Local Science, Global Knowledge:
Science and Nation after Socialism in the Novosibirsk Scientific Center, Russia

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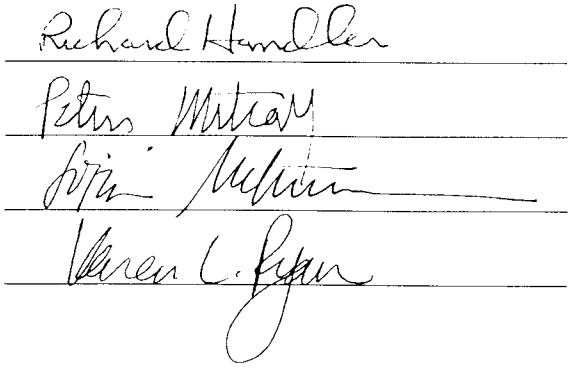

Abstract

This dissertation explores the changing relationships between science, the state, and global capital in the Novosibirsk Scientific Center (Akademgorodok). Since the collapse of the state-sponsored Soviet "big science" establishment, Russian scientists have been engaging transnational flows of capital, knowledge, and people. While some have permanently emigrated from Russia, others travel abroad on temporary contracts; still others work for foreign firms in their home laboratories. As they participate in these transnational movements, Akademgorodok scientists confront a number of apparent contradictions. On one hand, their transnational movement is, in many respects, seen as a return to the "natural" state of science—a reintegration of former Soviet scientists into a "world science" characterized by open exchange of information and transcendence of local cultural models of reality. On the other hand, scientists' border-crossing has made them—and the state that claims them as its national resources—increasingly conscious of the borders that divide world science into national and local scientific communities with differential access to resources, prestige, and knowledge. While scientists assert a specifically Russian way of doing science, grounded in the historical relationships between Russian science and the state, they are reaching sometimes uneasy accommodations with the globalization of scientific knowledge production. This ethnography argues that what counts as science—what makes science recognizable in a particular context—is more than what goes on in laboratories, but implicates how scientists imagine themselves to be part of national and even global communities.

Table of Contents

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Note on Transliterations and Names

Transliterations of Russian words use a modified Library of Congress system, omitting diacritical marks, except for names that have generally recognized forms (for example, Yeltsin, Dostoevsky).

The names of the scientists have been changed, except in cases where the details presented obviously identify them—for instance, if such details appear in other published materials, such as newspaper and magazine articles.

Chapter One

Introduction

> One cannot understand Russia with the mind.
> —Fyodor Tiutchev, 1866

> I don't know how you'll understand all this in a year; I've lived here all my life and I don't know what's going on.
> —Aleksei, Akademgorodok physicist, November 1998

These are daunting words for an ethnographer. Certainly, I was not the first foreigner to be confronted with images of Russia's incomprehensibility—in fact, I was one in a centuries-long line of visitors to Russia to hear such words. But they were intriguing because I was interested in those aspects of contemporary Russian life that seemed the most distant from romantic images of Russian mysticism: modernity and scientific rationality. Russianness has long been understood as a spiritual quality, and in this way the Soviet emphasis on planning, science, and technological control could seem like something superficial, a foreign imposition whose hold on twentieth-century Russian society and Russian imaginations was accomplished only by force. This dissertation is about the ways in which science and the imagining of a nation come together in a place and a time where it often seems as though the nation is coming apart and being transformed by—even overwhelmed by—global flows of people, ideas, and capital.

The crisis facing postsocialist Russia over the last decade has left much of the population poor and uncertain about the nature of the changes taking place in their everyday lives, in politics, and in the economy. Scientists, who once enjoyed the prestige of an important role in building modernity and adequate, stable state support for their research, find themselves with aging equipment, no chemical reagents, little access to

scientific literature, and months of unpaid salaries rendered nearly worthless by inflation. Their situation is not, perhaps, worse than that of other professions in Russia, but the dramatic change in their circumstances stands out. Many of the institutes and individual scientists in the Siberian science city of Akademgorodok have been looking abroad for opportunities to work or receive funding for their research, and the resulting movements of people, knowledge, and capital have engendered many apparent contradictions. On one hand, the transnational movement of scientists is in many respects seen as a return to the "natural" state of science—a reintegration of former Soviet scientists into a "world science" (*mirovaia nauka*) characterized by open exchange of information and the transcendence of local cultural models of reality. On the other hand, scientists' border-crossing has made them—and the state that claims them as its national resources—increasingly conscious of the borders that divide world science into national and local scientific communities with differential access to resources, prestige, and knowledge. While scientists assert a specifically Russian way of doing science, grounded in the historical relationships between Russian science and the state, they are reconfiguring the relationships between state, science, and society, reaching sometimes uneasy accommodations with the globalization of scientific knowledge production.

The experiences of Akademgorodok scientists suggest that science is much more than what goes on in laboratories. Science is intricately interwoven with the imagining of nations, places, and worlds, so much so that an outmigration of scientists, such as that taking place in Russia today, is seen as threatening not only to national security, but to the very existence of the nation. If, however, a national science is to generate progress and modernity, it cannot remain within its own boundaries, but must constantly make

connections to other national sciences. Like "culture," science's universality is constructed from its multiplicity; it is built from a dialogue between the local and the global. In Akademgorodok in the late 1990s, these tensions made science a field on which many of the anxieties about postsocialism—not least the question of national coherence—played out.

Akademgorodok

The Novosibirsk Scientific Center is informally known as Akademgorodok ("Academic Town")—only in official documents and newspapers is it referred to by its official name. It is located about 25 kilometers south of the Western Siberian city of Novosibirsk, the third-largest city in the Russian Federation and the largest in Siberia. Akademgorodok is on the right bank of the Ob' River, the fifth longest in the world, just downstream from the Ob' Hydroelectric Power Station, whose dam created the large lake adjacent to Akademgorodok, known as the Ob' Sea. The town sits at the southern edge of the Central Siberian plateau, and the land is covered with a mixed forest—mainly birch and pine—that has become the town's most memorable feature.

Akademgorodok is the headquarters of the Siberian Division of the Russian Academy of Sciences. The Siberian Division of the Academy of Sciences of the USSR was created in 1957, and construction on the town, which was built from scratch to house the Division's administration, a majority of its institutes, and residential areas for scientific personnel (apartments, shops, schools, hospitals), began soon thereafter. Akademgorodok at the time of my fieldwork in 1999 housed 27 research institutes, the State Public Scientific-Technical Library, Novosibirsk State University (NGU,

Novosibirskii gosudarstvennyi universitet), and five specialized design offices that served the institutes (Table 1.1). The Presidium of the Siberian Division administers not only

Table 1.1. Akademgorodok Research Institutes, 1999

Institute of Automation and Electrometry
Novosibirsk Institute of Bioorganic Chemistry
Institute of Computing Mathematics and Mathematical Geophysics
Unified Institute of Geology, Geophysics, and Mineralogy
M.A. Lavrent'ev Institute of Hydrodynamics
Institute of Computing Technology
Institute of Informatics Systems
Institute of Archaeology and Ethnography
Institute of Philosophy and Law
Institute of Catalysis
Institute of Laser Physics
Institute of Mathematics
Institute of Inorganic Chemistry
Novosibirsk Institute of Organic Chemistry
Institute of Theoretical and Applied Mechanics
Institute of Thermal Physics
Institute of Semiconductor Physics
Institute of Chemical Kinetics and Combustion
Institute of Solid State Chemistry and Mechanochemistry
Institute of Cytology and Genetics
Central Siberian Botanical Garden
Institute of Economics and Industrial Engineering
Institute of Nuclear Physics
Institute of Philology
Institute of Mining
Institute of Soil Science and Agrochemistry
Institute of Systematics and Ecology of Animals

Akademgorodok's institutes, but those of the whole Division (there are smaller scientific centers in Irkutsk and Krasnoyarsk and institutes throughout Siberia), and provides a link to the central Academy of Sciences in Moscow.

Akademgorodok is juridically part of Novosibirsk, located in the city's southernmost district (*raion*), Sovetskii (Soviet) raion. As such, it has no independent legal existence and no mayor; its public services, police, and schools are administered by the city of Novosibirsk. The Siberian Division administers much of the housing. Nonetheless, Akademgorodok feels separate from Novosibirsk. It looks much different from the generally gray, dirty, industrial city: Akademgorodok is small-scale, forested, generally quiet, and uncrowded; although there is a good deal of mud and litter, the air is free of the big-city smog and grit. The only form of public transportation is buses and, increasingly, private minivans; though there are more and more cars, there are no traffic jams. Large areas of Akademgorodok are covered with forest; a walk across town usually requires one to walk down a wooded path, and some of these are quite wide and well-traveled. The town is quite walkable, though buses traveling to and from central Novosibirsk make a ring around Akademgorodok linking residential areas to the institutes on the main avenue, prospekt Lavrent'eva (see figure 2.1).

People in both Akademgorodok and Novosibirsk feel as though they live in widely-separated communities: many Akademgorodok residents only infrequently make the 40-minute trip to central Novosibirsk, and while Novosibirsk residents may come to Akademgorodok to ski, enjoy the beach, or visit the botanical garden, many never see the science city at all. Both Akademgorodok and Novosibirsk residents admit that Novosibirskers, many of whom are factory workers, harbor some resentment of the

pleasant environment and, during the Soviet era, special privileges enjoyed by the scientists. Recently, however, the two are becoming closer: private minivans have cut the trip in half (but at double the price), affluent businessmen from the city are buying apartments in Akademgorodok, and there are even proposals to extend Novosibirsk's metro out to Akademgorodok.

The Fieldwork

I first visited Akademgorodok in the summer of 1995, when I participated in a Russian language program at Novosibirsk State University. Although I was struck by the idea of a large community of scientists set in the middle of the Siberian forest, at the time I was imagining an entirely different dissertation project. It was a difficult time in Akademgorodok, and I remember the contrast between the majestic forest and the crumbling buildings. I returned in the summer of 1997, this time to conduct preliminary research for a dissertation on the changes in postsocialist Akademgorodok. While in 1995 I lived in an NGU dormitory, in 1997 I lived with the Efimov family in their four-room apartment on ulitsa Tereshkovoi, practically in the center of Akademgorodok.

The major part of the fieldwork on which this dissertation is based took place from October 1998 to October 1999. After a week in Moscow, I flew to Novosibirsk, and except for a short trip to Tomsk in the summer, I stayed in Akademgorodok, again with the Efimov family, for the entire fieldwork period. I spent the fall engaged in two tasks: reading historical texts—both by local historians and the newspapers archived in the Institute of Philosophy and Law's library—and collecting life histories from

Akademgorodok scientists in order to get their sense of the changes that had taken place over the town's 40 years.

In the course of the fieldwork it became increasingly clear that forces loosely grouped under the rubric of "globalization" and "regionalism" were at the center of much of Akademgorodok scientists' discourse on the crisis in science. I began to focus more narrowly on traveling or migrant scientists—those who had worked abroad for periods of a few weeks to a few years. Some of these people had returned to Akademgorodok permanently, others were visiting friends or relatives, and others had returned at the ends of their contracts abroad only to begin to search for their next position abroad. I conducted a series of semi-structured interviews with migrant scientists; some of these interviews were one-time-only arrangements, while some were the beginning of a series of longer, more informal interactions. Networks of migrant scientists were not difficult to find—in fact, every scientist I interviewed either had worked abroad him- or herself or had a lengthy list of friends and colleagues who did.

I interviewed individual scientists in most of Akademgorodok's institutes, and I spent significant time with laboratory groups in the Institute of Semiconductor Physics and the Institute of Organic Chemistry, and shorter times with groups from the Institute of Theoretical and Applied Mechanics and the Institute of Mathematics. I focused mainly on those working in the natural sciences, though I also interviewed sociologists, economists, historians, and philosophers. Most of the interviews took place in offices and laboratories, though many, especially the more informal ones, happened in people's kitchens, at the House of Scientists, or by the tennis courts. Much of the time that I was in laboratories was either after working hours or during *obed*, the midday meal; this was

as much because my project did not focus on laboratory work per se as it was for security reasons (people often joked that I might be a spy, and I thought it best not to do anything that might encourage that perception). I also met with American and European scientists working in Akademgorodok's institutes, local teachers, Western NGO workers, and former scientists working in business, though I did not meet as many of the latter as I might have liked.

Interviews were conducted in Russian, except with American or European scientists (most of whom did not speak Russian and interacted with their Russian colleagues in English). Many of the interviews were tape-recorded; the informal interactions that form most of the ethnographic data were not, and I took notes on them as best I could afterward. I often discussed the interviews with the Efimovs and with Roza Ivanovna Rozhkova, who helped me with the transcriptions of the taped interviews; I took notes on these discussions and even taped some of them. These formed an important part of the ethnographic data as well.

Science, Nation, and World after Socialism

Russian and Soviet science has been cited both as an example of the influence of culture on science and as proof that culture need have no effect on science. Loren Graham (1998) argues that this paradox reveals the weaknesses of social constructivism as a methodology for science studies; I think it points to useful directions for cultural studies of science, particularly in the context of postsocialism and globalization. For Graham, the success of Russian and Soviet science despite its 300-year history in an "environment distinctly different from that of its origin" in Western Europe, a history that

sometimes included overt interference by the state, means that there is a universal and natural, if not always obvious, distinction between good and bad science, and between science and other "cultural products" (1998:4). "The fact that science, including the best science that we possess, is a social and cultural product should not prevent us from seeing the superior value of knowledge that stands up to empirical tests and intellectual analysis" (1998:27).

Soviet science is often held up as an example of the influence of culture and politics on science, though most often this is imagined as a pernicious effect, the compromise of science's purity by "ideological intrusions." This is a critique of Soviet science, not a critique of science, and in fact relies upon "realist" definitions of science as a mirror of nature. A science that is shaped by its cultural context is assumed to be a deviation from the norm of an objective science that stands wholly outside culture. Much work on Soviet science—particularly during the Cold War—was interested in evaluating Soviet science's successes and comparing them to the West's, and usually Soviet science did not fare well in the comparison. Soviet science was said to be insufficiently objective, inadequately creative, and overly focused on industrial and military applications (see, for example, Graham 1993:1; Josephson 1991:318-327; Vucinich 1984:3-4; and Nelkin 1995:15 for a critique). A relatively low number of citations of Soviet scientists in Western journals and a lag in the number of Nobel prizes awarded to them was taken as a sign of Soviet science's "failure to keep up" with "world science" (Fortescue 1990; Gustafson 1980; Josephson 1991), a failure caused by state meddling in scientific affairs: the setting of research agendas, funding priorities, and theoretical paradigms by bureaucrats, politicians, and scientists rather than scientists alone. In this

way, research on the "role of culture" in Soviet science has tended to reinforce images of science's transcendence of culture.[1]

Soviet science's "failure to keep up" or "lag" was prominent in Soviet discourse too—in fact, a perceived lag in the construction of science cities was behind the construction of Akademgorodok. In Russia in the late 1990s, scientists are intensely concerned with "maintaining the level" of their research in the face of economic crisis and with the possibility that Russian science may no longer be lagging, but decaying and dying. Science is comparable across national boundaries, but Russian scientists are increasingly aware that the transnational "imagined community" of scientists intersects with economic and political hierarchies developed under conditions of expanding global capitalism, and that these hierarchies turn back upon the ways national sciences are configured. I ask here how the relationships between Russian and "world" science are transforming—integrating and separating, keeping up and falling behind—and how these transformations are, in turn, implicated in the drawing of boundaries around Russian science.

While science may appear to be outside culture, historians, philosophers, sociologists, and anthropologists have shown that it was born in early modern Europe, relies upon peculiarly Western assumptions about mind, body, and nature, and is shaped by and shapes local understandings of race, gender, and other categories of difference. Science's "culture of no culture" turns out to be a culture (Traweek 1988), and its ideal of "value-free" research turns out to be a value (Harding 1998). Science's universality has been "brought down" to the local and the cultural. But when science is a national symbol, it must also rely on universality, on the sense that there is some underlying

natural reality that is being accessed or represented in more or less accurate ways. Having shown that science is embedded within local systems of meaning, we now need to take science out of its locality again, and look not only at how scientific universality gets constructed in particular locations, but how and what the universality of science means. If science were not assumed to be universal and the models of the world it produces "real," it could not have quite the nation-building force. The "problem" of culture in science always implicates processes recently labeled "local-global," and always involves looking both inside and outside the laboratories, at scientists acting as scientists in some contexts, and in other roles—as citizens, subjects, and agents—within scientific contexts and institutions as well.

A strong challenge to scientific universality and its attendant ideals of objectivity and rationality has come from feminist science studies. Scholars in this field have made two related points. First, science's "ideal knower" is not a disembodied mind removed from systems of signification and encountering nature unmediated; the structures of scientific reasoning and knowledge production presume a white, European male subject (Harding 1990; Keller 1995; Longino 1987). While not overtly "feminist," Shapin (1994) and Shapin and Schaffer (1985) have shown that this white male subject, in the early modern period, was also an honorable gentleman, the sole social category whose witness to natural phenomenon can be relied upon as credible. Women and non-gentle men, then, can only problematically embody the "ideal knower" (Haraway 1997). Second, science produces gendered and raced subjects and bodies (Haraway 1991:199-200; Schiebinger 1993). For Haraway (1997:27), the exclusion of women from the category of "witness" in science is a starting point for understanding how gendered

distinctions are produced and reproduced in science. Other feminist scholars, mainly Marxist-inclined ones seeking to appropriate and transform the gendered subject of science, have argued that women's exclusion from the status of "ideal knower" on the assumption that they are too deeply embedded in social relations should be translated into a "feminist standpoint," an epistemological stance from which women can see wholes, can be in fact more objective than can the universal male knower (Hartsock 1983; see also Harding 1986).

Haraway (1991) has argued that the either-or distinction between "value-neutral" and "value-laden" science could productively be replaced by a continuum of relative objectivity, and that evaluations of objectivity should take into account the knower's position in various networks of social relationships and cultural signification. Such "situated knowledges" would avoid the essentialism of standpoints by considering the complexity of scientists' social positioning. But while Haraway rejects the idea that there can be a "view from nowhere," her program for objectivity also rejects a symmetrical, relativist "view from everywhere."

These feminist models of substantially different kinds of science—what Harding (1986) calls "successor sciences"---conceptualize the relationship between science and culture primarily as one between the cultural position of the knower and the cultural construction of the known—mainly an epistemological question. But the emphasis on subject-object relationships as constitutive of science and culture has sometimes led to static reifications of culture, or essentialized and monolithic identities that do not allow for multiple and competing women's perspectives, such as those of Third World women (Harding 1986; Narayan 1989).

Sarah Franklin's essay "Science as Culture, Cultures of Science" (1995) shows how anthropologists have approached science from two angles: demonstrating that local, often Western, cultural frameworks give shape to scientific worldviews, and exploring how concepts of, for example, kinship, disease, immunity, procreation, and life itself are emergent from and constructed around scientific discourses. These efforts at contextualizing science are of course related—both break down the boundaries between the lab and the world, emphasizing instead how culture flows in and out and how the boundaries get constructed. Therefore, Franklin notes, the tendency in anthropological studies of science has been toward a multisited examination of science in and out of the laboratory, like Sharon Traweek's later work on physics (1992, 1995), Emily Martin's tracking of ideas about the immune system in American culture (1994), and a great deal of work on new reproductive technologies (for example, Strathern 1992; Franklin and Ragoné 1998; Franklin 1997; Kahn 2000).

Most anthropological studies of science have focused on Western contexts, following a more widespread movement toward the "repatriation" of anthropology (Marcus and Fischer 1986). A few studies have dismantled the monolithic "Western-ness" of science, showing how even mainstream Western science is comprised of diverse and sometimes incompatible local and national styles of work. Stacia Zabusky's (1995) study of the European Space Agency shows how scientists bring the European Union's values of "unity in diversity" to bear on international scientific projects, while Paul Rabinow (1999) details the collapse of an American-French research project on the genetics of diabetes. In both cases, the boundaries between laboratory and culture-at-

large are not only porous, they are the site of a great deal of contestation, as scientists work to control the ways culture continually creeps into the lab.

A few anthropologists, notably Sharon Traweek (1988, 1992, 1993, 1995) have looked at science outside the West. Traweek finds that Japanese high energy physicists are equally as committed to, in her now-famous phrase, "the culture of no culture" (1988:162) as their American counterparts are. Nevertheless, Traweek shows, not only are there significant differences between Japanese and American high-energy physics research institutes, groups, and approaches, but Japanese physicists are more interested in those differences than Americans (1988:14, 151). Physics laboratories in both countries appear as contingent upon broader cultural models of work, group, and individual, state and global politics, the operation of bureaucracies, and the interaction of private and public sources of capital. Traweek shows how physicists carefully demarcate these "external" factors from the knowledge they produce, which they agree is not cultural and not contingent.

Japanese high energy physics is part of science's "culture of no culture;" that is, high energy physicists everywhere recognize what their Japanese colleagues are doing as science and tend to minimize the significance of "Japanese-ness" in physics. In that sense, Traweek's work on Japanese physics, though it is set in a "non-Western" cultural context, is commensurate with studies of Western science that show how scientific values of objectivity and rationality appear to transcend local cultural models of the world. In colonial, postcolonial, and diasporic contexts, however, the scientificity of knowledge—what counts as "science"—is very much at stake, and brings into view negotiations over the national identity of knowledges, the universality of science, and the deployment of

scientific knowledge in state projects of control and domination. As Donna Haraway's history of the interactions between Japanese, Indian, Western, and African primatology suggests, multinational scientific communities have been shaped by common historical forces—"post-World War II material and semiotic fields"—as much as by local conditions (1989:263). In this study, therefore, I aim to show what the construction of cultural transcendence and universality means in postsocialist Akademgorodok, rather than argue that it ought to be debunked as "merely" local knowledge.

In India, a long tradition of Hindu scholarship intersects with discourses of universal modernity, progress, and development brought by British colonialism; both have been, sometimes simultaneously, fostered by Indian scientists and the postcolonial Indian state. Ashis Nandy's (1980) biographies of physiologist Jagadis Chandra Bose and mathematician Srinivasa Ramanujan portray two Indian scientists who struggled, in different ways, to find a place for a science made "Indian" as much by its drawing on Hindu cultural sources as by the fact of its being practiced by Indians, within—not outside or opposed to—a hegemonic Western rationality. Although Nandy is interested primarily in what Bose's and Ramanujan's lives reveal about the psychology of scientists and colonial subjects, his work points to the ways in which "alternative" and "mainstream" sciences mutually constitute one another.

Gyan Prakash's (1999) history of modernity, science, and the Indian nation explicitly connects science's claim to universality with the imagining of the uniqueness of nations. Prakash shows how Indian nationalist political figures and intellectuals formulated a "different modernity" in which India, not the West, was the site of universal modernity. Science—or more specifically, an indigenous scientific tradition that met or

even exceeded the scientificity of Western or universal science—was the marker of nationhood: "to possess a scientific tradition of one's own not only meant that one had existed as a people long before the British set foot in India, but also that one's existence as a community was irreducibly different" (1999:230). While critics of Western science have debunked its universality by showing how a diverse set of ideas and practices congealed in early modern Europe and how science continues to be transformed by and engage with Western cultural processes, Prakash shows how claims to a universal science are part of constructing a bounded, coherent, and unique nation. Where much work in science studies focuses on how culture inside and outside the lab produces science, Prakash connects science to the construction of cultures.

Prakash and others are not content to bring science down to the level of the local and leave it there; their work points to the connections between local, national, and global imaginaries that constitute science. It is, in fact, such connections—how high energy physicists, for example, see themselves as having more in common with physicists on the other side of the globe than with their next-door neighbors (Traweek 1988:126)—that produce science's universality and nationality in local contexts. Recent work in science studies and the anthropology of science—much of which picks up on Latour's (1987, 1993; Latour and Woolgar 1986) notion of human-nonhuman social networks in science and modernity—has suggested that an emphasis on connections, dialogues, and networks may be a productive way to theorize how science moves in and out of laboratories and educational institutions (for example, Pigg 2001; Zhan 2001; Verran 2001). In this study, therefore, I pay particular attention to what science means not only in local contexts—

Akademgorodok and its laboratories—but to how it is used in constructing national and transnational contexts as well.

The ostensibly universal nature of scientific truths and the transnational community of science's practitioners was assumed to be problematic in the Soviet Union. Bauer, Inkeles, and Kluckhohn write that a Soviet scientist's "allegiance to...supranational ideals" may channel his efforts in "'undesirable' directions—'undesirable' being defined in terms of the needs of the totalitarian state" (1956:73). With the collapse of that state, there is a sense in much media reportage and academic writing on postsocialist Russian science that emergent market mechanisms promise to "liberate" science from socialist-era economic and political constraints. Yet the experiences of scientists in Akademgorodok would suggest that this has not been the case, and that in fact science does not necessarily or naturally tend toward an easy fit with the "needs" of markets, either. The apparent naturalness of "market economies" and of "democracy" is like the apparent naturalness of science—in appearing to be devoid of location and history, these concepts become both symbolic resources for measuring and evaluating others and mechanisms of asserting Western power. In fact, civil society and democracy—which Verdery (1996:14) suggests are better understood as symbols than as things to be built in postsocialist societies—have histories intertwined with that of science. Witnessing in science and citizenship in civil society relied on the same conceptions of personhood in relation to the polity in early modern Europe (Shapin and Schaffer 1985). These historical connections have lent the ideological weight of "free markets" and "democracy" to science, making the "transition" seem to be leading toward

the restoration of a science disabled by ideological pollution (see Ninetto 2000). Deviation from this ideal is seen as a lack, a failure, or a sign of underdevelopment.

Rather than suggest, as many writers on Russian science do, that the difficult postsocialist "transition" in Russian science is the legacy of the distorting influence of communist ideology, I argue that we should instead question the teleology of the "transition," which is "not a unilinear one of moving from one stage to the next, as projected in neoliberal plans, but a combined and uneven one having multiple trajectories" (Burawoy and Verdery 1999:14). Humphrey (1991) and Verdery (1996), for example, have considered what it might mean to imagine the transition as one "forward to feudalism" rather than to capitalism, while Stryker and Patico (2001) show that what looks like progress in teleological models of transition is often experienced as retrogression or decay by postsocialist subjects. Ethnographies from all over the postsocialist world have shown that people in the region are not being freed to live without constraining ideologies, but are experiencing and producing a complex reconfiguration of power and meaning in a "process that both reflects and constitutes a dynamic interplay between large-scale systems and local—indeed individual—phenomena" (Berdahl 2000:5). The ethnographies of the region that I take as my guide stress how socialist culture leaves traces on the present, while paying careful attention to the contingent accommodations, inconsistent processes, contested boundaries, and unresolved contradictions that are emerging a decade "after the fall."

I hope to illuminate how the paradoxes and contradictions that Akademgorodok scientists face in their everyday life and work emerge from the encounter between a socialist past in which they were active builders of modernity, important national

symbols, and objects of state discipline, a globalizing, postsocialist present in which they are migrant workers, objects of national security concerns, and a last hope for progress, and an uncertain future. While scientists' experiences are distinctive, they are in many respects not unique among cultural domains in the former socialist world; ethnographers have shown that women's, workers', intellectuals', consumers', ethnic minorities', and farmers' experiences of postsocialism are generally characterized by "contradictions, paradoxes, and ambiguities" (Berdahl 2000:1).

Like postsocialism, globalization and transnationalism are tied to ideas about progress, appear to be weakening the state, are swathed in discourse about the ability of free markets to free individuals, and produce contradiction, paradox, and ambiguity on the ground. Much attention has been paid to the increasing intensity, since the 1970s, of transnational and global "flows" of people, media images, ideas, and money (Harvey 1990; Appadurai 1996). Piot (1999:22-23) argues that many of these interpretations rest on evolutionary and teleological assumptions about bounded, local, homogeneous premodernity and modernity giving way to untethered, flexible, and mobile postmodernity. The parallels to postsocialism are striking. Indeed, Verdery has suggested that the mutually constitutive relations between globalizing and localizing processes are particularly apparent in Eastern Europe and the former Soviet Union: "much of the turmoil in the former Soviet bloc comes precisely from its hosting *both* sets of processes (national and transnational) with such intensity" (1998:302). In the former Soviet bloc, postsocialist reconfigurations of property, citizenship, and personhood intersect with equally powerful reconfigurations of the same domains having to do with globalization. Under postsocialism, what constitutes "progress" and "freedom" is

contested and shifting, states contract their influence in one field while expanding it in others, and new economic and political hierarchies are being constructed out of old ones. Globalization, similarly, has been theorized as a "complex, overlapping, disjunctive order" (Appadurai 1996:32), in which difference and similarity are constantly being produced and reproduced (though neither of these new orders appears to represent a real shift away from the ordinary semiotic processes called "culture" [see Handler 2002], but rather a revaluation of certain kinds or patterns of similarities and differences).

While transnational connections are not exactly new to Akademgorodok—its scientists have traveled, hosted travelers, and participated in the transnational discourse and practices of science since the town's inception—their frequency, density, and particular patterns of flow and obstruction are changing. Who has access to various transnational "flows," in what capacity, and what does this access (or lack of it) mean locally? These shifts, in turn, are changing the way people imagine Akademgorodok as a local place within transnational flows of science and capital. This is not to say simply that the demise of state socialism has "opened up" Akademgorodok to the world; the "world science" into which scientists so desire integration is itself being transformed by global flows of capital, people, and ideas. While it may appear that Akademgorodok is being incorporated, if slowly, into transnational science and global capital, it should not be assumed that these processes are necessarily liberating for scientists. In fact, as in many places, globalization and transnationalism have breathed new life into old systems and created new ones, sometimes "hybrids" of old and new. In any case, in Akademgorodok these processes, like postsocialism, promise hope even as they generate apprehension about futures and nostalgia for pasts. I concur, then, with those writers on

transnationalism who pay as much attention to the obstructions and barriers to and concentrations within transnational flows as to the flows themselves (for example, Verdery 1998; Clifford 1997; Miller 1995; Sassen 1998; Ong 1999). For Akademgorodok's scientists, nation, state, and science have been disarticulated from their Soviet configuration and are being forged back together again in different ways.

Unlike "culture" or its many avatars (identity, ethnicity, nationalism), science appears to inhabit naturally a transnational space. Postsocialist science would seem to have been freed to inhabit this space by the weakening of the Russian state in the face of postsocialist collapse, open borders, and transnational capital flows; the state that "distorted" Soviet science is no more. But scientists in Akademgorodok are not so willing to relinquish the state and embrace transnationalism; in fact, they construct a specifically Russian science out of historical relationships between scientists and the state, and this national science is simultaneously a part of "world science." Globalization's promise to reintegrate Russian science into the world is in fact keeping Russian science Russian.

Structure of the Dissertation

Chapter Two is a spatial and historical analysis of the construction of Akademgorodok in the late 1950s and early 1960s, showing how space was used not only to encourage particular kinds of relationships among scientists and between scientists and local industry, but also to "locate" science socially within the Soviet state and the international scientific community. Akademgorodok demonstrates how scientific spaces extend beyond the walls of institutes, laboratories, and universities to interact with

regional, national, and global cultural and political discourses and processes. This science city has never been "local" in the common social-scientific understanding of that word—grounded, isolated, bounded, and discontinuous with other, equivalent "localities." Using documentary and oral historical sources, I argue that Akademgorodok's very place-ness was constituted at the intersection of national, local, and transnational images of science. Indeed, it is possible to imagine Akademgorodok as a "space"—both geographic and cultural---constructed by the unstable confluence of three discourses: Soviet modernism, Siberian "backwardness," and scientific universalism. I focus on the complex ways in which the built environment of Akademgorodok emerged as symbols of and attempts to produce particular social effects by joining science with Siberian development and Cold War competition.

Chapter Three, by way of providing an ethnographic overview of the aftermath of the August 1998 economic crisis and currency devaluation, examines what is at stake when Akademgorodok scientists claim that science is now dying or disappearing from their town. I argue that what they mean is not simply that less research is going on in the science city (which is true), but also that the particular connections between fundamental and applied science, everyday life, the state, and private interests that gave shape to Akademgorodok's local way of doing science are being severed, reconfigured, and rebuilt such that many scientists find the results unrecognizable. I detail controversies over the creation of for-profit joint-stock companies within institutes, the difficulties different groups of scientists face in everyday life and research, and the politics of grant applications and laboratory leadership. In short, in the symbol of "crisis" are crystallized

scientists' ongoing concerns about Russian science's relationships to the structures of international capital and Akademgorodok's "location" in the Russian nation.

