2004

Biological Citizenship: The Science and Politics of Chernobyl-Exposed Populations

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Disciplines
Anthropology | Social and Behavioral Sciences | Social and Cultural Anthropology

Comments
Stable url: http://www.jstor.org/stable/3655243

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ABSTRACT

In the transition out of socialism to market capitalism, bodies, populations, and categories of citizenship have been reordered. The rational-technical management of groups affected by the Chernobyl disaster in Ukraine is a window into this contested process. Chernobyl exemplifies a moment when scientific knowability collapsed and new maps and categories of entitlement emerged. Older models of welfare rely on precise definitions situating citizens and their attributes on a cross-mesh of known categories upon which claims rights are based. Here one observes how ambiguities related to categorizing suffering created a political field in which a state, forms of citizenship, and informal economies were remade.

INTRODUCTION

> "Common sense is what is left over when all the more articulated sorts of symbol systems have exhausted their tasks."
> —Clifford Geertz, *Local Knowledge*[1]

This essay explores the forms of scientific cooperation and political management that emerged after the Chernobyl nuclear disaster of 1986. It is about how such managements are interconnected with global flows of technology and their integration into state-building processes, new market strategies, and governance and citizenship in post-Soviet Ukraine. Together with such dynamics, the essay considers, through ethnographic example, how local claims of disease and health are refracted through such institutions, how the sociopolitical contexts in which scientific knowledge is made can influence particular courses of health and disease and outcomes of these conditions. The aim here is to articulate the circumstances through which communities of "at-risk" populations come into being; to show how norms of citizenship are related to such circumstances; and to show how such norms propagate through everyday scientific understandings and practices related to institutions of medicine and law in Ukraine. A set of working relations informs or is at stake in the propagation of

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I thank the editors and reviewers of this volume for their helpful comments and suggestions.

[1] Clifford Geertz, *Local Knowledge: Further Essays in Interpretive Anthropology* (New York, 1983), 92.

individual claims of being at risk. They involve the sciences of global institutions and experts, national sciences and laws, local bureaucratic contingencies, and familial dynamics of suffering. These relations are indeed "working" in the sense that they affect perceptions of the seriousness and scale of the disaster, claims to its continuing harm, and the scientific, economic, and political modes through which such harm is addressed. How do different systems of modeling risk from Chernobyl affect people's capacities to reason politically? How might the choice of illness, rather than health, become a form of "common sense" expressive of these models? These questions are explored in a context in which science is inextricably connected to state-building processes, and market developments are quite productively intertwined, generating new institutions and social arrangements through which citizenship, experience, and ethics are being altered.

My book, *Life Exposed: Biological Citizens after Chernobyl,* elucidates how scientific knowledge and Chernobyl-related suffering were tooled to access social equity in a harsh market transition. More generally, it showed that in this new state, science and politics were engaged in a constant process of exchange and mutual stabilization.[2] This essay builds on that material by showing how contested attempts to intervene and to quantify radiation risk shaped the nature of the postdamage legal and political regime. Viewed longitudinally, the Chernobyl aftermath exemplifies a process wherein scientific knowability collapses and new categories of entitlement emerge. Ambiguities related to categorizing suffering create a political field in which a state, forms of citizenship, and informal economies of health care and entitlement are remade. This appropriation of suffering at all levels is one aspect of how images of suffering are becoming increasingly objectified in their legal, economic, and political dimensions.[3] This essay is specifically concerned with how these objectifications become a form of common sense and are enacted by sufferers in ways that can intensify the political stakes of suffering and promote protection, as well as new kinds of vulnerability, in domestic, scientific, and bureaucratic arenas.

THE EVENT

The Chernobyl nuclear reactor's Unit Four exploded in Ukraine on April 26, 1986. The damages from this disaster have been manifold, including immediate injury in the form of radiation burns and death to plant workers, damaged human immunities and high rates of thyroid cancer among resettled populations, and substantial soil and waterway contamination. Soviet reports attributed the cause of the disaster to a failed experiment. According to one official report, "The purpose of the experiment was to test the possibility of using the mechanical energy of the rotor in a turbo-generator cut off from steam supply to sustain the amounts of power requirements during a power failure."[4] Many of the reactor's safety systems were shut off for the duration of the experiment. A huge power surge occurred as technicians decreased power and shut off

[2] Adriana Petryna, *Life Exposed: Biological Citizens After Chernobyl* (Princeton, 2002).

[3] Arthur Kleinman and Joan Kleinman, "The Appeal of Experience; The Dismay of Images: Cultural Appropriations of Suffering in Our Times," *Daedalus* 125 (1999): 1–24. See also Veena Das, *Critical Events: An Anthropological Perspective on Contemporary India* (Oxford, 1995). I use pseudonyms for the majority of people interviewed for this essay. Names that appear in scientific and legal print are in some cases actual.

[4] See Soviet State Committee on the Utilization of Atomic Energy, *Report to the IAEA* (Vienna, 1986), 16.

the steam. The unit exploded once at 1:23 A.M. and then again. Due to particular wind-pressure gradients that day and in the following weeks, the radioactive plume moved to an estimated height of eight kilometers. Subsequent attempts to extinguish the flames of the burning graphite core proved only partly successful. By most accounts, they even exacerbated the danger of the situation. For example, an attempt was made to suffocate the flames with tons of boron carbide, dolomite, sand, clay, and lead dropped from helicopters. As a result, the core's temperature increased. The cloud of radiation rose dramatically and moved across Belarus, Ukraine, Russia, Western Europe, and other areas of the Northern Hemisphere.[5]

An official announcement of the disaster came almost three weeks after the event. In that time, roughly 13,000 children in contaminated areas took in a dose of radiation to the thyroid that was more than two times the highest allowable dose for nuclear workers for a year.[6] A massive onset of thyroid cancers in adults and children began appearing four years later. Had nonradioactive iodine pills been made available within the first week of the disaster, the onset of this disease could have been significantly reduced. Soviet administrators contradicted assessments of the scale of the plume made by English and American meteorological groups. The Soviets claimed the biomedical aspects of Chernobyl were under control. Dr. Angelina Guskova of the Institute of Biophysics in Moscow initially selected 237 victims to be airlifted to her institute's acute radiation sickness ward. Acute radiation syndrome (ARS) was diagnosed among 134 of them. The official death toll was set at 31 persons, most of them fire fighters or plant workers.

