Chapter 1

Life Politics after Chernobyl

Time Lapse

On April 26, 1986, Unit Four of the Chernobyl nuclear reactor exploded in Ukraine, damaging human immunities and the genetic structure of cells, contaminating soils and waterways. The main reason for the accident is by now well known. Soviet engineers wanted to test how long generators of Unit Four could operate without steam supply in the case of a power failure.[1] During the test, operators sharply reduced power and blocked steam to the reactor's generators and disabled many of its safety systems. A huge power surge followed, and at 1:23 A.M. the unit exploded once and then again. Large-scale pressure gradients carried the radioactive plume to as high as eight kilometers by some estimates. The graphite core burned for days. Helicopter pilots dropped over five thousand tons of boron carbide, dolomite, sand, clay, and lead in an attempt to suffocate the flames of the reactor's burning core. These interventions are now known to have compounded risk and uncertainty. With suffocation, the temperature of the nuclear core increased. This in turn caused radioactive substances to ascend more rapidly, forming a radioactive cloud that spread over Belarus, Ukraine, Russia, Western Europe, and other areas of the Northern Hemisphere.[2]

Eighteen days elapsed before Mikhail Gorbachev, then general secretary, appeared on Soviet television and acknowledged the nuclear release to the populace.[3] Within that period, tens of thousands of people were either knowingly or unknowingly exposed to radioactive iodine-131, absorbed rapidly in the thyroid and resulting, among other things, in a

sudden and massive onset of thyroid cancers in children and adults as soon as four years later.[4] Such onsets could have been curtailed had the government distributed nonradioactive iodine pills within the first week of the disaster.[5] Contradicting assessments generated by English and American meteorological groups, Soviet administrators downplayed the extent of the plume and characterized Chernobyl as a controlled biomedical crisis. Soviet medical efforts focused on a group of 237 victims selected at the disaster site by Dr. Angelina Guskova; they were airlifted to the acute radiation sickness ward of the Institute of Biophysics in Moscow. Of those, 134 were diagnosed with acute radiation syndrome. Official reports set the death toll at thirty-one workers (IAEA 1991, WHO 1996). Behind such seemingly definite numbers lies a web of scientific, moral, and political uncertainties.

The fact is that over the years, 600,000 or more soldiers, firemen, and other workers, men and women, continued to be exposed to radiation.[6] Many were dispatched to the disaster site to carry out cleanup work ranging from bulldozing contaminated topsoil and disposing it as waste to working in one-minute intervals on the roof of an adjacent unit and shoveling radioactive debris into the mouth of the ruined one. Some of these so-called volunteers referred to themselves as "bio-robots," a term which suggests that the one-minute rule was not well enforced. Others were relatively well paid to construct the so-called Sarcophagus (*Sarkofag*, now simply called the Shelter), a structure enclosing the ruined fourth unit of the reactor and containing 216 tons of uranium and plutonium. Currently, fifteen thousand people work at the now decommissioned power plant or are paid to provide technical assistance in the Zone of Exclusion. The Zone is an area thirty kilometers in diameter circumscribing the disaster site. Access to the Zone is restricted to the plant's maintenance workers, engineers, health professionals, and researchers.

In 1992, during my first field trip to Ukraine, I met one of the maintenance workers who was on a two-week break from work in the Zone. He lived in a housing complex in Kyiv, Ukraine's capital, located about eighty miles south of the disaster site. Filled with anger, he said, "Now I'm a 'sufferer.' " He used the word "sufferer" in reference to a legal category introduced the previous year by a newly independent Ukrainian state for persons affected by the Chernobyl disaster. "I get five dollars a month compensation. What can I buy for that?"[7] He said he had no other option but to continue working in the Zone. Because of his work history, no firm outside the Zone would hire him. "This is from radiation," he said. He lifted his pant-leg and stuck his cigarette through skin that had puckered up to form a ring above his ankle. It was the result, he said, of direct contact with a radiation source, and what clinicians would call a "local skin burn." "This happened in the Zone . . . We're people no one

understands, in hospitals, in clinics." He characterized himself as one of the "living dead." "Our memory is gone. You forget everything—we walk like corpses."

In spite of the country's publicized efforts to improve safety standards in the Zone, a director of the Shelter complex told me in an interview, "there are no norms of radiation safety here." The country's Ministry of Health sets annual allowable norms of dose exposures, but, according to the director, these norms are not strictly adhered to. That is because in Ukraine's current period of sharp economic decline, employment in the Zone is considered premium. Referring to the plant workers, he told me, "Taking this risk is their individual problem. No one else is responsible for it." When I asked him to compare his country's enforcement of worker safety norms with those of Western Europe, he told me quite somberly, "No one has ever defined the price of a dose exposure here. No one has ever defined the value of a person here."[8] In a situation where economic forces drive people to become preoccupied with physical survival, the effects of leaving the value of a person undefined are far-reaching. In such a world, physical risks, abuses, and uncertainties escalate. The labor of the bio-robot appears ever more acceptable, desirable, and even normal.

■ ■ ■

In an effort to map environmental contamination, to measure individual and populationwide exposures, and to arbitrate claims of illness, government and scientific interventions have recast the Chernobyl aftermath as a complex political and health experience with its own bureaucratic and legal contours. The initial—contested—scientific and medical assessments of the disaster's extent and biological impact, the choice to delay public announcement, and the economic incentives to work in the Zone have uniquely shaped Chernobyl as a *tekhnohenna katastrofa* (a technogenic catastrophe), in the words of many of my informants, including people fighting for disability status, local physicians, and scientists. This term suggests that not only excessive exposures to radiation but policy interventions themselves have caused new biological uncertainties. Rational-technical responses have exacerbated the biological and social problems they tried to resolve, even generated new ones. This process, in turn, contributes to further uncertainty concerning a resolution to the crisis, an increase in illness claims, and social suffering among affected individuals and groups.[9]

Chernobyl was an "anthropological shock" for Western Europe, bringing the efficacy of everyday knowledge to a state of collapse and underscoring how much the conditions for secure living in what have

been termed risk societies lie in the hands of experts of all kinds (Beck 1987). This collapse also took place, but in a different form, in the other Europe. Chernobyl was closely associated with the collapse of the Soviet system as a whole. In this process Chernobyl, or risk itself, became an important resource to be tinkered with. Though this technological disaster has generated a strange world, difficult to comprehend, in its aftermath a postsocialist state, social mobilization, and local knowledge and experiences of health have been constituted anew. This book explores the ways people have learned to engage with Chernobyl-related bureaucracies and medical and scientific procedures as a matter of everyday survival—and, particularly, with how biology, scientific knowledge, and suffering have become cultural resources through which citizens stake their claims for social equity in a harsh market transition. Access to such resources is refracted through the fault lines of gender, class, and social status, to be sure. More broadly, these interactions illustrate how in the modern state, spheres of scientific production and politics are engaged in a constant process of exchange and mutual stabilization.

This book is based on eighteen months of field research in Ukraine, Russia, and in the United States between 1992 and 1997, with an additional one-month follow-up visit to Ukraine in 2000. It is a historical and ethnographic account of the rational-technical administrations of the Chernobyl aftermath (both in the Soviet and post-Soviet periods) and of these administrations' economic, social, and biological impact on the populations affected, displaced, or sickened by the disaster.[10] My particular focus is on Ukraine, a country that inherited the nuclear power plant—along with a politically and scientifically unresolved Chernobyl crisis—when it declared independence from the Soviet Union. Approximately 8.9 percent of Ukraine's territory is considered contaminated. Most of the Exclusion Zone is located in Ukraine (see figure 3). During the period of my field research, the country witnessed the rapid growth of a population claiming radiation exposure that made them eligible for some form of social protection. Social protections include cash subsidies, family allowances, free medical care and education, and pension benefits for sufferers and the disabled. This new population, legally designated as *poterpili* (sufferers) number 3.5 million and constitutes a full 5 percent of the Ukrainian population.[11]

On average, Ukraine expends about 5 percent of its budget on costs related to the Chernobyl aftermath, including the cleanup and technical maintenance of the ruined reactor. In 1995, over 65 percent of that outlay was spent on social compensations for sufferers and on maintaining a massive legal-medical, scientific, and welfare apparatus. Neighboring Belarus, by contrast, spends considerably less than Ukraine does on the social welfare of its sufferers and has limited the number of Chernobyl

claimants.[12] Twenty-three percent of this country's territory is considered contaminated, almost three times the percentage of contaminated Ukrainian land. The Belarussian government has tended to suppress or ignore scientific research; it downplays the extent of the disaster and fails to provide enough funds for the medical surveillance of nearly two million people who live in contaminated areas.[13]

Unlike Belarus, Ukraine has used the legacy of Chernobyl as a means of signaling its domestic and international legitimacy and staking territorial claims. It developed a politics of national autonomy through the Chernobyl crisis, devaluing Soviet responses to the disaster as irresponsible. The state established new social welfare and scientific institutions dedicated to a Chernobyl population and began to provide sufferers and the disabled relatively generous cash entitlements drawn from a statewide Chernobyl tax. Moreover, the new government defined new and ambitious safety measures for Zone workers. This meant stabilizing the deteriorating Shelter, following norms of workers' safety, mitigating future contamination, and closing the last remaining working units of the Chernobyl plant. The implementation of this new program had also become a key asset in Ukraine's foreign policy. In response to these efforts, Western European countries and the United States continue to promise Ukraine further technical assistance, loans, and potential trading partnerships. Such exchanges have legitimated a new political-economic arena in which profit, political influence, and corruption loom in the already powerful and tax-evading energy sector.