In Chapter Four, detailed narratives of four scientists' migration histories are placed in the context of the expansion of post-Fordist industrial production practices into the production of scientific knowledge. The chapter thereby illustrates the specific practices and processes that comprise Akademgorodok scientists' travel, and also shows how an opposition between science and nation frames scientists' experiences abroad and their sense of why they must seek work abroad. Although they pose their dilemma—science or nation—as an exclusive choice between abandoning the scientific research to which they have devoted their careers and leaving their home and country, many scientists in Akademgorodok try to find a compromise. One way they do so is through temporary migration, which they understand as a means of continuing one's research and improving one's financial situation in the short term, while making no commitments to leaving Russia permanently. Nonetheless, for many temporary migrants, this compromise situation seems untenable as well, as they find themselves disconnected both from everyday life in the countries where they live and from scientific work in their Akademgorodok laboratories. In this way, Akademgorodok's temporary migrants, in attempting to find a middle ground between science and nation in the context of postsocialist crisis, often find that one really does come at the expense of the other, that the "imagined community" of science and that of Russia no longer overlap in the same ways they once did.

Chapter Five complicates the distinctions made in Chapter Four by showing how, in contexts having to do with emerging national hierarchies in which Russia is perceived

to occupy a lower position, Akademgorodok's migrant scientists invoke the cultural specificity of Russian science. I focus on two overlapping sites in which Akademgorodok scientists highlight their difference from their foreign colleagues: technology and theory. A specifically Russian science is understood to be anchored in the particular historical relationship between Russian science and the state as well as the mental characteristics thought to be common to Russian people. The chapter shows how scientists' model of a unified, knowable, and transcultural nature is sustained by their imagining of the distinctiveness of particular ways of knowing that nature.

Chapter Six argues that the anxieties generated, among scientists, the media, and the state, about the transnational migration of Russian scientists is a result of the paradoxical position of scientists in generating national modernity and "civilization" in a context where the nation is thought to be moving backward, decaying, and becoming "feudal." Although scientists claim to be active agents in the production of a specifically Russian modernity, they also characterize themselves as the passive "victims" of national backwardness generated by the Soviet and then Russian states. At the same time, scientists often claim that their transnational movement is a progressive step toward integration into a global scientific community. This central position as producers of an as-yet-unachieved modernity makes scientists and their knowledge the cultural property of the nation. The threat to the nation posed by the outmigration of civilian scientists—unlike that posed by the movement of weapons scientists—cannot be understood only in terms of national security, but is part of paradoxical discourses of progress and decay that map spatial movement onto temporal progress.

In Chapter Seven, I conclude the dissertation by shifting gears to look at the career of an Akademgorodok physicist who has become a folk artist. Although he initially began this work simply to earn additional money, it soon became a second occupation which has garnered him international recognition and which now supports his family financially. I discuss how some of the same oppositions and paradoxes that face Akademgorodok scientists in their research and travel—tradition and modernity, local and global, progress and nostalgia, creativity and authenticity—shape the politics of folk arts in Novosibirsk, the invention of new art forms, and the uneven and uncertain incorporation of post-Soviet cultural forms—both science and art—into transnational and local market systems.

Chapter Two

A Space for Science in a Backward Place: Soviet Modernity, Siberian Otherness, and World Science in Akademgorodok's First Years

> Do you take with you on your travels a pocket atlas of the world? Put it aside. This time, you are a guest of the town that isn't even on a geographical map of the region.
>
> —Zamira Ibragimova (1997)

It has become customary in ethnographies of science to make at least a note of the generally bland, modernist, functional surroundings that are characteristic of many scientific research facilities. Sharon Traweek (1988), for example, who worked as a tour guide at the Stanford Linear Accelerator Center (SLAC) during her fieldwork, uses a narrative "tour" of the facility to discuss how physics is socially organized. Describing how theorists, experimentalists, administrators, and support staff inhabit SLAC's spaces allows Traweek not only to outline the ways in which space creates and is created by social distinctions between categories of scientific workers, but to discuss how architecture, ornamentation, and the patterns of human interaction within scientific spaces can reflect how scientists imagine the importance (or unimportance) of socio-cultural factors in their work:

> The physicists eschew any personal decoration or rearrangement of furniture that would differentiate their workspaces. This great visual uniformity, coupled with the clean, functional grey metal and glass décor of the building, creates a strong impression of stoic denial of individualism and great preoccupation with the urgent task at hand. (Traweek 1988:33)

Scientific spaces are, in most such descriptions, marked by a universalizing, rational-functional modernism. Similarly, Stacia Zabusky (1995:75-80) contrasts uniform, utilitarian, and modernist "serious" spaces dedicated to scientific work with postmodern

"playful" buildings housing offices, a canteen, and a conference center, noting that scientists at the European Space Research and Technology Center (ESTEC) found the playful office spaces an impediment to "the serious work that had to go on" there (Zabusky 1995:78). In these and other descriptions of scientific spaces (e.g., Gusterson 1996 on the Lawrence Livermore National Laboratory in California; Latour and Woolgar 1986 on the Salk Institute in Paris), the bland unremarkability, uniformity, and utilitarianism of scientific spaces is understood by scientists to reflect science's status as transcendent of local culture, and its detachment from particular configurations of the "cultural" as represented in vernacular architecture. Something of an exception to this rule is Stefan Helmreich, who uses the "tour" to show how researchers "sometimes feel they belong to an aterritorial—even acultural—community" (1998:29), despite the southwestern aesthetic that locates the Santa Fe Institute within various histories of domination.

Akademgorodok's spaces resemble, in many ways, those of other large scientific research complexes, with uniform, spare, modernist architecture; a lack of personal ornamentation in laboratories and offices, and an hierarchical structure of interaction within ostensibly uniform spaces. Yet Akademgorodok differs from SLAC, ESTEC, and Livermore because it was intended not only as a scientific workplace, but as a total community centered on science: "It was completely natural that in that town there should be everything—a House of Scientists, hotels, a cinema, schools, nurseries—it should be a socialist city of a new, modern type" (Ibragimova and Pritvits 1989:64). Even today, as Akademgorodok becomes more economically and professionally diverse, many residents

do not often make the trip to central Novosibirsk, a 40-minute bus ride away. Moreover, it was precisely the specific configuration of scientific and "everyday life" spaces that was intended to produce a scientific community whose knowledge could be harnessed and mobilized to serve the cause of Soviet development of Siberia.

Akademgorodok also demonstrates how scientific spaces extend beyond the walls of institutes, laboratories, and universities to interact with regional, national, and global cultural and political discourses and processes. This science city has never been "local" in the common social scientific understanding of that word as grounded, isolated, bounded, and discontinuous with other, equivalent "localities" (Handler 1988:50). Instead, following Gupta and Ferguson's (1997:36) assertion that "the identity of a place emerges by the intersection of its specific involvement in a system of hierarchically organized spaces with its cultural construction as a community or locality," I argue that Akademgorodok's very place-ness is constituted at the intersection of national, local, and transnational images of science. Indeed, it is possible to imagine Akademgorodok as a "space"—both geographic and cultural—constructed by the unstable confluence of three discourses: Soviet modernism, Siberian "backwardness," and scientific internationalism in the context of the Cold War. An understanding of the construction of space both within Akademgorodok and between it and other places—nationally and transnationally—is critical to conceptualizing the ideological-cultural role of science in general and Akademgorodok in particular in the Soviet modernist imagination. I therefore, focus on the complex ways in which the built environment of Akademgorodok and its geographic location within the Soviet Union emerged as symbols of and attempts

to produce a particular social effect by joining science with Siberian development. The town's location and plan articulated a modernist notion of spatiality in which the organization of space could be used as a tool to encourage a certain kind of social organization. Yet anthropologists have repeatedly observed that people inhabit even the most "rationally constructed" spaces in complex, contradictory, and even subversive ways. Indeed, Akademgorodok's plan itself was fraught with tensions and contradictions, which reflected some of the tensions and contradictions in the social space of Soviet science as a nationalist symbol. In short, I intend here to tease out the links between science's (and Akademgorodok's) spatial location and its social "location." But while the overlapping tensions that surrounded the creation of Akademgorodok and its pre-*perestroika* development can be considered in terms of both the cultural production of space and the use of space as an implement of social engineering, in the end, they must be left largely unresolved.

In the Russian and Soviet national imagination, Siberia brought tropes of wildness, backwardness, and freedom into dialogue with modernity, progress, and state bureaucracy and discipline within Akademgorodok's spaces. In bringing science to Siberia, Akademgorodok represented both a critique of certain tendencies within Soviet science and an attempt to mobilize science into a modernist project whose "universal aspirations [were] the outcome of a perpetual dialogue with localism and nationalism" (Harvey 1990:276). While science was to modernize this wild place, it was also supposed to be made Siberian by the natural environment and the particular social and spatial arrangements of scientific institutions that would be built there.

Akademgorodok's founders built their town with a vision of a particular kind of science that would emerge from the relative positions of applied and fundamental science, the role of researchers in education, and the links between science and industry. Akademgorodok was, therefore, an attempt to confront the paradox of science's national "location"—the tension between science as an transnational form of knowledge, a tool for local development, and a symbol of national modernity.

National Progress and Natural Symbols: How Science Came to Siberia

Akademgorodok's "origin myth"[1] is inscribed in official histories and repeated more or less consistently by residents. The narrative is revelatory not so much for the facts about Akademgorodok's founding, but for how it lays out geographies of interaction between cultural domains, in this case science, society, Siberia, and the state. Although I do not intend a structural analysis of Akademgorodok's origin myth here, I nonetheless take seriously Lévi-Strauss's view that myth is significant not because it records a long-ago world, but because it lays bare the configuration of cultural domains in the present. Typically, Akademgorodok's origin narrative begins with the town's founding "ancestor," Mikhail Alekseevich Lavrent'ev,[2] a mathematician and hydrodynamicist who took advantage of the Twentieth Party Congress's 1956 admonition to develop Siberia and who, in 1957, proposed, along with two other prominent scientists, Sergei Alekseevich Khristanovich and Sergei L'vovich Sobolev, the creation of the Siberian Division of the USSR Academy of Sciences. In July of that year, the Presidium of the USSR Academy of Sciences organized the first eleven institutes of the Siberian Division: the Institute of

Mathematics, the Institute of Theoretical and Applied Mechanics, the Institute of Hydrodynamics, the Institute of Physics (in 1958 renamed the Institute of Nuclear Physics), the Institute of Automation (in November of 1957 renamed the Institute of Automation and Electrometry), the Institute of Geology and Geophysics, the Institute of Thermal Physics, the Institute of Cytology and Genetics, the Institute of Economics and Statistics (after 1958, the Institute of Economics and the Organization of Industrial Production), and the Institute of Experimental Biology and Medicine (absorbed into the RSFSR Ministry of Health in 1963) (Goriushkin 1993:261).

Khrushchev had made "developing Siberia" a pet project. He saw Siberia much as did Russian and Soviet leaders before him—as a "resource frontier" (Mote 1998:109-114), a source of the natural resources that would make the postwar Soviet Union into a modern industrial power. To develop Siberia would be the test of the power of Soviet science—and the Soviet rationalist, modernist worldview—to do battle with and conquer the raw forces of nature, with which the region was identified. Conquering wild Siberia through science and technology, rationally and centrally managed, would not only raise the USSR's production capacity but, perhaps even more importantly, would symbolize to the whole world the might of the Soviet Union and of communism as a socio-economic system.

Since its conquest by Russian fur traders in the sixteenth century, Siberia has been represented in Russian thought by a dualism: as "both the frightening heart of darkness and a fabulous land of plenty" (Slezkine and Diment 1993:2). At the same time that, in Western Europe, Enlightenment philosophers were characterizing Russia as the backward

other to Western progressiveness—"a confused combination of 'the age of barbarism and that of civilization'" (Wolff 1994:13)— the center of the Russian state in St. Petersburg also looked eastward to Siberia for its own wild, uncultured other. From the point of view of the center, "Siberia is envisioned as symbolizing nature in contrast to...culture" (Grant 1995:9). Siberia became both a place of exile—a "dumping ground for human refuse from Russia"—and a source of immense natural riches that supported the center (Slezkine and Diment 1993:4). In the nineteenth century, the combination of Siberia's wildness and its richness later made it attractive to Romantics looking to escape the constraints of "civilization": "if Europe and its Russian epigones stood for artifice rather than art and civility rather than civilization, then savagery—the state of not having culture—equaled freedom and authenticity" (Slezkine and Diment 1993:3). The native peoples of Siberia were caught within these dualistic images of the land they inhabited, disparaged as backward and primitive and romanticized for their purity.

Soviet attitudes toward Siberia changed little after the October Revolution. For the builders of the socialist state, Siberia was a source of the natural resources that would industrialize the country, an exemplar of the Soviet system's ability to transform backwardness into progress, and, of course, a site of exile. Native peoples and nature were most often the objects of modernizing projects: "the most obvious route" to modernity "was to simply make backwardness illegal" among the peoples of the north (Slezkine 1994:226), to build hydroelectric dams and mines, to collectivize agriculture. Paradoxically, however, Siberian land and its people became "the Soviet Union's truest moderns" (Grant 1995:9). The Soviet state's ability to tame a wild place and civilize

savages was cast as evidence of its essential modernity, progressiveness, and rationality.

The Twentieth Party Congress in 1956 issued a directive calling for the intensified exploitation of Siberia's resources, and Lavrent'ev and his colleagues founded Akademgorodok with the dualistic images of Siberia as simultaneously wild and (potentially) modern in mind. Lavrent'ev characterized Siberia as a progressive, developing place on the cusp of modernity, though this modernity seemed very much to rely on the region's essential naturalness:

> In the future Siberia was to be turned into the largest base in the USSR for the extraction of coal, the production of electricity and into a major base for heat- and power-consuming industries—electrometallurgy, coal chemistry, electrochemistry, and the production of aluminum, magnesium, titanium, and others.... During the first postwar years all the state's energy was cast toward the rebuilding of the economy of the western part of the country, which was destroyed by the war. Now attention is gradually switching over to the development of the eastern regions. (Lavrent'ev 1980:9)

Although he was committed to using science to transform the region's natural resources into productive forces, Lavrent'ev also valued Siberia's romantic, pure nature. His reminiscences juxtapose rational planning with romantic raptures over nature in descriptions of the selection of the Golden Valley south of Novosibirsk as the site for the new science city:

> First of all, [the organizational committee had to] choose in order to have the possibility to construct immediately institute complexes with prospects for future growth, so that every institute had a large enough space, so that there would be enough in reserve to realize not only the ideas that already existed, but those that were to be born; second, to build either on the outskirts of a city or no farther than 20-30 kilometers, so that the new center could have contact with industry and institutes of higher education; and third, so that there would be the opportunity to use a powerful

> construction organization, by which the construction could be supported. (Ibragimova and Pritvits 1989:62)

> The site in Novosibirsk was chosen unanimously. Here everything suited us: the proximity to a major industrial and cultural center and also an adequate distance from it, so that the science town wouldn't dissolve into the big city and would preserve its internal uniqueness; the existence of the largest branch of the Academy of Sciences in Siberia, the Western Siberian Branch; the convenience of transportation (access to the Trans-Siberian railway, an airport with direct flights to Moscow, and finally the existence of a highway going almost directly to the construction site). Last but not least, natural conditions played a role: the soft terrain, beautiful birch groves and a belt of pine along the Ob', and the sea next to the town, which at that time was still being planned. We liked all of this, and we settled our choice on this site. (Lavrent'ev 1980:19)

Finally, Academician Anatolii Vasil'evich Nikolaev also highlights how both nature and technology were mobilized to serve the nation in his account of the site selection:

> A telegram arrived from Mikhail Alekseevich [Lavrent'ev]: we are going to Novosibirsk to choose a site. The site turned out to be beautiful and totally suitable for the healthy life of a Russian person: a wonderful sea, forest, excellent air... However, the forest, air, sea, and opportunity to live all year "in nature" were, of course, significant, but not the major factors that encouraged me to accept the invitation [to move to Akademgorodok]. The opportunity presented itself to create an institute in a field of research which was not widely developing, and at the same time whose development was directly helpful to the national economy of the country. (Ibragimova and Pritvits 1989:29)

The selection of the "Golden Valley," whose name refers to the color of the birch leaves in autumn, south of Novosibirsk along the Ob' River suggests the importance in the minds of Akademgorodok's urbanite founders of a romantic, naturalized, feminized image of Siberian "places"; the landscape of Akademgorodok is marked by fields of wild grasses, groves of birch trees, and surrounded by a protective belt of stately pines.

The birch in particular is a powerful national symbol for Russians; a forest composed predominantly of white birch covers much of the country, its wood and bark provided peasants with kindling and material for making everything from kitchenware to shoes, and its leaves and sap have medicinal uses.[3] Moreover, the tree is often represented in poetry as both feminine and as a symbol of Russia: in his poem "Rus'" (1914), Sergei Esenin describes how the harsh beauty of Russian nature sustains his love for "My Russia, sweet homeland" despite the agonies of war: "In the cruel frosts, in the hazy twilight, the birches wear silver lace" (Esenin 1994:60).[4]

Accordingly, Akademgorodok's founders, in building a town dedicated to the conquering of Siberian nature through science, made provisions to preserve as much as possible of the natural birch and pine forest into which the town was set. Thus, Akademgorodok became distinctive among Soviet cities not only for its scientific theme, but for its setting in a forest (cf. Ibragimova and Pritvits 1989:81). The site seems to fit—or to have been made to fit—a romantic ideal of Siberia as Russia's last pure, untamed wilderness, and, moreover, of rural Russia, covered with birches, the Russia of romantic nationalism. That is, the particular form of "natural" landscape that was selected as the site for the science city was itself "read" or constructed as a place extraordinary for its ordinariness, for the way it could be construed as both typically Russian and typically Siberian.

Although some of the town's forests were clearly planted—the trees of uniform species and height standing in neat, soldierlike rows give them away—there are belts of virgin forest both in the midst of and surrounding the town. In Akademgorodok's

"Upper Zone" (*verkhniaia zona)*, its central part, one is never more than a two-minute walk from a forested area. The largest area of forest stretches from Universitetskii prospekt north to ulitsa Stroitelei—in the winter this forest is filled with cross-country skiiers on its winding trails. The Novosibirsk State University complex is set in the middle of this forested space. A wide forested band also insulates Akademgorodok from the Berdsk highway, which runs past the town on the west, between it and the "Ob' Sea," the large lake on the Ob' River created by the construction of the Novosibirsk Hydroelectric Station. There is a wide sandy beach on the banks of the sea, which was built as part of Akademgorodok by trucking in vast quantities of sand (Josephson 1997:20). Akademgorodok residents enjoy sunbathing on the beach in the summer and cut holes in the frozen Ob' Sea for ice fishing and swimming in the winter. Akademgorodok, therefore, was supposed to be not only an experiment in science, but an experiment in a new kind of socialist community, one that joined nature and technological modernity to produce a comfortable living environment.

Everyday Life: Why Scientists Came to Siberia

Soviet city planning was guided by several principles, commensurate with the use of space to promote socialism, and Akademgorodok was in many ways a typical—or even archetypal—Soviet "new town." The construction of new towns was intended to reduce population densities in the largest cities, to populate less-developed regions (particularly Siberia, the Far East, and Central Asia), and to reduce or eliminate disparities in housing quality among various social groups, though there was only limited

success at these goals (Underhill 1990). More successful was the new towns' integration of work and everyday life by locating workplaces nearby residential areas. In industrial towns, factories were separated from residential areas by buffers of green space, while academic communities like Akademgorodok placed homes within walking distance of institutes (Underhill 1990:276).

Designed by a team of four architects, the general plan of the town was approved in 1958. Construction began soon thereafter, and proceeded over the next several years. Several of the Siberian Division's scientific institutes, however, began operation before their buildings were completed, working from temporary quarters in Novosibirsk. Akademgorodok was constructed using the urban planning technique of "microregions"—small "neighborhoods" of between 25 and 40 hectares in area and housing 6000-8000 people (Veksman 1963:15; Quilici 1976:313).[5] The microregion (*mikroraion*) was the accepted basic unit in Soviet city planning (Underhill 1990:275). Each of the seven microregions in Akademgorodok consisted of apartment blocks set in groups of 3, 5, or 7 surrounding a green courtyard containing benches, children's playground equipment, and racks for beating rugs and drying laundry (Veksman 1963:15). Central to each microregion, also surrounded by green space, were schools, kindergartens, nurseries, cafeterias, and shops; this arrangement was intended to produce "the most favorable living conditions for the population, which allow the combination of the conveniences of a well-constructed city with direct proximity to nature" (Veksman 1963:13). The town's three main streets—the present-day prospekt Akademika Lavrent'eva, prospekt Stroitelei, and Morskoi prospekt[6]— are said to form a slightly bent

letter П, although it is not clear whether this is the Cyrillic equivalent of the Latin P or the identical Greek letter and crux of the mathematical universe, *pi* (Marchuk 1997:22). With the exception of the campus of Novosibirsk State University, *bytovye* (roughly, everyday living) spaces were clearly delineated from, though proximate to, scientific spaces in Akademgorodok (see Veksman 1963:13). And although it was a stated goal of Soviet housing policy to reduce such disparities, within Akademgorodok's residential spaces, different "classes" of inhabitants were also separated. Scientific institutes are located primarily along prospekt Lavrent'eva and the small side streets that shoot off of it.

The main residential areas for scientific staff—microregions А, Б, В, Г, and Е—are in the southern and western parts of the town (see figure 2.1). This area is filled with the sturdy, block-like brick or concrete panel apartment buildings recognizable in any Soviet city, though perhaps on the whole smaller in size—only a handful of buildings (built in the mid-1960s, after Akademgorodok's first flowering) reach 9 stories—most are 3- to 5-story constructions, and many of the older buildings bear attractive ornamental architectural features like wrought-iron balcony rails and decorative medallions. Important scientists—members of the Academy of Sciences, institute directors, and winners of prestigious prizes—were given "cottages" (*kottedzhi)*—that is, houses, not apartments—in the "Golden Valley," a lush birch forest at the southern end of the town.[7] Other cottages were constructed along the stretch of ulitsa Tereshkovoi between Morskoi prospekt and Detskii proezd, though these are typically thought of by longtime Akademgorodok residents as cottages constructed for the *nachal'stvo*:

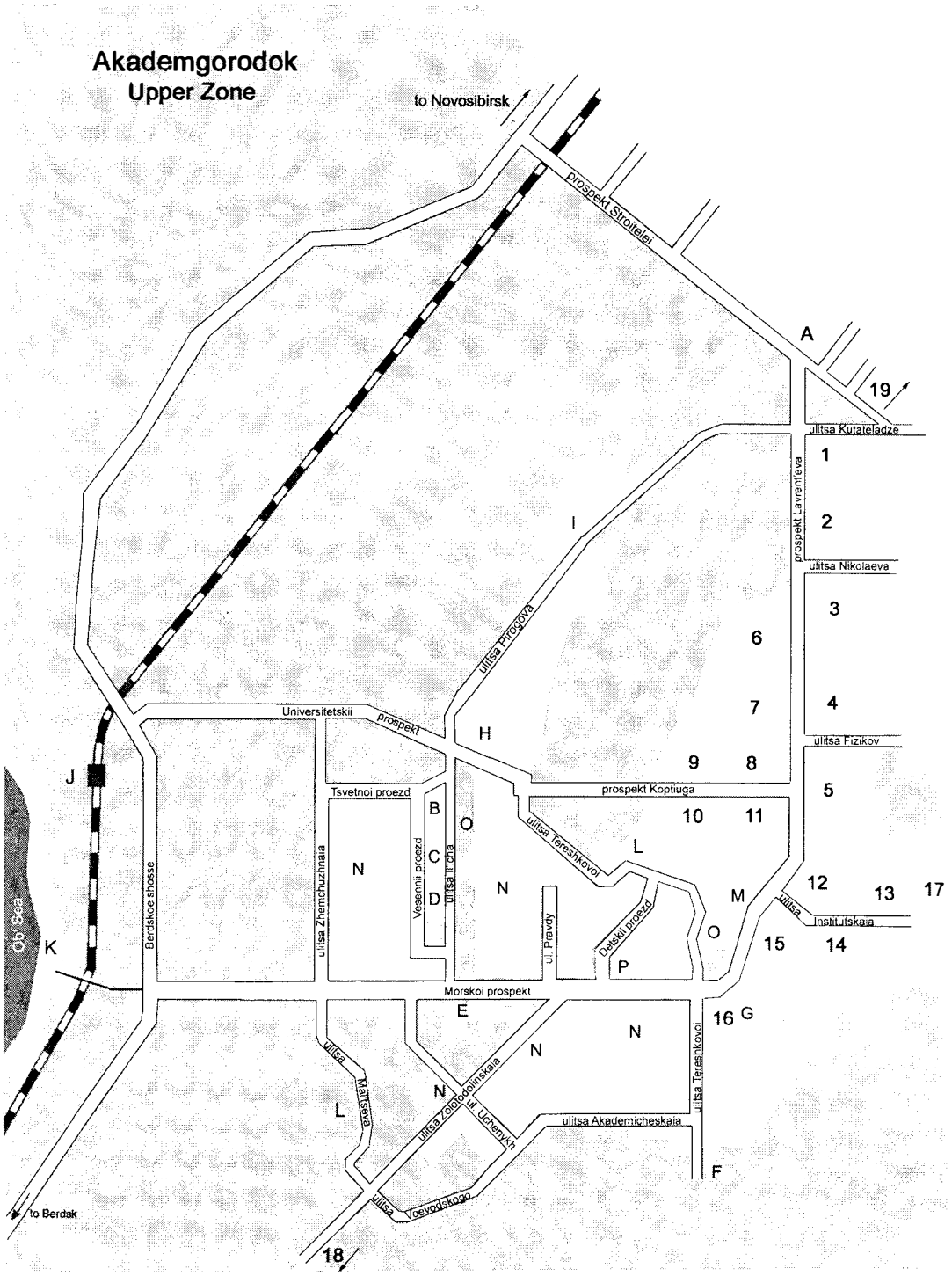
Akademgorodok
Upper Zone
to Novosibirsk
prospekt Stroitelei
A
19
ulitsa Kutateladze
1
2
prospekt Lavrenteva
ulitsa Nikolaeva
3
4
ulitsa Fizikov
5
I
6
7
ulitsa Prigozha
Universitetskii prospekt
H
9
8
prospekt Koptiuga
10
11
J
Tsvetnoi proezd
B
O
ulitsa Tereshkovoi
L
12
13
17
M
ulitsa Institutskaia
15
14
O
P
Ob Sea
K
Berdskoe shosse
ulitsa Zhemchuznaia
N
Vesennii proezd
C
D
ulitsa Ilicha
N
ul. Pravdy
Detskii proezd
Morskoi prospekt
E
N
16
G
N
ulitsa Tereshkovoi
ulitsa Marksova
L
N
ul. Zolotodolinskaia
ul. Uchenykh
ulitsa Akademicheskaia
F
ulitsa Voevodskogo
to Berdsk
18

Figure 2.1. Map of Akademgorodok. Adapted from Ibragimova 1997.

Key:

Institutes:

1 Thermal Physics

2 Inorganic Chemistry

3 Catalysis

4 Organic Chemistry

5 Nuclear Physics

6 Computing Center
Informatics Systems
Computing Technology

7 Bioorganic Chemistry

8 Cytology and Genetics

9 Mathematics

10 Geology, Geophysics, and Mineralogy

11 Automation and Electrometry

12 Semiconductor Physics

13 Theoretical and Applied Mechanics

14 Chemical Kinetics and Combustion

15 Hydrodynamics

16 Economics
Archaeology and Ethnography
History
Philology
Philosophy and Law

17 Laser Physics

18 Central Siberian Botanical Garden

19 Solid State Chemistry

Other Locations:

A "Youth" House of Culture

B Golden Valley Hotel

C Trade Center (shops, post office)

D "Academy" House of Culture (movie theater)

E House of Scientists

F Russian Orthodox Church (built in 1990-91)

G Presidium of the Siberian Division

H Novosibirsk State University

I Hospital complex

J Commuter rail station

K Beach

L Cottages

M Sibakadembank (former Club "Under the Integral")

N Microregion shopping clusters

O Open-air markets

P "Gorodok" Shopping Center (former cafeteria)

Forest and park areas

bureaucrats, administrators, and Party members, not scientists (cf. Marchuk 1997:35). This location is somewhat less peaceful and wooded than the Golden Valley.[8] North of prospekt Stroitelei—Builders' Street—were built microregions Д and Щ, where at first barracks and later apartment buildings for the workers brought in to construct the science city were located. Microregion Щ, the northernmost in Akademgorodok, is characterized by towering apartment complexes and a distinct (if only for its contrast with the rest of the town) lack of green space; it more closely resembles other Soviet cities. Josephson (1997:17) reports that in the early days there was a certain amount of complaining by workers that scientists received houses while they lived in cramped apartments, although of course the vast majority of scientists lived in apartments as well. Upon completion of the construction, microregion Щ was opened to the expanding scientific population.

In addition to the services provided in each microregion, there is a central shopping area for the whole town, the Trade Center (*torgovyi tsentr*), commonly known as the TTs (the "Teh-tseh"), located in the center of the town, on ulitsa Il'icha. Here there is a department store, a large grocery store, a restaurant, a post office, and a telephone-telegraph office. Just past the post office is the town's only hotel, the Golden Valley. Also near the TTs on ulitsa Il'icha stands the House of Culture (*dom kul'tury)* Akademiia (previously Moskva), which houses a movie theater and exhibition space. The House of Scientists (*dom uchenykh)*—the artistic and social center of Akademgorodok—is just up the street, straddling the intersection of Morskoi prospekt and ulitsa Il'icha. The House of Scientists contains two auditoriums, an indoor garden, a restaurant, an exhibition hall,

and meeting rooms for clubs. It is the site of scientific conferences, art exhibits, dramatic and musical performances, and social events such as wedding receptions, as well as a meeting place for residents. All of these are highlighted in what does appear to be a general consensus that the town plan created an attractive environment for both science and everyday living. In both respects, Akademgorodok compared favorably to other Soviet cities; it also was appealing to foreign visitors: "foreign researchers who visited Akademgorodok in the 1960s constantly underlined...the good working and living conditions of the scientists" (Vodichev 1994:91).

The opportunity not only to contribute to the development of the Soviet Union's eastern periphery (and thereby the whole country) but, more immediately, to escape the stiflingly hierarchical institutes characteristic of Moscow, to enjoy opportunities for rapid advancement up the scientific hierarchy, to work with renowned experts in one's field, to live in a community dedicated to science and known for intellectual ferment, and to obtain more adequate housing and other material rewards and everyday conveniences attracted many Moscow and Leningrad scientists to pack their things and move to Siberia. Khrushchev apparently believed that quality of life alone would be sufficient to attract workers to Siberia (Mote 1998:108), and to a large extent this was true in Akademgorodok. This first migration began rather slowly, with the founders and a handful of hardy souls living a rather spare existence in peasant huts in the woods a few kilometers from the construction site (Marchuk 1997:11-22). The reasons scientists cited for moving to Akademgorodok—even before it was completed—juxtapose quality of life issues with a romantic vision of developing Soviet Siberia:

> Many scientists who were satisfied with their work and life in Moscow refused to go. Some immediately understood the future of science in Siberia and agreed to move. And the youth, full of romantic expectations, prepared to surmount hardships that they hadn't even imagined, accepted the proposal with a "hurrah".... A large group of graduates of [Moscow Physical-Technical Institute] awaited their diplomas with impatience so that they could go build science in Siberia. (Marchuk 1997:10)

A senior mathematician and member of the Academy of Sciences, Iurii Grigor'evich Reshetniak, recalled that his decision to move to Akademgorodok was motivated by both the availability of housing and the opportunity to work with renowned scientists in his field. In 1957, he was working at an institute in Leningrad and living in one room of a communal apartment with his wife and two small children in Pulkovo, the site of an astronomical observatory outside Leningrad, where his wife worked as an astronomer. He read in the newspaper that Lavrent'ev was planning to build a scientific center "somewhere in the East" and began asking his colleagues their impressions of this plan. It turned out that Natal'ia Soboleva, the daughter of S. L. Sobolev, one of the Siberian Division's founders, worked with Reshetniak's wife at the observatory. Through these connections, he was able to meet Sobolev when he came to visit his daughter in Leningrad, and the two established a collegial relationship that resulted in Reshetniak's moving to Novosibirsk even before construction of Akademgorodok was completed. In such narratives, scientific and "everyday" motivations combine to draw scientists to Akademgorodok. The rationality of everyday life, like the planning of science, was meant to be emblematic of the progressive, modern, and humane society produced by socialist planning.

