new forms, both auspicious and ominous, to a world in constant change.

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<sup>16</sup> Arjun Appadurai, *Modernity at Large: Cultural Dimensions of Globalization*. Minneapolis: University of Minnesota Press, 2000, p.33.