The disaster continued, especially among the groups of workers who were recruited or went voluntarily to work at the disaster site. Among the hundreds of thousands of paid and unpaid laborers,[7] work ranged from bulldozing polluted soil and dumping it in so-called radiation dumpsites (*mohyl'nyky*), to raking and shoveling pieces of the reactor core—radioactive graphite—that had dispersed over a vast area, to constructing fences around the reactor, to cutting down highly contaminated surrounding forests. By far the most dangerous work involved the adjacent reactor's roof. In one-minute intervals, workers (mainly military recruits) ran onto the roof, hurled radioactive debris over parapets into containers below with their shovels, and then left. Many of these volunteers called themselves "bio-robots"; their biologies were exploited "and then thrown out." Based on extensive interviews, some laborers felt trapped and unable to leave the disaster area; this sentiment was particularly felt by unpaid military recruits and local collective farmworkers recruited to do the most menial and dangerous of tasks. Some said they went gladly, believing their tripled salary more than compensated for their risk. However, it cannot be definitively said that money truly compensated them for the suffering that was to come.

Five months after the disaster, a so-called sarcophagus (now simply called the Shelter) was built to contain the 216 tons of uranium and plutonium in the ruined reactor. At present, the power plant is decommissioned. Some fifteen thousand people conduct maintenance work or service the Zone of Exclusion. Most of the exclusion zone is located in Ukraine. The zone circumscribes the disaster site and covers thirty kilometers in diameter. Zone entry is limited to the plant's workers.

[5] See Alexander Sich, "The Denial Syndrome (Efforts to Smother the Burning Nuclear Core at the Chernobyl Power Plant in 1986 Were Insufficient)," *Bulletin of Atomic Scientists* 52 (1996): 38–40.

[6] See Yurii Shcherbak, "Ten Years of the Chernobyl Era," *Scientific American,* April 1996, 46.

[7] Estimates vary from 600,000 to 800,000. These workers came from all over the Soviet Union. The labor pool, however, drew heavily from the Russian and Ukrainian populations.

Ukraine inherited the power plant and most of the Zone of Exclusion when independence was declared in 1991. The government announced new and ambitious standards of safety. It focused its resources on stabilizing the crumbling Shelter, implementing norms of worker safety, decreasing the possibility of future fallout risk, and decommissioning all units of the Chernobyl plant. These acts were important from a foreign policy standpoint. Showing that it could adhere to strict safety standards, Ukraine became the recipient of European and American technical assistance, loans, and trading partnerships. The legacy of Chernobyl has been used as a means of signaling Ukraine's domestic and international legitimacy and staking territorial claims; and as a venue of governance and state building, social welfare, and corruption.

Some maintenance workers lived in government-constructed housing units in Kyiv, the country's capital, sixty miles south of the disaster area. They work in the zone for two weeks and then return home for two weeks. I met one such worker in 1992, the first time I traveled to the country. He identified himself as a "sufferer," a legal classification instituted in 1991 for Chernobyl-affected individuals. He complained about how little his compensation (about five U.S. dollars a month) was in relation to rising food prices.[8] The man was in absolute despair, trapped because he had nowhere else to work. He said he had attempted to find employment elsewhere, but nobody would hire him on account of his bad health and work history. The man linked his suffering to first a precarious and dangerous Soviet management of the aftermath, and then a complex medical and legal apparatus he felt unable to navigate. He then showed me a work injury, a flap of skin that had puckered and formed a kind of ring just above his ankle. Direct contact with a source of ionizing radiation had apparently caused it. His sense of violation and loss were clear when he referred to himself as a "living dead," whose memory of who he was in a former life "is gone."

In 2000, I interviewed the director of the Shelter complex. What I learned was that almost a decade after independence, worker protections, in spite of some improvements, were still deficient. The director told me that norms of radiation safety were inoperative. In a place of tremendous economic desperation, people *competed* for work in the Zone of Exclusion, where salaries were relatively high and steadily paid. Prospective workers engaged in a troubling cost-benefit assessment that went something like this: if I work in the Zone, I lose my health. But I can send my son to law school. "Taking this risk is their individual problem. No one else is responsible for it," the director told me. He compared Ukraine's mode of enforcing safety standards with European modes and told me that the "value" of a dose exposure remained untallied in Ukraine. In Europe, such values are calculated on the basis of the rem-expenditures workers incur; international safety standards limit the amounts. Despite the existence of these international limitations, the director's comment suggests that norms of worker exposures are in fact being decided locally and within the constraints of a national economy. In effect, he was revealing to me the extent to which workers' lives are undervalued by being overexposed (for much less pay). Yet however undervalued his workers' lives may be, they are still driven to work by a situation in which

[8] The karbovanets (Krb) was Ukraine's legal tender from 1992 to 1996. Exchange rates per US$1.00 plunged between 1992 and 1993. In March 1992, the exchange rate was Krb640:$1. By March 1993, that rate had fallen to Krb12,610:$1. Subsequent rates were as follows: 1994—Krb104,200:US$1; 1995—179,900:$1; 1996—188,700:$1. The hryvnia (Hrn) replaced the karbovanets at Hrn1: Krb100,000 in September 1996. The exchange rates were as follows: 1997—Hrn1.84:US$1; 1998—2.04:$1; 1999—4.13:$1; 2000—5.44:$1.

economic forces are overwhelming. In such an environment, physical risks escalate and risky work is seen as acceptable and even normal.