Ukraine's response to the Chernobyl legacy is unique in that it combines humanism with strategies of governance and state building, market strategies with forms of economic and political corruption. Such interrelated processes have generated new kinds of formal and informal social networks and economies that have allowed some segments of the population to survive on and benefit from politically guaranteed subsidies.[14] I worked in clinical and laboratory settings and in the now sizable social welfare apparatus dedicated to those affected by Chernobyl—in its state agencies, and in the offices of nongovernmental interest groups in Kyiv. Together, these sites make up a subsystem of the state's public health and welfare infrastructure where increasingly poor citizens—former and current Chernobyl plant workers and populations resettled from contaminated zones—mobilize around their claims of radiation-induced injuries.

I term this social practice that has emerged in Ukraine a "biological citizenship" (1999). In Ukraine, where an emergent democracy is yoked to a harsh market transition, the damaged biology of a population has become the grounds for social membership and the basis for staking citizenship claims. By examining how state-operated research and clinical institutions and nongovernmental organizations of "the disabled"

(*invalidy*) mediate individual and collective claims to biological damage, I show how rights and entitlements are contested, normed, and propagated. I also delineate the ways prior Soviet managements and scientific interventions into the lives of affected populations have patterned these dynamics. One can describe biological citizenship as a massive demand for but selective access to a form of social welfare based on medical, scientific, and legal criteria that both acknowledge biological injury and compensate for it. Such demands are also being formulated in the context of fundamental losses—losses of primary securities such as employment and state protections against inflation and a general corrosion of legal-political categories. Struggles over scarce medical goods and over the criteria that constitute a legitimate claim to citizenship are part of postsocialism's uncharted terrain. A stark order of social and economic exclusion now coexists with a generalized discourse of human rights.

The concept of biological citizenship sheds light on a fundamental practice of polity building in postsocialism. Recent ethnographies of postsocialist and market transitions have revealed the varying ways new nation-states find legitimacy in people's lives. These ethnographies have traced the way local narratives address the collapse of state socialism and the sudden conjuncture of capitalism, globalism, and new laws (Verdery 1996, Humphrey 1999, Wanner 1998, Ries 1997, Grant 1995). Contested forms of social inclusion and exclusion emerge through these processes. In the Ukrainian context, I consider the emergent form of biological citizenship from the following perspective: What is the value of life in that new political economy? How does scientific knowledge politically empower those seeking to set that value relatively high? What kinds of rationalities and biomedical practices are emerging with respect to novel social, economic, and somatic indeterminacies?

Existing ethnographic work shows that postsocialisms and conceptions of their future cannot be based on predictive models or treated as inevitably flowing toward free markets and democracy. Michael Burawoy and Katherine Verdery (1999) examine continuities between socialist and postsocialist societies as well as the evolving dependencies between state formations and global economics. Such dependencies, they note, "have radically shifted the rules of the game, the parameters of action within which actors pursue their daily routines and practices" (2). Ethnographic research methods remain fundamental for elucidating the dynamics of these processes at a local level, particularly where we are dealing with informal aspects of power relations and assessing the decisions people make based on limited choices available to them (Gledhill 2000:8).

Such "experience near" (Geertz 1983) studies of these transitioning political and economic worlds also reveal a fundamental reconfiguration

of human conditions and conditions of citizenship. The traditional concept of citizenship casts citizens as bearers of natural and legal rights that are (and must be) protected as a matter of birthright. Such rights were indeed extended to all inhabitants of Ukraine, regardless of nationality, at the time of independence. Yet the issue of birthright as it relates to state legal protection remains vexed, particularly given the fact that persons born in some parts of Ukraine are arguably disadvantaged on the basis of intractable environmental and health threats. For these groups, the very idea of citizenship is now charged with the superadded burden of survival. Thus what is particular to Ukraine, what I will be illustrating throughout this work, is not just the forms given to a new democratic way of life (openness, freedom of expression, and the right to information) but the fact that a large and largely impoverished segment of the population has learned to negotiate the terms of its economic and social inclusion in the most rudimentary life-and-death terms. Moreover, these citizens' experiences expose the existence of patterns that ought to be traced in other postsocialist contexts: 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. This book guides the reader through some of the contested spaces and politics of population management in the Chernobyl aftermath, highlighting the patterns by which science has become a key resource in the management of risk and in democratic polity building, and showing how Ukrainians employ knowledge of biological injury as a means of negotiating public accountability, political power, and further state protections in the form of financial compensation and medical care.

■ ■ ■

In March 1996, in the early stages of a year of field research in Kyiv, I went to the city hospital's neonatal unit to talk with the neonatologists about what they saw happening among newborns. Were there any changes? Dr. Zoya, the head of the unit, bemoaned the fact that the hospital's hematology unit "gets all the humanitarian aid." She considered her labors to be unpaid charity work. "How did Chernobyl affect the birth and development of newborns?" I asked her. Before conversation started, Dr. Zoya assumed that I would want statistical data. She told me, "I will not be able to show you any statistics. You will have to go to the Health Ministry for that." Neither then nor later did I ever ask for statistical information, yet every subsequent hospital administrator with whom I spoke told me the same thing: statistical information was off-limits. The urgent desire to withhold statistics on the part of these administrators

(whose Chernobyl-related activities are directly controlled by state health administrators) only highlighted another point. Without statistics, the effects of the disaster had to be understood from other perspectives. What I understood was that bureaucratic windows on the Chernobyl reality were open to a certain kind of reality, inviting me to see its brute physical effects and nothing more.

Dr. Zoya then led me to the critical unit (*reanimatsiia*). Like any other guest, I was given a white overcoat to wear during the visit. In a corridor we passed a young affluent couple—the new Ukrainians, or "the new rich"—waiting for a nurse to finish swaddling their newborn infant. We entered the critical unit. Six newborns in German-donated Plexiglas incubators were visible. The transparent boxes were separated and arranged so as to give ample walking space for visitors. The physical state of the infants varied. As we walked, Dr. Zoya described their deformities. My notes say, "One born premature, another survived the death of his twin; another born with a dysfunctional esophagus; another with signs of prenatal asphyxiation. One born to a mother who at age nine was evacuated from the Chernobyl zones; her infant has half a lung. Another was born to a Chernobyl worker: there are six fingers on his left hand. He's missing a trachea. His gut lay on the outside of his body. His left outer ear is gnarled and deformed." It was as if something internal to the gestational process had been left unfinished by Chernobyl. Life was obstructed, and the forms of that obstruction lay bare.

A few weeks later, I spoke on the telephone with a U.S. embassy worker who told me she had personally arranged for Warren Christopher, then U.S. secretary of state, to visit that same critical unit (the goal of his trip was further reductions of Ukraine's nuclear arsenal). This embassy worker said she had "arranged every step," and that "the director of the hospital decided that all the displayed babies would have Chernobyl in their family histories." She said, "It always helps Ukraine when politicians see these Chernobyl children up close."

The display of these infants stressed Chernobyl's core issue: the destruction of human life. That issue was also at the core of a political economy and administrative apparatus that attempted to evoke public recognition of the disaster's pathological facts. These bodies bore Chernobyl histories. They were also vectors of Chernobyl destinies that touched both individual families and this society as a whole. In that space where the neonatologist led me, there was no—and there should not have been any—resistance to these new facts of life. The state used biological images such these not only to project to the world its image as victim but to justify its own sovereignty. Such images reminded viewers of the cause of physical suffering. Out of the mire and mess of the Soviet mismanagement of Chernobyl had come a dreadful accumulation of diverse malfor-

mations such as these. Now it is through such images that a society is struggling with the price of its health. And, meanwhile, citizens must rely on their disease, and the knowledge they accumulate about it, as the currency through which they negotiate social, economic, and political survival.

A Technogenic Catastrophe

The scale of the Chernobyl aftermath and its long-term health effects have been subjects of intense dispute and controversy. International scientific organizations insist that contamination from the Chernobyl reactor has been successfully contained, but argue the need for ongoing technical surveillance and for continual informational exchange (IAEA 1991, "Chernobyl's Legacy" 1996). The UN Scientific Committee on the Effects of Atomic Radiation, which relies on data from the International Atomic Energy Agency, has acknowledged the sudden increase in thyroid cancers among children living in affected territories. Along with international biomedical and social scientific literatures, these agencies have characterized most other disorders as products of "informational stress" (Sergeev 1988, WHO 1996), "somatization of fear" (Rumiantseva et al. 1996, Guskova 1995), or lack of proper "risk perception" (Drottz-Sjoberg 1995, Havenaar et al. 1996). Ukrainian scientists and clinicians acknowledge rampant stress among affected populations but have criticized international health assessments for ignoring the contribution radiation makes—even in low doses—to adverse physiological change (Pilinskaya 1999, Bondar et al. 1996).