"Everyday life" (*byt*) as a domain was both valorized and disparaged in Russian and Soviet thought; it was simultaneously the site of social transformation and a soul-crushing, mindless routine detested by intellectuals. Svetlana Boym explains how in the 1920s campaigns against "domestic trash" were meant to replace petty-bourgeois aesthetics with those of the New Soviet Man and Woman—"the warlike spirit and nomadic lifestyle of the true revolutionary" (1994:38). Despite the apparent triumph of domestic trash over revolutionary frugality in the 1950s, the intelligentsia of the 1960s reclaimed the earlier "spirit of nomadic romanticism" before retreating into "the private domain and...'kitchen communities'" after the Prague Spring (1994:39-40). It was this rejection of the banal and everyday in the spirit of nomadic romanticism that initially peopled Akademgorodok, while a later retreat into protective domesticity was also enabled by the well-planned community. Moreover, *byt* in its most dangerous sense—as something that could drag people down and prevent them from achieving "higher" callings—fit with prevailing notions of the social role of the scientist. *Byt*, therefore, needed to be as invisible as possible in scientists' lives—neither suffocatingly banal nor luxuriously bourgeois—but making it so preoccupied Akademgorodok's founders and planners.

The convenience and rationality, even comfort, of everyday life in Akademgorodok was to enable scientists to devote all their time to the socially important labor of developing Siberia. If scientists did not have to concern themselves with transportation, shopping, and schooling for their children, the reasoning went, they could spend uninterrupted hours at research. And there were ample and convenient

opportunities for recreation that would clear scientists' minds and refresh them so they could resume their work productively. These ideals were embedded in Soviet visions of science as a profession. Science was supposed to be separate from everyday life, even as a preoccupation with creating the optimal living conditions for those who created scientific knowledge pervaded Akademgorodok's construction. Those who came to Akademgorodok were expected to devote themselves completely to the pursuit of knowledge, and early residents describe working long hours, bringing work home, feeling that they were part of a vitally important and urgent project, living and breathing the excitement of doing science and developing Siberia.

Lavren'tev's Triangle and the National Project in Siberia

Lavrent'ev, along with Khristanovich and Sobolev, had specific ideas not only about how science in Akademgorodok should be organized, but also about how Siberia in particular would be affected by the development of a local science. First of all, it went without saying that Russia's vast North Asian territory was in dire need of "development." Yet the Great Patriotic War (World War II in the West) had opened the door for the industrial development of the vast region, as hundreds of factories were evacuated, particularly to the cities of southwestern Siberia, so that Soviet industry could keep up with the war effort while much of the European part of the USSR was under Nazi siege. Yet infrastructure was poor—roads were virtually nonexistent, the Arctic Ocean is frozen over and therefore not navigable for much of the year, and the Trans-Siberian railroad ran only across the southern portion of the region, leaving immense

northern coal, oil, natural gas, gold, diamond, aluminum, and other natural resource deposits, as well as vast forests of timber, difficult to access and even harder to transport. Lavrent'ev posited that these resources could not be properly exploited—that is, they could not be put to work for Soviet society—from laboratories in Moscow. Instead, he argued, local scientific institutes needed to be integrated with local productive facilities, in order not only to speed the integration of scientific and technical innovation with production, but also to make this integrated science-production complex adaptable to local circumstances and local problems. That is, Akademgorodok's institutes, in Lavrent'ev's vision, were to address broad fundamental scientific questions as well as applied problems of industry, agriculture, and natural resource exploitation in Siberia. Lavrent'ev was trying to strike a balance between the fundamental science which he valued and which attracted esteem in the world scientific community, and the applied science necessary to a rapidly expanding postwar national economy and the incorporation of a colonial periphery into the rationalist, modernist Soviet system. And, it follows, Akademgorodok was to be a scientific center of not just local, but national and global significance, where local problems were studied to build the national economy and contribute to the universal, fundamental foundations of knowledge:

> In no case was the new center to become simply regional, as they say. Such centers played a large role in a certain stage of the development of science, facilitating the study of local problems, mainly the study of the natural resources of a given region and the solution of isolated technical problems facing the region's economy. ...But the new stage of the mastering of Siberia gave rise to new requirements from science, specifically the founding, in the east of the country, of scientific institutions of a general theoretical profile, and the constant creation of scientific foundations for practice. (Lavrent'ev 1980:15)

Lavren'tev's three-pronged approach to modernizing Siberia through science—his "triangle"—was not only a philosophy of (Soviet) science put into practice, but also a critique of certain "deficiences" (*nedostatki*) in Soviet science, specifically its rigid hierarchy and detachment from education. Lavrent'ev summarized his principles as "science, introduction [of scientific work into industry], personnel (*nauka, vnedrenie, kadry*)" (1980:17), and Akademgorodok's founders recited them almost as a mantra. These principles—the development of fundamental research, the rapid integration of scientific discoveries into the productive process, and the training of young scientific workers—were not all successfully realized, but they do represent an attempt to bring science into a certain position relative to politics and economics, both organizationally and spatially. The town's spaces, therefore, embody Lavrent'ev's vision of science's role and function in Siberia and the Soviet Union and his solution to the problems he saw in the science of European Russia. These ideas were inscribed into Akademgorodok's cityscape, and Lavrent'ev's influence lingers in that Akademgorodok scientists even today think about the town in much the same terms that he did, sometimes even quoting him, though these days they usually talk of how Lavrent'ev's ideal community has been destroyed, or how it was never realized in the first place.

Just as many contemporary writers on the social construction of science use "location" or "position" as metaphors for the ways in which science is interwoven with practices of power and cultural discourses, it is particularly striking how Lavrent'ev's "triangle" uses spatiality—that is, both the Siberian location of the progressive science city and the plan of the town itself—as a way of modeling science's social "location" at

the particular historical moment of the Khrushchev thaw. Just as the arrangement of research spaces and residential spaces was grounded in ideas about the relation of science and everyday life, the placement of the institutes relative to the university, local industry, and each other—as well as the location of Akademgorodok itself—were meant to promote Lavrent'ev's triangle.

Preparation of Personnel

Lavrent'ev was dissatisfied with what he saw as the stifling effect of hierarchical and centralized bureaucracy on Soviet science. He proposed for Akademgorodok a scientific community where interaction between enthusiastic young scientists and their experienced elders would maximize the creativity and productivity of scientific work. Lavrent'ev placed particular emphasis on the training of young scientists, arguing that they were the ones, organized by the Komsomol (the Communist Youth League), who represented the crucial link between science and production (Josephson 1997:283). Enthusiastic young people would find the incentive to do this important work in the potential for rapid advancement up the scientific hierarchy. At first, the newly-arrived researchers would bring with them from Moscow or Leningrad their students, but, Lavrent'ev writes, the numbers of these new arrivals would soon be

> inadequate for the powerful development of science and its active introduction into practice. It was necessary to organize a flow of fresh scientific powers, of capable youth learning contemporary ideas and the newest instruments and apparatus.... This meant that it was necessary to have a university under the auspices of the scientific center, where youth would be given broad knowledge and where the scientists of the Siberian Division would teach students directly in live situations, [through] their

> everyday participation in the work of the research institutes. (Lavrent'ev 1980:17)

Lavrent'ev wanted interaction between students and researchers to be, if not more informal, more of an exchange between experienced researchers and students with fresh, innovative ideas. By putting researchers and students into constant contact with one another, the town's institutes were supposed to reap the benefits of this combination.

The relationship of scientific spaces to the campus of Novosibirsk State University (NGU) was at the center of Lavrent'ev's emphasis on the importance of youth in Akademgorodok. Instruction began at the university in the autumn of 1959, even before the completion of construction—classes were held in a school, and students slept in tents at a Young Pioneers camp during the rather chilly September and October nights, until their dormitories were completed. Lavrent'ev, along with other prominent scientists, offered moral support by leading scientific discussions every evening at the camp (Marchuk 1997:25). Lavrent'ev believed that research and pedagogy needed to be better integrated; Soviet research science, having followed the German model of separation of research and teaching to an extreme, had become nearly totally divorced from teaching by the 1920s, although the rationale for such a split was precisely the opposite of the German model's: "While the Germans feared the effects of mass education on science, the Soviet authorities feared the effects of bourgeois scientists on education" (Graham 1993:177). There were many raucous debates on the issue, and numerous attempts to reform, yet by the late 1950s little had changed.

Lavrent'ev's vision, in this context, was indeed unusual; stemming from his emphasis on the necessity of constant interchange between young and senior scientists and the need to integrate research and teaching, NGU not only was located in Akademgorodok (nearby, though distinct from, the institute area), but its curriculum was also designed to take full advantage of the scientific resources at hand in the town. And indeed, it was perhaps this element of Lavrent'ev's vision that was most successfully realized. Students are taught by university faculty in their first two years, then attend lectures given by prominent institute-based researchers and participate in research projects at institutes during the next three years. NGU graduates were often funneled into Akademgorodok's institute system, where they could go on to find jobs or to do graduate work. After the initial settlement of the town, NGU is and was the major source of workers in the institutes (Vodichev 1994:143; see also Gustafson 1980:44).

Located on the campus of NGU, the Physics-Mathematics Boarding School (FMSh) was designed to bring young people into contact with cutting-edge "big science" even before they reached university. Talented schoolchildren were selected to compete in the All-Siberian Physics-Mathematics Olympiad, and high scorers were invited to attend the FMSh, where they were instructed in advanced physics and mathematics by well-known institute researchers. This elite school is now, after various organizational permutations, affiliated with NGU, and its graduates are therefore guaranteed admission to the highly competitive university.

Regardless of these innovations—which were successful both in producing a constant flow of new young researchers into the Siberian Division and in providing

students with hands-on research experience—the spatial organization of the town seems in other ways destined to subvert the ideal of open exchange between researchers. Perhaps this reveals an ambivalence about the effects of such a dramatic shift in the structure of Soviet science; perhaps everyday interaction was not considered part of this vision, in accordance with the separation of everyday life from science more broadly in Akademgorodok. The town's living spaces for scientists are in fact more obviously hierarchically organized than in many other Soviet cities, and they clearly segregate young scientists from their superiors. Institute directors, members of the Academy of Sciences, Party administrators, and other esteemed figures were offered cottages (single- or two-family houses) in the Golden Valley; rank-and-file scientific workers occupied the less desirable apartments in the Upper Zone, and by the early 1970s a housing crisis, which developed as migrants to the town exceeded its available space, required many young scientists and graduate students to live in communal apartments, dormitories, or in the more distant and less green microregion ІЦ. Ironically, in this way, the housing meant to attract young scientists to Akademgorodok emphasizes, rather than subverts, the centrality of those occupying high positions in the academic hierarchy and bureaucracy.

Emphasis on Fundamental Research

Akademgorodok's institutes were not only to engage fundamental scientific questions, but they were to do so by bridging disciplinary boundaries. Lavrent'ev

described this plan—and set up a hierarchy of sciences from the most fundamental to the less so:

> Insofar as the greatest number of serious problems in modern science are solved at the junctions of sciences, all the major disciplines should be represented in the scientific center by prominent scientists: mathematics, physics, chemistry, biology, geology, geophysics, economics. (Lavrent'ev 1980:17)

As we have already seen, Akademgorodok's scientific spaces form a "neighborhood" distinct from the town's everyday living spaces. Most of Akademgorodok's research institutes are located within a ten-minute walk of one another; the imposing buildings are lined up along prospekt Lavrent'eva, prospekt Koptiuga, and a few side streets in neat rows, close by one another and more or less architecturally indistinguishable from one another. Lavrent'ev's guiding principle here was a broad ideal of interdisciplinarity which would counteract the tendency toward narrow specialization which characterized metropolitan scientific institutes: "If there used to be rather a lot of exclusive fields, now everything has mixed together" (Ibragimova and Pritvits 1989:63; see also Graham 1993, Gustafson 1980:33). It was Lavrent'ev's plan that physical proximity would encourage intellectual interaction between specialists in different disciplines. Moreover, related subdisciplines are vaguely clustered together, so, for example, there is a chemistry cluster on northern prospekt Lavrent'eva consisting of the Institutes of Organic, Inorganic, and Bioorganic Chemistry and the Institute of Catalysis.

Within this interdisciplinary model, Lavrent'ev and his colleagues ascribed a privileged position to mathematics and physics, which they saw as the fundamental

building blocks for the description of nature upon which other natural and social scientific disciplines—genetics, chemistry, economics—would build.[9] The Institute of Nuclear Physics occupies pride of place along prospekt Lavrent'eva, and the Institute of Mathematics is nearby, just down prospekt Koptiuga. In fact, a map of Akademgorodok in a joint US-Soviet urban planning report sets the area of the Institutes of Nuclear Physics and Mathematics apart from the other institutes as the "institutes area center" (Underhill 1990:277). The central location of the mathematics and physics institutes reflects not only the relative prestige of these two disciplines, but also what was seen as their fundamental role as the underpinning of knowledge and methodology across scientific disciplines. Ibragimova writes:

> Not only a subjective partiality on the part of the organizers of the new Division toward this ancient science [mathematics], [but also] the objective situation brought mathematics to a premier role. The volume of information and the analysis of it for the choice of optimal variants all the more required computational methods in practically all spheres of intellectual activity. (Ibragimova 1997:13)

Fundamental science, based on what at the time were considered the abstract, neutral truths of mathematics and physics, thus assumed a central ideological and physical position in Akademgorodok, testifying to the power ascribed to participation in universal discourses in the identity of this local community. By the end of the 1960s, however, "a number of failures of a local character forced [scientists] to ponder the universality of mathematical methodology that [had been] so popular among Akademgorodok researchers" (Vodichev 1997:189). As it turned out, mathematical and physical models could not be universally applied to problems in economics, linguistics, and sociology:

both the foundational position of mathematics and physics and the ideal of interdisciplinarity seemed to be collapsing. This "disillusionment" happened at the precise historical moment that Akademgorodok scientists' idealism about their own position—and that of "pure science"—in modernizing projects was fading under increasing political and economic pressure from the state. Nevertheless, they continued to understand mathematics and physics as the "purest" of sciences, even as the barriers to their application in other disciplines became accepted.

Introducing Scientific Innovation into Production

The relative positions of "fundamental" and "applied" science were not, however, unproblematically hierarchical in Akademgorodok; indeed, the tension between them was central in Akademgorodok's early history and continues to shape the current crisis in post-Soviet science. Akademgorodok was to strike a balance between these two forms of science: Lavrent'ev's enumeration of his central principles included both the proposition that "institutes should be founded for the cultivation of major new future directions for science and technology" and that "any scientific achievement increases its value tenfold from rapid introduction into production" (Ibragimova and Pritvits 1989:63). "It is entirely obvious," writes Vodichev (1994:90), "that Academician Lavrent'ev did not belong to that circle of academic scientists who were supporters of the exclusively fundamental orientation of the Academy of Sciences." Lavrent'ev was reacting to what many saw as a chronic problem of Soviet science and economics: the system of centralized planning inefficiently integrated scientific innovations into the production

process (Josephson 1981; Gustafson 1980). The problem was largely structural: in reaction to Stalin's overemphasis on practical and technical research and demonization of "pure" research—which "pure" researchers in the Academy of Sciences saw as "flooding the Academy with engineers" (Graham 1993:182), academic and industrial research had split in the first half of the 1960s. The system of centralized planning did not usually permit for coordination between industry and the academy, or between industrial researchers and academic researchers; instead, competition between ministries and other bureaucracies for scarce resources was the rule (cf. Kornai 1992). But as criticisms of centralized planning were not likely to be well received, attention was focused on developing mechanisms for bridging the gap between science and the technology of production at the local level.

Science in Akademgorodok was relatively free of the direct state interference that characterized the Stalinist era, but it remained a powerful symbol of national strength as measured by economic productivity. There was, in Josephson's words, an "ironic tension between the view of science as a supremely rational endeavor that holds a central place in Soviet science and the insistence of many administrators, economic planners, and scientists alike that science is inherently political since it must reflect broader social goals and cultural aspirations" (1997:xviii). While Akademgorodok's founders may well have considered fundamental science both more prestigious and more "value-neutral" than applied work, they also included in the town's physical and organizational structure mechanisms for the application of scientific results to the betterment of the nation, specifically toward increasing industrial and agricultural production. Akademgorodok

was to be part of an "innovation beltway" (*poias vnedreniia*) which linked the science city directly to Novosibirsk's industry. The city was to be surrounded by design bureaus and factories in which scientists acted as intermediaries—"discoverers, creators, innovators, entrepreneurs, and salesmen all wrapped into one" (Josephson 1997:281-282)—between institute researchers and assembly line engineers (Vodichev 1994:77). For various reasons, not the least of which was scientists' desire to work on fundamental questions without regard for their industrial applicability, the plan was never implemented on the scale Lavrent'ev imagined it. Six special design bureaus were established within 15 kilometers of Akademgorodok, however, and Akademgorodok institutes did establish a longstanding cooperative relationship with Sibselmash (Siberian Agricultural Machinery), a Novosibirsk factory whose production process they modernized (Josephson 1997:286). Again, the use of spatial organization and geographical proximity characterize the models through which Akademgorodok's founders proposed to link science and economic production.

It was, therefore, the dual task of the scientist to conduct "value-neutral" fundamental science for the international prestige of modernity it drew to national science and to figure out how to bring those fundamental researches to bear on the productive process, thus bolstering the ever-rising achievements in productivity of the national economy. The way in which Akademgorodok was a local place constructed at the intersection of a colonialist national imaginary and a transnational form of knowledge makes it unlikely that the production of knowledge and the production of national symbols were ever separate operations. In fact, the production of knowledge in

Akademgorodok became a national symbol specifically by embodying a paradoxical relationship between center and periphery.

Far from Moscow: Akademgorodok and State Power on the Periphery

Akademgorodok's origin narrative, surprisingly, portrays the scientific center's creation as the result of something almost like grass-roots activism on the part of scientists, albeit powerful scientists with powerful friends. In a 1989 published account, Sobolev reports that a summer 1956 conversation between the three middle-aged scientists, all members of the Academy of Sciences, about how to "raise the scientific and technological potential of the motherland" in the postwar years, was the genesis of Akademgorodok (Ibragimova and Pritvits 1989:28; see also Ibragimova 1997:3). The three decided to make it their task to construct scientific centers all over the Soviet Union, where they could utilize local resources and, in turn, integrate their research into industrial and agricultural production. "We decided to appeal to the government," Sobolev reports, "to give us the opportunity to go to the East and undertake the creation of a massive scientific center which could be, in scale, in capacity, comparable with the famous centers in the European part of the country" (Ibragimova and Pritvits 1989:28).

Ol'ga Nikolaevna Marchuk was one of the early settlers of Akademgorodok. She arrived there with her husband Gurii Ivanovich, a hydrodynamicist and meteorologist who later became president of the Siberian Division and of the USSR Academy of Sciences, in September 1962, when the town was still under construction. Her memoir ascribes a central role to Lavrent'ev:

> In the 1950s, [Lavrent'ev] worked in Moscow in the Institute of Mechanics and Computing Technology. [He] saw inadequacies in the organization of Soviet science. Nearly all science was concentrated in the capital and a few major cities of the European part of the Soviet Union.... Mikhail Alekseevich thought that it would be good to move a group of scientists to a region where life was at a full boil, where industry was developing. The most promising from this point of view was Siberia.... Talking with his colleagues, M. A. Lavrent'ev discovered that Academicians S. A. Khristanovich and S. L. Sobolev, as well as a few other scientists, thought just like him. ...When the idea of establishing a scientific town was fully formed, Academicians Lavrent'ev, Khristanovich, and Sobolev went to the government with a proposal. The proposal was reviewed, the scientists were invited [to argue their case in person], they were heard, and were given the "go-ahead." (Marchuk 1997:8)

Akademgorodok historian of science Evgenii Vodichev clarifies what appears in these previous narratives to be a simple, yet striking, case of Soviet scientists noticing a problem, pointing it out to the Party and Academy leadership, and being given carte blanche to fix it. He notes that Lavrent'ev in particular was respected and admired by none other than Nikita Khrushchev, to whom the scientist became a kind of informal science adviser (Vodichev 1994:90). Vodichev notes that it was this influence, as much as any objective evaluation of Lavrent'ev's proposal, that ultimately ensured that Akademgorodok would be built: "It is obvious that the successful realization [of Akademgorodok] was possible thanks to Lavrent'ev's personal access to Khrushchev and his influence on the leader of the country" (Vodichev 1994:23). Moreover, Vodichev asserts, although the founders of Akademgorodok argued their case before Soviet leaders in terms of setting science the task of increasing the productive capacity of Soviet industry, their own ambitions to escape the confines of their narrowly-specialized,

heavily-bureaucratized Moscow institutes were also critical to their formulation of Akademgorodok's founding principles (Vodichev 1994:31; see also Josephson 1997:7).

Both Russian and Western writers on Akademgorodok have made the case (perhaps reflexively) that the town's physical distance from Moscow translated into an ideological and cultural distance that was the key factor in the development there of a scientific culture so different from the capital's, especially in the years before 1968. Josephson describes Akademgorodok's pre-*glasnost'* openness, focusing on its "social clubs and cafes, whose very existence was largely unheard of elsewhere in the Soviet empire" (1997:xiv).[10] In the clubs (male) scientists exchanged ideas,[11] read poetry, listened to traveling bards (whose lyrics were more or less obliquely critical of the regime), and by some reports, patronized prostitutes. Josephson states that this climate of scientific openness—and political and sexual permissiveness—"was facilitated by Akademgorodok's location, far from Moscow, the central Party apparatus, and strict ideological control," and that "the roots of this openness were the city's geographical and psychological distance from Moscow" (1997:xiv). Unfortunately, Josephson does not ask why scientific openness, political freedom, and social permissiveness should necessarily be equated.

In fact, scientists, reflecting on the past and the (ethnographic) present, do couch their understandings of Akademgorodok's significance and uniqueness in terms of center-periphery relations between Moscow and Siberia. One nuclear physicist, who arrived in Akademgorodok in 1962, remembered,

> Here's what the peculiarity was: Akademgorodok was at a great distance from Moscow. This was a certain "protection" from all the Moscow political changes. In Moscow, if, for example, Khrushchev said something, they quickly said, "Yes, sir!" By the time this gets to Novosibirsk, it's all maybe dying down. It's already not necessary to say, "Yes, sir!" The large distance promoted... Here that strict ideological control that existed in Moscow wasn't so strict. [The distance] promoted the specific atmosphere of Akademgorodok.

Implicated here is a version of Siberia as European Russia's "wild," "uncontrollable" Other: even the centralized Soviet system could not quite control how its directives were received in the peripheral region. This is an important part of Siberians' self-construction—if Moscow sees them as unruly and uncivilized, they see themselves as independent and authentic.

Of course, there is a flip side to this image, one which is more difficult to align with or use as an explanation for Akademgorodok's "freedom": if it was a place of freedom and weak state control, Siberia has also, since its Russian colonization, been a site upon which the violence of state terror and discipline has been most dramatically enacted. Siberian village prose writer Valentin Rasputin exclaims, "You should have tried to survive here, amid the unrestrained human lawlessness stemming from Siberia's position as a land for correction and exile and one given to arbitrary rule" (1989:173). And indeed, few thoughts come to mind either for Russians or Westerners quicker than "gulag" and "exile" upon mention of Siberia. Upon meeting me, people often jokingly asked for what political crime I had been sent to Novosibirsk. Spatiality—figured as distance from the center—was of course central in Siberia's career as a penal colony; the tsars began sending political subversives—often intellectuals—to Siberia, where their

ideas could not easily be communicated to or influence the metropolitan masses. After some years, these "involuntary migrants" became a significant proportion of the Russian population of Siberia—Western Siberia in particular—where they developed a culture reputed to be "freer" and "more democratic" than that of "feudal" European Russia (Mote 1998:60-62).

The image of Akademgorodok in its early years clearly echoes this construction of Siberia as free and democratic. It was the Soviet system, with its promise of modernism, that turned exile into a bureaucratic and economic system. The use of labor camps expanded greatly after the October Revolution, and by the depths of Stalin's Terror, Solzhenitsyn (1973) could point to the existence of a "Gulag Archipelago"—a chain of prison camps stretching across the country and comprising millions of people as both inmates and guards, a virtual country within a country.[12] Mote (1998:94) notes that 120 of the 225 camp regions surveyed by Solzhenitsyn in *The Gulag Archipelago* were in Siberia. There is, therefore, a paradox between Siberia represented as a site of resistance to, or untamable by, the modern state and its incorporation into that state as a site of disciplined bodies and state-sponsored violence, not to mention the slave labor upon which the Soviet economy relied so heavily. At any rate, Siberia's essential "wildness" had been brought into direct dialogue with the modern disciplinary apparatus of the state long before Akademgorodok was built. It is helpful, then, to think about Akademgorodok's social and ideological "location" in terms of this rather paradoxical construction of the region with which it was so closely associated.

Akademgorodok's founders were well aware of this irony: "I don't know for what sins they sent you here. No one goes from Moscow to Siberia voluntarily," the first secretary of the Party Committee for Novosibirsk Oblast reportedly told Lavrent'ev (Marchuk 1997:11).[13] And narratives about Akademgorodok's early days do concur that a measure of scientific and intellectual "freedom" was achieved by establishing Akademgorodok as an independent scientific community, structured along different lines and committed to different principles than (though still accountable to) Moscow. Yet it also appears that what enabled Akademgorodok to exist at all and to function with a certain degree of autonomy was its leaders' access to government and Party officials, including Khrushchev himself, and these powerful officials' implicit trust in Lavrent'ev, Sobolev, Khristianovich, and others, though this is not to say that all Akademgorodok leaders—or even these three—were "friends" of the regime. But the assumption that they could realize their ideas shows how top scientists, at least, perceived themselves as agents with regard to the state. Walking through the Museum of the History of the Siberian Division in the summer of 1997, my friend Natasha stopped in front of a large black-and-white group photo of an official delegation to Akademgorodok. She called over her teenage daughter and me, saying, "Look! Lavrent'ev is seated at the right hand of Khrushchev." She went on to point out other Party dignitaries who were seated much farther away from the General Secretary, and she made clear that she wanted us to understand that Akademgorodok's founder had been close to Soviet leaders.

Positing that Akademgorodok's closeness to Moscow political elites might have been as important a factor in its culture as its distance from the capital makes us take a

second look at the "origin myth" of the town, where Lavrent'ev highlights "access to the Trans-Siberian railway [and] an airport with direct flights to Moscow." Closeness to Moscow—or at least easy access to it—was equally important as distance from it (just as proximity to and distance from Novosibirsk were important). Academician Samson Semyonovich Kutateladze remarked, "If there hadn't been the TU-104 [a Soviet passenger jet], there wouldn't have been a Siberian Division either" (Ibragimova and Pritvits 1989:66). On the other hand, one scientist's wife wished Novosibirsk were closer to Moscow, as her husband frequently left her behind when he traveled to the capital for committee meetings (Maddox 1987:800). Clearly, easy contact with Moscow's governing structures and scientific institutions was as desirable as the relatively loose ideological and political control that followed from Akademgorodok's distance from Moscow. If the time-space compression made possible by mass media and rapid transportation is what makes the "imagined community" of the nation imaginable, then it is clear that Akademgorodok's simultaneous and paradoxical distance from and proximity to Moscow represent the troublesome incorporation of a peripheral region into a Soviet nationalist project (Anderson 1983; Harvey 1990).

While Akademgorodok was intended to produce a local, Siberian science, its leaders' close ties to Moscow created suspicion and resentment among local Party leaders in Novosibirsk. Akademgorodok's unusual political liberality among Soviet cities was tolerated only by the largesse of Kremlin leaders, as is attested by the 1968 "crackdown" on scientists' political freedom—after a small number openly protested the Soviet invasion of Czechoslovakia and signed a letter of protest against the Brezhnev

regime's treatment of four dissidents (see Josephson 1997:296-302). As the ouster of Khrushchev changed the national political climate, Akademgorodok's relations with local authorities, who had tolerated the scientists, became increasingly strained. The town's institutes were forced to compete with other productive units for scarce resources, and the "regional Party powers began to launch ever more intensive attempts to regulate the town as its patrimony" (Vodichev 1997:192-193). Akademgorodok was again suspended between the center and the periphery, but this now meant stricter control from both ends.

The city, after all, played a crucial role in an important ideological project of the central, national state. If Akademgorodok's very existence was in some sense a critique of the Soviet scientific and industrial systems, disciplinary mechanisms had to be activated in order to appropriate and mobilize that critique into the center's unitary discourse of progress and modernity triumphant. Nonetheless, it provides an instructive critique of totalitarian models of Soviet society by pointing out the way in which Soviet policy was shaped by a tug-of-war between the center and the regions. That tension continues, in even more powerful ways, to shape postsocialist Akademgorodok.

Was Soviet Science International?

The overlapping tensions that created Akademgorodok were not only national and regional, but also international. On one hand, Akademgorodok represented a particular response to the inadequacies of Soviet science as perceived by Lavrent'ev, Sobolev, Khristianovich and others, as well as a way of localizing and concretizing in

space a particular model of science's role in national progress and the "development" of a peripheral region. On the other hand, from the beginning, it was also woven into a network of international models of science and society and politics. For all its seeming provincialness in the wilds of Siberia, Akademgorodok represents a direct attempt to confront the question of science's national "location." Again, it is worth reiterating here that Akademgorodok represents an implicit critique of the excesses to which certain tendencies in tsarist and, later, Soviet scientific organization had been allowed to develop. If the separation of research and teaching which Lavrent'ev wanted to transcend was derived from "German" models, some accounts attribute the science city's very existence to American models of the relationship between science and society. Josephson, for one, argues that the peculiar climate of the Khrushchev "thaw"—a relative loosening of state controls internally and the intensification of the Cold War with the US—was characterized by anxieties over the USSR's "lag" in science and technology vis-à-vis the West. This led Khrushchev to become a vocal supporter of science and technology. In 1959 he visited the United States, in order to "see for his own eyes what ought to be copied, emulated, or adapted in the Soviet context" (Josephson 1997:9). Josephson asserts that Khrushchev took "America's universities...to be cities of science" and that the Soviet leader "was convinced that these cities had secured America's technological leadership and were the epitome of scientific achievement" (Josephson 1997:9). Roy and Zhores Medvedev, an historian and a biochemist, respectively, write that the construction of science cities was "a response to the influence of the West, where small scientific and university cities (Cambridge, Oxford, Gif-sur-Yvette, Heidelberg,

Berkeley, and many others) have, in some cases, existed for centuries" (1978:108). Finally, Akademgorodok historian Evgenii Vodichev notes that, though it may not have been permissible at the time to say so,

> Certain organizational-administrative decisions, already approved in the founding of scientific complexes in a number of leading countries of the world, first of all in the USA, found their embodiment in the conception of a regional scientific center in Siberia. (1997:186)

Lavrent'ev, for his part, imagined Akademgorodok as something other than a specialized science city focusing on one discipline or task, such as the Soviet ones built around the same time (and also like American towns such as Los Alamos during the Manhattan Project) were. But he also saw Akademgorodok as different from "foreign science towns, for example Stanford and Princeton in the USA, Grenoble and the centers near Lille and Marseille in France, [which] exist on the basis of [their] corresponding universities" (1980:14). He wanted Akademgorodok to be its own kind of science city, situating the town between foreign and Soviet models of such a place.

Lavrent'ev took advantage of Khrushchev's sense that there was a "science city gap" between the US and the USSR and his determination to catch up and surpass the US in the construction of science cities.[14] While Americans do not usually think of universities or even university towns as "science cities," the American term "college town" implies a similar set of spatial, institutional, social, and economic relationships between knowledge production/producers and local culture as the Soviet "science city." Khrushchev focused in on the pleasantness of the surroundings in the towns he visited,

> somewhat simplistically assum[ing] that scholars and scientists in the West work so successfully because they are peacefully isolated from the bustle and distractions of the big city, enjoy pleasant living conditions, and can concentrate all their attention on their scientific work. (Medvedev and Medvedev 1978:108)

Khrushchev, then, imagined that particular relationships between scientific spaces and living spaces were the reason for the United States' superiority in certain fields of science. The particular configuration of science and everyday life in Akademgorodok was the result of long-standing Russian ideas about *byt*, the various models of science prevailing in the post-Stalin Soviet Union, the tensions between Moscow and the regions, and, no less, an internationalist imaginary in the context of Cold War competition and its flip side, mimesis. The USSR was to catch up to and surpass the West at its own game. Akademgorodok as a place, therefore, even at its inception as a localized scientific community, occupied a "space" in a transnational imaginary of science's relationship to the nation-state and to a kind of reified economic and scientific "progress." In this imaginary, the Soviet Union lagged behind—even as the US, for its part, feared that it was lagging, especially in the wake of Sputnik (see, for example, Wallace 1957).