"As a result of all the compounding uncertainties in the factors involved," wrote Frank von Hippel, "our estimates of the long-term health consequences of the Chernobyl accident are uncertain even as to the order of magnitude."[9] Indeed, available models of assessment could not account for the scope of the disaster. As the short history of the disaster indicates, rational-technical responses and political administrations (both in the Soviet and Ukrainian periods) have been compounding factors in the medical and welfare tragedy that now affects more than 3.5 million people in Ukraine alone. Contested scientific assessments of the disaster's extent and medical impact, the decision to postpone public communication, and the economic impetus to work in the exclusion zone have made Chernobyl a *tekhnohenna katastrofa* (a technogenic catastrophe). This is a term that was used among my informants, including people fighting for disability status, local physicians, and scientists. It suggests that not only radiation exposure but also political managements have produced new biological uncertainties.

Ulrich Beck noted that Chernobyl was an "anthropological shock" in Western Europe. The shock came from the fact that everyday knowledge proved useless in the face of this catastrophe, as did expert knowledge.[10] This "collapse" of knowledge also occurred, but in another way, in the other Europe. Chernobyl was associated with the collapse of Soviet life in general. Knowledge about risk, how to deliver it, how to value it, became something of a political resource. In this disaster's wake a state, a society, and knowledge and experience of health have been reconfigured.

In exploring this aftermath, I use a methodological approach that involves moving back and forth between vulnerable persons and the everyday bureaucracies and procedures by which they express their desires, claims, and needs for protection and security. Such an ethnographic mode of engagement is in itself meant to question the possibility of a linear account or an all-or-none moral or political solution to this complex reality. Instead, its dynamics are approached from a prismatic point of view to gain a broader perspective on the interests and values involved in particular claims and sites.

EXPERIMENTAL MODELS AND ETHNOGRAPHIC METHODS

Between 1992 and 1997, I conducted archival and field research in Ukraine, Russia, and the United States. In Ukraine, I worked with resettled families and radiation-exposed workers. I also carried out archival research in the country's new Chernobyl Ministry, the Health Ministry, and Parliamentary Commissions on Human Rights. I conducted interviews with key scientific and political actors in Kyiv and Moscow, comparing scientific standards informing concepts of biological risk and safety in the Soviet and post-Soviet administrations of the aftermath. The very nature of the problem, that is, understanding the everyday lived aspects of the Chernobyl aftermath, led me to a number of different sites and challenges. One of those challenges involved understanding how scientific knowledge about radiation risk was being circulated, assimilated, or rejected at the various levels (international, national, and local) in which interventions were being made.

[9] Frank von Hippel, *Citizen Scientist* (New York, 1991), 235.

[10] Ulrich Beck, "The Anthropological Shock: Chernobyl and the Contours of a Risk Society," *Berkeley Journal of Sociology* 32 (1987): 153–65.

I examined claims about the scale of the disaster made by scientific experts affiliated with the International Atomic Energy Agency. I compared expert knowledge with that of basic scientists in U.S. radiation laboratories and learned about how radiobiologists went about evaluating radiobiological effects at the cellular and subcellular levels.

As a consequence, I could better situate expert claims and their measures in the context of their laboratory production and testing. I soon discovered that there was a "black box" separating knowledge about the effects of low-dose radiation at the animal (laboratory) level and human (field) level. The dose-effect curves for high doses of radiation were one to one and fairly straightforward. The same could not be said for ongoing exposures at low doses (a typical condition after Chernobyl). On the one hand, experts promoted their authority, based in part on their mastery of what composed appropriate evidence of Chernobyl-related injury. On the other hand, there was considerable disagreement at the laboratory level over what the terms for interpreting radiation-induced biological risk in human populations are. International experts' projections about the health effects of Chernobyl often contradicted people's lived sense of those effects. For Ukrainian scientists, the lack of consensus at the basic science level meant that the criteria of evaluation of injury were, in essence, contestable.

Ukraine became a most compelling place to examine the relations between risk, rational-technical power, and the emergence of new populations. Indeed, a new political, economic, and moral arena had been thrown open owing to the absence of consistent evaluative criteria. During the period of my field research, the country saw the growth of a population claiming radiation exposure qualified them for some form of social protection. Social protections included cash subsidies, family allowances, free medical care and education, and pension benefits for sufferers and the disabled. This new population, named *poterpili* (sufferers), numbered 3.5 million and constituted 7 percent of the population. A political economy of Chernobyl-related illnesses with new kinds of social categories and hierarchies of entitlement was emerging. An individual classified as "disabled" received the best entitlement package as compared with a mere "sufferer." Nonsufferers, that is, people outside the Chernobyl compensation system, had even less or no chance of receiving state social benefits. Scientific know-how became essential to the negotiation of everyday life and the maintenance of one's status in the Chernobyl system. One had to know one's dose and be able to relate it to one's symptoms and work experiences in the Zone of Exclusion. The effectiveness of this knowledge determined the place one could occupy and how long one could occupy it in the system of management of Chernobyl populations.