Much of the disagreement between UN-related and local scientists centers on the significance of *proven* versus *expected* health outcomes. Based on studies conducted after Hiroshima and Nagasaki, an "excess" of 6,600 cancer deaths, including 470 leukemia cases, were expected. Other Japan-based studies on incidence and mortality of cancer indicate that the risk of disease varies according to cancer type. The highest risk is observed for leukemia, breast cancer, thyroid cancer, and lung cancer, as well as some cancers of the gastrointestinal tract. There is considerable disagreement between UN-affiliated scientists and their counterparts in Ukraine and Belarus regarding Chernobyl-related cancer rates. Leukemia estimates in particular vary widely. While UN agencies do not recognize rises in leukemia rates, Prysyazhnyuk et al. indicate the standardized incidence ratio (SIR) for leukemia to have increased significantly among the most heavily exposed cleanup workers in Ukraine (1999). A team of Belarussian physicians claims that leukemia rates are four times the Belarussian national average among the most heavily exposed cleanup workers

(Pearce 2000:12).[15] Gennady Lazjuk of the Institute for Hereditary Diseases in Minsk, along with collaborators in Japan and Europe, found that radiation exposure accounted for a 12 percent increase in birth defects in heavily contaminated areas in Belarus (Lazjuk et al. 2000). Notwithstanding the recognized increase in thyroid cancers in children, the International Atomic Energy Agency and the UN Scientific Committee on the Effects of Atomic Radiation have not acknowledged increases in cancers and congenital deformities, both of which have been anticipated on the basis of research on Hiroshima and Nagasaki bombing survivors (Pierce et al. 1996).

UN scientists and local experts also disagree over where research emphasis should be placed, or at what level biological changes should be detected. Human radiation effects vary according to whether they are deterministic or stochastic. Deterministic effects occur when levels of absorbed radiation doses are significant enough to kill cells that, if not adequately replaced, produce clinically observable pathologies. The severity of the effect is dependent on the radiation dose, with steep linear dose-effect relationships. This is opposed to stochastic effects, which, based on gene damage, confer a probability or chance that a harmful outcome will develop. In contrast with deterministic effects, stochastic effects are nonlinear in terms of the kinds of harm they can produce, but are most commonly associated with cancer and leukemia induction. Unlike deterministic effects, they increase the probability rather than the severity of a given pathology (Gofman 1981:708). Recent collaborations among post-Soviet and Western scientists, some of whom are unaffiliated with international radiological committees and agencies, have yielded new data related to stochastic effects. Using techniques far more sophisticated than those available at the time of the Hiroshima and Nagasaki studies, researchers have shown increases in human germline alterations under conditions of chronic exposure to low-dose irradiation among children born in 1994 in Mogilev, Belarus, in comparison with a control population in Britain (Dubrova et al. 1996). Others have noted significant increases in the frequency of chromosomal aberrations and other genetic markers of radiation effects in children living in contaminated areas (Pilinskaya and Dibskyi 2000). Clearly, the science of the human health effects of Chernobyl is an evolving one. As new technologies and research funds become available, new fields of knowledge are established. But at the present moment, what we know of the precise figures of damage is far from complete.

What we can conclude with some certainty, however, is that the processes of making scientific knowledge are inextricable from the forms of power those processes legitimate and even provide solutions for.[16] How scientific knowledge is valued and the level at which it is said to hold significance can affect the planning of state interventions and medical sur-

veillance, the size of populations considered to be at risk, and the courses of suffering and illnesses those populations experience. State interventions are predicated, in part, on policy makers' understandings of the relationship between radiation dose and bodily harm. The so-called linear hypothesis states that harm is proportional to dose indeed, that radiation is harmful at any dose.[17] Here it is not a question of whether harmful effects such as additional cancers exist but whether there are technologies available that are sufficiently powerful to make those effects statistically detectable, and whether governments desire to invest in or make use of those technologies. Hence, the issues raised by the linear hypothesis are of an ethical, political, and economic nature.

Policy makers have several intervention options at their disposal. The degree to which they accept or reject the linear hypothesis shapes the types of intervention they consider and eventually implement. At one end, those options can be described as "low-tech" and minimally interventionist. The rationale here is that because it is impossible to detect the small increases in cancer deaths predicted by the linear hypothesis, cancers—or, for that matter, many other diseases—should not be singled out as radiogenic. In the Chernobyl case, this rationale influenced the size of affected cohorts receiving intervention. Soviet officials claimed that except for the initial group of cleanup workers sent into the Zone, the radiation exposures populations received were insignificant to their health. Indeed, there are many experts who remain committed to the idea that the primary health effects of Chernobyl are of a mental or psychosocial nature. In line with this reasoning, Soviet interventions focused on information dissemination (as in, for example, the state's battle against "radiophobia") and on the introduction of therapeutic and surveillance regimes to address psychosomatic ailments, characterized as products of individual psychological weakness and self-induction. Psychosocial medical categories were applied to exclude the majority of claims.

An alternative course of action would involve a state's immediate full disclosure about what is and is not known about the complexity of health outcomes (including an acknowledgment of those health outcomes as being some combination of clinically observable, stochastic, and psychological effects). This kind of approach informed Ukraine's management of the aftermath and led, for example, to an improvement of the state's public health surveillance system. Lifting constraints on international collaboration and foreign aid, the state made a variety of research technologies, ranging from the epidemiological to the clinical and molecular biological, available to researchers assessing the disaster's health impact. A number of local scientists, in collaboration with molecular biologists and geneticists from Western Europe, the United States, and Japan, are still sorting out the genetic causes of radiation-induced cancers.

Both the Soviet and post-Soviet approaches entail social and political risks. If in the first case, Soviet managers can be accused of undermedicalizing or denying the health effects of the disaster altogether, Ukrainian managers can be accused of overmedicalizing their constituencies, and of creating a health system that fosters both rectification and abuse. My purpose, however, is not to allocate blame but to paint a clearer picture of the dynamic interplay between scientific and social orders, and how those orders come to define actual conditions of health: those aspects that protect or undermine it, and the moral and ethical discourses addressing its values and responsibilities. Following Veena Das's characterization of the aftermath of the Bhopal chemical disaster, I also aim to elucidate how "pain and suffering are experiences that are actively created and distributed" (1995:138) within scientific/social orders themselves.

The number, novelty, physical variability, and duration of the kinds of harmful particles that were released in the Chernobyl explosion make the open-endedness of the disaster's health effects hard to deny. This open-endedness necessitates further reflection on the ways the scientific research process itself contributes to the spread of pain and suffering by searching for easy answers and simple closures. In discerning the "true" causes of their subjects' suffering, researchers themselves have inadvertently reified categories of authentic and inauthentic suffering, thus marginalizing those who happen to fall into the latter category. So as not to contribute to this marginalizing, I avoided pigeonholing people affected by the disaster as suffering from either "hard" biologically induced symptoms or "soft" psychological ones—though their reasons for claiming the primacy of one etiology over another often entail moral and epistemological claims.

My decision to abstain from judgment is also supported on empirical grounds. Scientific understanding, along with policy decisions, popular pressures, and availability of technological resources, can shift the frames of what is considered evidence of the physical impact of the disaster. What becomes central to this analysis is the different social contexts in which scientific knowledge is placed and the ethical values it is used to support. Worlds of science, statistics, bureaucracy, suffering, power, and biological processes coevolve here in particular and unstable ways. How to discern their patterns as locally observable realities that affect people's daily lives and senses of moral and bodily integrity—or, put another way, how to do an ethnography of the relationships among biological, political, and social processes as those relationships evolve—is a major creative challenge of this work.

The concept of biopolitics provides a further key to making sense of the ways these processes are related and the way they shape the lives of individuals and populations. Biopower refers to controls over life, denoting

"what brought life and its mechanisms into the realm of explicit calculations and made knowledge-power an agent of transformation of human life" (Foucault 1980a:143).[18] Such transformations are said to occur at two levels: that of the human body as the object of discipline and surveillance, and that of the population as the object of regulation, control, and welfare. Michel Foucault pointed to a particularly salient moment in the history of biopower in his analysis of eighteenth-century France (1980b). It was in this period, he argued, that the consolidation of centralized state administrative power went hand in hand with a new concern for the health and social welfare of populations. Health was recast in the service of the state; the capacities of individuals were to be maximized inasmuch as those individuals lived, labored, and reproduced within a given territory and ruling apparatus. Populations possessed biological characteristics that made them more predictable. Demographic statistics, calculations of life expectancy and levels of mortality, patterns of marriage and procreation, and the categorization of bodies as more or less useful with greater or lesser prospects of survival constituted new types of knowledge contributing to radically new experiences of control in modern life.