There seems to be almost an inferiority complex running throughout both Soviet and American nationalist discourses about science and technology, most obviously with regard to the space race of the 1960s, but also in physics, computer science, and mathematics. Much Soviet energy was devoted to catching up to the West, developing an undeveloped region—in other words, using science as a demonstration of present strength was in some sense a tacit admission of past weaknesses. Perhaps this is why the

transnational imagining of space is so fraught with contradiction in Akademgorodok's history.

On one hand, Akademgorodok was to be an *international* center of science and technology: much was made of the international congresses, conferences, and symposia that were held there beginning in the early 1960s. One of the original inhabitants, even before the town was built, was a Chinese graduate student (Marchuk 1997:12). Although contacts with them were controlled, foreign scientists—and sometimes dignitaries—were never an uncommon sight in the town. Soviet science's achievement was based not simply in the anxiety it produced in Western scientific circles, but the respect it had gained abroad and progress it had made after the excesses of Stalinism. Soviet scientists valued their foreign colleagues and wanted to participate in the "world science" community as equals.

On the other hand, Akademgorodok was a *national* symbol, a symbol of a particular way in which science could be used to construct national superiority. Its international character—the respect it garnered from the very foreigners with which it competed—was one way of demonstrating the achievements of Soviet national science. Every hectare of Siberian land brought under cultivation, every new oil well dug, each more powerful particle accelerator or advance in cybernetics told the world of the ability of Soviet science to master the wildest, most uncontrollable place on earth and, in fact, nature itself.

Tensions and Transitions

The apparently bland, functional surroundings of science are usually taken to refer to science's "culture of no culture" (Traweek 1988:162), its disarticulation from the mundane, its rejection of "the local" in favor of the universal and transcendent. Akademgorodok, with its buildings and labs that are in many ways typical of scientific spaces around the world, shows that science is not only created by local, historical subjects, but in particular physical and ideological spaces. And just as the "culture of no culture" is, in the end, a "culture," and "value-free" is a value, the apparent uniformity of scientific spaces is itself a culturally and historically specific form of spatial organization. This form contains within it, however, implicit tensions about the role of science in society.

At the birth of modern science, the issue of what kinds of spaces were appropriate for the production of experimental facts was hotly debated. Should the new "laboratories" (the word was coined in the seventeenth century) be public or private spaces? How could laboratory spaces and their contents produce credible "virtual witnesses" to experimental replication? The answers required a settlement on what kind of a *social and political* space the laboratory was to be (Shapin and Schaffer 1985:334-341).

Akademgorodok is not only a scientific space like so many others; it is also a particular solution to the problem of science's social and political location. The apparent transnational homogeneity of scientific spaces tends to conceal how these spaces are embedded within local, national, and global processes and discourses.

Akademgorodok's scientific spaces continually break out of the laboratory—indeed break out of the town itself, connecting Siberia, the Soviet Union, the world. Akademgorodok was, in short, a local solution to a nationalist problem based on an international model; it did not resolve those tensions, but existed in an uneasy balance between them. And as we have seen and will in the chapters that follow, when those relationships shift—as with the ouster of Khrushchev or the end of the Cold War—Akademgorodok as a scientific space changes as well.

As at the early modern birth of experimentation, a great deal of effort must be put forth—by scientists and political authorities alike—to universalize localized phenomena, to turn a local space into a national or transnational one. These universalizing projects are, and perhaps can only be, partially successful. The ability of experimental results achieved in a laboratory to represent natural phenomena was not at stake in Akademgorodok's construction: this had already been settled hundreds of years earlier. But the way Akademgorodok's founders and builders used space to construct a scientific culture—and the ways in which some of these efforts failed—show that the spaces created for science remain spaces for the negotiation of "solutions to the problem of social order" within complex webs implicating translocal connections, state authority, and imagined collectives (Shapin and Schaffer 1985:332).

Soviet rationalist high modernism as applied to Siberia—specifically the idea that science could modernize or develop a peripheral region—relied on science's universality as knowledge. That is, in order to bring Siberia into the twentieth century, so to speak, science had to be imagined as something transferable to a periphery, something that

could be moved across cultural and social divides—and even temporal ones, given how Siberia was understood to be "backward." But although it relied upon a conception of science as ultimately transcendent of locality, Akademgorodok also owes its existence to the idea that science is—and ought to be—local. Siberian science—and Siberia—could not be developed from Moscow; this required not only that science be physically located in Siberia, but also that a specifically Siberian science be developed, one that had its own priorities, approaches, and organization. Science, while thought to be essentially transcendent of "the local," was in Akademgorodok localized, territorialized, and tied to a place and the spaces that comprised it, both inside and outside.

Akademgorodok was both a Siberian center and a national center, albeit physically located on the periphery. It, its science, and the development project of which it was a part were all the sites of struggle between regional and central authorities. Akademgorodok was a part of neither Moscow nor Novosibirsk, it was part of both, and it was "its own world" (Vodichev 1997:195). Its workers came mainly from the center, and it was part of a project that demanded the objectification of—and, many would say, the exploitation of—a peripheral region in the service of a nationalizing project produced at the center. In a very real sense, then, Akademgorodok's science became the cultural property of a nationalist and colonialist project in Siberia: "Regardless of the fact that, administratively, the scientific center was located within Novosibirsk, far from the center of the country, in fact it belonged not so much to a given city or region, as to the country as a whole" (Vodichev 1997:195).

Nationalizing projects represent the nation as homogeneous and bounded for both internal and external audiences, though the work is essentially the same. In this sense, the defeat of backwardness in Siberia—what I have called the nationalist/colonialist project—and the international prestige of Soviet science were part and parcel of the same discourse in the context of the Cold War. Siberia and the United States were both, though in different ways, the "uncultured" others against and upon which Soviet modernity was constructed. In a classic case of difference and imitation mutually eliciting one another—what Gregory Bateson (1972:68) called schismogenesis by symmetrical differentiation (see also Taussig 1993)—the US and the USSR's scientific communities relentlessly mimicked one another, guiding one another's research programs and priorities, driving new and more spectacular achievements, and creating anxieties about "lags" and the need to "catch up and surpass," while all along their countries held each other at bay with nuclear weapons. Science here is used to stand for the essential modernity and civilization of one nation and, thereby, the rightness of its solution to the problem of social and political order, even as science and scientists are thought to transcend those deep boundaries. Science in an international space, therefore, cannot be disentangled from science's place in the imagining of nations, regions, and localities.

In the decade since the Soviet Union's collapse, the question of science's relation to regional, national, and transnational spaces—and to the vexing question of what kind of social and political order will emerge from the ruins of state socialism—has been at the center of Akademgorodok residents' experiences. Everyday life, which was once

comfortable and facilitated scientific careers, has become extraordinarily difficult for many in Akademgorodok, and the daily struggle to get by consumes much of the energy that was once poured into science. Moreover, scientists feel as though they no longer get to actively imagine how they fit in the nation and the world, but instead must react to the untenable position they have been put in, no longer a priority of the center, caught in the midst of regional politics, and unevenly incorporated into global scientific networks. Indeed, Akademgorodok's spaces have become nearly unrecognizable to many, though the birch trees and the concrete panel institutes along prospekt Lavrent'eva and the comfortable cottages are still there.

Chapter Three

Is Science Disappearing?
Crisis, Capital, and Connections

> The pattern of change was not background, as we may now be inclined to study it; it was, rather, the mould in which general experience was cast.
> —Raymond Williams (1983[1958]:31)

In October 1998, I went to do fieldwork in Akademgorodok not quite knowing how the city would have changed since my last trip there in the summer of 1997. As the summer of 1998 wound to a close and I prepared to go to the field, it felt as though some kind of seismic shift was underway in the world. Asia had already succumbed to economic near-collapse and IMF-imposed austerity plans. Eerily, the United States retaliated for the bombings of its embassies in Kenya and Tanzania by bombing facilities suspected of being terrorist bases in Afghanistan and the Sudan, just as Bill Clinton was publicly admitting having had an "inappropriate" relationship with Monica Lewinsky. On 17 August, the same day that, in Washington, Clinton was testifying before a grand jury and delivering a televised address about the Lewinsky affair, the Yeltsin government, facing imminent financial collapse, delayed scheduled payments on foreign debt, restructured government bonds, and—most significantly for Russians, it would turn out—"sacrific[ed] the ruble to market forces" (Bohlen 1998).

Russians commemorated the ritual sacrifice of their national currency before the invisible-handed gods of the market as "the August 17th crisis" or simply "the crisis" (*krizis*) or "August 17th." Quickly, the worst-case scenarios were surpassed by reality. The government had removed some controls on the ruble's exchange rate—a de facto devaluation—allowing it to sink from its pre-crisis level of about 6 rubles to one US

dollar as low as 9.5 rubles to the dollar. By the time I left the field in October 1999, the ruble-dollar exchange rate was about 25-1—more than four times lower than it had been 14 months earlier. But in the days just after 17 August 1998, appearances were confusing. US media portrayed long lines of panic-stricken Muscovites, in a rush to convert their ruble-denominated savings into "hard" deutsche marks or dollars, clamoring outside currency exchanges that had closed because the operators were uncertain about the value of the ruble. Many shops, too, closed temporarily while workers recalculated prices to reflect the declining exchange rate. Ordinary Russians, in a fit of crisis-induced thriftiness, were reported to be choosing Russian-made goods over more prestigious imported ones, or postponing major purchases altogether. On the day after the crisis, an American investment banker predicted in the *New York Times*: "You're going to see a lot of Mercedes 500's and 600's for sale. You'll be able to buy them for the price of a Nissan" (Wines 1998). Rumors flew of impending shortages of staples—flour, sugar, meat, medicine.

Concerned, I sent an e-mail to the Efimovs, the family I had lived with during preliminary fieldwork in 1997 and was planning to live with during my year of dissertation research. Did they need me to bring anything with me? Did they need me to wire them some dollars? Their response was cautious, but they seemed a bit perplexed at my alarm, asking, "What are they reporting there? Because we don't always hear the whole story here, maybe you have more information than we do." But everything seemed fine; there were no shortages apparent in Novosibirsk, and the family had kept their small savings in dollars. Several Russians who were in the US at the time of the

crisis, also alarmed by media reports into concern for their families in Moscow and Novosibirsk, told me that when they finally reached their relatives over busy phone lines, their families were equally perplexed by reports of panic and shortages of flour. Later, in Akademgorodok, I met a woman who was working as an interpreter in New York at the time of the crisis; when she called her mother to ask if she should return with a suitcase full of groceries, her mother burst into laughter.

What was this crisis, that could provoke both near-panic in the streets, baffled laughter, and sheer puzzlement? Moreover, why was it so difficult to get a clear picture of what the crisis signified? Was it all just an abstraction, something that happened at the level of international political and banking institutions, and which average Russians could shrug off with a knowing chuckle? Or was it a serious breakdown in the ability of the state to support social services and even the value of the national currency, a breakdown that would make everyday life even more unpredictable and difficult for Russians? And if the crisis was a kind of shifty signifier—if it was all of these things at once—then how were people experiencing and making sense of this shifting and contradictory symbol in the peripheral center of Akademgorodok?

Soon after I arrived, it became clear that the August 17 crisis had very real effects, most notably the sinking value of the ruble and the complications this caused in people's everyday lives—food and other necessities, many of which were imported, had become prohibitively expensive. Moreover, August 17 had come to stand for a whole series of crises, indeed for the entire decade-long process of postsocialist "transition" in all its ambiguities and contradictions. The effects of the crisis on Akademgorodok science

were seen through scientists' understandings of the ways everyday life, capital, and science converged in this peripheral, scientific setting. In turn, experiences of the crisis shaped scientists' interpretations of the changes in the organization and funding of science, the shifts in their travel patterns, and their relationships to the Moscow scientific hierarchy. In short, in the symbol of "crisis" were crystallized scientists' ongoing concerns about Russian science's relationships to the structures of international capital and Akademgorodok's position in the Russian nation.

Akademgorodok scientists' ambivalent relationships with Moscow, on which they once relied for economic support and ideological purpose, but from which they valued their distance and relative independence, have become less ambivalent. During my fieldwork, the prevailing attitude toward Moscow—both as a symbol of the Russian state and as the capital city—was one of disdain and undisguised resentment. Akademgorodok scientists increasingly saw themselves as pushed to the margins of the nation-state: in their view, the center viewed Siberia as a source of natural resources, and similarly saw Siberian scientists with foreign contracts or small businesses as sources of tax revenue and, perhaps, as national security risks. The purpose and support that the Moscow center once provided had evaporated, and scientists were setting about finding other, often foreign, sources for big science's necessities. But they also feared becoming a kind of scientific colony, a source for highly-qualified labor that produced little knowledge locally. They worried that the effects of foreign capital—and its demand for practical results in short time—would destroy the particular emphasis on fundamental science that had been so carefully engineered in Akademgorodok. And they resented the increasing

divisions between those with access to foreign and domestic sources of capital and those without, and the effects those divisions were having on Akademgorodok's vibrant research environment. Science, people often claimed, was dying in Akademgorodok; I argue that what they meant by that was not simply that less research was going on in the science city (which was true), but also that the particular connections between fundamental and applied science, everyday life, the state, and private interests that gave shape to Akademgorodok's local way of doing science were being severed, reconfigured, and rebuilt in ways that many scientists found unrecognizable. What counts as science—what makes science recognizable in a particular scientific context—is more than what goes on in laboratories, but implicates how scientists imagine themselves to be part of national and even global communities. In the following series of vignettes that show the crisis from various perspectives in Akademgorodok—focusing especially on the household in which I lived—I hope to capture something of the ambiguity and uncertainty that were so prominent in Akademgorodok residents' experiences of the crisis, while illustrating how socialist-era forms of organizing and thinking about science in Akademgorodok are shaping those experiences.

Disappearing Science

December 31, 1998. At midnight, we opened the door to welcome 1999 and drank a champagne toast, then went outside into the lovely night—the temperature had risen to just below freezing, and the freshly-fallen snow sparkled in the moonlight—to set off some fireworks and wish our neighbors well. Later in the night, my host, Valerii, his

wife Liuba's best friend Margarita, and I, bored with the pop concert on TV and running out of ideas for toasts to drink, decided to take a walk to the center of Akademgorodok to see the *elka,* the New Year tree. Margarita lives in central Novosibirsk, and so she was curious to see what Akademgorodok's festivities were like, though they were of course more modest than those taking place in Lenin Square in the city. We strolled down Morskoi prospekt, which was bustling with people, even at two or three o'clock in the morning. Everyone was wishing one another a happy new year, and the mood was festive. As we neared the House of Scientists, we could hear the thumping of dance music, and as we got even closer, we could see colored lights and the blinking of strobes from through the trees. The House of Scientists had been converted into a two-story, multi-room disco for the evening, and I remembered having seen ads promoting the party in the local free newspaper. There were maybe a hundred cars parked outside the building—mostly imported makes like Toyota, Nissan, and Daewoo, and an above-average number of Mercedes, BMW, Lexus, and American SUVs. There were leather-jacketed men and mink-clad, miniskirted young women standing among the cars, yelling over the music into mobile phones, another sure sign that this was an upscale, moneyed crowd, as very few people in Akademgorodok had mobile phones.

As we passed the transformed House of Scientists, the celebratory and even giddy mood in our little group suddenly changed. Valerii became somber, even sad. He grabbed my arm, stopped in the middle of the sidewalk across the street from the disco, and said, "Look, if you really want to know how Akademgorodok has changed, you only need to look over there. Those people have nothing to do with science, they're New

Russians. They have no relation to science at all. It used to be that even I couldn't get in there. When I was younger, just a junior researcher, you couldn't just go eat there or see a concert there the way you can now. It was for important scientists, institute directors and prize winners, only. If a junior scientist wanted to go there, for a birthday or something, you had to use connections and you had to plan it months in advance. I couldn't even go there, and now look. All those people have no connection to science whatsoever. That's how Akademgorodok has changed." I commented that it seemed that one privileged class had simply replaced another, with the same net effect of excluding a large proportion of Akademgorodok's residents. Valerii clearly thought I didn't get it, exclaimed, "But they have nothing to do with *science*!" and threw a snowball at me.

For those, like Valerii, who imagined science to be a non-profit-oriented enterprise sponsored largely by the state and engaged in long-term fundamental projects, rather than short-term income-generating concerns, science in Akademgorodok is, indeed, being replaced. It is not clear, however, what kinds of ideas and institutions will emerge in its place.

Some Background: August 17th and a Decade of Postsocialist "Transition"

People in Akademgorodok saw August 17th not only as a moment that split time into two different periods, "before" and "after," but also as an ongoing process, even a permanent state. Akademgorodok sociologists have even referred to postsocialist Russia as a "crisis society," one in a permanent state of upheaval and uncertainty (Gordienko, Eremin and Pliusnin 1997). The most immediate effects of crisis—the signs people took

to indicate that there was a crisis—were apparent long before the 17th of August, though the events of late August gave them a convenient label. In Akademgorodok, the collapse of state support for science, salary arrears, sliding social prestige, an energy crisis, and a widening gap between rich and poor, were all problems that had worsened since, not begun with, August 17.

State allocations for science collapsed in the early 1990s, stabilized at a low level in the middle of the decade, and then collapsed again in 1998. During the first nine months of 1998, for example, the Siberian Division received only 60% of the funds budgeted for it (Basareva 1999:4), which, given the inflation that took place in late 1998 and 1999, quickly lost much of its purchasing power. The Russian Academy of Sciences, with its headquarters in Moscow, receives its state funds from two main sources: allocations directly to the Academy from the budget, and contracts concluded between the Academy's institutes and other government ministries and agencies such as the Ministry of Atomic Energy, the Ministry of Defense, etc. The Academy then allocates from its state funds to its divisions and branches, such as the Siberian Division, of which Akademgorodok is the center. The Siberian Division must pay its workers' salaries and maintain its infrastructure before funding research; this elaborate and centralized hierarchy of spending means that few resources actually trickle down to support laboratory research in peripheral scientific communities such as Akademgorodok. The national budget crisis at the center is thereby compounded with shortfalls and nonpayments as the funds make their way out to the regions. As teachers, doctors, scientists, and municipal workers all over Russia in the 1990s know all too well, money

to pay the *biudzhetniki*—those whose salaries and pensions rely on the budget (*biudzhet*)—was month after month failing to reach regional governments for distribution.

Akademgorodok sociologists Gordienko, Eremin, and Pliusnin report that, by 1994, the average salary of a non-scientist *biudzhetnik* had grown 480 times by comparison to pre-*perestroika* levels, while the salaries of scientific workers grew only 260 times. This may sound like a positive move toward salaries more commensurate with those received by scientific workers in western countries, but one must also take into account that prices grew during the same period an average of 970 times. Thus, by as early as 1993, 56% of scientific workers were receiving wages below the state-determined living minimum (1997:41).

In the aftermath of the 1998 crisis, the salary situation reached a critical level: some scientists had not been paid for six months or more. Arrears added up all through the summer of 1998, not just for scientists but for all *biudzhetniki*. Throughout my fieldwork in 1998-99, as each payday neared, rumors would begin to circulate: "They say there still won't be any salaries," or "They promise there will be salaries this time." Eventually, institutes would have to admit that there was no money for salaries, or only for partial payments, with no guarantees as to when the money would appear. I was witness to several near-riots in the post office on ulitsa Il'icha, when pensioners waiting in line to collect their pensions were informed tersely that there was no money, again. Some *biudzhetniki*, teachers in particular, took to the streets in protest—and during the summer of 1998 miners even blockaded the Trans-Siberian railway to freight traffic to

draw attention to the two years of salary owed them. There were some sporadic and, by all reports, small demonstrations by scientists, mainly in Moscow, St. Petersburg, and the science cities surrounding Moscow, but no mass action like that taken by teachers or miners. When I asked scientists why they did not go out in the streets to protest their plight, they consistently shrugged and asked, "Who would care?" They pointed out that although teachers and doctors provided services that the public and government officials understood to be essential to the proper functioning of society and the rehabilitation of the economy, most Russian people, facing harsh economic times themselves, could not see the value of spending money on fundamental research into the nature of life and the universe in an economy that demanded austerity. Science was a luxury, not a necessity. "We don't strike," a physicist told me, "because if we did the state would be happy, because then they wouldn't have to pay us at all."

Consumers had to be prepared for all kinds of unpredictable fluctuations in the prices and supplies of the goods they needed and wanted. People who depended solely on budget money—especially pensioners—often went without meat or medicine, not to mention new boots or coats, for long periods. Still, people managed to get by, using connections, relying on family and friends, spending long hours and sometimes traveling long distances searching for the best prices, buying the cheapest goods available, hoarding huge quantities. In the Efimovs' apartment, for example, one whole closet was packed with giant sacks of flour, sugar, salt, and rice; Valerii and Liuba spent hours scouring the hundreds of newspaper ads for these items and calling around to see whose prices were lowest. Then, in the blink of an eye, spending, rather than hoarding, became

urgent: suspicions of imminent inflation or devaluation sent consumers into stores, looking to buy something of value before their money became worthless. Liuba liked to point out that her imported food processor and microwave oven were purchases made under such circumstances in the mid-1990s.

Sometimes, certain categories of items just disappeared from markets. The puzzlement and anger such events caused reinforced Akademgorodok—indeed, Novosibirsk—residents' sense of being marginalized vis-à-vis the center in Moscow. In early December 1998, the price of beef in markets all over Novosibirsk Oblast' began to rise, to about 50 rubles (US $2.50) for a kilogram of the worst sort of meat, used for boiling soup stock. Then, beef began to disappear from the markets; while it never became totally unavailable, its supply was noticeably reduced. People began to wonder what was going on and, as was typical in such situations, began to call one another to find out if the same thing was going on in other parts of the city, or if a friend might happen to know where one could get some meat at a reasonable price. Soon a coherent story explaining the meat crisis emerged: beef was apparently in short supply in Moscow, and so buyers from Moscow had circulated to villages and farms in the provinces and offered about 50 rubles a kilogram—a higher price than local buyers could offer (average incomes in Moscow—and therefore prices—are significantly higher than in other parts of the country). Soon, local meat suppliers were pushed right out of the market, causing shortages, and the base price of the meat that was available in Novosibirsk rose to the levels offered by Moscow buyers. People complained that Moscow was comfortably and cheaply eating the regions' meat, while in the localities that produced the meat, people

went without. In the spring of 1999, Novosibirsk newspapers warned of a similar problem emerging with bread.

Not only were salaries unreliable and barely adequate in the face of inflation, the town's residential and scientific infrastructure was literally crumbling. Akademgorodok's infrastructure—streets, housing, utilities—was also dependent, both directly and indirectly, on federal budget funds. The Siberian Division is responsible for most of the land and buildings in Akademgorodok, including residential areas, parks, and forest land. It owns the apartment buildings, though many individual apartments have been privatized, and its *domoupravlenie*, or housing administration, is responsible for their maintenance—painting, repairing the mortar that joined the concrete panels (a constant concern in my building, whose walls leaked when the wind blew rain against them), keeping the streets relatively clean, making repairs to plumbing and electricity, and collecting rents on the remaining unprivatized apartments, however minimal those rents were. Since the Siberian Division was responsible not only for maintaining and operating 30-odd research institutes, but for so much of the town's infrastructure, the budget crisis in Akademgorodok crept out of science and into everyday life. For this reason, for example, hot water (heated at a central coal-fired plant just outside of town on the Ob' Sea) was sometimes sporadic because neither the city of Novosibirsk nor the Academy could pay for the coal. People in Akademgorodok suspected that Sovetskii *raion* (which includes Akademgorodok) was always the first in the city to have its hot water shut off, because "in Novosibirsk they don't like us."

In a town that was designed so that the ease of everyday life would enhance scientists' creativity and productivity in the laboratory, scientific workers' everyday struggle to adapt to changing crisis conditions and just feed and clothe themselves was taking a toll on science. And conversely, the difficulties of doing "big science" without funds, equipment, reagents, computers, and technical assistance impinged on the ways scientists lived their daily lives. The subordination of everyday concerns to scientific ones, an idea around which Akademgorodok was constructed, had fallen apart.

Akademgorodok's Institute of Semiconductor Physics (IFP, *Institut fiziki poluprovodnikov*) is not the worst-off of the town's research institutes, but neither is it among the handful of relatively prosperous institutes. Throughout the spring and summer of 1998, before the crisis of 17 August, workers at IFP, like those of the Siberian Division in general, were not receiving their salaries. Unlike their colleagues at some other institutes, however, researchers at IFP for the most part did not have private contracts or grants to fall back on. In fact, many complained that they were sitting practically idle during their work hours.

IFP's building on ulitsa Institutskaia (there is another, auxiliary building located a few blocks north on prospekt Lavrent'eva) is, like many of the other institutes in Akademgorodok, built of white concrete panels. It sits close to the street, behind a small flower bed and a circular driveway. One enters by climbing a few marble stairs and walking through metal and glass doors into a wide, low lobby. A caretaker, usually a woman (*vakhtersha*), sits at a small desk on your left—it is her job to check the identification of people who enter, make sure visitors signed in, answer phones, and keep

the lobby clean. Behind her is a coat check—presumably the *vakhtersha*'s duties also include checking coats—though I never saw it used; workers kept their coats in their labs and offices. Opposite the front doors are a stairwell and two elevators. Usually, though not always, the elevators worked. The windowsills in the stairwell, as in most institutes, were filled with exotic tropical plants of all kinds, which thrived on the bright sunlight and warmth they received in their location just above the radiators. Although the lobby was brightly lit with fluorescent tubes, IFP's halls were dim, lit only by light from windows at each end of the long corridor; in fact, unlit halls were characteristic of nearly every institute I entered, with the exception of the Institute of Nuclear Physics. The institutes saved some money by keeping the lights off. The halls of IFP were lined with doors leading to labs and offices, unmarked except for a number. Separating each lab door from its neighbor down the hall were three or four sets of numbered storage closets behind double wooden doors. The walls were painted an institutional green or yellow or blue. It was usually very quiet; I often felt as though my escort and I must be the only people in the building, though I knew that not to be true. Walking down the hall, our footsteps on the concrete floor sounded irresponsibly loud, and I often found myself lowering my voice to a whisper. It was difficult to imagine what this dark, silent, and spartan place must have been like when it was a vibrant, thriving, prosperous research center.

Inside the laboratories, however, people were trying their best to continue their work, with varying degrees of success. Valerii's room, which he shared with another researcher, looked like a rummage sale. Shelves reaching to the ceiling were packed

with old Soviet-made voltmeters, pieces of computers, glass dishes containing microchips, spools of wire, coffee cans filled with odds and ends, books and notebooks overflowing with paper. Tables were also covered with partially-disassembled instruments, tools, papers, and the remains of the previous day's tea. His computer, an old 486, looked to have been cobbled together from spare parts. Scientists in all of Akademgorodok's institutes have learned to save every piece of old equipment or material, especially metal, that they can get their hands on; almost everything could have a use someday. Like consumers at home, scientists have learned to hoard carefully, and spend when possible. But nearly a decade of reliance on recycled materials and ill-repaired instruments is taking its toll; the carefully-stored supplies are beginning to dwindle, and instruments are breaking down ever more frequently, with neither spare parts nor technicians to repair them properly.

In Akademgorodok's laboratories (which are organizational as well as spatial units), it is generally the responsibility of the head of the laboratory—the *zaveduiushchii laboratoriei* or *zavlab* for short—to develop the lab's research project, supervise the project, and, as is increasingly necessary, secure outside funding for the project. The institute may provide minimal salaries and overhead (though sometimes even hot water, heat, and electricity are in short supply) but if the project requires any sort of equipment, reagents, or instrumentation, or if the researchers wish to receive livable salaries, they usually can no longer rely on the institute to provide such luxuries. The responsibility for securing funding for a project—selling it to a granting agency or a corporate sponsor—is a new one for Akademgorodok's *zavlaby*, and they do not all have the skills

or the motivation to spend time searching for appropriate grants, writing proposals, budgeting funds received, and organizing short-term projects. As sociologist of science Steve Fuller (2000:43) has shown for the West, Akademgorodok scientists note that administrative tasks are overtaking scientific research—actual time at the bench—as the main activity of a scientist's work day.

That the responsibility for funding has landed mainly on the *zavlab*'s—and also on the institute director's—shoulders means that wide disparities are developing within and between institutes. One *zavlab* may aggressively seek relatively lucrative Western contracts and grants for his laboratory, while his colleague down the hall may, out of despair or disorientation, do nothing. Thus, whole laboratory units—or, on occasion, whole institutes—may sit idle while the administration tries to figure out what to do. One former senior researcher told me that his *zavlab* was so paralyzed that he spent the better part of each day at his computer, playing solitaire. One of the lab's programmers decided to play a trick on the *zavlab*, and secretly programmed the *zavlab*'s computer to shut down every time he opened the solitaire game. The colleagues laughed as they recalled how their boss would not ask any of them for help, for fear of admitting that he had been spending his long hours in front of the computer playing solitaire—a secret which, of course, everyone knew.

By 1998, Valerii's lab had "died a long time ago scientifically." The director of IFP had fallen seriously ill (he died in 1999), and one of his deputies took over as acting director. Rank-and-file researchers complained that the acting director was not doing enough to find projects and money for the institute in the absence of clear state directives

and plentiful state funding. While the highest levels of the institute administration—the director and his ever-multiplying deputies (*zamestiteli*)—and some *zavlaby* were charged with inaction in the face of the deepening crisis, some *zavlaby*, like Valerii's, actively sought what work they could, even if it was not research. Valerii's lab, for example, manufactures each year a handful of thermal imaging systems for use in medicine, using a small infrared-sensitive microchip.

Scientists in such labs who chose to remain at their posts (many left for other labs or jobs outside the institute) responded to the waning opportunities for research in several different ways. Some sought grants and contracts on their own, for their own individual efforts or for those of a small group of co-workers. Others languished without much work: it was not uncommon for me to see researchers playing ping-pong in the halls of one institute, for example. Others occupied their time with tasks unrelated to scientific work, as was the case with Valerii's birch bark sculpture (see chapter seven).

This malaise infected even the instruments the physicists used to do what little work they had. In early 1999, Valerii's "machine," a French-manufactured apparatus for manipulating microchips, broke down. His laboratory didn't have much work at the time, and he often spent only the mornings at work actually working; after a long *obed* (midday meal), he would return to the lab and occupy himself with arranging exhibitions and trips abroad for his birch-bark artisanry by e-mail. The lab had seen its contracts and projects dwindle to practically nothing. So with what he somewhat affectionately called "my machine" on the fritz, Valerii found himself unable to work on even the simple manufacturing tasks that the laboratory had been assigned. In fact, Valerii blamed the

breakdown on the lack of work in the lab: during the previous summer's financial crisis, the machine sat idle in an un-air-conditioned room for several months, since there was no money to keep research operating even superficially. This had caused some delicate parts on the machine to corrode, and then, in January 1999, when it was finally needed, the machine would not work.

The machine had been purchased in France in the late 1980s, affording Valerii his first trip abroad. It was a time when scientists were enjoying some fruits of economic and political reform before economic crisis set in. Cooperative ventures were springing up in institutes, and for a time scientists enjoyed not only freedom, but prosperity. Valerii and his wife were even confident enough to have a third child—something nearly unheard of. There was optimism, albeit tempered by caution, in the air.

But more than a decade later, the French machine broke down, and, unlike previous breakdowns, Valerii was unable to fix it on his own (he shrugged that he is a physicist, not a mechanic, and reminded me that his car, a 1957 Volga, didn't run either). Support staff such as technicians and repairmen had been severely reduced in the previous years, and scientists in his laboratory and others had become accustomed to performing their own, sometimes jury-rigged, repairs on equipment and computers. The situation was complicated by pressure from the *zavlab*, who threatened Valerii that he had to either fix the machine or he would not be allowed to take time off for a trip to a birch bark exhibition in France in March, at which he expected to be able to sell enough of his works to earn several times his yearly scientific salary.