Today, approximately 8.9 percent of Ukraine is considered contaminated. On average, 5 percent of its state budget is spent on Chernobyl-related expenses. This includes costs related to the environmental cleanup and technical support of the destroyed reactor. The majority of funds (65 percent), however, are spent on social compensations and financial maintenance of the Chernobyl public health and scientific apparatus. Belarus was much more heavily affected than Ukraine. Nearly 23 percent of its territory is contaminated. Contrastively, Belarus expends much less than its southern neighbor does on affected populations; it has curbed its sum of Chernobyl claimants—as has Russia.[11] Dr. Guskova, who oversees the Russian compensation

[11] In Russia, the number of people considered affected and compensable has been kept to a minimum and remains fairly stable (about 350,000, including 300,000 Zone of Exclusion laborers and 50,000 resettled).

system for workers of nuclear installations, including Chernobyl, is a well-known critic of Ukraine's compensation system. She told me that Ukrainians were inflating their numbers of exposed persons, that their so-called invalids "didn't want to recover." She saw the illnesses of this group as a "struggle for power and material resources related to the disaster."

In response to her former colleague's indictment, Dr. Angelina Ceanu, a neurophysiologist and physician to Chernobyl victims in Kyiv, told me, "It is inconceivable that an organism of any kind is passive to its own destruction." Her response was based on evidence from experiments conducted by the Soviet radiobiologist V. L. Komarov. In one experiment conducted in the late 1950s, he observed that sleeping rats, without provocation, woke up when exposed to small amounts of ionizing radiation. From these examples one can begin to appreciate how competing scientific models (animal vs. human; psychometric vs. biological; laboratory vs. field-based), financial agendas, and distinct moral attitudes regarding the need for scientific work in this arena were not simply at odds with each other. Their confrontation opened up a novel social arena consisting of contested claims around radiation illness. Indeed, a number of civic organizations lobbying for the right to compensation for such illnesses evolved with the biomedical and political institutions promoting "safe living" in Ukraine. These so-called *fondy* (funds) were conduits of international charity and represented the concerns of exclusion zone workers and resettled persons living in Ukraine. These funds enjoyed tax-exempt status and with their numbers (more than 500 in 1996) established an informal economy of a variety of imported goods, including vehicles, drugs, and frozen and dry foodstuffs. In short, the Chernobyl aftermath became a prism of the troubled political-economic and social circumstances that typified the Ukrainian transition to a market economy. The production of scientific know-how, markets, and state formations were mutually embedded, generating new inequalities and opportunities in the redefinition of citizenship and ethics.

This work is based on multiple lengthy research visits to various state, scientific, and domestic contexts during 1992–1995, fieldwork conducted during 1996–1997, and a follow-up visit in 2000. The Radiation Research Center, also known as Klinika, became a primary focus of the field research. The center was established in 1986 to monitor the health of zone laborers; shortly afterward it began providing similar services for resettled persons. Its national-level Medical-Labor Committee (Ekspertiza) comprises scientists, physicians, and administrators who have the authority to diagnose illnesses as Chernobyl-related (there are twelve regional committees). Patients with illnesses diagnosed as such receive a document, the so-called Chernobyl tie, which qualifies bearers to receive compensation privileges as a result of their Chernobyl-related illnesses. By 1996, the center had become the site of intense scientific and legal disputes. I observed physicians, nurses, and patients as they negotiated over who should receive the tie. I looked into current research, particularly in the center's neurological division. I also carried out interviews with sixty middle-age male and female patients and reviewed their medical histories, their illness progressions, and their experiences in attempting to qualify for disability status. A significant aspect of my research focused on the daily lives of the clinic's male patients and their families. I was concerned with how their belonging to a political economy of illness displaced their self-perceptions and roles as breadwinners and paternal figures. I traced changing experiences of *lichnost'*, a Russian-Soviet model of personhood evidenced in a

person's work ethics and level of commitment to a collective of laborers,[12] the effects such changes had on domestic life, and the techniques household members used to have their illnesses count in the rational-technical domain in which their futures came to be addressed.

These anthropological concerns illustrate the extent to which definitions of health and illness are embedded within spheres of politics and economics and are almost always connected with dimensions that go beyond the immediate body, such as interpersonal and domestic relationships. Arthur Kleinman has elucidated the "social course" of illness.[13] Other anthropologists, such as Veena Das and Nancy Scheper-Hughes, have been concerned with constructions of health as they indicate discrepancies in power, social position, and inequality, particularly as lived by marginal groups and individuals. Recent ethnographies of science have portrayed how, more and more, biomedical technologies play a key role in that constructedness. PET scans, genetically based diagnostics, and sonograms image biological facts and are therefore inseparable from the objects they recognize and remake as disease.[14] Social problems, health problems, and the technologies that image them are also linked. Anthropologist Paul Farmer has shown how patterns of "structural violence" affect the construction and expansion of populations at risk for diseases. Deteriorating health care, limited treatments, and inequalities are worsened by structural adjustment programs and have led to epidemics of preventable infectious diseases such as multidrug-resistant tuberculosis. Indeed, "social forces and processes come to be embodied as biological events."[15] In Ukraine, efforts to remediate the health effects of Chernobyl have themselves contributed to social and biological indeterminacy and novel formations of power. Radiation exposures and their unaccountability, bureaucratic interventions by the state and failures to intervene, the growth of clinical regimes, and harsh market changes intensified the course of illness and suffering. Thus in the Chernobyl aftermath, illness and health are engendered and made sense of within the technical and political domain in which they come to be addressed.

CONSTRUCTED UNKNOWNS

In what follows, I address some of the scientific elements that played a key role in measuring and delineating the scope of the disaster and defining remediation and compensation strategies. In this context, matters such as atmospheric dispersion maps, international scientific cooperations, and local scientific responses, as well as people's involvement in bureaucratic and testing procedures, led up to what can be called a "technical and political course of illness." Examples of people's engagement with, and influence on, such courses will then be discussed.

Most scientists today would agree that given the state of technology at the time of the disaster, specialists "did not know how to make an objective assessment of what had

[12] Oleg Kharkhordin, *The Collective and the Individual in Russia: A Study of Practices* (Berkeley, Calif., 1999).