This model of government provides a useful counterpoint for understanding Soviet and post-Soviet responses to Chernobyl and their social and scientific arrangements. In both responses, state power is as concerned with making bodies and behaviors ever more predictable and knowable as it is with creating—both intentionally and inadvertently—spaces of nonknowledge and unpredictability. The biology of populations is held in question; the government of life is unmoored. Where Soviet officials generate medical statistics, they designate them state secrets. People become uncertain as to what medical categories they belong to, how sick or healthy they are. Given the array of scientific and medical uncertainties, old measures of suffering lose their meaning and validity. Into that void come new biological definitions, some by chance, others by design. Some individuals with certain symptoms are said to be sick, while others, with different symptoms, are said to be not sick. Statistics and the use of medical diagnostics become contested. As these governments grapple with creating zones of predictability and intelligibility where they can operate and increase welfare, citizens are faced with what seem like random instantiations of scientific measures, biomedical categories, and compensation criteria. According to international experts in the field of nuclear medicine, the death toll from Chernobyl is thirty-one. According to local experts, the figure is in the hundreds of thousands. Radiation safety norms demarcate contaminated from presumably safe territories, but are those norms too liberal or too conservative? The area of contaminated land shrinks, then expands, then shrinks again. As a result, some rural populations are resettled once, then again, only to return to the area

from which they resettled (see chapter 4). There is an absence of maps indicating the spread of contamination; then, in the Ukrainian period, an array of maps appear—unofficial maps, state maps, revisions of state maps. In short, daily life is characterized by overwhelming uncertainty and unknowability. It is in this social, scientific, and legal arena that defining and acquiring a biological citizenship takes on central interest.

■ ■ ■

Today, relations between the human body and populations are again being recast in the context of the life sciences revolution. The Chernobyl disaster happened at a time when there was considerable change in research priorities in the world of international science.[19] Knowledge of the genetic code and how to technically manipulate it is not only transforming public health practices but influencing national politics, global commerce, and medical ethics, as well as conceptions, experiences, and politics of health and disease. In conceptualizing new social groupings in the context of the Human Genome Initiative in the United States and in France, Paul Rabinow examines how genetic knowledge and techniques are bringing about a literal redefinition of self and social identity, what he calls "biosociality."[20] As genetics-based diagnostic tools refocus health care away from direct clinical intervention to risk factor analyses and prevention, patients are engaging in health-promoting behaviors that may help prevent future illness; thus they elude their genetic "fates."

The social and behavioral changes implicated here (from face-to-face medical encounters to databased assessments of individual risk factors) do not necessarily imply a new medical impersonalism. Far from it. They engender novel social groupings bound by the hopes, fears, fates, and politics that have been made available to sufferers on the basis of biological knowledge. Three points follow from this recasting of biopower and are relevant to this investigation of the Chernobyl aftermath. First, the linking of biology with identity is not new. What is new is how connections between biology and identity are being made. In contrast with older and discredited biologized categories such as race or ethnicity, which in the past reinforced political programs and continue to foster patterns of unequal medical access and social injustice around the world (Proctor 1988, Lewontin 1992, Farmer 1999), these "new" biological identities and the interest groups formed in their name now have the potential to drive political economies and forms of commerce, as in Iceland (Palsson and Rabinow 1999); to foster identity-based illness movements, as in the United States (Dumit 2000); to generate new affective disorders, as in Brazil (Biehl 2001); and to become central to contemporary forms of citizenship. Such transformations illustrate the extent to which explana-

tions and claims of health and their failures are understood within the scientific, economic, and political domains in which they are coming to be addressed. A third point follows. In such domains, pain and suffering are experiences that are being rationalized and to some extent made into social instruments. This is not to say they are any less authentic, but that new determinations and values are being attached to them. Acts of suffering can carry stakes beyond themselves, organize social behaviors, and inform policy actions regarding welfare and insurance, health care delivery, and courses of scientific investigation and its funding.

Historians of science have commented on the irony of such dynamics of suffering in that "the process of pathogenesis [becomes] so complex that discussions of cause necessarily become a socially constructed domain" (Brandt 1997:67; also see Proctor 1995). Recent ethnographies of science have vividly portrayed how, more and more, biomedical technologies play a pivotal role in that social constructedness. Sonograms, PET scans, and genetically based diagnostics, by their imaging of biological facts, are inseparable from the objects they recognize and remake as disease (Martin 1994, Rapp 1999, Kleinman 1988). Research into the constructedness of pathologies expands well beyond biomedical circumstances to include diverse forms of violence that can significantly threaten health. Institutions sanctioned to respond to social problems—legal, welfare, and medical—organize distinct programs and policies that can result in distinct courses of health and disease (Das 1995, Kleinman and Petryna 2001).[21] The social making and expansion of populations at risk for disease is also determined by what Paul Farmer has identified as patterns of "structural violence." Lack of health care, limited treatment interventions, and persistent social inequalities that are intensified by structural adjustment programs have led to worldwide epidemics of preventable infectious diseases such as multidrug-resistant tuberculosis (Farmer 1999).

In the Ukrainian context, efforts to assess and remediate the Chernobyl aftermath have contributed to social indeterminacy and novel formations of power.[22] Widespread unaccounted-for radiation exposures, state interventions and failures to intervene, expanding clinical and bureaucratic regimes, and market economic changes came to bear on a rational-technical course of illness and suffering. Suffering—its experiences and interpretations—has been patterned and realized within the rational-technical dynamics that were meant to remediate Chernobyl over time. At the same time, these dynamics have laid the groundwork for a "counter-politics" (Gordon 1991:5) that currently involves 7 percent of Ukraine's population. Citizens have come to rely on available technologies, knowledge of symptoms, and legal procedures to gain political recognition and access to some form of welfare inclusion. Acutely aware of themselves as having

lesser prospects for work and health in the new market economy, they inventoried those elements in their lives (measures, numbers, symptoms) that could be connected to a broader state, scientific, and bureaucratic history of error, mismanagement, and risk. The tighter the connections that could be drawn, the greater the probability of securing economic and social entitlement—at least in the short term. This undertaking of "illness-as-counter-politics" suggests that sufferers are aware of the way "politics shapes what they know and don't know" (Proctor 1995:7) about their illnesses, and that they are willing to exploit these politics to limit further assaults on their well-being which they see as resulting from a collapsing state health system and loss of adequate legal protections. Inconsistencies related to the interpretation of radiation-related biological injury, together with the social and political uncertainties generated by Soviet interventions and current political-economic change, make the enormity of the affected population in Ukraine and its claims to injury at once plausible, ironic, and catastrophic.

■ ■ ■

What follows is an account of my field sites, methods, and the challenges of developing an ethnographic sensibility in this environment. I began my work in 1992, and during the summers of 1993 and 1994 I returned to Kyiv to continue to interview and work among resettled families, mothers of exposed children, and radiation-exposed workers. I followed them to public events in the Kyiv area and sat in on their meetings with state administrators at the Parliamentary Commission on Human Rights, where they negotiated the broadening of Chernobyl-related social and health care mandates. My initial data collection was oriented around these key questions: (1) How does the Ukrainian government administer individuals and populations claiming to be affected by radiation exposure? (2) What scientific knowledge and administrative policies are applied in the categorization of risk groups and in the formulation of compensation laws? (3) What scientific knowledge and political strategies are deployed by groups pressing for compensation and social justice on the basis of their Chernobyl condition? I carried out interviews with members of the country's new Chernobyl Ministry, responsible among other things for attracting relief organizations and humanitarian aid; coordinating international efforts for financing and maintaining the Shelter unit; funding environmental monitoring and new building construction, such as homes for persons and families resettled from contaminated areas; coordinating the work of central and local state bodies and scientific and medical institutions; recommending policies for affected citizens; allocating finances for treatment and health care costs of affected populations; and distribut-

ing benefits and compensation. Heorhii Hotovshyts, the ministry's first head, afforded me access to state legislators, administrators, Zone administrators, and local civil servants. I was permitted to read memos and internal reports outlining the dynamics of social response to the disaster; rules of hygiene for living in the zones; reports on patterns of media coverage; policy recommendations and medical criteria that Ministry of Health officials used in compensation decision making; and reports on emerging social psychological problems and methodological recommendations for rapid assessments of psychological status. Investigating how Chernobyl-related social mandates legitimated Ukrainian state-building processes, I collected data on Chernobyl welfare budgets and related them to national priorities for health and social protection spending in Ukraine, and I gathered information on how and on what scientific bases laws of compensation for Chernobyl sufferers had been established and expanded since Ukraine's independence.