Under pressure not only from above, but from a colleague who had secured a small contract and who was willing to provide Valerii with a few hundred dollars' worth of work—if only the machine was in order—Valerii and his laboratory-mates struggled for weeks simply to diagnose the problem. If the problem had been electronic, it would probably have been within their capabilities as semiconductor experts to repair, but it turned out to be mechanical. They not only took the entire piece of equipment apart, but also engaged in extensive e-mail and fax communications with the manufacturer in France. The French company immediately offered to send a technician to Novosibirsk to repair the machine—at a cost of $10,000. Obviously, this was well outside the realm of financial possibility for the institute, one of Akademgorodok's poorest.

Valerii, usually a jovial character who had long since learned to shrug off the seemingly irrational behavior of higher-ups, became increasingly tense and moody during this period. He wanted and needed to be working on his birch bark art, hoping to take as much of it as possible to exhibit and sell in France. Yet the problems with the machine—themselves the result of financial difficulties at the institute—threatened to undermine or even cancel the entire trip. Instead of enjoying his normally flexible schedule, Valerii was forced to spend hours—including evenings and weekends—at the laboratory, working on the machine. When, at last, the machine was fixed, all the staff who had worked for weeks on the problem enjoyed a joyous, drunken evening out, and we at home breathed a sigh of relief too.

Situations like this one confronted Akademgorodok scientists every day, and they reacted with frustration, anger, nostalgia, fatalism, and a great deal of tenacity. That

scientists have become accustomed to working in conditions of crisis—that crisis has become both an acute situation and a permanent state—was made clear to me during an afternoon I spent in a laboratory in the Institute of Organic Chemistry. An institute administrator, the woman in charge of supplies, entered the laboratory with good news: a list of chemical reagents the institute had received and that laboratories could obtain if needed. She sat down, and the whole lab collective gathered around a table. She began to read the list, and had barely uttered the name of the first item when the youngest member of the collective, a young man about 26 who had just completed his *kandidat* degree, blurted out, "We'll take it all." The woman glared at him: "You have to listen to the whole list." "But we'll take all of them," he continued, looking puzzled. She tried to go through the list, but each time she named a chemical, the whole group of 8 to 10 people would cry out, laughing and smiling, "We'll take it all!" Finally, after the woman gave up and left, one senior researcher leaned back in his chair, closed his eyes, and said, "It's been so long since we've had some of those, I can't even remember how they smell." For this lab, which had become so accustomed to doing without necessities that the smells of once-familiar (and quite foul-smelling) substances had disappeared from memory, opportunities were not to be squandered. Whatever could be obtained had to be hoarded, because one never knew when, or even if, the next shipment of reagents was coming.

Scientists experienced the ongoing crisis, then, not so much as a moment of transition from one way of doing things to another, but more as a set of rapidly-changing circumstances to which they had to constantly readjust. There was little stability—

something could go wrong, or right, at any moment. And appearances could be contradictory—inside institutes and labs, the crisis looked rather different than it did in other kinds of spaces. And even within institutes, crisis appeared in different forms: sometimes, it represented the end of science in Akademgorodok, and sometimes the beginning of new ways of organizing science's relationships to commerce and the state.

Selling Akademgorodok's Scientific Spaces

Some of Akademgorodok's spaces had transformed into showplaces for imported goods, signaling significant shifts in the way science and capital intersect in Akademgorodok. The building on Morskoi prospekt that houses the Gorodok ("Town"), a two-story shopping center, was once a cafeteria. Now, it sells everything from packets of individually-wrapped slices of Gouda to Italian fleece-lined boots, from Chinese auto parts to pirated American action movies. The Gorodok was always packed with people, and had become what Svetlana Boym (1994:2) calls a "common place," a site of "the everyday...rituals of ordinary life," a place many people visited regularly and which had become a part of the daily life of the community. Many people shopped there, though the supermarket's prices were known to be a bit higher than in less flashy stores in town. Many more just browsed, particularly in the sections devoted to jewelry and imported liquor and cigarettes. Teenagers would hang out in the Gorodok's café, which served coffee, tea, and pastries. Although I occasionally heard some people regret the passing of the last cafeteria in town, where one could get a hot, affordable—if not particularly tasty—lunch in the middle of the workday, people seemed to appreciate the convenience

of the Gorodok and the availability there of some goods and services that were previously available only at the *torgovyi tsentr* in the center of Akademgorodok or even in central Novosibirsk.

Other, similar spaces devoted to global goods and consumerism generated more ambivalence on the part of residents. One such space, which symbolized for many how science was being pushed toward the margins of the science city was the shopping center that had appeared at prospekt Koptiuga 1a, an annex to the Institute of Automation and Electrometry. At some point the institute must have grown such that it required additional space, and a two-story structure was joined to the back of the first building. What was once auxiliary laboratory space had become an enterprise similar to the Gorodok: two floors of corridors lined with businesses—shops selling upscale European clothing, jewelry, and furniture, kitchenware, cosmetics, and second-hand clothes, the offices of a real-estate agency and a small newspaper. The Institute of Automation had become, for most Akademgorodok residents, not a research facility, but a destination where one could find good prices on imported shampoo.

Other institutes adopted a similar approach of renting space to businesses in order to raise some cash, though most did it in a less grand and total fashion than the Institute of Automation. The Computing Center, for example, contained a bank, a pharmacy kiosk specializing in herbal remedies, a foreign language school, and an internet service provider—not to mention a vegetable stand and a few women selling hand-knitted mittens and socks. In 1997 there was an imported car dealership there, but it was gone by the time I returned in 1998, perhaps a casualty of the sinking ruble. Further south on

prospekt Lavrent'eva, the former "Under the Integral" club, which was shut down in the late 1960s and converted into a cafeteria, had become the Sibakadembank, the bank that handled all the Academy of Sciences accounts. In the residential areas, it seemed that every available corner had been turned into a commercial space: basements of apartment houses turned into a tiny milk-cheese-and-sausage shop, a video rental outlet, or a second-hand store.

Akademgorodok's most emblematic feature, its forest, was also on the verge of sale. The city had faced a serious housing shortage since its early days, and the privatization of apartments and the demand for apartments from "New Russians" from Novosibirsk who were attracted by the peaceful, wooded setting of the science city had worsened the shortage and driven up the price of apartments—by my quick calculations of the prices of apartments in Akademgorodok's Upper Zone advertised in a July 1999 newspaper, a two-room apartment averaged about US $15,000, and a three- or four-room apartment roughly $28,000. Clearly, these prices were well beyond the means of scientists making less than $100 a month, when they were paid on time. Those who had been allocated apartments before privatization were entitled to stay, but if one needed to move—because of a divorce, say, or simply the desire to have more space—one would have to buy an apartment. Students from NGU who decided to remain in Akademgorodok after they left the dormitories faced an especially difficult situation; in fact, the lack of affordable housing was one of the reasons NGU graduates cited for not wanting careers in scientific research (Eremin, personal communication, 1999). A proposal was floated a few times during the year of my fieldwork to allow Novosibirsk

banks and businesses to build new luxury apartments for their workers on some of the open land owned by the Siberian Division (Figure 2.1 shows that much of Akademgorodok's land is forested), provided they reserved a certain percentage of the new construction for promising junior researchers in Akademgorodok's institutes. Most of the scientists I knew were reluctant to take steps they saw as allowing Akademgorodok to become a bedroom community for Novosibirsk businessmen—whom they generally viewed with suspicion at best and contempt at worst—but they recognized that some solution had to be found to the housing problem if the Siberian Division was to have any hope of attracting talented young people away from the banks and into the institutes (see Nakoriakov 1999 for a summary of the proposals).

Sometimes, the "privatization" of Akademgorodok's scientific spaces and resources was, as elsewhere in Russia, semi-legal or illegal. Individuals within institutes sold equipment for cash, and institutes were constantly worried about the theft of valuable equipment and even scrap metal; most had installed security systems and bars on the windows, but metals theft reached a point where, in 2000, President Putin was considering introducing a state monopoly on trade in non-ferrous metals (Corwin 2000). There were even rumors that chemists were manufacturing illegal drugs in their laboratories.

Within the town's institutes, out of sight of consumers, scientists and administrators were also starting legitimate businesses and tapping into what sources of foreign and domestic capital they could find. Sometimes the survival of scientific projects depended on scientists' entrepreneurship; sometimes scientists blamed

entrepreneurial activities for distracting researchers and administrators from science or, worse, for diverting funds from research. This ambivalence toward the effects of private capital, especially foreign private capital, in Akademgorodok was made clear in the comments of Nikolai Dobretsov, the president of the Siberian Division, in a newspaper article: "If the budget completely ceases to finance science, the Siberian Division will in any case retain tens of institutes. And they will actively work, but on the money of foreign companies [and] foundations" (Verem'ianina 1999). There would be something to regret in the loss of Akademgorodok's specific way of doing science, but perhaps something to be gained as well.

Brain Drains: Selling Akademgorodok's Scientific Minds

One of the more pernicious effects, in the minds of scientists, of the collapse of science-as-they-knew-it is that scientists have become distracted from scientific research by subsistence concerns. In a strange inversion of anthropological models that pin progress to increasing occupational specialization, scientists in Akademgorodok have had to diversify their occupations and, in many instances, become subsistence producers in order to provide for their families' needs. Within the widely-held view that scientists need to devote themselves fully to scientific pursuits without concerns for everyday tasks—indeed, a view that guided the construction of Akademgorodok—this distraction from scientific activity represents a significant change.[1] And it is a change that Akademgorodok scientists often view with fear, resentment, and anger—and, occasionally, with pride.

Sociologists Gordienko, Eremin, and Pliusnin note that in the initial phases of Russia's economic collapse, in the early 1990s, scientists were hesitant to search for work outside of science. While engineers and technicians quickly found employment outside the budget-financed sphere, scientists, "having fallen into the most difficult material position, continued to perform scientific activities as their sole or main work, voluntarily agreeing to lose a year or a year and a half, while 'more important problems' were solved" (1997:41). And although their minimal salaries are often justified on the basis of the assumption that most scientists have extrascientific sources of income, a 1996 survey in Akademgorodok found that 25% of scientific workers lacked such incomes and 93.4% named their institute salaries as their main source of income (1997:41).

For many Russians—pensioners, unemployed factory workers, and scientists alike—the vegetable garden or *ogorod* has become a critically important aspect of economic and social life. Russian urbanites have transformed into a kind of shuttle peasantry, traveling by bus, train, and car to their small garden plots, surrounded by thousands of other similar plots, on the outskirts of towns and cities. While once the *dacha* (country house) was a privilege, a place to relax, enjoy the fresh air and a sauna, maybe pick some berries, the *ogorod* has become essential to survival. Liuba used to bristle when she heard someone refer to his or her garden plot as a *dacha*, saying, "A *dacha* is for relaxing, but we don't relax there—what we have is an *ogorod.*" The Efimovs were less than serious gardeners: Liuba grew carrots, beets, onions, dill, parsley, red, black, and white currants, raspberries, *oblepikha* (seabuckthorn), *cheremukha* (European bird cherry), marigolds, irises, asters, gladiolas, *valeriana*

(valerian, used as it is in the US, as a tranquilizer or sleep aid), and *zveroboi* (St. John's wort, used to treat stomach complaints). Although the produce of the *ogorod* contributed to our summertime diet, it alone would never have sustained us. Yet Liuba spent at least one day of every summer weekend there, tending the plants, weeding, and watering. The Efimovs' *uchastok* (garden plot) included a small two-room wooden house and a separate *bania* (sauna), both of which Valerii built himself. But the floor was collapsing in the sparsely-furnished, musty house, and Liuba didn't like to stay there overnight, though their daughters and their friends sometimes did.

Others depended more on their *ogorody* and, in turn, had to spend more time there. Ekaterina, a chemist, for example, grew tomatoes and cucumbers in addition to root crops like carrots, beets, and potatoes (another high-maintenance crop)—and this represented a significant increase in time and labor, because of the difficulty of growing frost-sensitive tomatoes and cucumbers in the short Siberian summer. Ekaterina's summer weekends were therefore consumed with garden labor, and sometimes I would meet her on the bus on the way to her *uchastok*, which was not far from Liuba's.

At harvest time in August and September, it seemed everyone in town was preoccupied with making pickles and *varen'e* (fruit preserves, runnier in consistency than those familiar to Americans). Most people kept their stores of pickles, preserves, and root crops in cellars located just outside of town—the Efimovs' was beneath their garage, about a fifteen-minute walk from the apartment. The Efimovs were able to buy the items they didn't grow—tomatoes and cucumbers for pickling, and also potatoes and onions for storage. They also traded some of their produce for others': for example, they had a

surfeit of *cheremukha*, but needed more raspberries, and some of Valerii's colleagues were happy to supply us with their raspberries for a liter or two of the highly-regarded *cheremukha*.

All year long, the sidewalks outside the Gorodok and the TTs were lined with women and men, many elderly, sitting on wooden crates, selling vegetables they had grown in their gardens from red plastic buckets. These individual entrepreneurs usually set up near "official" places where people bought vegetables—the permanent outdoor markets or shops like the Gorodok or TTs. Some people were able to supplement their small state incomes by selling the produce they grew in their *ogorody*. Others found that the tiny profits from selling vegetables on the street did not make up the costs of their labor: Liuba told me she tried selling some vegetables and flowers once, but gave up after a day or two, bored, humiliated, and realizing just how meager was the money she made.

Western newspapers liked to report that once-famous scientists were now to be found sitting on the sidewalk selling vegetables (see, for example, Proctor 1998; Williams 1997). I didn't know any scientists who sold their produce in the markets on a regular basis, and when I put the question to my friends they scoffed at the possibility. Nonetheless, I have no reason to doubt that there were scientists among the perhaps hundreds of individuals—most of whom came to urban markets from surrounding villages—selling their own vegetables along Akademgorodok's streets.[2] In the conditions of the permanent crisis, activities such as gardening were not hobbies associated with privilege, but labor associated with deep economic dislocation.

Some scientists had taken second jobs performing unskilled or manual labor to support themselves. I knew scientists who remodeled apartments, worked as electricians, even unloaded trucks. These jobs were often sporadic and temporary, so researchers usually kept their scientific positions as well. Others made a choice to leave science for more stable and lucrative work in other sectors of the economy. Simanovsky, Strepetova, and Naido (1996:28) suggest that so-called internal brain drain—the outflow of scientists from research positions to administrative, production, and other spheres within the country—has been at least as damaging, and perhaps more so, than the international migration of specialists.

Many Akademgorodok scientists echoed this concern: a computer scientist remarked,

> Internal immigration is more frightening. People are not going into science, but leaving into companies. If undergraduates and graduate students in earlier times worked with us with pleasure, now, as soon as a student gets a...fair qualification, he quickly finds a place in a company, where they pay him decent money, and he goes there.

Indeed, for computer scientists jobs in business were generally easy to find; software companies, large and small, foreign and Russian, had popped up all over the country, and even within Akademgorodok's institutes. Other scientists went into fields unrelated to their scientific education: for example, a chemist I knew had become a successful stockbroker in the mid-1990s, but lost nearly everything after the crisis. Her husband, also a chemist, had remained in his institute post; this situation was perfectly tenable while his wife was earning a large salary, but it was unclear what they would do after she lost her job and her investments.

Valerii's transition into art was somewhat unusual. He still worked every day at his job in IFP, but spent his evenings and weekends crafting jewelry boxes, Easter eggs, and other decorative items out of birch bark. He was reluctant to sell the items in local shops, claiming he could not get the prices he felt his art deserved. Moreover, he was hesitant to turn his workshop (actually a half of his and Liuba's bedroom, separated from the sleeping area by bookshelves) into a mass-production factory, preferring to produce just one or two examples of an original work. He was hopeful, however, that his work would be appreciated and would sell abroad, and in 1999 he and Liuba traveled to France and the US to exhibit and sell their work. The proceeds of these trips (funded by a French woodworking magazine and a grant from the Soros Foundation, respectively) supported the family for a few years, and even allowed them to purchase a new stove, kitchen cabinets, and a stand-alone freezer. Valerii sometimes wondered about the strange twists of political-economic fate that had led him from physics to folk art, and said repeatedly that he found more satisfaction in birch bark work than he had in physics—birch bark work allowed him to be more creative, original, and independent than physics, and he was very proud of the beautiful and intricately-decorated items he produced. He enjoyed the local and international recognition he received, I believe, more than the money he made. And Valerii was not the only scientist-turned-artist in town: there was an organic chemist who sculpted in cedar, and sculptors and painters among IIaF's staff as well. They exhibited their work at fairs and exhibits in Novosibirsk museums, on the steps of Akademgorodok's movie theater, and sometimes in small gift shops, including one a former cafeteria by the Computing Center.

The expanding administration of the institutes and Academies of Science also, as we will see in the case of IFP, drew researchers out of the labs. Ekaterina, whose situation is discussed in more depth in chapter four, left research for the administration of the Academy of Medical Sciences, where, although she finds her work less interesting than her research in organic chemistry, she makes twice her salary as a researcher. Ekaterina had also spent a year working for a biotechnology company in Texas; her temporary migration abroad allowed her to buy a three-room apartment. Because of the ways in which scientists migrate—contracts intended to be temporary may slowly become more permanent arrangements—there are no good statistics on how many scientists have permanently left Akademgorodok for other countries. Some laboratories, even some institutes, have been left practically empty due to emigration; others are relatively untouched. But the cultural impact of "brain drain" probably exceeds its significance in demographic terms. Both temporary and permanent migration abroad raise the specters of economic colonization by the west, of science that slavishly follows the whims of consumers, and of the fatal disruption of Russian scientific education, even as migration promises to keep at least some Russian scientists working in Russia some of the time.

Not only were researchers leaving science, working second jobs, going abroad for months on end, and spending long hours in their gardens, they were aging. It was a matter of immense concern to the Siberian Division and to scientists themselves that the flow of university graduates into work and study at the institutes had all but ceased; this was all the more disconcerting because Akademgorodok and Novosibirsk State

University had been designed to integrate university education with scientific research and to provide a steady supply of researchers for the Siberian Division's institutes. But better opportunities—for money, for prestige, for interesting work—were luring young people elsewhere. Institutes that once had a hundred graduate students were down to one or none, and the average age of institute researchers was rising. "The average age of holders of the degree of *kandidat* [in the Siberian Division] is 50, *doktor*—60, corresponding members [of the Academy of Sciences]—67, and Academicians—68. In a couple of years, science will finally die," said Anatolii Popkov, the president of the union of scientific workers of the Novosibirsk Scientific Center, in an interview with *Vechernii Novosibirsk* (Bobrov 1999). The son of a chemist and a mathematician, about to graduate from high school, dismissed his parents' desire that he attend NGU: "My child just today said, 'I'm not going to enroll in your university. How do you and Dad live? It's frightening to look at you. I'm going to some other place.' Well, go ahead," his mother told me.

At stake in the movement of scientific personnel into their gardens, non-scientific jobs, and other countries is not only the ideal of the scientist as wholly devoted to the pursuit of natural knowledge; scientists feel their once-central position in the nation-state has slipped away. Where once scientists as a category and as individuals were admired, now they are so marginal as to have become nearly invisible. Those who travel abroad, as we will see in the following chapters, often find themselves on the periphery of foreign scientific communities, working at jobs that may be incommensurate with their professional status. Most of all, as Akademgorodok's scientists leave science—whether

due to age, economic necessity, or professional dissatisfaction—they become concerned that their status in the world scientific community, which in many disciplines (particularly mathematics and physics) links youth and innovation, is declining. Ironically, Akademgorodok's increasing marginality in relation to the Russian state centered in Moscow has led its scientists to increasing engagement with scientific communities outside Russia and outside states. Yet in a place where the balance between centrality and marginality was so critical in shaping its particular atmosphere and particular science, the prospect of peripheralization in relation to that global community as well seems especially dire.

Entrepreneurship: Innovation, Restatization, and Pollution

The appearance of private businesses in institutes was not limited to retailers selling foreign goods. In fact, many institute-based scientists were retooling to make their research valuable on the global market. Although this allowed some scientists to earn livable salaries, keep their research projects going, and, in the end, remain in science, it also raised new concerns about the influence that private capital and a focus on profit-making would have on scientific research. Akademgorodok's traditional character as a center of fundamental research was at stake, and some scientists balked at the idea that their research should produce immediate practical and profitable results. Others were concerned that expanding networks of administrators and bureaucrats, formed into corporations, were exploiting their positions in institutes by "privatizing" state funds needed for research. The dependencies, connections, and boundaries

between science, capital, and the state were being reconfigured, in ways that gave some scientists hope and others cause for concern. Moreover, one's concern about these new structures seemed strongly linked to the extent of one's access to them. Those who stood outside these structures often characterized themselves as the ones with the most to lose from them.

High-energy physics is a field in which, since World War II, states—or more specifically, defense-industrial complexes—have been heavily invested. Though Akademgorodok's Institute of Nuclear Physics (usually referred to around town by its initials, IIaF [*Institut iadernoi fiziki*], pronounced "ee-yaf") was not primarily engaged in weapons research—it was always a more fundamentally-oriented facility—its significance, symbolic and practical, to the Soviet state was high. In the 1960s, IIaF was one of a handful of facilities in the world to pioneer the use of colliding-beam accelerators in research on subatomic particles—an apparatus which has now become standard in particle physics.

After the collapse of the Soviet science establishment, elementary physics—a flashpoint of Cold War competition and a very expensive undertaking—was like other disciplines in Russia left without significant funding. In addition, the cancellation of construction of the Superconducting Supercollider in the US (and its replacement as a destination for large amounts of public funds by the Human Genome Project) signaled a shift away from the atom and toward the gene as the scientific preoccupation of the twenty-first century. In the West, however, particle physics remains in large part a publicly-funded project, as the knowledge produced is either highly abstract or

applicable to weapons projects (Traweek 1988, Gusterson 1996). In Akademgorodok, IIaF, like all the other institutes, has suffered from a lack of state funds as well as the loss of some of its most prominent researchers to jobs in the West. Even Akademgorodok residents who were not scientists or who were not affiliated with IIaF could name some of the more prominent nuclear physicists who had left; these were people with a high profile in Akademgorodok who now occupy prestigious positions at universities and national laboratories, mainly in the United States, but also in Europe and Asia. Off the top of his head, one of IIaF's deputy directors counted, "I think 70 people have already left for good, and another 30 will likely stay [abroad]."

IIaF, then, has been hit particularly hard by the emigration of some of its most experienced and esteemed researchers, physicists who are very marketable in the rather small world of high-energy physics. In response, the institute has developed strategies for making the best of these losses. Perhaps with some of its early entrepreneurial spirit intact, IIaF has come to rely heavily on its emigres to secure contracts for work for their new laboratories. "Our institute is alive only because we earn money" on such contracts. Institute administrators and researchers maintain close ties with many (though not all) of their former workers now abroad, many of whom occupy high positions in well-funded state research facilities or public and private universities, and these emigres have a high enough opinion of the capabilities of their former colleagues that they often pass along what work they can.

As of December of 1998, IIaF was receiving only twenty percent of its annual budget from the state through the Siberian Division of the Academy of Sciences. An

approximately equal amount came from the Ministry of Science and other state ministries and grants from Russian funds. But at least fifty percent of its budget the institute itself earned from contracts it had concluded with foreign research facilities—about $10 million a year. The institute's annual report for 1997 lists collaboration agreements between IIaF and foreign laboratories in ten countries, going back to 1977. These are research collaborations, not contracts for work or equipment, but they involve sharing of grant funds that helps support research at IIaF.

In addition to its research functions, the institute manufactures scientific equipment and sells it, focusing on specialized and custom instruments and apparatus that Western firms do not find it profitable to make. In fact, the newspaper *Vechernii Novosibirsk* reported in November 2001 that IIaF's industrial accelerators are being used to disinfect US government mail after two letters containing anthrax spores were sent to senators earlier in the fall (Agafonova 2001). The money made from these enterprises (which dates back to the 1960s) supports research at IIaF and gives young scientists and technical workers (engineers, machinists, etc.) productive and interesting work to do. The money from these commercial enterprises (the institute does also have "purely scientific" relationships with foreign labs but has of late been concentrating on the commercial) pays salaries (IIaF uses only 50% of its budget to pay salaries, in comparison to some other institutes which use up to 80%. Although IIaF's staff is much larger than that of other Akademgorodok institutes—3000 in 1997, including 490 researchers, it also has a much larger budget). The deputy director (admittedly, an interested party) insisted on differentiating IIaF's commercial enterprises from those of

some other institutes, where commerce is basically a way for the *nachal'niki* to enrich themselves on state funds. He joked that now IIaF is an island of socialism in a capitalist country, though nothing much has changed about the way it operates since the 1960s. "It's society," he concluded, "that has changed."

In one of the most rarified, abstract, theoretical realms of science, and one of the disciplines traditionally most dependent on state support, IIaF has come to a kind of compromise with capital. Indeed, it has been striving for that compromise for at least 35 years. Workers at several other institutes, including IFP, expressed admiration for IIaF's strategies and held them up as examples their own institutes may do well to follow. Nonetheless, there was nostalgia at IIaF and in Akademgorodok in general over the prominence that commercial applications had assumed over fundamental research; some researchers felt that the combination of financial crisis and brain drain were making IIaF less competitive with other high-energy physics centers than it had been in its heyday. It seems unlikely that IIaF researchers will become as deeply attached to the instruments they manufacture as they are to the machines that reveal the fundamental structure of nature.

By contrast to nuclear physics, the study of semiconductors has more obvious practical and marketable applications, and has been advanced in large part by private companies in the West. Yet at IFP, "privatization"—or the mixing of private and state forms of funding and managing scientific research programs and their applications—was a controversial process. The key tension was not so much between researchers and administrators as such, as between the interests of the expanding administrative

bureaucracy and its profit-making enterprises and the interests of the traditionally state-sponsored scientists working in the institute. Workers at the institute noted that the administration had actually grown in the years following the collapse of the Soviet Union, as more and more deputies and assistants to the director were created; researchers claimed that while the total number of personnel working at the institute had held steady at around 1000, the number of researchers had been halved, while the number of administrators had grown to make up the balance. One woman who worked in the institute described this proliferation of administrative personnel as an "infestation." Indeed, a review of a 1991 list of the personnel in one of IFP's laboratories, which was described to me as one of the leading labs at the time, shows that of the 30 researchers, engineers, and technicians listed, only nine remained there in 1999, though two have moved to other laboratories within the same institute. The others had become administrators, joined private firms, retired, or emigrated.

From the perspective of researchers and support staff, the administration's growth was yet another example of the privileged protecting their privileges, of schemes by the relatively powerful to siphon off what scarce budgetary funds the institute received from the state and keep them, in the form of disproportionate salaries and, worse, small corporations set up under the auspices of the institute, which were capitalized by state science funds and in which the institute's administrative cadres were the shareholders. A discussion between Aleksei and Ivan, both senior researchers in different labs, pointed out how researchers saw the administration as a drain on research funds:

Ivan: It all depends on the director. It's necessary to support [research] financially so that people don't run away, so that everything can be done here. But that doesn't depend so much on the director but on...

Aleksei: How? On the director. Lower your own salary and that of the *zavlaby*.

Ivan: That's not enough. It's not enough for everyone. You need normal funding from Moscow as well.

Aleksei: If they fired one deputy director, on that money they could support ten lab assistants.

Ivan: It's not that much.

Aleksei: Ten assistants?

Ivan: No...

Aleksei: From one deputy director there's more harm... From ten lab assistants there's a use.

Ivan: There is a little something in that, I agree. We have a lot of... Probably three extra people, deputy directors.

For Aleksei and Ivan, the administration was expanding at the expense of "science"—represented by the lab assistants who at least have a "use." They noted an increasing salary gap between administrators and researchers, which they also saw as a drain on scarce funds. But although Aleksei and Ivan were suspicious of the expanding administration, they also looked to it for leadership—a successful institute required not just initiative on the part of individual scientists, but active and interested *zavlaby* and directors. What troubled Aleksei and Ivan was that they saw the administration as a hindrance, rather than a help, to science, because they understood its expansion as tied to the development of private enterprise rather than scientific research.

One enterprise, ostensibly a response to acute financial crisis, in which valuable instruments and raw materials were sold, drew the ire of researchers as the money made from the scheme went, they believed, not to the support of scientific work but into the pockets of the *nachal'stvo*, leaving the scientists without the necessary equipment to do their jobs.[3] There was also a firm under the auspices of IFP which, perhaps attempting to reproduce some of IIaF's success in similar endeavors, bought and resold scientific instruments from other institutes—again, scientists understood this to be impoverishing them not only financially, but scientifically:

> Under the roof of the institute there are several commercial firms that, using the face of the institute, conduct their own business. That actually establishes a poor climate in the institute, so it's necessary that they either work on a rental basis and the institute gets some money, or to get rid of them... A lot of money—budget money—passes through these firms, and actually the institute receives very little of it—kopeks. The main part of the money goes to these little firms.

At least three such firms existed at IFP, and some researchers suspected there might be more, hidden from view within the bureaucracy. As researchers there described it, the director would use IFP's reputation to get contracts "in Moscow," then the funds were funneled through a closed joint stock company (*zakrytoe aktsionernoe obshchestvo*, ZAO), of which high-level administrators were the stockholders, then back to the stockholders in the form of institute salaries. The researchers suggested that perhaps scientists—not adminstrators, whom they saw as self-interested and out of touch with laboratory work—should own such companies.

Aleksei and his associates, perhaps because of the complicated situation in their institute, were deeply suspicious of administrative attempts to blend private

entrepreneurship with state-sponsored science. Though critical of the state and equally suspicious of state attempts to dictate the practice and substance of scientific research, they felt that the state had a responsibility to verify that the little money it did earmark for science went to "actual science" and not into administrative pockets:

> Okay, so the state gave money for this research, but after that, if the state doesn't verify where that money went in actuality, then it's all a game. Like in the theatre... And no one but the state will ever implement any kind of control, because the Presidium will never be interested in any kind of control.

Aleksei didn't imagine this kind of financial auditing responsibility to be incompatible with academic freedom. He described a hypothetical scientific project funded by a state grant:

> Where did the money go? Let's say it went to this experiment, and the experiment didn't yield anything. For that, of course, state bureaucrats never have the right to punish a scientist, because he [the scientist] could not have known. But if instead the money went toward the construction of a cottage, the state is obligated to do something. Otherwise you get the development of theft.

IFP researchers were, therefore, attempting to draw clear lines between scientific and non-scientific activities within their institute. For this group of semiconductor physicists, who operated in a context where their discipline lagged severely behind by comparison to Silicon Valley and Japan, the desire to conduct cutting-edge research seemed to pose for them an opposition between state and private science, rather than a way to blend the two. Participation in the private sector meant either leaving Russia or the kinds of activities they saw going on in their institute—there did not appear to be any kind of compromise. Not surprisingly, these physicists were among the most suspicious of and hostile toward

the administration, Moscow, and "business" of the groups of scientists I worked with (which also included chemists, biologists, and other physicists). They saw capital as potentially and actually polluting or disruptive of scientific work. They saw business as corruption and theft, categorically, regardless of whether there was anything at all dishonest going on. The state, while hardly "disinterested," appeared in their models as the only possible guarantor of fairness and financial honesty (a strange thing, given the financial disarray and corruption throughout the Russian government).

Katherine Verdery's (1996:204-228) discussion of "destatization" and "restatization" processes in formerly socialist countries shows how, in the late 1980s and early 1990s, the weakening and then collapse of centralized party-states' control over resources and power began to produce a strengthening of localized networks of patrons and clients, which in turn resulted in increases in violence and corruption. Paradoxically, however, the local "sovereigns" could not allow the central state to wither away altogether, as it was the state that provided the subsidies on which they fed. Moreover, pressure from people and institutions demanding familiar forms of social support (health care, pensions, support for cultural institutions, education, and, of course, science) has also helped to maintain a role for the central state in former socialist countries: "Everywhere, in asking for subsidies people were reaching out for the familiar allocative state of before, and in so doing they re-created a role for it. Or, looked at from the other side, whatever 'the state' is, it does not relinquish domains easily" (Verdery 1996:214). In Akademgorodok, which lived on money directly allocated for research from the state budget and from contracts with government ministries, joint-stock companies formed

within or attached to institutes have become the means of transforming the resources of the allocative state into private property. But it would be a simplification to suggest that researchers desiring "pure" science simply hoped to reclaim the socialist-paternalist state and administrators, self-interestedly, embraced capital. While private enterprises at IFP depended to a large extent on state funds, researchers were seeking sources of funding—working abroad, for example, or securing foreign grants and contracts—by bypassing the Academy, institute, and state hierarchies on which they occupied the bottom rungs—and going directly to the source, often a foreign one.