[13] Arthur Kleinman, *Social Origins of Distress and Disease* (New Haven, Conn., 1986).

[14] Emily Martin, *Flexible Bodies: Tracking Immunity in American Culture from the Days of Polio to the Age of AIDS* (Boston, 1994); Rayna Rapp, *Testing Women, Testing the Fetus: The Social Impact of Amniocentesis on America* (New York, 1999); Joseph Dumit, *Picturing Personhood: Brain Scans and Biomedical Identity* (Princeton, N.J., 2004).

[15] Paul Farmer, *Infections and Inequalities: The Modern Plagues* (Berkeley, Calif., 1999), 5.

happened."[16] Tom Sullivan, who until recently directed the Atmospheric Release Advisory Capability (ARAC) group at Lawrence Livermore Laboratory in Livermore, California, agrees with this general appraisal.[17] Prior to the Chernobyl disaster, Sullivan's ARAC team had generated atmospheric dispersion models of the size and movement of nuclear plumes resulting from American and Chinese aboveground nuclear weapons tests and the Three Mile Island accident. "A 200 by 200 kilometer area had been sufficient to model prior radiation releases," he told me. "We did the imaging near the Chernobyl plant using this 200 kilometer square grid, but the grid was so saturated, I mean, you couldn't even make sense of it because every place had these enormously high radiation values. . . . *Our codes were not prepared for an event of this magnitude.*"[18]

Soviet scientists, too, were unprepared, but they did not admit their ignorance. In an August 1986 meeting with the International Atomic Energy Agency (IAEA), they presented a crude analysis of the distribution of radiation in the Zone of Exclusion and in the Soviet Union: "assessments were made of the actual and future radiation doses received by the populations of towns, villages, and other inhabited places. As a result of these and other measures, *it proved possible to keep exposures within the established limits.*"[19]

The issue at stake is the state's capacity to produce and use scientific knowledge and nonknowledge to maintain political order. Historian Loren Graham, for example, has written about how "false" sciences such as Lysenkoism, which denied the existence of the gene and advocated labor-intensive methods of accelerating crop yields, have been instrumental in shaping work psychology and social life in the socialist project.[20] The fact is that limited Soviet maps of Chernobyl helped to justify limited forms of dosimetric surveillance and resettlement actions. Nonknowledge became essential to the deployment of authoritative knowledge. High doses absorbed by at least 200,000 workers during 1986–1987 were insufficiently documented. According to one biochemist, many of the cleanup workers "received 6–8 times the lethal dose of radiation."[21] "They are alive," he told me. "They know that they didn't die. *But they don't know how they survived.*" His statement speaks to the extent to which not only knowledge but also ignorance were constructed and used as state tools for maintaining public order. As science historian Robert Proctor tells us in his informative book on how politics shapes cancer science, ignorance "is not just a natural consequence of the ever shifting boundary between the known and the unknown." It is a "political consequence" of decisions concerning how to approach what could and should be done to mitigate danger or disease.[22]

[16] *One Decade After Chernobyl* (Vienna, 1996).

[17] ARAC is a national emergency response service for real-time assessment of incidents involving nuclear, chemical, biological, or natural hazardous material.

[18] Sullivan's team offered technical assistance through a Swedish intermediary, but the offer was refused by Soviet administrators.

[19] Soviet State Committee on the Utilization of Atomic Energy, *The Accident at Chernobyl Nuclear Power Plant and Its Consequences.* Information complied for the IAEA Expert's Meeting, Aug. 25–29, 1986, Vienna; Zhores Medvedev, *The Legacy of Chernobyl* (New York, 1990).

[20] Loren Graham, *What Have We Learned about Science and Technology from the Russian Experience?* (Stanford, Calif., 1998).

[21] Symptoms of acute radiation sickness begin at 200 rem. At 400 rem, bone marrow failure sets in. Lethal dose (LD100) is a dose exposure that causes 100 percent of the death of cells or the human. LD50/30 is a dose exposure that causes 50 percent of the death of cells or the human within thirty days.

[22] Robert Proctor, *Cancer Wars: How Politics Shapes What We Know and Don't Know about Cancer* (New York, 1995), 7.

Chernobyl also became a venue for unprecedented international scientific cooperation and human research. President Mikhail Gorbachev personally invited a team of American oncologists led by leukemia specialist Robert Gale (UCLA) to conduct experimental bone marrow transplantations upon individuals whose exposures were beyond the lethal limit and for whom these transplantations were deemed appropriate. Additionally, 400 workers selected by Dr. Guskova and others received a genetically-engineered hematopoietic growth factor molecule (rhGM-CSF), thought to regenerate stem cell growth. Though the results of the transplantations and trial proved unsuccessful, the medical work on this cohort (and the objective indices created around them) helped consolidate an image of a biomedical crisis that was being successfully controlled by cutting-edge scientific applications. In an effort to alleviate the public's fear, Dr. Gale appeared on television and walked barefoot in the zone with one of his children.

As this internationalization of science ensued, however, the physical management of contamination at the accident site was internalized—to the sphere of Soviet state control. One policy statement released by the Soviet Health Ministry at the height of these cooperations, for example, directed medical examiners in the Zone of Exclusion to "classify workers who have received a maximum dose as having "vegetovascular dystonia," that is, a kind of panic disorder, and a novel psychosocial disorder called "radiophobia" (or the fear of the biological influence of radiation). These categories were used to filter out the majority of disability claims.[23] Substantial challenges to this Soviet management came from certain labor sectors in subsequent years. At the end of 1989 only 130 additional persons were granted disability; by 1990, 2,753 more cases had been considered, of which 50 percent were authorized on a neurological basis. Levels of political influence of specific labor sectors are reflected in the order they received disability: coal miners, then Ministry of Internal Affairs workers (the police), and then Transport Ministry workers. These various labor groups would soon realize that in the Ukrainian management of Chernobyl, forms of political leveraging had to be coupled with medical-scientific know-how.