Along with my research at the level of state and civil society, I developed a brief social history of the scientific knowledge and technical experience that Soviet, American, and Ukrainian experts gained in the immediate and long-term management of Chernobyl. It became apparent that in order to do a fair analysis of the lived experience of Chernobyl, I had to do multisited work. That meant becoming scientifically literate—inquiring into the circulation and assimilation of scientific knowledge at national, international, and local levels, as well as exploring their tensions. I conducted interviews with key scientific and political players in both Kyiv and Moscow, comparing scientific norms of biological risk and safety in the Soviet and post-Soviet administrations of the aftermath. I also looked into expert claims at the International Atomic Energy Agency and at government laboratories in the United States. At Lawrence Berkeley Laboratory (whose scientific work is unrelated to Chernobyl issues), I learned some of the basic radiobiological techniques for assessing the biological impact of radiation at the cellular and DNA levels. But as one radiation scientist told me, the difference between this manipulable animal environment and populationwide exposures to low-dose radiation remains a "black box." Though causal links between high doses of radiation and human biological effects have been well-established, the same cannot be said for continuous human exposure to low doses. It is no surprise that health predictions made by international health experts have often contradicted people's lived experience. The calculus of cost and criteria of assessment of injury are, by definition, open-ended and contestable.

In the absence of agreed-upon standards, a new social and political arena opened in Ukraine. I learned in my long-term work with civil servants of the Chernobyl welfare apparatus that disputes over the scope of injury of this disaster, and over how to model it, continue to influence

policy, social mobilizations, and not least the very nature of the course of illnesses in the affected populations I worked with. From the field I could also observe that different scientific approaches (psychometric versus biological, laboratory versus field-based research), different funding priorities, and different senses of urgency concerning the unknown health effects of the disaster were not simply at odds with each other; nor were they simply waiting to be assessed for their suitability or unsuitability. Their confrontation and juxtaposition engendered a new environment—or, more precisely, a political economy of claims around radiation illness. Developing alongside the new scientific, biomedical, and legal institutions promoting "safe living" in Ukraine was another social phenomenon that caught my attention. It was the boom of civic organizations called *fondy* (funds) that administered international charity and the compensation claims of the Zone workers. Also, since these more than five hundred funds are tax-exempt, they have sparked a large informal economy based on imports of a variety of goods, including pharmaceuticals, cars, foodstuffs, and so on.

In this political economy of Chernobyl-related illnesses, it was common knowledge that a person categorized as "disabled" was far better compensated than a mere "sufferer." Persons completely outside the system of Chernobyl sufferers knew they had little chance of getting decent social protections from the state. In this economy, scientific knowledge became a crucial medium of everyday life. The effectiveness of relating one's dose exposures to radiation-related symptoms and experiences and work histories in the Zone determined the position one could occupy in the hierarchy of sufferers, and the extent to which one could wield capital that could further guarantee state protections. Broadly speaking, postsocialist Ukraine presented a unique constellation in which science, state building, and market developments were quite productively intertwined, generating new institutions and social arrangements through which citizenship and ethics were being transformed (see also Biehl 2001).

When I returned to Kyiv for a year's field research in 1996, my key field site became the Radiation Research Center.[23] In the Soviet period, the center served as the clinical research division of the All-Union Center of Radiation Medicine. The center's staff grew from ninety to over thirteen hundred by 1991. These numbers reflect its growth in status as an important social institution; they also illustrate how in the context of economic crisis, government bureaucracies expand rather than contract to provide their own forms of social protection. The center monitors patients with acute radiation sickness and conducts research on the clinical outcomes of human exposures to ionizing radiation. What is most important, it houses the national-level medical-labor committee (*Ekspertiza*), a group

of scientists, clinicians, and administrators who are responsible for evaluating the health of Chernobyl Zone workers, resettled families, and inhabitants of contaminated areas. Their job is to evaluate a patient's level of disability (or loss of labor capacity) and to either verify or disavow the etiology of that disability in Chernobyl-related radiation exposure. Members authorize the Chernobyl connection or "tie" (*sviaz*)—a legal document attesting to the link between certain illnesses and radiation exposure. The tie entitles its bearer to social protections in the form of pensions, health care, and even education benefits for children. This package of benefits is, comparatively speaking, much better than average pensions and is therefore very desirable. As of 2000, the state paid an average twelve dollars per month for social insurance. The poverty line was approximately twenty-seven dollars a month. For persons disabled by the Chernobyl accident, for the same period, pension benefits averaged between fifty-four and ninety dollars per month, depending on degree of disability. A sufferer, a person who does not have disability status but has the status of having suffered from the Chernobyl accident, received twenty dollars per month, on average.

Through contacts with politically active groups of disabled Chernobyl Zone workers who frequented clinics, I obtained permission to conduct research in the clinical wing of the center (known as the Clinic). By 1996, the Clinic had become an epicenter of medical-scientific and legal wrangling. Exams, scientific resources, and specialized medical treatment became precious assets for patients who were fortunate enough to be there, helping them qualify for lifetime compensations. I was allowed to observe interactions among physicians, nurses, and patients; to attend decision-making meetings related to compensation claims; and to examine current research, particularly in the Clinic's Division of Nervous Pathologies. This choice of division was intentional on my part. Medical-labor committee members told me that the majority of all disability claims were channeled through neurological wards on account of a variety of nervous system disorders. Yet it was unclear whether these disorders stemmed from social stress owing to the country's dire economic situation or from Chernobyl radiation exposure, or from some combination of the two. In addition to talking with scientists, health workers, and administrators, I conducted extended interviews with sixty male and female patients (aged 35–55) and reviewed their medical records. I documented the course of their illnesses, diagnosis, and progress in obtaining disability status (*oformyty hrupu*, which means "to make the group"). I also worked with three of the Chernobyl funds, tracing the history of their membership and looking into their strategic relationships with the Clinic and the medical-labor committee. A final part of my work involved following the everyday activities of five of the Clinic's male patients and their wives and children.

I was interested in how these men's induction into this novel political economy of illness was influencing their identities as breadwinners and father figures, as well as affecting their mental health. I was particularly interested in these men's changing sense of *lichnost'*, a Soviet concept of personhood that was expressed in individual commitment to work and to the labor collective; and in how married couples were using radiation illness as a means of subsistence in the new economy.

The ways in which scientific and social knowledge circulated at public and private levels also framed aspects of the ethnographic encounter. How people expressed their grief, how the demands of institutional settings shaped their discourse and body language, and how they elicited the responses they needed from technocrats (and their choices of words or silences) all found their place in the political and scientific regime that defined everyday life. People's actions, politics, and sensibilities were encoded in and restricted by the professional and legal discourses of this rational-technical domain.

At the same time, codes are secrets, signals ensuring privacy; they are systematic abbreviations of human experience. In new technologically mediated contexts, social scientists have voiced concern that our capacities to think critically about moral values are being lost within the expedient languages of bioethics (Churchill 1999:259). What has been called a principlist approach to bioethics is said to work precisely because it is reductive and is widely adaptable to moral problems and dilemmas in a pluralistic society (Callahan 1999:283). One casualty of this standardization of bioethics is knowledge of how certain ethical norms propagate in actual and diverse settings, and of the particularities of local conditions and moral accounts as they may bear on or challenge universalized ethical framings (Kleinman 1999, Cohen 1999).

Such critiques of bioethics challenge ethnographers to restore language adequate to account for contexts where, in the terse words of the director of the Shelter complex, "the value of the human is yet to be determined." My concerns are not with the rhetorics and images that project the value of the human as universally given but with the mundane office spaces, clinics, wards, and homes where the chances for justice, benevolence, and nonmaleficence routinely disintegrate; where individual accounts of suffering, if they are to be heard at all, must transmogrify into numbers and codes fitting standard categories.[24]

Nation Building

Chernobyl was a watershed event marking communism's end, defining critical tensions in international relations, accelerating processes of