Moscow, Grants, Networks

In the Soviet Union, institutes, not projects, were funded. This system had the unintended effect of giving scientists the space, time, and resources to work on long-term research projects with little pressure to produce immediate results; it also gave the state a great deal of influence over the direction of particular scientific fields, sometimes with disastrous consequences such as the dominance of Lysenkoism in Stalin-era Soviet biology. Postsocialist reform of the Academy is supposed to lead to a more meritocratic system along the lines of Western state science policy, including funding by a variety of state and non-state agencies of temporally-delimited projects with clear research objectives on the basis of peer review (see Lebedeva 1998:115). The Russian Fund for Fundamental Research (*Rossiiskii fond fundamental'nykh issledovanii,* RFFI), founded in 1993, and the Russian Humanitarian Science Fund (*Rossiiskii gumanitarnyi nauchnyi fond,* RGNF), founded in 1994, are state funds along the lines of the US National Science

Foundation, which offer grants for projects evaluated in open competition and by peer review.

Akademgorodok scientists generally see the existence of these foundations—which were designed to compete with the old Academy of Sciences system, which has been slow to change—as one of the more promising developments in postsocialist Russian science. Nevertheless, there are some problems that concern them. First, RFFI and RGNF grants suffer from some of the same drawbacks as institute-based funding, most notably that grants often go unpaid for months at a time. A laboratory may be awarded an RFFI grant, but that means little for their research if they never receive the funds, or if they receive them only after they have been rendered valueless by inflation. Second, and more significantly for the ways scientists are reimagining the relationships between science, the state, and individual scientists, there are fears that RFFI and RGNF's peer review processes may not be as objective as they could be, that scientists from peripheral centers like Akademgorodok, in particular, are less likely to be funded than those from Moscow or St. Petersburg. It is certainly not the case that Akademgorodok laboratories do not receive RFFI funds—many do. The points I wish to make are that Akademgorodok researchers frequently perceive themselves as marginal in relation to Moscow structures and institutions, that these perceptions are part of a context in which Akademgorodok residents, Novosibirsk-ers, and Siberians understand themselves to be increasingly peripheralized in political, economic, and social senses vis-à-vis the center, and that the ways Akademgorodok scientists go about seeking outside

(i.e., not Academy of Sciences) funding for their work are shaped by constructions of their marginality.

One day in February 1999, I sat in the office in the Institute of Philosophy and Law that I shared with four other researchers: two sociologists working on the psycho-social consequences of the crisis of Akademgorodok science, another working on the satisfaction levels of students at Novosibirsk State University, and the statistician who processed their survey data. We were talking about the difficulties Russian scientists encounter at home and abroad, and one of the sociologists, who had himself worked on projects funded by RGNF, began to tell me a story about the problems with the new peer review system. He claimed that a group of five women, researchers at the Institute of Linguistics in Moscow, had between them received 33 separate grants from the RGNF, totalling about a million rubles (about US $42,500). They had so monopolized the process, he said, by listing themselves as each other's advisors on the application forms. Moreover, he said, this was an unavoidable consequence of the peer review system, which, he and other scientists said, was not anonymous: reviewers know the names of the most prominent figures in their fields, and those applicants tend to get the grants.[4] With great emphasis, he concluded, "Of course, they're all Muscovites." With this remark, the sociologist was placing the peer review system in the context of postsocialist regional relations and personal networks.

Alena Ledeneva has detailed the complex of networks and informal exchange relationships in the Soviet Union called *blat*. "*Blat*," she writes, "is the use of personal networks and informal contacts to obtain goods and services in short supply and to find a

way around formal procedures" (1998:1). The centrally-planned system of distribution under "classical" socialism produced pervasive conditions of shortage,[5] which people evaded by developing reciprocal ties of informal exchange with others who had access to needed goods and services—everything from food to furniture to vacations or even jobs. To give a rather oversimplified example, a shop clerk might set aside some sausages for a doctor, who might provide the shop clerk with extra attention or care. According to Ledeneva, *blat* may have been a potentially subversive reaction to the structural constraints of the Soviet economy, but its very pervasiveness suggests that the Soviet state was able "to ensure that for the most part [*blat* practices] contributed to rather than undermined the formal targets and activities of society" by easing the effects of chronic shortage on citizens (1998:3). Ledeneva notes, however, that despite the use of *blat* practices at every level of society, people seem to systematically "misrecognize" it; that is, they deny that their own informal exchange networks constituted *blat,* while attributing *blat* to just about everyone else, particularly top officials, tradespeople, and doctors (1998:59-72).

In the post-Soviet period, as the shortages of socialism were replaced by the inflation of post-socialism in making goods and services "scarce," *blat* was transformed. Ledeneva finds that while *blat* seems to be losing some of its centrality in public life, "informal contacts still remain primary where money is not accepted as a mean of exchange—that is, at the upper level where there is much corruption and nepotism, or at the very bottom level, where informal networks are used to tackle scarcity" (1998:180). In addition, businesspeople and "bandits" have mixed *blat* practices with short-term

economic rationality or "business ethics," resulting in large-scale corruption in the former case and protection rackets in the latter. In a similar vein, Janine Wedel (1998:121-163) has shown how Soviet-era networks (which she calls "cliques") were re-formed into "democracy-building" foundations and agencies that received millions of dollars in rather naively handed-out Western aid; she argues that a better understanding of the functions of "cliques," "circles," "clans," or "networks" in Russia—one that conceptualized them as an integral part of Soviet reality—might have helped USAID to avoid this situation.

Akademgorodok's scientists use the idea of "personal networks" in two ways: first, they use personal connections, established through e-mail correspondence, at scientific conferences, or through previous emigrants, to locate and secure positions abroad and contracts at home (see chapter four); second, they do this because, like Ledeneva's informants (about 30 percent of whom lived in Akademgorodok, though not all were academics), who systematically attributed *blat* to "someone else," they believe that channels leading through "Moscow" will give preferential treatment to Muscovites—where those who make decisions have network connections—and that Novosibirsk scientists will inevitably be left out of such opportunities. By "Moscow" in this context, people were referring metonymically not only to the state, but to what they perceived as a whole culture of "centrality," in which the actions of the inhabitants of the center could be understood as an ongoing effort to preserve their central position. While I only occasionally heard "Moscow's" privileging of Muscovites referred to specifically as *blat*, it seems clear that Novosibirsk scientists' perceptions are framed by that Soviet commonplace. On several occasions, Ekaterina told me a story about a trip she took to

Moscow to a scientific meeting; while she was there, as was common practice, she went to the Presidium of the Academy of Sciences to collect honoraria for published articles for several members of her laboratory. When she got there, there was a long line of scholars from all over the country; she explained that there was a line for Moscow scholars and one for others, and that the line for Muscovites was empty, while the "others" waited. The "others" all quickly became friendly and were having a good time, eating and drinking and laughing while they waited in line, when two well-dressed women entered the room. They broke to the front of the line, saying they just needed to ask a quick question. "Well," Ekaterina snorted, "we all knew what 'just asking' meant!" When the women had finished at the window, one of them turned to the crowd and said, "It seems there's a different line for Muscovites." "You should have asked," someone in the crowd replied, "we could have told you that." "Girls!" the woman exclaimed, "What, isn't it obvious we're Muscovites?" Ekaterina told me this story as an example of how "Moscow" not only protects its own, but how it does not even recognize its privileges as such.

Moreover, the perception exists—and Wedel's research would suggest that it is not entirely unfounded—that even NGOs with Muscovites working in them are probably more likely to give grants and other assistance to Muscovites than to Novosibirsk residents. In fact, several people interpreted my own difficulties getting assistance with some visa problems from IREX to the fact that I was dealing with the Moscow office; they suggested I either call Washington or deal with the problem with a box of candy delivered to the relevant official in Novosibirsk (a common *blat* strategy). Some, in

applying for grants, try to apply to programs where the decisions are made by the Western partner, not in Moscow; they feel that this may lead to a fairer evaluation. Yet scientists are going abroad, and are getting grants and contracts; within the context of their perceived marginality vis-à-vis "Moscow," they do this using strategies—most obviously the Internet—that they imagine will circumvent the need for Moscow connections.

Access to the Internet has been crucial in shaping Akademgorodok scientists' access to foreign travel and funding in the overlapping contexts of their perceived marginal political-economic position within the Russian Federation as well as fears of becoming economically dependent on and scientifically marginal to the West. The Akademgorodok Internet Project (www.nsc.ru; www.soros.org/internet/foundations/RUSSIA.html) was proposed in 1994 and funded by the International Science Foundation (ISF), a now-defunct project of George Soros's Open Society Institute (OSI) to provide grants and aid to Russian scientists.[6] The project provides researchers with access to the Internet through servers in each institute. High-speed leased lines connect the institutes' servers to a central one located at the Institute of Nuclear Physics, where a satellite terminal sends electronic traffic to the Moscow backbone, also constructed by ISF. From this central Russian point, connection to the global Internet moves through Germany. In addition, OSI included Novosibirsk University as one of the first three of 33 Russian universities where "University Internet Centers" were created, starting in 1996. These centers, funded in part by OSI and in part by the Russian government, provide access to e-mail, the World Wide Web, and other databases as well as classes on

building Web pages and using multimedia hardware and software. Although the centers are located at universities, access is, in principle, available to all local residents, and is one of OSI's broad civic initiatives (Basareva 1998). In fact, Novosibirsk Oblast' boasts the most computers connected to the Internet of any of Russia's regions (Radio Free Europe/Radio Liberty 2002).

The vast majority of scientific workers in Akademgorodok are very happy to have more-or-less reliable Internet access. They use it much as American researchers do: to search databases, access online journals, communicate with colleagues and friends near and far, and pursue personal interests and hobbies. They also use it to search for opportunities to work abroad or to get grants or contracts from foreign sources for work in Russia. One microbiologist explained to me how the Internet has opened up possibilities for work abroad that simply did not exist before: "There was no Internet, and you can't send hundreds of letters just like that, in the mail," a biologist explained. A local journalist has written that the skills Akademgorodok's researchers gain by searching for grants and contracts using the Internet not only reduce their dependency on state funds but also prepare Russian science as an institution for integration into the Western system of grant-writing and peer review (Basareva 1998).

This opening up of possibilities and acquisition of "Western" skills, combined with other Soros initiatives like the ISF, has led to a certain backlash against Soros—or rather, backlash against Soros as a metonym for all Western foundations providing grants to Russian scientists—which I encountered both in the media and in conversations with some scientists (most of whom rarely used the Internet themselves).[7] Some feel

that Soros's efforts, however benign and philanthropic they may appear, are really designed to empty Russian science of its best personnel, to turn Russia into a training ground for scientists who will inevitably emigrate to the West (cf. Smirnov 1998). Even many who did not imagine this to be the result of malevolence on the part of Soros or other Western benefactors, and who used the Internet in their own research and travel, noted that the Internet had made scientific travel much easier to arrange and more accessible to rank-and-file researchers.

The concerns underlying these critiques point to what Saskia Sassen (1999:58) has called the "embeddedness of electronic space." Sassen critiques utopian visions of the Internet, which envision electronic space as a model "civil society," open and decentralized, on the grounds that they are "ahistorical" and "exclude the fact that electronic space is embedded in actual societal structures and is internally segmented (1999:50-51; see also Haraway 1997:3-8). In the case of the Soros-funded Internet Project (and other, similar projects in other cities), critics note that the Internet has not resulted in a romantic, democratic equality among scientists in different places, but instead has produced or exacerbated hierarchies of difference within science, in which former Soviet scientists are becoming, essentially, a migrant labor force in the service of Western state and corporate sciences.

Yet the hierarchies within which Akademgorodok's scientists must maneuver are not just emerging, nor are they just "virtual." In fact, the structure of the Akademgorodok Internet points back to the widespread use of personal, rather than official, channels to obtain temporary positions abroad and the persistent concerns of

peripheralization, vis-à-vis both Moscow and the West, that appear throughout discourse on Akademgorodok's crisis. Ironically enough, Akademgorodok's branch of the Internet connects the city to the world, right through Moscow.

What is Disappearing from Akademgorodok?

Scientists' sense that science is disappearing or dying in Akademgorodok is based on the multitude of effects of both the decade-long crisis and the more immediate aftermath of 17 August. While Akademgorodok was designed to allow scientists to devote themselves entirely to science, it often seems now as though science is being pushed to the margins of the town. Scientists are working at other tasks, leaving research altogether, and young people seem disinterested in scientific careers. Laboratories and institutes are manufacturing and selling equipment rather than conducting research. Institutes have rented their space to retail shops.

But despite what looks very much like the replacement of a state domain with one controlled by capital, many scientists stressed to me that science in Akademgorodok was not gone—and (in contradistinction to Akademgorodok residents' perception that Moscow was refusing to share resources for science) several scientists from Moscow told me that they understand Akademgorodok to be the last place in Russia where "real research" is going on. These apparently contradictory ideas about what is happening in Akademgorodok—science is disappearing, science is surviving—suggest that while the scale of science in Akademgorodok is certainly shrinking, what is disappearing—or, better, transforming—is a particular understanding of science and its place in Russia and

the world. What was once the exclusive domain of the state and its nationalizing and modernizing projects is not so much being replaced by capital as combining with it to produce new forms of organizing science that have not yet completely emerged. While centralized planning made the achievement of Lavrent'ev's "innovation beltway" impossible, scientists are now putting practical applications and fundamental research together in different configurations and with different results. And Akademgorodok's relations to Moscow and to the world are shifting. The town's distance from Moscow appears to be increasing, while it becomes a locus in a network of connections that reach around the world. Akademgorodok in the crisis shows not only that what constitutes science is more than what goes on in laboratories, but that sciences are multiple, even in one scientific community. Akademgorodok scientists are encountering these multiple sciences both at home and abroad.

Chapter Four

Temporary Migration in the Permanent Crisis: Choosing Between Science and Nation

> If we look at, for example, the year 2000 in my own country...,
> jobs will demand workers who are flexible and fluent in the Information Age.
> —Hillary Rodham Clinton, at Akademgorodok, 16 November 1997

Scientists in Akademgorodok often expressed the extremity of their situation to me by posing a choice: "You either stay in Russia and leave science, or you leave Russia and continue your research." In doing so, they meant to stress just how bad things had become, how economically and socially untenable a scientific career had turned out to be. They were expressing a common feeling that there was no truly desirable solution to the crisis of Russian science, a sense that whatever gains one might make in the new Russian scientific economy, they always involved the sacrifice of something equally important. In short, people felt as though they had been caught *mezhdu molotom i nakoval'nei*—literally between a hammer and the anvil.

As scientists framed it, science and nation had transformed into mutually exclusive, even opposed, categories; loyalties and identities could not, in this view, be split, hybridized, or synthesized. This opposition was something new: Akademgorodok science's essential Sovietness—its embeddedness in the state's modernizing enterprise in Siberia—had never really been in doubt. Even as scientists were privately critical of the Soviet system, being a scientist and being Soviet were at least potentially commensurable, because scientists enjoyed a prominent ideological role and the economic privileges and, to a lesser extent, political influence that accompanied that role. But as the structures that once supported them and assured their participation in—if not

loyalty to—the Soviet system crumbled, scientists' views shifted: the institutions that once supported them now undermined them, and being a Russian scientist—a scientist in Russia—became to Akademgorodok's residents a near logical impossibility. Yet full integration into "world science" also seemed unlikely and, perhaps, undesirable.

As the Soviet Union's massive scientific establishment became loosed from the state that built it, shifts were underway in the way capitalism—and its science—worked as well. In a kind of "de-nationalizing" of science that paralleled broad political-economic trends some have argued will end in the nation-state's irrelevance, certain scientific disciplines, most notably molecular biology and genetics, were increasingly worked into the structures and institutions of global capital. In an odd parallel to broad patterns in the former Soviet Union, post-Cold War Western science became more decentralized, less dependent upon government and military funding and priorities, and smaller, more flexible, and more entrepreneurial. Yet while those broad tendencies are part of widespread decay and collapse in Russia, their Western parallels are taken to represent the triumph of capitalism and its global reach. The conjunction of these two historical transformations forms the background against which Akademgorodok's scientists face what they understand to be a difficult choice between two equally (un)appealing alternatives.

Although they pose their dilemma as an exclusive choice between abandoning the scientific research to which they have devoted their careers and leaving the country they call *rodina* (motherland, homeland) or *otechestvo* (fatherland), many scientists in Akademgorodok try to find a compromise. One way they do so is through temporary

migration, which they understand as a means of continuing one's research and improving one's financial situation in the short term, while making no commitments to leaving Russia permanently. Temporary migrants often feel uncomfortable with the idea of permanent emigration; they insist on their love for their homeland and believe that permanent emigration would be a kind of betrayal of the country that educated and supported them for many years. Nonetheless, for many temporary migrants, this compromise situation seems untenable as well, as they find themselves disconnected both from everyday life in the countries where they live and from scientific work in their Akademgorodok laboratories. In this way, Akademgorodok's temporary migrants, in attempting to find a middle ground between science and nation in the context of postsocialist collapse, often find that one really does come at the cost of the other, that the "imagined community" of science and that of Russia no longer overlap in the same ways they once did.

The four scientists whose migration histories I recount in this chapter share the sense that they confront an exclusive choice between remaining at home and remaining in science. Their stories not only point to the contingent, improvisational character of temporary scientific migration from Akademgorodok in the late 1990s, but also to the ways in which notions of home, homesickness, and cultural difference structure scientists' experiences of travel. The chapter, therefore, focuses on the ways in which science and nation are constructed as opposed or dichotomized categories under the particular conditions of the collapse of postsocialist Russian science and the increasing influence of global capital on "world science." Not wanting to leave home behind,

Akademgorodok's temporary migrant scientists narrate their experiences abroad through a neatly-drawn distinction between everyday life and laboratory life. In distinguishing between life in the lab, which "doesn't differ anywhere," and life outside the lab, in which they often experience radical cultural incommensurability, scientists are trying to stay both "in Russia"—culturally, if not spatially—and "in science." Indeed, when Akademgorodok's scientists go abroad, they take with them the very problem—the trade-off, as they see it, between science and nation—that drove them abroad in the first place.

Shifts in Scientific Travel: Postsocialism and Flexible Economies

While some Russian scientists—probably a relatively small percentage of the large numbers of scientific cadres trained in the Soviet Union—have emigrated permanently (among them several scientists of world stature, such as the physicist Roald Sagdeev), many more have found ways to sidestep the difficult choice between science and homeland. Temporary migrants participate in a wide array of travel practices. They go abroad as researchers, teachers, consultants, and students, in universities, government laboratories, and private companies. They are esteemed professors with comfortable salaries and postdoctoral fellows just beginning their careers. They travel to every continent—the scientists I interviewed had worked in 29 countries. They travel for periods ranging from a few weeks to a few years. What they share is a sense that living permanently abroad is either undesirable or unfeasible. In other words, they are either unwilling or unable to make the either-or choice posed above; they attempt to find a way to stay in science without abandoning Russia permanently.

The difficulty many temporary migrants encounter in finding a way around the choice between their homeland and their profession speaks to the ways they conceptualize the relationship between these two domains. That even those who manage a compromise pose the relationship as an exclusive choice reveals that Akademgorodok scientists imagine scientific and national cultures to be, in a sense, different kinds of cultures. While science can fairly easily be moved beyond the borders of Russia, Russianness is experienced as intimately tied to particular places. A traveling Russian scientist, then, takes advantage of science's cross-cultural "portability," but often finds him- or herself encountering not only hierarchically-ranked differences between national scientific communities (see chapter five), but also, and more importantly for this discussion, deeply disjunctive differences in everyday life. Moreover, these particular configurations of difference were forged in recent historical shifts in patterns and practices of scientific mobility that accompanied both the transition from socialism and the globalization of capital. And they exist against the background of science's paradoxical role in constructing state-sponsored modernity: the notion of science's transcendent "indifference" to local realities, against its application to and symbolic role in specific national projects.

Although the population of the Soviet Union, as a result of the system of internal passports and residency permits, is often characterized as remarkably *immobile* (Kerblay 1983:231-234), travel within the country was, for many scientists, a way of life. Most residents of Akademgorodok migrated there from other parts of the USSR, their numbers relatively few within encompassing flows of migrants following industry from European

Russia and Ukraine to Siberia during and after the war, the general urbanization of the country, and the continual replenishment, even after Stalin's death, of the populations of Siberian labor camps. After moving to Siberia, Akademgorodok scientists often traveled around the country: they took trips to meet with colleagues in Moscow, Leningrad, and other cities; they visited friends and families in their hometowns; they took vacations on the Black Sea.

Travel beyond the borders of the Soviet Union (*za granitsa, za rubezh),* although far less common, was perhaps more a part of everyday life in Akademgorodok than in any other city in the Soviet Union (cf. Gerber 1995:65). Scientists attended conferences and worked on joint projects, mostly in the so-called "satellite" countries of the socialist world, but sometimes in the West. Yet scientific travel abroad took place under the watchful eye of the central Academy of Sciences and, by extension, the state. Not only were international scientific exchanges organized at levels of officialdom ranging from the institute to the Academy, but potential travelers had to be screened and approved by the Party and/or the intelligence services.[1] Foreign travel, therefore, was the privilege of a few, mostly Party members,[2] who had been gradually "tested" by successive trips to more and more distant lands—distance being figured ideologically, not geographically. Sergei Dovlatov, in his series of short stories *Kompromiss* (*Compromise*), satirizes this clearly-defined yet somehow nonsensical hierarchy. An editor chides a journalist who has written an article on an international scientific conference:

> "You have committed a crude ideological error."
> "?"
> "You list the countries..."

> "Is it forbidden?"
> "You should and you must. The thing is *how* you list them. In what order. You have Hungary, the GDR, Denmark, then Poland, USSR, FRG..."
> "Naturally. Alphabetically."
> "That's a non-class approach," groaned Turonok, "An iron-clad order exists. Democratic countries first! Then neutral states. And finally members of the bloc..."
> "OK," I say. I rewrote the information and gave it to the secretariat. The next day Turonok runs in:
> "You're mocking me! Do you do this intentionally?"
> "What?"
> "You've mixed up the people's democracies. You have the GDR after Hungary. Alphabetically again? Forget that opportunistic word! You're an employee of a Party newspaper. Hungary goes in third place! There was a putsch there."
> "There was a war with Germany."
> "Don't argue! Why are you arguing? That was a different Germany, different! I don't understand who trusted you?! Political short-sightedness! Moral infantilism!" (Dovlatov 1995:177-178)

A map of the world entitled "International Scientific Contacts of the Siberian Division of the Academy of Sciences of the USSR, 1959-1961" confirms: the arrows shooting out across the globe from Novosibirsk lead to each of the Soviet Union's socialist allies (Poland, Bulgaria, Czechoslovakia, Yugoslavia, Hungary, Romania, East Germany, Vietnam, Mongolia, China, North Korea), and also to "neutral states" and "members of the bloc" such as France, Italy, Finland, Sweden, Norway, Austria, Greece, West Germany, Japan, Spain, Ghana, New Zealand, India, the United States, and Canada (Migirenko 1962:204). Thus, while travel abroad and participation in international projects were assumed to be essential parts of scientific life, actual patterns of international interaction in science were defined on a spectrum of relative ideological "distance"—of both places and people—from Soviet officialdom.

Akademgorodok, despite its geographic distance from Moscow and Leningrad, was a place where foreigners were not an entirely "foreign" sight. It was never a closed city, as were several Soviet scientific research complexes focusing on nuclear and biological weapons development and construction (see Schweitzer 2000; Tikhonov 1996, 1994). Colleagues—again, mostly from other socialist countries, but sometimes from the West—visited and worked in Akademgorodok laboratories. A few Western travelers, usually romantically-inclined riders of the Trans-Siberian railway, or else socialist idealists, stopped by Akademgorodok and wrote—often quite glowingly—about what they saw (for example, Sullivan 1967). Sometimes foreign celebrities and dignitaries visited: I was surprised one day when Aleksei showed up at my door with a photo album in his hands, saying, "Do you want to see my photos of... Who was the first man on the moon? Neil Armstrong?"[3] Westerners of all sorts were kept on fairly strict itineraries, and contact with them was limited to supervised encounters—formal dinners and receptions, tours, scientific conferences and symposia, etc. People told me, as I sat casually drinking tea in their kitchens, that until the collapse of the Soviet Union, they would have come under great suspicion for having an American guest in their homes outside of an official occasion. More times than I can count, when escorting me past the checkpoint at the entrance to institutes, people joked that I might be an American spy. These comments were part of my informants' memory not only of the tightly-controlled character of Soviet-era contacts with foreigners, but also of the ways in which contact even under supervised conditions was limited to those occupying high-level positions. Nonetheless, it is true that quite a few Western scientists visited Akademgorodok, and

their praise for the scientific complex is often highlighted in histories of the town published in the Soviet Union. One account of Akademgorodok's early years proudly cites an American visitor's (strangely Soviet-sounding) opinions of the town and of Soviet science:

> "Akademgorodok is a planetary phenomenon," said the famous American mathematician Richard Currant in a conversation with journalists after a visit to Novosibirsk.
> "What does 'planetary' mean?" someone wondered.
> "The experience of the Soviet Union in the rapid foundation of a powerful scientific center has a progressive significance for all countries."
> (Davydchenkov 1974:135)

After a few more such testimonials from American and French scholars and politicians, the author concludes, "Yes, indeed, the founding of Akademgorodok had enormous significance not only for Soviet, but also for world science" (Davydchenkov 1974:136).[4] Although the Soviet state and the Akademgorodok scientific community had their own criteria for evaluating the successes and failures of Akademgorodok, they also placed great stock in positive impressions made specifically on foreign visitors, and to some extent used "the world" as the measure of national science and national modernity. Visits from foreign scientists were understood as a somewhat risky yet essential part of producing "world-class" science.

Science as the engine of (and symbol for) Soviet modernizing projects in Siberia was therefore deeply enmeshed both in international scientific travel and in internal Soviet flows of migrants. Travel, then—or, rather, specific practices and patterns of travel planned by and taking place under the oversight of the centralized state—has always been constitutive of Akademgorodok as a place emblematic of Soviet modernity,

even as the construction of Soviet modernity in other contexts meant rendering other classes of person, be they collective farmers, Roma, or reindeer herders, immobile (see, respectively, Humphrey 1998; Lemon 2000; Slezkine 1994).[5] The general tendency of modernist states to immobilize their populations, thereby, in James Scott's (1998) terms, making them "legible," was complicated by a presumption that, at least to some extent, science—the very symbol of the individual state's modernity—"naturally" inhabited a kind of transnational space within which its practitioners moved and communicated. Science could be applied to modernizing and modernist projects precisely because its techniques and knowledge were (at least in theory) accessible to anyone, regardless of culture (see Fuller 2000:120; Prakash 1999:228-229). Clifford's (1997:2) description of modernity as "unfinished" at sites where people are moving and contacting seems particularly apt: science, for all the modernist hopes pinned on it (and for all the ways in which it was used to rationalize and enforce modernist visions of society), complicated the modernist state's urge to draw boundaries, immobilize, and homogenize.

Although it presented the Soviet state with certain dilemmas, Soviet scientists' travel took place in the context of state-sponsored "big science;" that is, it was centrally organized to take a form conducive to constructing and maintaining the national security state. When *perestroika*—only somewhat hyperbolically—flung open the doors of the country to both external and internal movement, the meaning and shape of travel to and from Akademgorodok shifted.[6] Suddenly, travel abroad was no longer a privilege afforded to the ideologically reliable, but for a brief moment at least, something available to anyone. Many Akademgorodok scientists—of different generations and stances vis-à-

vis the changes—jumped at the chance, as did their countrymen across professions. Some went abroad to escape economic collapse and political instability, others out of curiosity or a romantic vision of life in the West, others because they had been victims of political or religious persecution in the Soviet Union, still others "returned" to their ethnic "homelands." Quickly, however, travel to the "far abroad" (*dal'nee zarubezh'e)* again became a privilege of elites—including the newly moneyed classes, employees of international organizations, and the intelligentsia with contacts abroad. Simultaneously, Russia became the site of an influx of millions of ethnic Russian immigrants from the "near abroad" (*blizhnee zarubezh'e*)—the fourteen other countries that along with Russia used to comprise the Soviet Union, where their rights as a national minority were no longer assured (Pilkington 1998; Melvin 1995). In addition, Russia has become a "staging post" for asylum-seekers and labor migrants from Ethiopia, Somalia, Sri Lanka, and Iraq on their way to Europe and North America (Pilkington 1998:11). Thus, it is probably fair to say that the Soviet-era dichotomization of population movement into "internal" and "external" migration has become complicated by the post-Soviet division of "abroad" into "near" and "far," qualitatively different kinds of lands beyond Russia's borders. Here, however, I am concerned narrowly with scientists' movement to countries considered part of the "far abroad;" that is, countries not part of the former Soviet Union.

As the Russian "abroad" became divided into separate, qualitatively different "near" and "far" spaces, the post-Cold War configuration of scientific space was also changing. First, dualistic models ("people's democracies" and "the bloc"—or "East" and "West," in Western terms) of scientific space were blurred. In place of the mortal

competition between capitalist science and socialist science as stand-ins for the political-economic systems they represented, a newly-Russian (as opposed to Soviet) science faced its own economic collapse and a growing interest in integration into "world" (read: Western) science. Second, as post-Soviet Russian science was collapsing or being reconfigured in relation to the West, Western science was undergoing a transformation of its own. In a move away from the state "big science" laboratories of the Cold War era, science in the West—some disciplines more than others—began to move toward private, profit-seeking, small-science entrepreneurship (often funded by a combination of private and state capital). Biotechnology and computer science, in particular, have been very visible sites of this transformation. Paul Rabinow, for example, shows that the biotechnology sector as a "distinctive configuration of scientific, technical, cultural, social, economic, political, and legal elements" (1996:2) split from government and university science in the 1970s, as recombinant DNA technologies with both commercial and research potential developed in a particular climate of state regulation of safety, ethics, and intellectual property (1996:22-29; see also Haraway 1997:90-94). More broadly, Harvey (1990:160) shows how universities have increasingly taken on the role of producers of knowledge for corporations, citing "the celebrated Stanford Silicon Valley [and] the MIT-Boston Route 128 'high tech' industry connections" as "configurations that are quite new and special to the era of flexible accumulation." Fuller (2000:117-130) argues that, while this post-Cold War configuration of the university-corporate research relationship holds the potential for more open and democratic forms of science, the general tendency in science policy in the US and UK has continued to

promote Cold War-era secretiveness, competitiveness, and elitism, while deskilling and casualizing the scientific workforce.

The post-Cold War reconfiguration of science in the West is tied to increasing demands for labor force and institutional flexibility in both Western universities (Pi-Sunyer 1998; Nelson 1997; Pratt 1997) and corporations (Martin 1994:143-159, 207-225; Harvey 1990:141-172). These economic and structural transformations—which parallel broad transformations taking place in the structure of capitalism since the 1970s (Harvey 1990)—have given rise to a class of highly-skilled yet (relatively) ill-paid scientific workers who serve as a flexible labor force. What a US government report called the "unfaculty"—untenured, migratory Ph.Ds working on fixed-term contracts—occupied at least 20% of research positions in US research universities in 1991, and 40% in Britain in 1998 (Office of Technology Assessment 1991:214-215; Fuller 2000:127).[7]

Indeed, North American, Western European, and to some extent Japanese scientific institutions have come to rely upon "brain drain" from less affluent countries to fill demand for highly-trained specialists. By the mid-1960s, scholars of intellectual migration were beginning to take note of a shift in migration patterns: in the first half of the twentieth century, intellectuals moved mainly from Europe to the United States and from colonies and former colonies to Europe, while after World War II, the major pathways led from Europe's former colonies to the United States. Colonial administrations had purposefully created indigenous intelligentsias trained in the metropole country or in Western-style institutions in the colonies (Prakash 1999), thereby establishing patterns of mobility for colonial intellectuals that centered on the colonizing

country; eventually these shifted to include the United States, as the latter's postwar economic and technological influence grew and its demand for highly-trained specialists outstripped the locally-produced supply (Hamlin 2000; Sukhatme 1994:2; Portes 1976; Chorafas 1970). By the end of the twentieth century, Asia, Latin America, and Eastern Europe and the former Soviet Union, rather than Western Europe, had become the major sources of scientific and technological emigration to the United States and Europe (Simanovsky, Strepetova, and Naido 1996; Sukhatme 1994; Cortes 1980). Russian scientists are aware of these patterns, and are alarmed that they are filling a structurally parallel role to countries that they believe have much weaker science than Russia does.