Arguably, the new Ukrainian accounting of the Chernobyl unknown was part and parcel of the government's strategies for "knowledge-based" governance and social mobilization. In 1991 and in its first set of laws, the new parliament denounced the Soviet management of Chernobyl as "an act of genocide." The new nation-state viewed the disaster as (among other things) a key means for instituting domestic and international authority. Legislators assailed the Soviet standard for determining biological risk to populations. The Soviets had established a high of 35 rem (a unit of absorbed dose), spread over an individual's lifetime (understood as a standard seventy-year span), as the threshold of allowable radiation dose intakes. This threshold limited the scale of resettlement actions. Ukrainian law lowered the Soviet threshold dose to 7 rem, comparable to what an average American would be exposed to in his or her lifetime. In effect these lowered measures for safe living increased the size of the labor forces going to the exclusion zone (since workers had to work shorter amounts of time if they were to avoid exceeding the stricter dose standards). The measures also expanded territories considered contaminated. A significant new sector of the population

[23] In my interviews, I heard instances of workers mimicking symptoms of ARS (vomiting, for example). This shows the level of desperation on the part of some of them to receive permission to leave the zone.

would want to claim itself as part of a state-protected post-Soviet polity. A biophysicist responsible for conducting retrospective dose assays on resettlers told me: "Long lines of resettlers extended from our laboratory doors. It wasn't enough that they were evacuated to 'clean' areas. People got entangled in the category of victim, by law. They had unpredictable futures, and *each of them wanted to know their dose.*"

Statistics from the Ukrainian Ministry of Health gave evidence of the sharp increase in 1991 of zone workers, resettled persons and inhabitants of contaminated territories registering their disability, and the annual patterns of enrollment of this new population for which the state committed itself to care. The statistics also show that the sharpest increase in the clinical registration of illnesses occurred under the category "symptoms and other inadequately known states," Class 16 in the International Classification of Disease, ICD 10 (see Figure 1). These states typically include afflictions such as personality changes, premature senility, and psychosis.

Ukrainian claims to a sudden expansion of Chernobyl health effects became a target of international skepticism. Ukrainian scientists were often rebuked for their "failure to use modern epidemiological methods and criteria of causality and a reliable data system." As a World Bank consultant noted, "Right now virtually any disease is attributed to Chernobyl, and no effort is being made either to prove or disprove these claims that would satisfy standard epidemiological criteria of causality."[24] For the government, however, one can argue that these new statistics became a kind of "moral science,"[25] a resolute display of its intention to make visible the effects of the Soviet mismanagement of the disaster and to guarantee its own social legitimacy while keeping world attention on the Chernobyl risk.

In this daily bureaucratic instantiation of Chernobyl, tensions among zone workers, resettled individuals and families, scientists, physicians, legislators, and civil servants intensified. Together, these groups became invested in a new social and moral contract between state and civil society, a contract guaranteeing them the right to know their levels of risk and to use legal means to obtain medical care and monitoring. The sufferers and their administrators were also supported by the nonsuffering citizens, who paid a 12 percent tax on their salaries to support compensations. The hybrid quality of this postsocialist state and social contract comes into view. On the one hand, the Ukrainian government rejected Western neoliberal prescriptions to *downsize* its social welfare domain; on the other hand, it presented itself as informed by the principles of a modern risk society. On the one hand, these Chernobyl laws allowed for unprecedented civic organizing; on the other hand, they became distinct venues of corruption through which informal practices of providing or selling access to state privileges and protections (*blat*) expanded.[26]

Ethnographic accounts have illustrated that postsocialism's future cannot be based in predictive models or treated as unproblematic flows toward free markets. Michael Burawoy and Katherine Verdery point to the links between the socialist and postsocialist worlds as well as growing dependencies between postsocialist state formations and global economics. Such dependencies "have radically shifted the rules of the game, the parameters of action within which actors pursue their daily routines

[24] World Bank, *Managing the Legacy of Chernobyl* (Washington, D.C., 1994), 7:6.
[25] Ian Hacking, *Taming of Chance* (Cambridge, 1990).
[26] For an elaboration of the concept of *blat,* see Alena Ledeneva, *Russia's Economy of Favours: Blat, Networking, and Informal Exchange* (Cambridge, 1998).

Figure 1. Symptoms and Other Inadequately Known States (per 10,000)

1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1.3	1.7	1.7	1.9	2.3	2.7	5.9	34.7	108.3	127.4	141.3

SOURCE: Ministry of Statistics, Kyiv, Ukraine.

and practices."[27] Ethnographic methods are critical for elucidating such interrelated processes at local levels. This is particularly true with regard to assessing the decisions people make based on limited choices available to them and the informal aspects of power that inform those decisions.

Shifts in aggregate human conditions and the circumstances of citizenship are also at stake in these changing political and economic worlds. The principles of a "classical citizenship" endow citizens with natural and legal rights protected as matters of birthright.[28] Regardless of nationality, such protections were granted to all Ukrainian inhabitants when the country declared independence. Yet birthright remains an insufficient guarantor of protection as the lives of inhabitants of some Ukrainian areas cannot be fully, or even partly, protected owing to long-term environmental challenges. For these inhabitants, the very concept of citizenship is charged with the superadded burden of survival. The acquisition and mastery of certain democratic forms related to openness, freedom of expression, and the right to information are primary goals to be sure. Yet populations are also negotiating for the even more basic goal of protection (i.e., economic and social inclusion) using the constituent matters of life. Such negotiations expose certain patterns that are traceable elsewhere: the role of science in legitimating democratic institutions, increasingly limited access to health care and welfare as the capitalist trends take over, and the uneasy correlation of human rights with biological self-preservation.