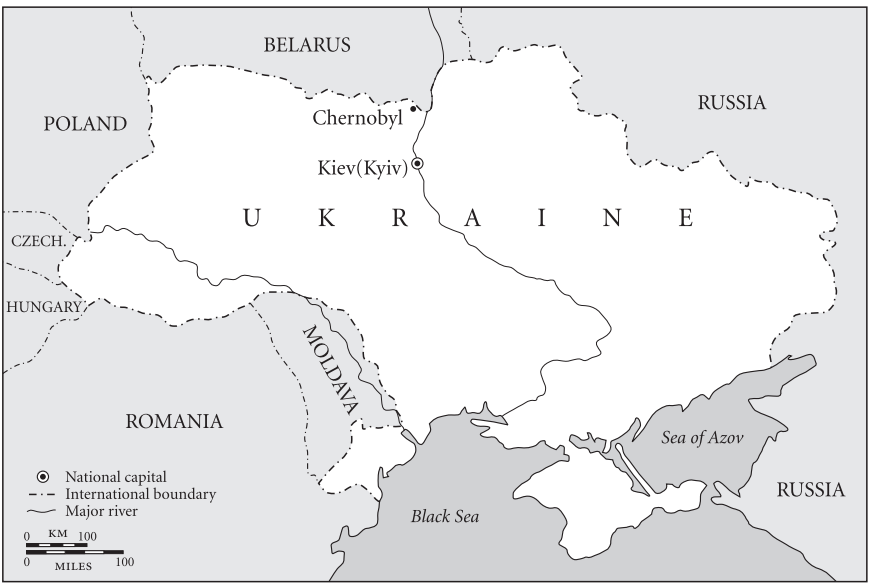

Figure 1. Map of Ukraine

glasnost, and giving glasnost exceptional relevance in Ukraine. The disaster generated consequences, many of which are yet to be grasped, and whose truths have been only partly revealed through estimates derived from experimental science. 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 here stabilization proves to be a much more difficult task. That is because reality can subvert scientific claims to certainty and truth. As Ulrich Beck notes, in the flood of contradictory findings that is so characteristic of large-scale industrial disasters, scientific reason can break up into many sets of competing rationalities "with specific claims to errors, deceptions, and truths" (1992:167). Such uncertainty in scientific spheres can produce a social and political unraveling. In the Ukrainian context, the unraveling has taken the form of an expanding set of claims based on Chernobyl-related damages. Such claims reflect new experimental fabrics in which science, nation building, and market developments are interdependent, and where the biology of citizens becomes a contested part of a political process and a tool of government.

Ukraine is located between Poland to the west and Russia to the east, both of which (in addition to the Austro-Hungarian and Ottoman Empires) have laid claim to Ukrainian territories over the past three centuries

(figure 1). At the time of the disaster, Ukraine was the second largest of fourteen republics of the Soviet Union, with a population of approximately fifty million.[25] Once known as the breadbasket of the Soviet Union, the country is also a land of pogroms and wars. Many Ukrainians today regard the region as having been a brutal laboratory for Stalinist collectivization campaigns and the site of a state-induced famine of 1932–1933 in which, according to one estimate, six million people are said to have died.[26] Many immigrants know it as a place from which their Jewish ancestors, survivors of pogroms, fled in the late nineteenth and early twentieth centuries. During World War II, German and Soviet armies clashed in Ukraine's villages and cities, leaving behind ruins as well as new social spaces for the mobilization of public support for the socialist order, as evidenced by rapid and massive postwar reconstruction efforts. In the late sixties, Chernobyl was built as a kind of reactor theme park to show the world how advanced and well-organized Ukrainian socialist society and life had become.

Like other nascent post-Soviet states, Ukraine became sovereign and democratic without much prior experience. In the last century, Ukraine achieved sovereignty for a brief period in 1918, before Bolsheviks took over the capital.[27] One of the leaders of that failed attempt declared: "Truly, we were like the gods. . . . attempting to create a whole new world from nothing" (Vynnychenko 1920:258, quoted in Subtelny 1988:354). Interestingly, national identity in Ukraine is, in part, an effect of a Stalinist policy called *korenizatsiia* (rooting). *Korenizatsiia* created nationalities that were fundamental to a kind of ethnoterritorial administration of socialist republics (Slezkine 1994). The motto of this policy was "National in Form, Socialist in Content." Yet when the Ukrainians, Uzbeks, and Estonians among others emerged from their ethnoterritories, they did so at a time when prospects for building strong nation-states were faint. Ukraine was trapped in a paradox of having to constitute itself at the same time nation-states were increasingly becoming destabilized by globalizing forces. Although ethnically mixed, the country's metamorphosis from a Soviet republic to an independent nation occurred without armed conflict—Ukraine never became the ethnic tinderbox that some American observers predicted it would be. These predictions were based on assumptions about ethnicity as the decisive marker of national belonging and therefore of possible internal conflict or war. What these observers failed to recognize was that their imaginary ethnic types were not at all predisposed to war. Instead they were asserting values related to life, values that were expressed not in spite of but because of a Soviet experience.[28]

Neither do the processes leading to Ukraine's independence support a triumphal narrative in which a victimized Ukrainian nation subverts its

colonizing master (Torbakov 2001:462). Soviet welfare legacies played an important role in shaping the way in which support for independence was won. At the time of independence, about 40 percent of all inhabitants of the Ukrainian republic were receiving one or more cash benefits. Legislators knew that in order to justify statehood and to win over citizens, they had to appeal to these inhabitants' materialist side. They had to promise enhancements to a Soviet-style welfare state, including health and welfare benefits, in addition to guaranteeing civic freedoms, human rights, and equal participation in political life—what are generally regarded as the principles of a "classical citizenship" (Schnapper 1997:201). Soviet welfare legacies, as well as the dire economic conditions in which Ukraine declared independence, created a context for division and competition among groups for social welfare.[29] Thus the struggle for claims rights went hand in hand with a more universally bestowed civic logic of citizenship (202).[30]

In 1991, the year Ukraine declared independence from the Soviet Union, leaders of this once socialist republic condemned the Soviet administration of the Chernobyl aftermath and began fostering their own political legitimacy. Nationalists, Communists, and Democrats alike entered into a novel (and short-lived) political alliance when they unanimously denounced the Soviet administration as an "act of genocide." The charge of genocide referenced a national symbol of Soviet oppression, the 1930s famine, often described as man-made.[31] Legislators claimed that not only had the Soviet state apparatus failed in its obligation to protect citizens' lives during Chernobyl but that in its denial of the event and its effort to restart the nuclear program, it had exacerbated patterns of morbidity by delaying intervention.

Legislators (many of whom had had roles in the Soviet administration as its dissidents, cleanup workers, and implementers) viewed their political alliance as an opportunity to quickly do away with central power. This was especially true of well-organized Ukrainian Communist elites who, after much of the initial symbolic power of anti-Soviet nationalist groups such as Rukh had waned, rose to central prominence.[32]

In this moment of nation building, one could observe how bioscientific knowledge became a crucial medium in state-building processes and in the establishment of new policies guaranteeing safe living, social equity, and human rights. Legislators assailed the Soviet standard for determining biological risk to populations. The Soviets had established a high 35 rem spread over an individual's lifetime (understood as a standard seventy-year span) as the threshold of allowable radiation dose intakes.[33] This threshold restricted the scope of resettlement actions. Ukrainian law lowered the threshold dose to 7 rem, comparable to what an average American would be exposed to in his or her lifetime. In effect this

lowered measure for safe living increased the size of the labor forces going to the Zone (since workers' stints had to be shortened if they were to avoid exceeding the stricter dose standards). The change also expanded the territory considered contaminated. A significant new sector of the population would want to claim itself as part of a state-protected post-Soviet polity. One radiation protection specialist, who conducted retrospective dose assays on resettlers, recollected: "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 *they all wanted to know their dose*."

The laws also made the "normal citizen" financially liable for the sufferer. A 12 percent tax was automatically deducted from the income of private businesses and state enterprises to fund Chernobyl laws on social protection. Such financial and moral obligations were meant to create a national bond—where otherwise there might not have been one—between sufferers and nonsufferers. Put another way, the Ukrainian laws attempted to "settle accounts" with the deleterious Soviet past, a retributive process first outlined by John Borneman in East-Central Europe (1997). The Ukrainian process was not about retribution per se, a process whereby people are rewarded or punished for past deeds; it was about compensation (*kompensatsiia*). Ukrainian administrators, many of whom had managed the Soviet containment of Chernobyl, were now authorizing payments on behalf of the state to those who claimed damages. These administrators did not thereby suffer any losses of employment or prestige, a key feature in retributive processes; in fact, many of them materially benefited from those processes by claiming material and physical damages themselves. The laws they implemented went beyond the goal of adding predictability to a democratizing process through retribution (ibid.). They inscribed Chernobyl as a key moral, economic, and political event in daily postsocialist Ukrainian life. They also fostered new appropriations (and misappropriations) of the law in the context of social and economic upheaval; compensation as a form of payment for past damage was reinterpreted as a form of market compensation.

With the lowered dose standard, more and more people became active participants in a system of compensation and social protections. State statistics registered sharp increases, starting in 1991, of Zone workers, resettled persons, and inhabitants of contaminated territories registering their disability, and in this new population's annual patterns of enrollment. Such social statistics became a kind of "moral science" (Hacking 1991) through which the government revealed the effects of prior mismanagement and guaranteed its own social legitimacy while keeping world attention on Chernobyl-related risk.

Injured workers, resettled families, physicians, scientists, lawmakers, and local civil servants were increasingly bound together through law. And together, they constituted a set of public interests in which state and civil society negotiated a new social contract based on a right to know and "safe living." Though the laws addressed a broad constituency, they were selectively applied, and "every one knew that." The fight for disability status became the source of new solidarities and tensions. As the market economy took over, access to state protections and benefits became restricted. Persons claiming injury and the arbiters of those claims became consumed in public dramas over who had right of access to a system of compensation and social protections.