At the same time that US and European universities have come under increasing pressure to adopt corporate models of labor flexibility, which may include hiring workers from abroad, Western corporations have found that, as with the production of jeans, running shoes, or handbags, scientific production can be outsourced to sites where there is an abundance of highly-trained, cheap labor. In fact, Russian scientists' unique combination of excellent foundational training in their disciplines, high technology skills, and economic desperation made Russia one of the hottest countries for scientific outsourcing in the late 1990s.

The US-based computer company Sun Microsystems, for example, was an early entrant into the Russian labor market, signing its first contract with Russian software developers in Moscow, St. Petersburg, and Novosibirsk in 1992 (Markoff 1992). These software engineers work either in private companies or academic institutes that have contracts to produce specific software products for Sun. Labor costs in Russia are a

fraction of what they are in the US or Europe; salaries at Unipro, a Novosibirsk software company that operates mainly under contract to Sun, range from $300 to $1500 a month. These salaries are significantly higher than those for Academy of Sciences jobs, but low enough to make worthwhile the extra training Russian workers require in English, intellectual property law, and US business practices (Wagstyl 2001; Jack 2000). The Sun jobs are very attractive to Akademgorodok's computer programmers. Viktor was a senior software engineer until he left his position at the Institute of Computing Technology several years ago to begin his own real-estate brokerage firm. Although his business had been reasonably successful, Viktor was planning to return to his old position in the institute, as many of his colleagues were working on contracts for Sun. Working for Sun not only held out the opportunity to work in his specialty, but to work more reasonable hours—Viktor carried the whole operation of his real estate brokerage himself—and perhaps to travel to the US on occasion. Although Russia's share of the global offshore software market is not as large as that of India, the leader in the production of outsourced software, it is, nevertheless, one of the few areas of science in Akademgorodok enjoying something like growth.

Akademgorodok's migrant scientists, as the four "tales of travel" below demonstrate, use both strategies offered by the new global scientific economy—temporary research contracts abroad and contracts for outsourced research in their Russian labs—in their attempts to resolve the dilemma of staying in science *and* staying in Russia. A third option, teaching, often takes academic scientists to Third World universities, where Russian scientists' expertise in high technology and fundamental

research is highly valued; long-standing exchanges and connections with socialist countries—Cuba, Vietnam, Angola—were forged during the Soviet era, and some continue to operate. But teaching in universities in developing countries is not something many Akademgorodok scientists are prepared to do; Soviet pedagogy and research were almost entirely detached from one another, even in Akademgorodok, which was designed to integrate them. Moreover, Russian scientists often value teaching less than research; add to this the low level of science they ascribe to, for example, Malaysian, Brazilian, or Zambian scientific communities, and Russian scientists working in Third World universities often fail to find either the financial or the professional satisfaction they sought in working abroad.[8] In addition, their efforts bring them little prestige at home. I spoke with Aleksandr, a physicist, about a friend of his who was working in Thailand, and the conversation revealed how Russian scientists were disparaging both of teaching and of science in developing countries. Aleksandr's friend both taught applied mathematics and computer science at a university and worked on joint research with Thai colleagues. He found the level of science to be extremely low by Russian standards—Aleksandr shrugged and said, "Is there even science in Thailand?" Aleksandr believed that Thai universities were interested in hiring Russians because they desired participation in research led by the Russians that would garner international prestige to the Thai researchers, but could not afford to hire Americans or Western Europeans. Aleksandr explained that his friend remained in Thailand because he received a salary of around $1000 a month—perhaps more than 10 times what he would earn in Akademgorodok; for half of that, Aleksandr explained, his friend would gladly return to

Russia. Aleksandr himself had worked briefly in Taiwan, where, he said, "there was enough money but not enough well-qualified scientists."

Akademgorodok scientists' travel practices, diverse as they are, depend upon the desirability of the skills and knowledge of Russian scientists on various world scientific markets. For some, this has enabled them to find high-paying, prestigious positions in well-respected institutes and universities abroad: a deputy director of the Institute of Nuclear Physics listed the US institutions where his former colleagues now work:

> Many of our highly-qualified people now have very good positions in the United States. For example, Professor S., our theoretician, was one of the first who left. He's a professor at Stony Brook. And A.V. He's the director of an institute of high energy physics, a small institute of the physics of elementary particles. At Livermore, there's our academician R., who led our thermonuclear program. We have a large team at the Argonne National Laboratory [working on] sources of synchrotron radiation. At Duke, in one laboratory there's V.L. and I.P., there's a team at Brookhaven, at Cornell there are six people, at Berkeley, at SLAC, practically in all the leading physics centers.

As Akademgorodok's scientists have spread out around the globe, foreign scientists—and foreigners of all occupations—have become almost commonplace in Akademgorodok now. In fact, scientific researchers from other countries are probably less numerous than foreigners working for NGOs, as language teachers, as missionaries, and as businesspeople. During the time of my fieldwork, a handful of Americans were teaching English-language courses at Novosibirsk State University, for which students paid high tuition but were not required to pass entrance exams; two retired lawyers taught law, and a man who had just received his bachelor's degree taught American history. There were a few foreign researchers in institute laboratories (including myself); most were graduate

students working in an Akademgorodok lab for a semester or so before writing their dissertations. Jacques, an undergraduate student studying fluid mechanics at the Pierre and Marie Curie University in Paris, was spending three months at the Institute of Hydrodynamics doing a laboratory practicum required for his degree. He loved living and working in Novosibirsk, and thought he might like to return for his Ph.D. research, if he could get a French grant to pay for it. Jacques shrugged off my question about the material hardships that local scientists complained were driving them out of the country: "The PC I'm using is enough for the program I am using. It's a small program, and it's not big information, so I don't care about the problems of computing. For me it's not a problem. Maybe it will be later, when I come back and am more clever about computing."

Within all this travel and movement there was a sense of uneasiness. Although Akademgorodok scientists welcomed the opportunity to interact freely with foreign colleauges, both at home and abroad, indeed associated this opportunity with progress itself, they also suspected that it was costing them something very important. Namely, they wondered whether the distinctiveness of Akademgorodok science, formed from a unique experiment in linking scientists' everyday and professional lives, was a casualty of both postsocialist collapse and the globalization of science. In the four travel histories that follow, I hope it will become apparent, without losing a sense of the idiosyncrasy of scientists' travel practices in the late 1990s, that Akademgorodok scientists participating in "world science" often experienced a misfit or disconnect between scientific culture and the culture outside the lab.

Four Traveling Scientists: Opportunity and Isolation

Ivan: Exploratory E-mails

Ivan was in his mid-40s at the time of my fieldwork; he grew up in a small town in the Russian Far East, and graduated from the physics-mathematics faculty of Novosibirsk State University in 1974. He holds the degree of candidate of physical-mathematical sciences and works as a senior researcher at the Institute of Semiconductor Physics. For the past three years, his work has focused on the investigation and construction of infrared light-sensing elements. Before that, he did experimental work on the interaction of light radiation with the silicon compounds used in microchips. He has been divorced for many years, but until early 2001 shared an apartment with his ex-wife; neither of them could afford to buy a separate place, and the two remain close friends at any rate. He has two adult children, a son and a daughter, both of whom are married and out of the house.

Because his salary, like that of other *biudzhetniki* around Russia, was rarely paid on time, and when it was paid, was far below the level necessary for even subsistence, Ivan had to look for other sources of income. He found relatively regular work in the evenings remodeling apartments that had been purchased by "New Russians" who wanted more open floor plans than the standard concrete-panel *khrushchevka* offered and "Euro-standard" furnishings for their kitchens and bathrooms. Although this manual labor provided him with supplemental income, he was dissatisfied because it distracted from his scientific work: "Scientists shouldn't have to do manual labor in order to survive." So in the late spring of 1999, when he heard about a post-doctoral fellowship at

Georgia State University, a position that he hoped would allow him to continue and expand the research he had been working on, he jumped at the chance. He found out about the position through a former classmate at NGU who had emigrated several years earlier and held a permanent position at nearby Emory University. The friend read the announcement of the post-doc and immediately sent Ivan an e-mail. He also contacted the chair of the search committee at Georgia State, a physicist from Sri Lanka, recommending Ivan for the position.

Ivan was a close friend of the family I lived with, and he came to me for advice and assistance in applying for the job. He could read English texts in his specialty fairly well, but could not speak or write English. I helped him translate his CV and an introductory letter into English—where my knowledge of specialized physics terms failed, Ivan always knew the English equivalent. We sent the documents off to Georgia by e-mail and waited.

In the interim, Ivan and I had many conversations about life in the US: what Atlanta was like, whether one could live there on the rather modest post-doctoral stipend, and still save some money to bring home. He didn't harbor any illusions about becoming a millionaire; he was prepared to live frugally: "Russians are used to living in conditions Americans would never consider," he asserted with a little bit of pride. Ivan had many friends who had worked abroad temporarily or had emigrated permanently. He kept in touch with several of them by e-mail or when they returned to Akademgorodok for visits. When I asked him how, judging from their conversations, he expected that doing scientific research would be different in the United States, he answered, "There aren't

any particular differences. Science here and there is approximately the same. It's just that there, insofar as there are more possibilities, everything gets done faster than here."

The professor in Atlanta asked for recommendations; I translated those that needed to be translated as well, and they were e-mailed to Georgia. A few more e-mails about details were exchanged. Ivan was one of two candidates on the short list for the job. When we talked about the possibility of his moving to Georgia, Ivan was ambivalent. He would prefer, he said, not to go, and he was actually quite depressed at the possibility of leaving, imagining leaving his familiar surroundings, his friends and family for a large city in an unfamiliar country. But, in the end, what drove his decision was scientific curiosity and ambition: he said he couldn't pass up a chance to work on his research in an environment in which he could achieve some useful results—with good equipment and computers. He was reassured by the knowledge that there were substantial communities of Russian immigrants in many American cities, and that he would be able to "live as if in Russia" if he so chose.

Ivan's best friend and colleague, Valerii, became visibly frustrated and depressed at the thought of his friend leaving. "There's nothing left here, now even Vania's going to America," he often complained. It was not only his personal loss, he said, but in some way Russia's—yet another talented scientist had become fed up and was preparing to leave. For Ivan, the idea that "there's nothing left here" was precisely what was driving him abroad—he was no longer responsible for his grown children, and his work was stalled due to a chronic lack of money. The whole episode transpired remarkably quickly for an academic job search—within a period of about a month we knew the result: after

what the letter described as a very difficult decision, the department in Georgia had decided to go with the other candidate. If Ivan was disappointed, he didn't show it much; he shrugged and said he was rather relieved that he wouldn't have to go to America after all. Nonetheless, he wouldn't rule out applying for another position if one came up.

In fact, after I drafted this chapter, I found out that Ivan had applied for the same position again in the fall of 2001, and this time he was successful. He arrived in Atlanta in early February 2002. "Write in your dissertation that the last brain has drained from Siberia," Valerii e-mailed me.

Ekaterina: Reality Check and Return

Ekaterina grew up in the coal mining region of Kemerovo Oblast', east of Novosibirsk. Her mother, who now lives in Tomsk, was a schoolteacher, her father a driver. She studied in the chemistry faculty of Novosibirsk State University, and remembers that when she first came to Akademgorodok she was impressed by the beauty of the town's forest setting and the cleanliness of its streets and buildings, compared to the coal-dust-covered community she grew up in. She met her husband, now a mathematician, while they were students, though they married late by comparison to many of their peers. For sixteen years, Ekaterina, her husband, and their son lived in one room of a three-room apartment in Akademgorodok's upper zone, which they shared with her in-laws ("old Russian intelligentsia," according to Ekaterina) and her husband's elderly grandmother.

Ekaterina first traveled abroad as part of a Komsomol work brigade to Prague as a university student in the 1970s. She remembers being overwhelmed by the abundance of consumer goods available in Prague (relative to Novosibirsk), as well as by the palpable hostility of her Czech hosts toward their Soviet counterparts just a few years after the Prague Spring.

She continued her studies at the Institute of Organic Chemistry in Akademgorodok and, after receiving the degree of candidate of chemical sciences, she continued to work in the laboratory of nitrogen compounds. Her work focused on the synthesis of stable nitrous radicals for use in biochemistry and biophysics. She was one of only a handful of women researchers in the lab, though there were women assistants and technicians. In 1992, her graduate supervisor emigrated to the United States after establishing contacts with American researchers at a 1989 conference sponsored by the Institute of Organic Chemistry. Subsequently, he established his own biotechnology firm and made it a point to hire talented Russian specialists when he could. When his firm contracted with an Israeli company to synthesize the same substances in which she specialized, he found a grant which would bring Ekaterina, through the University of Texas at San Antonio, to work for his firm. Ekaterina herself was not clear on the details of the grant process—nor even, off the top of her head, could she recall what organization funded the grant. She said that her supervisor had "kept it all a strict secret" because he feared that others would find out about the same funding source and thereby diminish it for him: "He said, 'Why would I show [others] the trough from which I feed myself?'" Ekaterina told me.

She went to San Antonio in 1996 motivated, she says, mostly by financial need and the desire to move out of her in-laws' apartment, but also by a crisis in her marriage and curiosity about how people lived on the other side of the "Iron Curtain." Ekaterina loves her son fiercely, and is intensely loyal to her husband—the decision to leave tore her apart. Her life in San Antonio, as she describes it, was ascetic and frugal, as she scrimped and saved every penny she could. She spent only fifteen dollars a week on food, subsisting mainly on potatoes, milk, and soup. She refused to use her apartment's air conditioner until one day a friend discovered her dizzy and disoriented from the summer heat. Moreover, she was lonely. She spent her evenings knitting (and suggested that I might ease my own loneliness the same way; unfortunately, despite Ekaterina's best efforts to teach me, knitting provided little more than frustration for me). She made few American friends other than one colleague and his wife and a secretary at the office where she worked. She socialized mostly with a family from Akademgorodok who had settled permanently in San Antonio several years earlier, and with some other Russians in the lab, which also included a couple from Sri Lanka.

When Ekaterina and I sat in her kitchen one winter evening, looking through an album of photographs from her year in Texas, I was struck by the seeming contradictions in her narration of her experiences. Indeed, I would come to see as I got to know her better, Ekaterina often framed her reminiscences of working and living in the US in diametrically opposed terms. "I hated the lack of street life," she said, describing how she was often stopped by the police or motorists, who assumed her car had broken down, as she walked through suburban streets to work. I loved [the discount store] Marshalls,"

as she showed me a photo in which she smiled in a shopping mall. "I hated Americans' superficial smiles," when she posed with some American colleagues in a steak house. "I loved Sea World," with dolphins. Such statements always followed one another in quick succession in her stories, and they reflected the deep ambivalence she felt about being away from both her family and her homeland; being away from her family "spoiled my impressions of America a little."

She describes her work in San Antonio as rather mechanical: she would arrive at the lab in the morning, set up the reaction for the day, and while it ran, she would make her coffee and chat with the secretary. When the substances were ready, she gave them over for a check and they were immediately put to use. Her supervisor, she said, "in fact used me as an unskilled manual laborer (*kak chernorabochego).*" Despite her sense that she was overqualified for her job, she found working with the modern equipment and easily-available reagents in her Texas lab "sheer pleasure." She might have stayed and continued to work in San Antonio; she says the topic came up "more than once," but that she wasn't sure of how her family would feel about emigrating. She entered the green card lottery, but was relieved to find out she didn't win. She returned after a year because she missed her family and because, she says, "I'm a Slavophile by nature. I love Russia very much, and [staying in the US] wasn't for me." She had saved enough money to buy her own three-room apartment in a desirable location in Akademgorodok, and her brother, a prosperous businessman in Tomsk, helped her do the necessary repairs.[9]

Although her living situation and her marriage had improved, she found the transition back to Russia difficult professionally. For months, she says, she could not get

accustomed to the working conditions in Russia—not having reagents, instruments, and equipment she had come to think of as indispensable. When I met the Nitrogen Compounds collective in March of 1999, those conditions had changed; in fact, every one of the researchers in the lab had either worked abroad, worked in Akademgorodok with a foreign contract or grant, or was planning to go abroad. The lab had clearly benefitted from these contacts: nearly all the bottles of chemicals stored on crowded, high shelves had German labels on them, and during my conversations with the group, one or another member would often be called to the telephone by a call from a German colleague. There were, nonetheless, clear signs of material hardship. For example, most of the women technicians and assistants had left or been let go due to a lack of money to pay their salaries (though they, and Ekaterina, are invited back every year to celebrate International Women's Day). For Ekaterina, being one of few women in the lab began to become more and more uncomfortable; she often felt that despite her experience working in the US, she was being treated as a second-class intellect.

In late 1998, Ekaterina applied for and got a job as the head of international programs for the Siberian Division of the Russian Academy of Medical Sciences, located fifteen minutes by bus from Akademgorodok's upper zone, in Nizhniaia El'tsovka. Her knowledge of English and her experience working abroad, she says, helped her get this job, which is not a research position, but an administrative one: "unfortunately, it's paperwork." In some ways she misses working in the laboratory, but her salary, while still very low by Western standards, is now nearly twice what it was when she was a researcher. Moreover, she says, having an administrative job will help her avoid some of

the health hazards associated with a lifetime spent around hazardous chemicals: "I don't know a single chemist who doesn't have problems with his liver." She says that while she wouldn't rule out another stint working abroad, and considers that shuttling back and forth between the West and Russia in general is "good for the person and for the laboratory as a whole," she is not actively looking since she no longer does research work. When she moved beyond the concrete financial concerns of a particular institute, laboratory, or research project, however, Ekaterina often asserted that the internationalism of science under the present conditions of crisis in the Russian scientific community was "not entirely good for our Russian society," as it was facilitating the outmigration of "the most progressive layer of society." On the whole, though, she believed that "science isn't different anywhere, if [scientists] are enthusiastic."

Galina: Working 'Abroad' at Home

Galina grew up in Novosibirsk and attended NGU. After finishing university, she studied in Pune, India for four months on a formal exchange program between the Soviet Academy of Sciences and its Indian counterpart. She went to India, she says, out of curiosity, a desire to see the world. In our first interview she characterized India as a place where science was at a very low level by comparison to Russia, a "backward" country where she was both excited by the allure of the exotic and fearful of "tropical diseases." Yet in a later conversation which included her partner, Oleg (a biologist who had worked in the US), she defended India against his dismissive comments about the "feebleness" of Indian science. "Actually, it's very uneven. In one lab you might have

world-class research going on, and next door people sit with nothing to do." India, of course, suffers from a "brain drain" as serious as—and much more well-established and routinized than—Russia's (having to do with patterns established under British colonialism, I imagine). Though Galina did not connect brain drain to the "unevenness" she witnessed in Indian science, she did venture the prediction that Russian science will become, if not "feeble," then "uneven" due to its continuing financial crisis and unimpeded outflow of specialists.

The experience working abroad that she characterizes as the main one, however, came after Galina had finished her graduate work at the Institute of Catalysis in Akademgorodok. In 1994-95 she held a post-doctoral research position at a university in Germany. She got the position through her own search: she introduced herself to a German researcher, whom she knew from his publications, at a conference, and asked him if there was any possibility that he could find a post-doc for her in his laboratory. She found her work in Germany very fulfilling: "It was interesting to test myself, to try my strengths in a different place. There was very good equipment on which you could get very interesting results; we still don't have that here. What else? The salary was normal, completely commensurate with my level." She was initially invited for a three-month stay, but her supervisor was so satisfied with her work that her tenure was extended twice, though she said that one of the extensions took place at the last minute and just a month before her visa's expiration she did not know whether she would stay in Germany or return to Russia. It was impossible, she said, to live normally in such unpredictable circumstances.

She might have stayed longer in Germany, but her supervisor took a position as the director of an institute in Berlin. Without him, the whole laboratory was restructured to reflect the new supervisor's research interests, and there was no longer a place for her. Her supervisor would have liked to take her along with the handful of researchers who accompanied him to Berlin, but she described the former East German institute as suffering from many of the same problems that afflict former Soviet ones: "It wasn't really an appropriate moment, insofar as it was an institute in the former East Berlin and of 2000 researchers there, 200 remained. The situation was rather harsh, and he had just arrived there." Anyway, she says, "I was a little tired of working in Germany, I missed my home and friends. Honestly, I emotionally wanted to return here, but I understood with my mind that it's very difficult and very complicated here, so..." she extended her stay till her supervisor departed for Berlin.

Galina now works at the Institute of Catalysis, one of Akademgorodok's more successful institutes: "I know that in some institutes people can't even work because there are no reagents or equipment. You can't say that about our institute." She is not, however, wholly dependent upon the institute (and thereby the state) for support of her research or her salary; in the spring of 1999 she signed a contract with a German firm for work she performs in her Akademgorodok lab:

> They looked at my publications, we had a few preliminary meetings, and they ordered a large review of a given topic, but with a slant that interested the firm. In it, it was necessary to take productivity into account, [but] in general it wasn't completely slanted toward industry. And they paid for this work, it was my work for three months. In parallel, I continued to lead [my own] work. I have a technician-assistant, and in parallel I

> conducted other research, but nonetheless that was my work, and they paid 5000 dollars.

Galina saw the foreign contract as an optimal solution for her at the time: she could continue to work in her Akademgorodok lab, in an environment she found intellectually stimulating, and could continue to live in Akademgorodok, among friends and family. She could use the money and equipment from the contract to conduct her academic research on the side. Yet she found that the five-thousand-dollar contract in fact meant much less than that:

> I'd work in the institute with pleasure if, of that five thousand dollars, I received two. Maybe even... Well, two, but we have such a system: The institute first takes half the money from Western contracts, then it divides the remaining half into two parts: one for salary, the other for equipment. Of the part for salary, half goes to taxes. Of that five thousand dollars, I received seven hundred. That's a big difference... I didn't spend money on materials or equipment; it was my labor, my head, my knowledge. I worked in parallel, continued to do experiments and did the review. To receive one-eighth or one-tenth? I won't agree to those conditions.

It turned out, then, that the contract was, in Galina's words, "inadequate for a normal life." Nevertheless, her laboratory had recently signed another, larger contract, this time for 20,000 dollars, and she expected another smaller one to be signed shortly. "Maybe," she concluded, "it's simpler to find work abroad."

In fact, Galina had, by the summer of 1999, begun actively searching for work abroad. She thought she'd try France or the United States this time, and she had recently returned from an international catalysis conference in France and was planning to attend the European Catalysis Congress in Italy that September. She hoped that she would again be able to make contacts at these conferences that would help her find another

position abroad. "I would like to work here, but I know that in order to do what I can do, I must work abroad."

This peripatetic life, always searching for the next contract, or hoping the current one would be renewed, wondering in what country she would find herself in six months, did not appeal to Galina much anymore. The curiosity about the world that took her to India had faded, and she longed for a more stable situation in which she could marry and have children, a situation she saw as practically impossible for a woman living as a temporary worker in a foreign country without the social benefits of health care and child care provided to citizens: "I'd advise [young people] to try living abroad. It widens your horizons. But on the other hand, after age 30 one wants some kind of... I understand that it's certainly hard to find some kind of stability in life now. One wants there to be a little more of it, so let there be contracts, but for a more extended period and with some kind of social guarantees, so if you want to have children... On a post-doc's salary you can live well by yourself..., but if you think of having a family, a child, I can't even imagine... It's impossible, you can live for a year, maybe two, but then you tire of that.... And to become a professor in a university, being Russian—I understand that my chances are close to zero."

Andrei: Permanent Impermanence

Andrei, like Ivan, is a semiconductor physicist. Since 1994, he has worked at the Joint Research Center for Atom Technology in Tsukuba, a science city in Japan (Traweek 1995; 1992; 1988) reported to have been modeled on Akademgorodok. When he began

his search for work abroad, he did not specifically focus on Japan: "I ended up in Japan by chance... I began to look for work and, I remember, found it quickly and went there." He searched by looking for articles in scientific journals by foreign scientists working on analogous projects to his, writing letters to them, and receiving invitations. (He made it sound awfully easy and matter-of-fact). When I met him, in July 1999, he was visiting Akademgorodok for a month or so, and had recently been notified that the Center had funding to continue his work for another two years, and so he planned to be in Japan for at least two more years. Beyond that, he said, "it depends on circumstances."

Andrei's wife originally went to Japan with him, but returned so that their daughter could attend high school in Russia. Moreover, she was not willing to give up her job in Russia, and so she visited her husband in Japan once or twice a year for a month or so. Andrei's colleagues, however, insist that his wife found life in Japan so intolerable that she demanded to return home. At any rate, their daughter finished school in 1999 and was admitted to Novosibirsk State University, so Andrei hoped that his wife would be able to spend more time in Japan with him.

His work group in Tsukuba is composed of Andrei ("the only European type"), one Chinese scientist, one Korean, and seven Japanese researchers. They converse in English with one another; Andrei does not speak Japanese, and says that he is always aware of his "foreignness" in Japan. He describes the atmosphere in his laboratory as "without problems," insofar as his colleagues know that he does good work and respect him for it, but nonetheless he finds his Japanese co-workers to be anxious around foreigners: "it was a closed country for a long time." He does not have many personal

contacts with his Asian colleagues, and associates mainly with other Russians and some Europeans, a situation he describes as fairly typical for foreigners working in Tsukuba: "Foreigners contact Japanese researchers at work, but in everyday life (*v bytu*) very little. Everyone basically lives by country; Russians (*russkie*) from Russia cluster together among their own...in their free time. Others also cluster together like that, in the sense of maintaining contacts, it's rare for someone to maintain contacts between other countries." He says that by official statistics published in the newspaper there are about 150 Russians living in Tsukuba, but that includes his wife, and presumably others, who do not live there year-round. He associates mainly with a group of Russian tennis players who number, including family members, about 30-40 people, who play tennis regularly and hold get-togethers once a month or so.

When Andrei arrived back in Akademgorodok in July 1999, some of his former colleagues at the Institute of Semiconductor Physics, whose garden plots were nearby Andrei's, remarked how joyful he had seemed while working in his garden, planting and harvesting the tomatoes and cucumbers his family would pickle and eat over the winter, and repairing the small house on the property. They interpreted his happiness, found in work many disliked or even resented, as a sign that Andrei felt himself to be truly at home only in his native land—actually working the soil—that he was uncomfortable and even unhappy in Japan, though he tolerated living there for the sake of his family's financial survival and his own professional satisfaction: "He's already a 'Shogun,'" one colleague joked. Moreover, they reported, Andrei's wife, after returning from Japan, had

declared that she could not live there, not ever. In my conversations with him, Andrei stated the situation more gently, but did not dispute his colleagues' interpretation.

Science and Everyday Life in the Transnational Scientific Labor Market

The travel histories told by Ivan, Ekaterina, Galina, and Andrei share a distinction between the comparative ease with which their scientific skills and knowledge moved across borders and the difficulties they faced in adjusting to everyday life abroad. During my fieldwork, this distinction shaped not only first-hand, but also second- and third-hand narratives about scientific migration, and not only narratives of migration, but also sociological research about it. Indeed, it had become part of Akademgorodok scientists' common sense and expectations about nation, science, and migration that adjusting to life in the lab was easier than adjusting to life outside it.

The ongoing sociological research of Gordienko, Eremin, and Pliusnin, of the Center for Social Adaptation and Retraining of Highly-Qualified Cadres, on the social-psychological state of the Novosibirsk Scientific Center's workers focuses on a variety of issues, among them "brain drain." In a 1997 survey, they asked scientists who had worked abroad, "How much time was needed for you to adapt to the conditions of life and work abroad?" The question was then broken into four sub-categories: Language, Forms and Methods of Work, Integration into the Collective, and Culture of the Country. Although the vast majority of scientists surveyed claimed that it took them—remarkably—less than a month to adapt in all of the above categories, adaptation in the domains of Language and Culture seemed to proceed more slowly than in the other two

categories, which center on the work context. For example, 69.1% of respondents claimed they adapted to Language in less than one month, and 70.9% adapted to Culture in the same time, compared to 85.6% in Forms and Methods of Work and 83.5% in Integration into the Collective. There were differences across disciplines as well: for example, physicists seemed to claim the slowest integration process, while economists unanimously claimed integration in all four categories in less than one month (Gordienko, Eremin, and Pliusnin 1997:167-168). The point here is not that these statistical studies represent some kind of truth about the astounding speed with which Akademgorodok's scientists learn the culture of their new laboratories and countries. Rather, I wish to highlight that this quantitatively-oriented study reflects—indeed is structured by—the discourse prominent in Akademgorodok scientists' travel narratives about the disconnect between everyday life and laboratory life.

In fact, it was in the office I was assigned in the Institute of Philosophy and Law, an office I shared with the members of Gordienko, Eremin, and Pliusnin's research team, that I began to pay attention to what I called the "horror stories" about migration that were circulating around Akademgorodok. My first impression was that these "horror stories," narratives about scientists who had terrible, even traumatic experiences abroad, were meant to warn potential emigrants from leaving. Against the backdrop of the globalization of scientific labor, and Russians' increasing role in it, though, these stories sound more like a way of reconciling science's transnationality with Russian nationalism, rather than a simple nationalist warning. The following excerpt is from an e-mail I sent

to some fellow graduate students in their field sites in South Korea, Indonesia, and Zimbabwe:

> I'm also collecting a lot of "horror stories"—unanimously scientists abroad are said to report that they find their new environments uncomfortable, unlivable, lonely, and just generally awful, though they may like certain things about them too (e.g., Wal-Mart). Even if they stay abroad, even if they become citizens of another country, they swear to their friends and relatives that it is only for the money, that they would really rather be in Russia, where they can go ice fishing.... So I'll hear things like, "My friend Yuri's brother-in-law went to Mexico, and he had no friends at all there, he had to socialize on the Internet! And he just about went crazy from the loneliness. He likes to hunt and fish—a man needs to hunt and fish in his native country. His wife liked it there because clothes were cheap, but when he was offered a second year on his contract, he refused and came back here, where he works for $30 a month, when it's paid on time." (23 February 1999)

Loneliness and longing for *nashi rodnye otnosheniia*—interaction on Russian, familial terms—and for Siberian nature were common themes of migration narratives. It is noteworthy that in this account "Yuri's brother-in-law" did not complain that he found his work in Mexico unsatisfactory; the focus in these narratives was on the patterns of everyday life and social interaction particular to Russian or Siberian places. And in the travel histories recounted above, Ekaterina and Andrei lived primarily in Russian communities outside the lab, having little social contact with the "natives;" Ivan expected to be able to do so. Andrei, moreover, felt particularly "at home" when he was working his "native soil" in his garden—even though garden labor symbolized for many Akademgorodok scientists the decay and collapse of their national scientific establishment. The inability of Russian scientists to adapt to everyday life abroad was,

therefore, taken for granted and rationalized as a broader incommensurability between national characters.

One sweltering, sunny summer afternoon, Ekaterina took me to a dormitory to meet with her friends Marina, a geneticist, and Nikolai, a microbiologist. Both had recently returned to Akademgorodok: Nikolai for a brief visit from his job in Germany, and Marina from her latest position in Germany (she had also worked in England, the US, and at two jobs in different German cities). We were surprised to find that Marina and I were neighbors sharing a *dvor*, or yard—in fact, the windows of our apartments faced one another. Marina's daughter Nastia chattered away with me in the nearly-flawless English of a cosmopolitan preadolescent, saying that although she enjoyed living in the United States, she was happy to be back in Russia and would want her own children to speak Russian as their first language. Marina and Nikolai described their own feelings of discomfort and disconnection abroad:

> *Marina*: I didn't like that very often there aren't enough of our close, familial kinds of relationships (*ne khvataet nashikh rodnykh otnoshenii*). That is, Russian people are very dependent, in my view, on friendships. And when we are on long trips, there isn't always the opportunity to meet a large number of people with whom you can socialize often. In that way, it's fairly hard. And without question there are difficulties simply in mastering foreign life, insofar as our life is organized in a completely different way. There's a moral burden there, a kind of heaviness.
>
> *Nikolai*: I agree: with work everything is good and pleasant. That's understandable: after all, I went there to work. But with regard to personal contacts with foreigners, for me there it's generally... There were some attempts, but they ended in nothing, and now I keep a Russian company there; there are many Russians from Russia.
>
> *Amy*: So you socialize mainly with Russians.

> *Nikolai*: Yes. No, I don't have any common interests with... I have nothing in common with Germans. Of course...
>
> *Marina*: Friendship doesn't work out, but is there conflict?
>
> *Ekaterina*: Do they not understand you, or you them?
>
> *Nikolai*: No, everything's *friendly*.[10] Everything's friendly and all that, but I don't know. They have a different sense of humor, different relations.
>
> *Marina*: Relationships aren't bound up so tightly...
>
> *Nikolai*: They don't understand your jokes, and their jokes don't seem funny, that's all. It's impossible to live like that.