BIOLOGICAL CITIZENSHIP

In Ukraine, where democratization is linked to a harsh market transition, the injured biology of a population has become the basis for social membership and for staking claims to citizenship. Government-operated radiation research clinics and nongovernmental organizations mediate an informal economy of illness and claims to a "biological citizenship"—a demand for, but limited access to, a form of social welfare based on medical, scientific, and legal criteria that recognize injury and compensate for it. These demands are being expressed in the context of losses of primary resources such as employment and state protections against inflation and a deterioration in legal-political categories. Struggles over limited medical resources and the factors that constitute a legitimate claim to citizenship are part of postsocialism's uncharted terrain. Against a stark and overwhelming order of insecurity, there are questions to be asked about how the value of another's life is being judged in this new political

[27] Michael Burawoy and Katherine Verdery, *Uncertain Transition: Ethnographies of Change in the Postsocialist World* (Lanham, Md., 1999), 2.

[28] Dominique Schnapper, "The European Debate on Citizenship," *Daedalus* 126 (1997): 201

economy, about the ability of scientific knowledge to politically empower those seeking to set that value relatively high, and about the kinds of rationalities and biomedical practices emerging with respect to novel social, economic, and somatic indeterminacies. The indeterminacy of scientific knowledge about the afflictions people face and about the nature of nuclear catastrophe materializes here as both a curse and a source of leverage. Ambiguities related to the interpretation of radiation-related injury, together with their inextricable relations to the social and political uncertainties generated by Soviet interventions and current political-economic vulnerability, make the scope of the afflicted population in Ukraine and its claims to injury at once plausible, ironic, and catastrophic.

One instance of how these scientific and political dynamics operated in the everyday: the country's eminent expert on matters related to the disaster, Symon Lavrov, was well-regarded internationally for having developed computerized fallout models and calculating population-wide doses in the post-Soviet period. He told me, however, that "when a crying mother comes to my laboratory and asks me, Professor Lavrov, 'tell me what's wrong with my child?' I assign her a dose and say nothing more. I double it, as much as I can." The offer of a higher dose increased the likelihood that the mother would be able to secure social protection on account of her potentially sick child. Lavrov and the grieving mother were two of the many figures whose efforts I documented. The point is the following: the mother could offer her child a dose, a protective tie with the state, which is founded on a probability of sickness, a biological tie. What she could offer, perhaps the most precious thing she could offer her child in that context, is a specific knowledge, history, and category. The child's "exposure" and the knowledge that would make that exposure an empirical fact were not things to be repressed or denied (as had been tried in the Soviet model) but rather things to be made into a resource and then distributed through informal means.

Specific cases illustrate how these economic and state processes, combined with the technical dynamics already described, have laid the groundwork for such "counterpolitics."[29] Citizens have come to depend on obtainable technologies and legal procedures to gain political recognition and admission to some form of welfare inclusion. Aware that they had fewer chances for finding employment and health in the new market economy, these citizens accounted for elements in their lives (measures, numbers, symptoms) that could be linked to a state, scientific, and bureaucratic history of mismanagement and risk. The tighter the connection that could be drawn, the greater the chance of securing economic and social entitlement. This dimension of illness as counterpolitics suggests that sufferers are aware of the way politics shapes what they know and do not know about their illnesses and that they are put in a role of having to use these politics to curb further deteriorations of their health, which they see as resulting, in part, from a collapsing state health system and loss of adequate legal protections.

Probability in relation to radiation-related disease became a central resource for local scientific research. This play with probability was being projected back into nature, so to speak, through an intricate local science. Young neuropsychiatrists made the best of the inescapability of their political circumstances (they could not get visas

[29] Colin Gordon, "Government Rationality: An Introduction," in *The Foucault Effect: Studies in Governmentality,* ed. G. Burchell, C. Gordon, and P. Miller (Chicago, 1991), 5.

to leave the country) as they integrated international medical taxonomies into Soviet ones and developed classifications of mental and nervous disorders that in expert literatures were considered far too low to make any significant biological contribution. For example, neuropsychiatrists were involved in a project designed to find and assess cases of mental retardation in children exposed in utero in the first year after the disaster. In the case of one such child, a limping nine-year-old boy, researchers and parents pooled their knowledge to reconstruct the child's disorder as having a radiation origin. Even though the boy's radiation dose was low, he was given the status of sufferer because of his mother's occupation-related exposure (she was an emergency doctor who elected to work in the zone until late in her pregnancy) and also because a PET scan did reveal a cerebral lesion that was never hypothesized as being related to anything other than radiation. (It could have been birth trauma.) As researchers constructed a human research cohort, they were also constructing a destiny for the newly designated human research subjects. It was precisely the destiny the parents were intent on offering to this child—a biological citizenship.

These radiation-related claims and practices constituted a form of work in this market transition. A clinical administrator concurred that claims to radiation illness among the Ukrainian population amounted to a form of "market compensation." He told me, "If people could improve their family budgets, there would be a lot less illness. People are now oriented towards one thing. They believe that only through the constitution of illnesses, and particularly difficult illnesses, incurable ones, can they improve their family budgets." Administrators such as he informed me that they should not to be "blamed too much" for fueling an informal economy of diagnoses and entitlements. Complicities could be found at every level, and the moral conflicts they entailed were publicly discussed. Another administrator who authenticated compensation claims told me illnesses had become a form of currency. "There are a lot of people out of work," he said. "People don't have enough money to eat. The state doesn't give medicines for free anymore. Drug stores are commercialized." He likened his work to that of a bank. "The diagnosis we write is money."