The state's social welfare system expanded rather than contracted in order to accommodate the large influx of new Chernobyl sufferers. This rapid expansion defied Western prescriptions for a smooth transition to market economics—prescriptions that mandated a decrease in the social expenditures of the state. Sufferers became knowing participants in the logics of this transitional state expansion. These everyday events constituted a moral microcosm of the paradoxes of an emerging democracy founded on ethical principles of justice, benevolence, and human rights. If, on the one hand, these Chernobyl laws engendered new and demonstrably democratic forms of civic organizing and opportunities for nongovernmental action, on the other hand, they became one of the state's most notorious mechanisms of corruption, one through which *blat*, for example (a term denoting the informal practice by which access to state privileges and protections could be obtained with connections or material resources), could persist (Ledeneva 1998).

Experimental Systems

As the everyday experience of Ukraine's citizens—sufferers and nonsufferers alike—demonstrates, the Chernobyl aftermath is by no means a phenomenon confined to the past, interpretable as mere psychological trauma, or reducible in terms of scientific absolutes. Rather, it is a dynamic lens for understanding the role of science, economics, ethics, and politics in the arrangement of a postsocialist civil society. Fields as diverse as radiobiology, health physics, molecular biology, neurology, neuropsychiatry, and social psychology contribute to the aftermath's data-producing enterprise. These sciences define, quantify, psychologize, biologize, and geneticize; their isolated facts can thus obscure the aftermath's more general dimensions. From an anthropological standpoint, scientific facts become significant in terms of how, in their partiality, they become incorporated into an ongoing struggle for life, understood here as a complex

and often painful interplay between technical visions for managing the accident's effects and lived individual and social disturbances. The vitality of the aftermath's knowledge-production arises from the changing dynamic between the known and the unknown, and the complex ways that people become incorporated into it as subjects, objects, proxies, agents, and victims.

In scientific circles, Chernobyl has been valued as a kind of "experiment," allowing scientists to corroborate or refute biomedical data concerning the long-term health consequences of nuclear exposure ("Chernobyl's Legacy" 1996:653). In this analysis, I take the meaning of experiment in a wider sense, and examine how technical interventions aimed at containing the aftermath introduced new uncertainties in social and scientific arrangements. Hans-Jorg Rheinberger has observed that this kind of experiment is manipulative, "designed to give unknown answers to questions which themselves we are not yet able clearly to ask" (1995:110). Experimental systems are "machines for making the future" (Jacob 1988, cited in Rheinberger 1995:110). This definition provides an ethnographically rich alternative to the more traditional notion of experiments as "singular, well-defined instances embedded in the elaboration of a theory and performed in order to corroborate or to refute certain hypotheses" (109). Rather than achieving an isolated instance of certainty as the result of a rigidly controlled environment, experimental systems produce new and unanticipated resources in environments where little if anything is held constant.

In the Soviet setting, whole populations were understood as "new resources." "Our social psychology would be empty," wrote a leading Soviet social psychologist, "without the remarkable experiment of our people led by [the Party] in the reformation of the psychology and consciousness of the Soviet people." For these scientists, human nature itself was a newly liberated resource, open to tinkering with within an experimental paradigm. Thus, social psychologists sought to demonstrate the accumulation of "new facts and laws of socio-mental [*sotsial'no-psikhicheskii*] phenomena." Consciousness, epistemes, and mental phenomena were cogenerated within such a paradigm; they expressed themselves in the form of "socially conditioned reflections of reality" or "reflections of objective reality in the form of sensations, ideas, thoughts, feelings, voluntary actions, and the like" (Kuzmin, quoted in Slobin 1966:87).

That human nature could be engendered experimentally, that novel cognitive capacities could be constructed and accumulated over time, speaks to the profoundly interventionist character of science in everyday Soviet life. What has consistently come as a surprise to Western observers is the extent to which Soviet and post-Soviet individuals could describe the constructedness of their psychological capacities with such accuracy

and without relegating them to the realm of an unknown or an unconscious (Inkeles and Bauer 1959:142).

The ability to unmask behavior as socially conditioned, the capacity to "disown" the psychological structures one inhabits, has been characterized as a by-product of Soviet pedagogical programs that focused almost exclusively on ensuring the dominance of the collective over the individual (Kharkhordin 1999). Mastery of these kinds of unmasking abilities is clearly evident in the way post-Soviet scientists related to some international scientific experts who framed Chernobyl as a largely psychosocial phenomenon; this framing was interpreted as telling an incomplete story and obscuring more complicated truths. In a speech commemorating the tenth anniversary of the Radiation Research Center in 1996, for example, I listened as the former Ukrainian minister of health at the time of the Chernobyl disaster toasted the progress of Chernobyl science. His audience included scientists and clinicians who worked tirelessly with leukemia, cardiac, and acute radiation sickness patients (among others) several floors above the meeting hall. With his glass raised, the slightly inebriated bureaucrat and scientist burst out, "Friends! Yesterday we were ignorant, today we are mental cases, and tomorrow, *who knows what science will bring!*"

These words resonated remarkably (and uncannily) with English philosopher Alfred North Whitehead's 1926 observation, "Heaven knows what seeming nonsense may not to-morrow be demonstrated truth" (Whitehead, cited in Arendt 1989:290). Whitehead's comment is a call for grounding scientific abstractions in their human consequences and realities. When such grounding is absent, persons, their behaviors, and their natures run the risk of conforming to illusory truths. And this loss of touch with reality was precisely what the former minister's mordant humor mocked. That he could draw humor from his own record of ethical neglect speaks to the essence of tragedy—to what Whitehead so aptly described as "the solemnity of the remorseless working of things" (1926:11).[34] In this moment, postsocialist scientists have before them the opportunity to transcend a personhood founded on a collective adherence to objective reality; to imagine and speak from different ethical locations; to deploy moral critiques of a science-as-human-progress paradigm.

Docta Ignorantia

Persons occupying "lower" orders of the social scale—the collective farmers, policemen, and industrial workers who became sufferers or persons claiming disability—deployed critiques of their own, albeit in much

more subversive ways, as a means of asserting their human rights claims. They took up their roles—in many creative ways—as the "epistemic murk" of scientific progress (Taussig 1987). Where absolute truths prevailed, so did ignorance; where emphasis on the precision of facts ruled, so did imprecision. This is not to suggest these individuals were "anti-science." Rather, they became masters of the reality of what science did not know about them. Ignorance, understood as a form of self-assertion, is fundamental to scientific progress too.

A brief excursus into the processes by which modern forms of self-assertion could prevail over a period of self-abnegating absolutism may prove useful here. In *The Legitimacy of the Modern Age*, Hans Blumenberg devotes two chapters to the importance of ignorance in the story of progress in modernity. He takes his example from the formulations of a medieval speculative metaphysician, Nicholas of Cusa.[35] In his treatise, the *Docta Ignorantia*, the Cusan opposed the Scholastic belief in knowledge as "the end of a summation process of what is humanly knowable" and replaced it with a "novel cognitive procedure." Blumenberg interprets the Cusan's work as an attempt to provide "something like a mundane and human compensation for theological absolutism." The *Docta* reflects "skeptical resignation vis-à-vis the metaphysical pretensions of the age with an element of indefinite expectation of a knowledge that could no longer have the form it had had hitherto" (1983:492).

For Blumenberg, "ignorance" conveys a spectrum of meaning, from a "mere misfortune of the pretension to truth" to a "positivized negativity" (493). Ignorance does not represent a negative state of knowledge. Nor does it imply a simplistic lack of access to or unwillingness to recognize the truth. It refers to "a praxis, a method, a path to a certain sort of attitude" (490). The Cusan's example demonstrates how the modern idea of scientific progress will be the sum total of something like ignorance, knowledge, and imprecision as an important "intervening phase *between simpler truths and more complex ones*" (504; emphasis added).[36]

This last point marks a pertinent shift: from a scientific knowledge that is accessible to a privileged few, to one that acknowledges a lack of closure and thus provides more people with a stake in its epistemological rules (Kohler 2001). That this science can be the sum of knowledge, ignorance, and imprecision becomes part of the plasticity of the biosocial experience I illustrate here, and what enables many sufferers to get a foothold in this world. The indeterminacy of scientific knowledge about the illnesses people face and about the nature of atomic catastrophe emerges here as both a curse and a point of leverage.

The word ignorance expresses how the Ukrainians depicted here saw and continue to see themselves within (and, more recently, how they are capable of manipulating) a hierarchy of knowledge and power. The flip

side of ignorance is what I saw as the savvy comprehension among affected individuals of the shifting stakes, experiments, and technologies in the international life sciences that implicated them in, or excluded them from, an experimental knowledge process. This "bios" of Chernobyl becomes an unexpected yet highly versatile cultural and political resource.

■ ■ ■

Ivan Nimenko learned how to navigate these new times. He was moving up the social-welfare ranks from sufferer to disabled person. While working in the state militia in the first weeks following the accident, he was ordered to evacuate the residents of Prypiat', a city of fifty thousand housing nuclear plant workers and their families, within thirty-six hours after the disaster. I met him in the Radiation Research Center. Once closed to foreigners, the center is a highly charged bureaucratic and clinical institution in which workers' occupational injury claims are made and stamped as authentic. Nimenko, like any prospective disabled person, sought the Chernobyl "tie." As he put it, "This is the document I need for my health." The "tie" would assert that his illnesses are not "general" but rather are attributable to Chernobyl.

Nimenko was admitted to the center's Division of Nervous Pathologies with a diagnosis that read "cerebral arteriosclerosis with arterial hypertension, osteochondrosis, gastritis, and hypochondriacal syndrome." Such a complex of diagnoses was not uncommon and suggested that he might be merely a "psychosocial" case, and therefore ineligible for the benefits he sought. He needed to eliminate that possibility and replace it with an unconditional radiation-based etiology. Fundamental to this task was a radiation dose assessment that he had fought hard to get. Nimenko knew that according to international nuclear industry standards, a worker can incur up to 25 rem over his entire lifetime. He had incurred at least 25 rem in just ten years. Through a brother-in-law, a laboratory director, Nimenko had managed to enter the system, to be assigned a coveted hospital bed, and to receive a medical examination. He could count on familial connections, old Soviet, primarily urban-based, informal exchange networks, and the system of *blat* to establish his legal status in the new state. He was successful.

Like many others, Nimenko maintained that he was historically unaccounted for in the Soviet administration of the disaster. Referring to the lax radiation monitoring of Chernobyl workers, he said, "Regarding our individual cases, they wrote nothing. If there was any distinctive mark written about us in the registers, it read 0.0 (*nul'-nul'*), whatever the unit of measurement was." In characterizing his dose exposure as *nul'-nul'*, Nimenko recognized himself as having gained no legal weight, no

consequence or value, during his Chernobyl work. For Nimenko, this Soviet 0.0 symbolized false accountability. Even now, scientists involved in executing the Soviet state's disaster response maintain that only 237 people with known doses are legitimate acute accident victims, and that only 31 of those died from the disaster. These kinds of squared-off facts defined the scope of the disaster's consequences and foreclosed compensations to many like Nimenko, whose injuries might not become evident until later. Nimenko knew these numbers by heart.

A 1991 British television documentary shows the grueling labor Soviet administrators demanded of the workers sent to Chernobyl. The documentary describes a particular cleanup effort that took place in September 1986, four months after the initial explosion. Soviet administrators were intent on restarting Unit Three of the power plant, adjacent to the exploded unit. But debris from Unit Four covered the third unit's roof, delaying start-up. Initially robots were deployed to remove the roof's radioactive debris; radiation levels were so high that the electronics powering these robots failed. A month later young men, their bodies covered with primitive lead suits, rubber gloves, and thin cloth face masks, were conscripted to complete the job.

In one segment of the documentary, workers who are about to go up onto the roof are shown scenes from a video monitor posted on the roof of the third unit. "This is how your mates do the work," the work unit commander says. The workers are instructed to be on the roof for no more than one minute. They are told that within that time frame they must shovel radioactive debris and hurl it over the parapet into containers below. They are to repeat the process once more, and then run for their life.

At the end of the segment, a representative from a group of disabled persons is interviewed. He refers to these men as the original "bio-robots." The label suggests that Soviet administrators exploited workers' biology as a resource to contain the disaster. In the representative's own words, biological resources were "to be used and thrown out." According to one biochemist, many of these bio-robots were exposed to six to eight times the lethal dose of radiation, "They are alive," he said; "they know that they didn't die. But they don't know how they survived." This "ignorance" over how they survived does not stem from a lack of knowledge; it is a political consequence of decisions concerning how to approach what could and should be done to mitigate danger or disease (Proctor 1995:7). In the face of overwhelming danger, the state slated certain workers for bio-robotic death. Those who survived this political decision were abandoned to a gray zone of scientific and bureaucratic indeterminacy.

Approximately 50,000 of the 600,000 workers sent into the Zone over a ten-year period did work of this extreme nature. In the Ukrainian period

of disaster administration, this experience was taken up as an emblem of the deadly effects of the Soviet response to the accident, and, more, it opened the possibility of a new politics which took that very injury as legal material. This process became part of the social history of an emerging postsocialist personhood. In his essay on the subject, Marcel Mauss states that personhood is "more than an organizational fact, more than a name or a right to assume a ritual mask. It is a basic fact of law" (1985:14). Indeed, the law of scientific indeterminacy introduced by the disaster's interventions allowed for new legal personhoods founded on incalculable harm.

New gender dynamics and domination were also at stake in this new legal and moral environment. In 1996, another representative from a fund told me the first words he spoke to his wife and son when he returned home from work: "Get away from me, I am contaminated!" Kulyk was a mere thirty-eight years old when I met him, but he looked at least sixty. He lay on a living room couch, a kind of centerpiece, surrounded by members of his fund. As he spoke, his wife, Tania, mocked her husband's "stupid sense of duty." She was left to take care of a deteriorating person, "He was a Party secretary, and now he is a skeleton. His stupid sense of duty is now killing everyone!" Tania explained that Kulyk had experienced all the signs of acute radiation sickness: "He frequently lost consciousness; he coughed and vomited blood. . . . He is alive, and that's all I know. I don't want to know what is inside his body." Every village, every housing block, every work collective knew a living bio-robot—or one who had already died.

Many who had done less dangerous labor, like Nimenko, saw these bio-robots as political kin. Unlike Kulyk, Nimenko remained physically and socially mobile. For him, science had social utility. It could be called upon to set a price on survival, to create assets based on that survival, assets that could be used to leverage the state for compensation. Nimenko had mastered a language of symptoms and science. He was also part of a disabled persons fund that mediated the claims of other cleanup workers. He was scientifically literate and had a strong sense of the value of science in empowering him to set the value of his life. He knew how to read cytogenetic tests indicating chromosomal aberrations in his cells. He used the ambiguities of radiation science—and there are many—to facilitate his chances of having his case reassessed favorably for his compensation claim. Referring to a request he had made in 1991 for a retrospective quantification of his internal dose, Nimenko told me:

> The central polyclinic of our ministry arranged a contract with the Institute of Oncology of the Ukrainian Academy of Medical Sciences. I went to the director of the polyclinic and said I want to know my dose

> burden. After three months, they gave me a dose burden based on the increase of the level of chromosomal aberrations in my blood, which testifies that radiation activity in my organism is higher than 25 rem. . . . That was five years after the accident. And if you throw away five more years, how much dose I received, *I don't know*. Obviously it was more. Nonetheless there is radiation in my body.

Where ignorance once amounted to a form of repression (in the Soviet period), it is now used as a resource in the personal art of biosocial inclusion. Nimenko based his self-account on an accumulation of unknowns. In this regard, he used scientific knowledge in a specific way: not to know but to circumscribe what he can never know. Nimenko crafted his social identity in terms of what Hans-Jorg Rheinberger in another context has referred to as a "characteristic irreducible vagueness" (1995:48). He politicized what-he-can-never-know as a means of securing his place as a scientific subject and, by extension, as an object in an official exchange relation with the state. In this move, he acquired a name, a document, and a position as an individual "in the rights he enjoys and his place in the tribe, as in its rites" (Mauss 1985:11).

The Unstoppable Course of Radiation Illness

I went to the state's Ministry of Statistics to ascertain the impact these developments in the politics of knowledge might have had on health data. To my surprise, beginning in 1990 (the year the laws on Chernobyl social protection were being publicized by Ukrainian legislators), I noticed a sharp increase in the clinical registration of illnesses under the category "symptoms, signs, and ill-defined states"—Class 16 in the International Classification of Diseases. These states include anything from insomnia, fatigue, and persistent headaches to personality changes, hallucinations, and premature senility. In a sense, people were claiming Chernobyl as *their* ill-defined state.

Table 1
Data on "Symptoms, Signs, and Ill-defined 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.

International observers, not surprisingly, grew ever more skeptical of claims to a sudden expansion of Chernobyl health effects and strongly criticized Ukrainian scientists for their failure to prove or disprove these

claims on the basis of epidemiological criteria of causality. Yet as this book shows, the complex strategies, techniques, and relations that have been engendered within this postsocialist environment are not measurable by scientific criteria of causality alone. Upon these relations of injury and compensation, other risks, particularly those connected with the market transition, are superimposed.

The collective and individual survival strategy called biological citizenship represents a tangle of social institutions and the deep vulnerabilities of persons; it is also part of a broader story of democratizing processes and structures of governance in the postsocialist states. Here the experience of health is irreducible to a set of norms of physiological and mental activity, or to a set of cultural differences. Only through concrete understandings of particular worlds of knowledge, reason, and suffering, and the way they are mediated and shaped by local histories and political economies, can we possibly come to terms with the intricate human dimensions that protect or undermine health. Seen this way, health is a construction as well as a contested way of being and evolving in the world.