The story of Anton and Halia (age forty-two in 1997) shows the ways such complicity functioned in the most personal arenas. The new institutions, procedures, and actors that were at work at the state level, at the research clinic, and at the level of civic organizations were making their way into the couple's *kvartyra* (apartment). Anton's identity as a worker, his sense of masculinity, and his role as a father and breadwinner were being violently dislocated and altered in the process. In 1986, the state recruited Anton to work for six months in the Zone of Exclusion, transporting bags of lead oxide, sand, and gravel to the reactor site. The bags were airlifted and deposited using helicopters. He had no idea how much radiation he absorbed during those six months. From 1991 on, Anton routinely passed through the clinical system, monitored like any "prospective" invalid. His symptoms mounted over time. He had chronic headaches, lost his short-term memory, exhibited antisocial behavior, developed a speech disorder, and experienced seizures and impotence, as well as many other problems. Despite the growing number and intensity of his symptoms, his diagnosis did not "progress" from an initial listing as a "psycho-social" case.

When I met Anton and his wife, Halia, they were trying to manage on a small pension he received as a sufferer. Anton saw himself as bankrupt, morally as well as economically: "The state took my life away. Ripped me off, gone. What is there to be happy about? An honorable man cannot survive now. For what? For what? We had a

life. We had butter. We had milk. I can't buy an iron. Before I could buy fifty irons. The money was there. My wife's salary is less than the cost of one iron." He told me that he did not know "how to trade goods" or to sell petty goods on the market. His meager pension left Anton with few options. He found himself confronting the shameful option of breadwinning with his illness in the Chernobyl compensation system or facing poverty. Over time, and in a concerted effort to remove Anton's psychosocial label, the couple befriended a leader of a disabled workers' activist group in a clinic. Through him they met a neurologist who knew the director of the local medical-labor committee. The couple hoped this individual would provide official support for Anton's claim of Chernobyl-related disability.

The economic motives for these actions were clear. Yet it was difficult for me to see this man giving up everything he knew or thought about himself to prove that his diffused symptoms had an organic basis. Neurology was a key gateway to disability; neurological disorders were most ambiguous but most possible to prove using diagnostic technologies, self-inducements, and bodily display. At each step, Anton was mentally breaking down; he fell into a pattern of abusive behavior. His legal-medical gamble—this gaining of life in the new market economy through illness—reflected the practices of an entire citizenry lacking money or the means of generating it. This approach has become common sense, in Clifford Geertz's words, or that which is "left over when all [the] more articulated sorts of symbol systems have exhausted their tasks."[30]

When I returned in 2000 to Kyiv to conduct further research, I discovered that current democratic politicians, many of whom drafted the original compensation laws as sovereignty-minded nationalists, now saw the Chernobyl compensation system as a dire mistake that has "accidentally" reproduced a socialist-like population. Funds and activist groups were now supported by socialist and communist leaderships, who lobbied for continued aid in an increasingly divided parliament. Meanwhile, international agencies such as the World Bank cited the Chernobyl social apparatus as a "dead weight" to Ukraine's less-than-ideal transition to a market economy. Bank officials were so ill-disposed toward the system that they made its quick extinction a condition of future loan contracting. The disappearance of this exposed population from the state's radar seems ever more likely. Once "protected" by a safety-conscious state, this exposed population is being left alone to their symptoms and social disarray.

Opinions about how the state should address the fate of these Chernobyl victims also serve as a kind of barometer of the country's changing moral fabric. Rural inhabitants who normally received the least in terms of socialist redistribution tended to be sympathetic to the victims' struggles. Among inhabitants of Kyiv and other urban centers, there is a growing consensus that the invalids are "parasites of the state, damaging the economy, not paying taxes." Many youths who had been evacuated from the zone do not want to be associated with groups of sufferers as this association makes it more difficult for them to find employment.

Chernobyl was a key political event, generating many effects, some of which have yet to be known; its truths have been made only partly known through estimates derived from experimental science. The immediate postindependence discourse in Ukraine centered on the "truth" of Chernobyl. Ukrainians tried to put their suffering in perspective vis-à-vis the repressive model of science and state: the number of

[30] Geertz, *Local Knowledge* (cit. n. 1).

people who died, how the government deceived citizens about the scale of the disaster, how the maps of contamination were misrepresentative, and so on. As harsh market realities entered everyday life, this model of organizing suffering quickly gave way to a different kind of scientific and political negotiation, one which had directly to do with the maintenance, and indeed the remaking, of a postsocialist state and population.

If, at the level of the modern state, spheres of scientific production and politics are in a constant process of exchange and mutual stabilization, then what I have suggested here is that stabilization proves to be a much more difficult task. At stake in the Chernobyl aftermath is a distinctive postsocialist field of power-in-the-making that is using science and scientific categories to establish the state's reach. Scientists and victims are also establishing their own modes of knowledge related to injury as a means of negotiating public accountability, political power, and further state protections in the form of financial compensation and medical care. Biology becomes a resource in a multidimensional sense—versatile material through which the state and new populations can be made to appear. This postsocialist field of power has specific physical, experiential, political, economic, and spatial aspects. It is about knowledge and constructed ignorance, visibility and invisibility, inclusion and exclusion, probabilities and facts, and the parceling out of protection and welfare that do not fit predictive models. It is also about how individuals and populations become part of new cooperative regimes in scientific research and in local state-sponsored forms of human subjects protection. In this context, suffering is wholly appropriated and objectified in its legal, economic, and political dimensions. At the same time, these objectifications constitute a common sense that is enacted by sufferers themselves in ways that can promote protection as well as intensify new kinds of vulnerability in domestic, scientific, and bureaucratic spheres.