In Marina and Nikolai's view, laboratory life was so transparently transcultural that it hardly bore remarking. Everyday life, by contrast, was the site of deep incommensurability between cultural patterns of interaction and, therefore, produced emotional and moral hardship for Russians, who were figured as both highly dependent upon Russian-style relationships and unable to adapt to other styles. As Marina put it,

> Our people relate very deeply with one another. That is, they can discuss serious questions for a very, very long time, and not always from literature. It's relatively rare when people of Western culture relate very deeply; that is, as if they confess their soul *(kak by dushu svoiu ispoveduiut)*, fully tell their secret thoughts *(polnost'iu rasskazyvaiut svoi mysli potainye)*, I don't know.

Interestingly, my own intermittent homesickness in the field was understood rather differently: people generally assumed that my feelings of disconnectedness and discomfort were the result of a lack of material goods on which, of course, Americans were understood to depend. This was notably *not* a question of styles of interaction—or even being away from family and friends—even though I experienced "culture shock"

most acutely in relation to the hierarchical interaction between Russian professors and graduate students and the strains of collective life with a large family for someone accustomed to living alone. In short, Akademgorodok scientists' narratives of cultural dislocation in their work abroad, in emphasizing the deep cultural difference between deeply-connected, collectively-oriented Russians and their more individualistic foreign colleagues, implied the transcultural portability of science.

Scientists' narratives gave the sense that Russians seemed to experience difference differently. Moreover, Russian forms of interaction were intimately tied to Russian places—Russia, obviously, but also places outside of Russia that Russians had made their own. Nikolai, in describing the émigré community in which he lived in Heidelberg, pointed out that Russian communities were centered on identifiably Russian places: "There's something spiritual there, where there are Russian churches." Traveling scientists, therefore, often spoke of a kind of incurable, deep longing for familiar people, places, and things that seeped into and tainted their lives abroad, leaving them unable to become settled and well-adapted in other places—what Marina called "a kind of heaviness." This longing or homesickness—*toska*—was understood to be the natural reaction of a Russian separated from his or her home places. The experience of *toska* is understood as a particularly Russian one; like *byt* (everyday life), *dusha* (soul), and *poshlost'* (banality), *toska* is what Boym (1994:3) calls a "cultural untranslatable." *Toska,* in fact, can mean both "longing" and "boredom." "To miss someone" is usually expressed with the phrase *skuchat' po komu-nibud'*, which is less strong than *toska* or its verbal form *toskovat'*; the verb *skuchat'* can also mean "to be bored."[11] When used to

talk about the longing of the traveler for home, *toska* brings the suffering of separation and the ennui of boredom into the same frame. The traveler experiencing *toska*, for example, might find him- or herself unable to form "deep," "spiritual" friendships along the lines of prevalent Russian cultural models (Pesmen 2000), becoming bored by everyday life, if not by work. The boredom and inability to form social relationships along familiar patterns may result in an aching, longing, or desire to return home. So Ekaterina spent her evenings in San Antonio knitting and longing for her family and her country. In terms of *toska*, then, Ekaterina's boredom and her missing her family and *rodina,* motherland, are part of one and the same cultural frame, in which the Russian inevitably longs for Russia (or at least an idealized image of it, in which things aren't falling apart), Russian nature, and Russian social relationships.

Toska, it is worth noting, is also frequently used in reflections on the Soviet era, when, as nostalgic visions have it, people's relationships were not marked by the competitiveness, envy, and opportunism of the postsocialist era, and when everyday life, while not easy, was at least predictable and familiar. *Toska* in this sense is sometimes used to code postsocialist material desire combined with nostalgia for the past—a woman might look ruefully at a worn-out dress she cannot afford to replace and sigh, "*toska*." Even in this nostalgic mode, however, *toska* denotes a kind of homesickness for an idealized homeland from what is, after all, another country.

Culture and the Unevenness of Global Science

Akademgorodok's migrant scientists see themselves as driven from their country by their commitment to doing scientific work into contexts where they cannot feel at home; they pose the alternative as leaving science for jobs in commerce. Longing for a past in which scientific work and feeling at home were not incompatible, they see their lives as split between scientific career, which gives them skills and knowledge that can be moved more or less unproblematically on the global scientific marketplace, and social life, which involves a radical disjuncture between cultural styles of interaction. This trade-off enables scientists to participate in the global scientific structures that provide them with the opportunity to do their research and support their families, while feeling as though some part of them—perhaps their souls—remains in Russia. In this sense, then, the framing of an exclusive choice between science and nation makes it possible for Akademgorodok scientists to draw strategically on shifting and overlapping identifications with both global-scientific and national-spiritual communities.

Yet Akademgorodok scientists' incorporation into "world science" has been nothing if not uneven. As Ivan's, Ekaterina's, and Galina's stories show in different ways—and as will be discussed in greater depth in the next chapter—Akademgorodok's migrants often find themselves doing some of the less creative and professionally fulfilling labor necessary to contemporary scientific research. Ironically, however, they are desirable on the global scientific marketplace in large part because of Russian scientists' traditional strengths as creative theoreticians. Boredom and longing, despite scientists' attempts to isolate them to the sphere of social relationships, implode into the

lab in ways that highlight how the global scientific economy relies on local differences in order to sustain its image of a transcultural "culture of no culture" (Traweek 1988:162), and how important participation in this culture has become as a powerful signifier of science's potential to generate postsocialist progress.

Chapter Five

Cold Fusion:
Negotiating Universal and Particular in Russian Science

> To see scientific knowledge as located and heterogeneous practice, which might (or might not) be "global" and "universal" in specific ways...is to adopt the worldly stance of situated knowledges.
>
> —Donna Haraway (1997:137-138)

> To take a faraway idea, which one tries to reach for a long, long time, gradually—that's for Russia.
>
> —Nikolai, Akademgorodok biologist, July 1999

Although Akademgorodok's migrant scientists contrast the relatively easy transnational mobility of science with the difficulties they face in everyday life and interaction, life in transnational laboratories is not free of obstacles to the unfettered flow of knowledge and information that scientists believe should characterize science in a global context. In fact, the globalization of Akademgorodok science is making scientists—both those who travel and those who do not—increasingly aware of the contrasts between ways of doing science that they identify as specifically Russian and those that they characterize as typical of other nations. Ideas about the specificity of national science are hardly new in Akademgorodok; indeed, the town was founded on just such a premise. But the apparent paradox between a specifically Russian science and science's presumed transcultural universality is shaping the ways scientists travel, participate in joint projects with foreign scientists, and envision their position in "world science."

The duality of science as both a national and an international set of institutions and discourses was particularly problematic during the Cold War. Soviet and US scientists had, on one hand, a sense of working on a common project that transcended superpower rivalry and, on the other, a desire to exceed the scientific and technological achievements of the other, to put science and technology to work in the service of competing cultural and political projects. US-USSR scientific cooperation—and rivalry—was characterized by a play between similarity and difference, between national and universal interests and values. In her history of such cooperation, Linda Lubrano counterposes science's "universal characteristics," such as "the intellectual content of the natural sciences" and "high values placed on organized scepticism, rationality, new information, and the search for truth" with its national variations "in philosophies of science and in modes of analysis...[and in] the diversity of social and economic support systems that enable science to develop in different directions and for different purposes" (1981:451-452). Although Lubrano distinguishes between universal natural knowledge and the culturally specific institutions and values that produce that knowledge, she concludes that "the universal and culturally specific characteristics of science are difficult to delineate, since science exists simultaneously in both a national and an international context" (1981:452). This ambiguity was what allowed Soviet and US scientists to maintain cooperative relationships—albeit problematically in many cases—in political contexts ranging from friendly rivalry to deadly competition.

Lubrano is pointing to something that interests Akademgorodok scientists as they re-imagine their place in the new Russian nation and the post-Cold War world—delineating what is Russian about Russian science from what is universal or transcultural

about science. For Akademgorodok scientists, the nationally specific and the universal co-exist; in fact, constructing national difference is one way Akademgorodok scientists construct the universality of science. Akademgorodok's researchers are committed simultaneously to the idea that there are no national differences in science and to the idea that there are particularly Russian ways of doing science that are grounded in Russian history and culture. Akademgorodok scientists see national differences in approaches, definition of scientific problems, data interpretation, use of laboratory technologies, the fate of the knowledge produced when it moves outside the lab, and the general "level" of science. Russian science is said to be distinctive for its emphasis on fundamental and theoretical questions, its style of extended, "deep" exploration of a given topic, and scientists' ability to improvise when laboratory machines are lacking. Thus, even if rationality and the search for truth are indeed universal scientific values, as Lubrano suggests, these values have different and particular historical and cultural resonances in Russia. Russian science is differentiated from other sciences using symbols similar to the ones scientists use to explain their feelings of disconnection from local communities in their everyday lives abroad.

But in the context of science, these differences are seen as historical and political, not essential or grounded in "national character." Russian science can, therefore, be seen as potentially commensurable with, perhaps even superior to, the unmarked, universal "world science" produced in the West. With the "universal" values of science becoming increasingly determined by the West, those on the periphery and those in the process of becoming peripheralized must continually prove that they too can participate in universal science's goals, approaches, and methods, that they too can achieve a universal

modernity (see Prakash 1999; Goonatilake 1993). Akademgorodok scientists' understandings of cultural difference in science are imaginings of Russia's changing place in the structures of global knowledge production and of a transcendent, universal science. In this chapter, then, I am interested in how the "flow" of global science and the sense of science as universal, transcendent knowledge get constructed out of disparate national and local sciences, and, conversely, how the transnational imagining of science has differentiating effects at its peripheries.

Making Science Local

Eduard Dmitrievich is in his 60s; he holds the degree of doctor of mineralogical sciences and works as a chief researcher (*glavnyi nauchnyi sotrudnik*) at the Institute of Mineralogy and Petrography. He has published extensively on the chemical reactions that take place in minerals under geologic pressure, including several articles in English-language journals. I met him when I gave a talk on the history of English to the local English club, which met every Thursday evening in a cramped second-floor meeting room, furnished with red vinyl sofas, in the House of Scientists. He waited for me as I chatted with club members after the presentation, and when I was ready to leave, he introduced himself and asked where I lived. I told him, and he replied that he lived nearby and offered to walk me home, warning that I should not walk about town alone at night. He hadn't said much during the meeting, and I assumed he wanted a chance to practice his English in a less "public" venue than the crowded, noisy, and female-dominated club meeting. He seemed relieved, though, when he found that I spoke Russian, and he immediately began to do so as well. As I began attending the meetings

regularly, it became a habit for us to walk the ten minutes or so to my apartment building together, sometimes with others, sometimes by ourselves. I remember Eduard Dmitrievich as a charming, old-fashioned gentleman, always dressed in a gray suit, white shirt, and tie. Every Thursday, as we arrived at the entrance to my building, he would shake my hand, give a stiff bow, and wish me a pleasant evening. In Russian he always addressed me as *vy*, the more formal form of the second person singular pronoun, whereas most others his age addressed me using the familiar *ty*.

Once, in the spring, Eduard Dmitrievich asked me to proofread a translation of an article he had written for submission to an American geosciences journal. We agreed to meet one afternoon in the weedy, overgrown yard (*dvor*) that the residents of my building shared with those of three others. We sat on a bench while I read the short article and added a few "a's" and "the's" here and there. Eduard Dmitrievich presented me with a tiny book made from polished malachite and quartz as thanks: "It's made of stone, and I'm a geologist, you see?" he explained. After we went over my corrections to the translation, Eduard Dmitrievich began to explain to me a related project he was working on. I was slow, I admit, to realize what he was describing: he told me that he had spent the last several years developing, at least on paper, a means of producing nuclear fusion at room temperature, using materials as simple as fresh water—the elusive "cold fusion." He walked me through a detailed explanation involving heavy water, deuterium, palladium, and an electrical current. Finally, he made a sweeping gesture with his arm in the direction of the Ob' Sea and said, "I know how we can solve Russia's energy crisis, even the world's. The water in the Ob' Sea could generate as much energy as the sun. We won't need any more coal or oil. Just the water in the Ob' Sea. But right now there

is no money to do more than theoretical work." I nodded, not really knowing how to evaluate or respond to his claim, but aware that the claim—unsubstantiated, as it turned out—to have produced cold fusion had caused quite a stir in the US a decade or so earlier.[1]

After this conversation, I got up to walk home, and just after I parted from Eduard Dmitrievich, I ran into an acquaintance, a physicist named Mikhail. He asked me who the old man he had seen me interviewing on the bench was. "A geologist," I told him, "who says he's discovered cold fusion." Mikhail began to laugh, and asked whether the old man had been drunk. I answered that he didn't seem so, and explained how Eduard Dmitrievich had said he could produce nuclear fusion in a pickle jar using just water from the Ob' Sea. Mikhail shook his head—whether at my naivete or Eduard Dmitrievich's, I don't know—"With heavy water and palladium, right? Every physics undergraduate knows that story! It's a dream (*mechta*)!"

Eduard Dmitrievich's claim on cold fusion—a technology which, in the United States, has become a symbol of (misplaced) faith in the social-transformative power of scientific knowledge—was a claim to be able to direct this transformative power simultaneously toward specifically Russian problems using specifically Russian means, and toward universal or global problems using the universal knowledge of science. The energy crisis was immediate in people's minds at that time—the winter just passed had been the first of, so far, four during which energy shortages have left some parts of Siberia and the Far East without heat. He located the natural resources necessary for cold fusion within the (engineered) landscape of Akademgorodok, the water contained in the Ob' Sea, which was created when the Ob' River was dammed to build the Ob'

Hydroelectric Power Station (GES).[2] The use of the Ob's fresh water to solve Russian—and world—energy problems seemed particularly fitting as scientists were struggling to obtain from abroad reagents no longer manufactured in Russia, or to conduct experiments using jury-rigged and salvaged equipment. The Ob' Sea's water, by contrast, was local and freely available.

Eduard Dmitrievich hoped to put his research to work solving Russian energy problems; what he understood as Russian ways of doing science had provided the ideas but not the means through which he could realize this goal. The opportunity was the freedom to explore a subject without the time constraints imposed by the short-term interests of capital, yet within the models of the relationship of scientific knowledge and social good developed during the Soviet era. The emphasis on theoretical work was both a reaction to local material constraints and a particularly Russian approach to scientific problems. Eduard Dmitrievich saw himself as solving a scientific problem, not a practical one—the practical application of cold fusion would come later, so much later that it seemed a faraway dream. The lack of means that Eduard Dmitrievich bemoaned was the state's financial neglect—in this courtyard, disintegrating through the anomic neglect of its residents, he was telling a story that linked the local meanings of Akademgorodok science to national and global narratives of progress, made possible in the very cracks and fissures of science's decay and degeneration.

Mikhail's response, by contrast, imagined Eduard Dmitrievich's cold fusion as a metonym for social disorder and chaos, the "idiocy" of post-Soviet scientific life, the hyper-individualism fostered in response to state ideologies of hyper-collectivism, the "sickness" or "deformity" of Soviet science, the "dead souls" who continued to be

numbered among scientific workers. From his perspective on the "Russianness" of Eduard Dmitrievich's project, a focus on impractical schemes and dreamy, visionary projects without clear application or goal was peculiarly Russian. Despite his rejection of Eduard Dmitrievich's cold fusion research as a scientific waste of time, he was in fact reputed among his colleagues to be a producer of ideas that were similarly strange-sounding at first blush, if not so grandiose.

Bart Simon (1999) argues that "undead sciences" like cold fusion—whose factuality (or lack of it) seems to have been settled in some contexts, such as the US, but is still under discussion in others, like Japan and Eastern Europe—should not be simply considered as external to "mainstream" science, either as alternative sciences or as nonsciences. Instead, he points out, continuing research on cold fusion "is contingent on the particular relations between [cold fusion] researchers and mainstream scientific culture" (1999:78-79). The relations between what counts as science in particular contexts and the production of "mainstream" or universal science are not simply mutually constitutive; they are asymmetrical (see also Verran 2001; Zhan 2001). Universal science's universality is constructed not simply by opposing or externalizing "nonscience" or "alternative sciences," but by encompassing them in a system of differential value. Universal science claims to be able to translate or explain "other sciences" in its terms; "alternative" sciences are scientific insofar as they can be made commensurable with the unmarked, universal science.

For both Eduard Dmitrievich and Mikhail, Russian science was uniquely suited to address the problem of cold fusion because of its location both inside and outside universal science, for better or worse. Russians had access to what is universal about

science and also had particular approaches of their own. In claiming particular access to the methodologies and habits of mind that constitute science, Akademgorodok's scientists walk a fine line between national and transnational images of science.

Such tensions exist not only at the borderlands of science—cold fusion, prions, and acupuncture—but equally as strongly within "the knowledge and practices of subjects whose scientific status is most fully uncontested" (Segal 2001:452). In fact, I argue that difference—ranked hierarchically and even evolutionarily—is crucial to producing an image of science as uncontestedly culturally universal and scientific institutions that operate transnationally and claim to be global. In other words, science's universalism is built from the differences among national and local scientific communities. When Akademgorodok scientists claim simultaneously that "science doesn't differ anywhere" and that "in Russia we have our own science," the latter is what makes the former true.

What is universal about science?

Much ink has been spilled in the so-called "science wars" over to what extent "nature" as scientists encounter it can be said to be a product of historical and cultural forces, rather than a pre-existing reality waiting to be uncovered by the judicious application of the scientific method. Hacking (1999), for example, suggests that while scientific models of nature or reality are socially and culturally embedded, the objects of these models—quarks, for example—also have a reality or a history that is independent of the models. Pickering (1984) argues that the models and the objects are inseparable, both entirely the product of social and cultural forces; quarks could, conceivably, have

been something else, had particular historical contingencies turned out otherwise. And Gross and Levitt (1994) categorically and polemically reject the whole proposition that science is anything other than an unmediated mirror of nature, though they find unproblematic the idea that science *studies* might be the product of dangerous forces tearing apart the republic: romanticism, anti-intellectualism, feminism, socialism, postmodernism, environmentalism, multiculturalism, and AIDS activism, to name a few.

It is not my intent to intervene in these debates here. Akademgorodok scientists' views about the "reality" of science's object are closer to Gross and Levitt's (though not identical to them in important ways) than to Pickering's or Hacking's; this should not be surprising, since both Gross and Levitt are scientists (though there are no comparable "science wars" in Russia). Instead, I begin from Akademgorodok scientists' assumption that the object of science is unproblematically transcultural and transhistorical, and how these understandings both facilitate and complicate their participation in global scientific communities, laboratories, and labor markets. Akademgorodok scientists presume the existence of a nature or reality that is given and outside human social activity and symbolic mediation. Scientists in Akademgorodok, like scientists everywhere, believe that nature exists and that it is regular and transhistorical.

They also believe it can be known, more or less accurately, by applying scientific methods and models; to believe otherwise would probably make it absurd to be a scientist. Those methods and models may be historical developments, but they are designed to remove the human observer's humanity, his or her cultural and social embeddedness—from the act of observing. Not only the methods of science, but the knowledge it produces, should be valid for all places and at all times; in fact, the

replicability of experiments and the ability of theory to predict and explain experimental results are taken to indicate their accuracy as reflections of nature (see Shapin and Schaffer 1985; Hacking 1992).

For scientists, then, science appears, if not as a single entity or institution, as a complex set of ideas, practices, and techniques for lifting people out of their particular cultural contexts to achieve a "view from nowhere" of a transcultural, transhistorical nature—what Haraway (1991, 1997) calls the "god-trick." In blurring or erasing the distinction between knowledge and method, the god-trick implies not only that scientific knowledge is transcultural, but that science as an institution and method that produces such knowledge is natural, inevitable, and barely more human and cultural than nature itself. In this way, the global reach of scientific knowledge and scientific institutions comes to be identified with the presumed transcultural object of knowledge—the transnational movement of science and scientists "proves," as it were, the detachment of nature and scientific methods from local symbolic systems. Here I want to pull the two apart again and focus not so much "inward" on the disunity of scientific knowledge and metaphysics (see Galison 1996; Hacking 1996), but "outward" on science as a field in which articulations of global, national, and local similarity and difference take shape.

When I asked scientists in Akademgorodok how science was different in the other places where they or their colleagues had worked, they almost always replied that it wasn't:

> I have the impression that science won't differ anywhere if the people are enthusiastic. Just as the Americans are enthusiasts who give themselves completely to the work, so are Russians. (researcher, Institute of Organic Chemistry, worked in US)

> You know, it seems to me that science—maybe it's a cliché, but it's international. It doesn't differ in any way. The possibilities for scientific work differ, but science itself doesn't differ in any way. (deputy director, Institute of Hydrodynamics, worked in Denmark)
>
> Particular differences? I couldn't even say. There are no particular differences. Science there and here is approximately the same. (senior researcher, Institute of Semiconductor Physics, never worked abroad)
>
> The question isn't right. Science is the same everywhere... I have a desk, I have a computer. Work will be the same in any country. It's all the same. (laboratory head, Institute of Hydrodynamics, worked in Germany and Switzerland)

For Akademgorodok's traveling scientists, the "culture of no culture" (Traweek 1988:162) is assumed because they link the labor and institutions that produce knowledge with the object of knowledge: "I have a desk, I have a computer," and therefore science is the same. In this view, science not only mirrors nature in that it represents nature, but its institutions also take on the transcendent, border-crossing quality of nature itself. By virtue of their participation in the activities broadly called science, they can move from Akademgorodok to Heidelberg to Cambridge. But even as they move to laboratories around the world in ways they characterize as relatively unproblematic (by comparison to, say, everyday life), Akademgorodok scientists are acutely aware of national and local differences in science.

Technology and Local Laboratories

When Akademgorodok scientists go "on the road," so to speak, they find that the use of laboratory technologies is a site where the play between difference and similarity, between local ways of doing science and transcendent, universal science, is foregrounded. At a conference in New York, after I gave a paper on the subject of

Russian scientists' perceptions of the differences between Russian and Western sciences, a fellow conference attendee told me the following—apocryphal—story. I include it here before the ethnographic descriptions of how technology symbolically and practically differentiates between Russian and Western (particularly American) scientists, simply because it is so vivid.

A team of American, Canadian, and Russian biologists were studying polar bears in their natural habitat. Because polar bears can be aggressive toward humans, the Americans and the Canadians were armed with rifles. The Russian researcher, however, could not afford a rifle, and so he went around with two sticks. The Americans and Canadians were baffled and bemused, and after a few days they asked their Russian colleague whether he actually thought he would be able to defend himself against an enormous, enraged polar bear with two sticks. It was the Russian's turn to be amused; he explained that the sticks were not for fighting off bears. He held the sticks vertically in each hand, with the upper ends by his chin. In doing so, he claimed, he resembled a walrus, the polar bear's only natural enemy.

While this story may seem bizarre, it resonated with the ways Akademgorodok scientists both differentiated among national sciences and moved between them by means of technology. In *Laboratory Life*, Bruno Latour and Steve Woolgar suggest that the technologies deployed in the production of scientific knowledge (in their terminology, "inscription devices") make scientific practices local and specific to particular laboratories. Following Bachelard, Latour and Woolgar show how laboratory technologies—computers, spectrometers, assays, etc.—have the quality of "reified theory." That is, such technologies are based upon conventionalized models of natural

phenomena that have already been established, often in other fields, and "built in" to their operation, where they become, in a sense, invisible. Latour and Woolgar offer an example:

> When...[a] member [of the laboratory] handles the NMR spectrometer...to check the purity of his compounds, he is utilising spin theory and the outcome of some twenty years of basic physics research. Although Albert knows little more than the general principles of spin theory, this is sufficient to enable him to handle the switchboard of the NMR and to have the power of the theory working to his advantage. (Latour and Woolgar 1986:66)

For Latour and Woolgar, laboratory instruments are like Marx's commodity fetishes, both concealing and congealing social relationships and histories of contestation in material form (see also Latour 1987); much as the relations of production behind commodities appear "self-evident and nature-imposed" (Marx 1976[1867]:175), laboratory instruments appear transparently functional (cf. Pfaffenberger 1992). Latour and Woolgar argue, moreover, that the particular configurations of technologies available in a laboratory contain the cultural specificity of that laboratory; the ideas, facts, and texts produced in a lab are the products of that lab's inscription devices and the particular configuration of theory reified in them (1986:65). I would add, however, that it is precisely the qualities of laboratory technologies that make every laboratory a particular configuration of theory, fact, and text that also enable those theories, facts, and texts to move between laboratories, between fields, even between differently-organized and oriented scientific communities. That the controversies, texts, theory, and contingent conditions of production behind the technologies have become invisible, quickly forgotten as they are turned into texts and, perhaps, into new "inscription devices," enables those technologies to move between contexts more or less unproblematically.

Laboratory machines thus come to be seen as external to the facts produced, transparently transcultural.

The lack of modern scientific equipment that characterizes Akademgorodok science a decade after the Soviet Union's collapse is one of the most common reasons scientists cite for wanting to leave science or leave Russia. Without equipment, reagents, or animals, scientists cannot do their research. Equipment problems actually began under the Brezhnev regime, when the Siberian Division was forced to compete with other industries for scarce instrumentation and other resources. Even before the collapse of socialism, scientists had learned to store scraps and supplies that could be useful someday. In the early 1990s, these supplies came in handy, and many labs were able to operate relatively normally by drawing on them and fixing their own equipment. But as the years of crisis wore on, technicians and mechanics were let go or left institute positions, supplies were used up or sold off, and equipment began to fail beyond repair, as with Valerii's machine in chapter three. Going abroad to use the various laboratory technologies and computers available there is appealing to scientists; behind this appeal is the assumption that laboratory technologies are a universal aspect of science. One Russian philosopher, for example, argues that the cultural specificity of Russian science cannot be found in technology: "If one takes science in its highly technological points, as in a machine that gives rise to some results—scientific truths—then we find in it only its invariable, intercultural characteristics" (Brianik 1998:362).

The experiences of migrant Akademgorodok scientists suggest otherwise—that there are local ways of using technology that are not invariable and only partially intercultural. Ekaterina, the organic chemist whose trip to Texas and return to

Akademgorodok were discussed in detail in chapter four, found that there were differences in the organization and use of technology in Texas and Akademgorodok that could not be explained simply by the presence of certain machines in Texas and their absence in Akademgorodok. And she understood these as—almost counterintuitively—disruptive of the transnational community of science, even as she certainly believed that such a community existed. She came to understand, paradoxically, that although science "doesn't differ anywhere," differences in science not only exist, but are hierarchically arranged.

More than anything else in Texas, Ekaterina liked working with the modern equipment in her laboratory. She was overjoyed at what many American colleagues would take for granted—machines and computers that worked, reagents that were easily available and plentiful, though she found US libraries poor in organization and research assistance by comparison to that of her Akademgorodok institute. Despite her satisfaction with the material circumstances of her work, Ekaterina found that these differences affected the way she did her daily work and—potentially—its accuracy or scientific validity. In her Russian laboratory, she explained, there were highly-trained assistants who specialized in the use of, for example, various kinds of spectrometers; researchers themselves got the data only after it had been produced through the interactions of these assistants and machines. Such an arrangement is typical of Western labs as well. The problem for Ekaterina was that, as a temporary member of her Texas laboratory, she was expected to perform tasks that assistants generally performed in Russia. At the time Ekaterina went to Texas, she held the rank of researcher (*nauchnyi sotrudnik*) in her lab in the Institute of Organic Chemistry. According to the handbook

published by the Academy of Sciences in Moscow and kept on hand in the personnel office (*otdel kadrov*) of each institute, a researcher's duties include

> conducting scientific research...in the role of principal investigator or with a scientific supervisor, carrying out complex experiments and observations, collecting, analyzing, and generalizing scientific-technical information and the results of experiments and observations, and participating in the drawing up of plans and methodological programs for research. (Russian Academy of Sciences 1999)

"But in America," Ekaterina said, "I had to learn how to work on the K-spectrometer—well, a spectrometer is easy—but nuclear magnetic resonance? That's entirely [different]. I couldn't record a spectrum as well as a specialist could, and at that moment I could lose some information."

Though she knew first-hand the difficulties of doing good science without good technology, Ekaterina did not assume that better technology leads inevitably to better science. She became aware that the ways in which instruments are used to produce "data" are not, in fact, just a technical or mechanical matter, but rooted in the social organization of scientific labor, which may vary cross-culturally (on a number of scales: laboratory, discipline, nation). Ultimately, what it meant to be a specialist was different in Texas, because specialized instruments were used differently and by different people. And when Ekaterina returned to Akademgorodok after a year, she experienced great difficulty in growing reaccustomed to the technological lack in her old laboratory and, in the end, she left research work to take an administrative position, partly out of frustration at the technological obstacles to research in Akademgorodok. In Russia, laboratory machines were significant not only for their absence or poor condition, but for the way their use structured and was structured by the division of labor in labs. In Texas, where

these machines were present and Ekaterina had access to them, using the machines meant something very different. Rather than reading and interpreting the data put out by, say, a nuclear magnetic resonance spectrometer, Ekaterina was expected to produce that data by operating the spectrometer herself. For her, this drop in her position in the American lab relative to that she held in Akademgorodok—from one involved in the mental labor of science to an "unskilled" equipment operator—was mirrored in a decline in Russian science's international standing, from a place where scientific knowledge was produced to one that produced only a scientific labor force. While laboratory technology's quality as reified theory makes the machines relatively easily mastered by those without knowledge of the theory behind them, Ekaterina's experience shows that the intersection of theory and technology is not always transparent. It is, rather, mediated by the social structure of laboratories and of scientific communities, including Western-dominated "world science."

Ivan, the semiconductor physicist whose 1999 attempt to secure a postdoctoral fellowship at Georgia State University was described in chapter four, suspected that he would, if he got the job, encounter differences in the approaches taken by American researchers to similar problems. He attributed these expected differences to a difference in the use of instruments, computers, and other technologies. Specifically, Ivan believed—as did Akademgorodok scientists in a variety of disciplines—that American research in his field was characterized by a too-great reliance on computers. He related how he had recently read an article by an American physicist; the data displayed in a graph, on which the author of the article based his assertions, appeared to Ivan to be clearly not data at all, but noise or interference produced by the data-generating

equipment: "There should be localized noise, there should be tiny, tiny drifts [on the graph]. There wasn't any of this, just a completely straight line, which just cannot be, according to [the laws of] physics." Ivan attributed what he understood as a mistake to the American author's reliance on the computer to set the parameters through which valid data are distinguished from noise: "He just didn't pay attention to this thing, that's all." When researchers did their calculations—or at least checked them—by hand, they often saw things they wouldn't see if they relied solely on computers, he maintained. It may seem strange, then, that Ivan's main reason for wanting to take the postdoc in America was that he wanted the opportunity to work with the excellent computers and other instrumentation available there: "It makes work easier, because it's not so labor-intensive. When you have to do everything by hand, you spend a lot of time."

Ivan saw his work in Russia as limited by the lack of necessary equipment, and, of course, many of Akademgorodok's traveling scientists said that it was this lack more than anything else that motivated them to leave Russia. Yet a lack of the laboratory technologies readily available in the West was incorporated into Akademgorodok scientists' images of particularly "Russian" ways of doing science. In such images, Russians did not depend on such technologies; they could think through problems themselves, perform calculations by hand, find a way around the lack of instruments. Many scientists I interviewed quoted a phrase Lavren'tev used to describe the improvisational skills required of scientists when established technologies and methods were lacking: in Akademgorodok people learned to do science "by the help of sticks and strings" (*pri pomoshchi palochki i verevochki*). A lack of technology suited Russians' ideas about their particular approaches to scientific problems and habits of mind; they

had learned to think in different ways and conceptualize problems differently because they did not rely so heavily on machines. As one biologist put it,

> There are simply different approaches. [In Russia] there was an approach from an idea, and then they looked for... They want to study this or that effect or property, and later they look for a way to achieve it. [In Germany] they don't [focus on] the end purpose, but some problem or another which is being studied is built up exclusively from the available technology. [The difference is in] this technological approach, most likely.

The contrast described here lies in the origins of scientific problems: Russians begin from a desire to understand a property of nature, while Germans aim to solve a technical problem or explore questions opened up by new laboratory technologies. Though they desire the "possibilities" for research provided by cutting-edge laboratory technologies and regret their lack in their Russian labs, Akademgorodok scientists also wonder whether the presence of such technologies might divert Russian science from what they see as one of its most distinctive characteristics—its strength in theoretical and fundamental science. In this, they oppose, rather than meld, technology and theory.

Habits of Mind

In 1840, Tocqueville observed a contrast between the habits of mind of Europeans and Americans: among the Americans, who lived in a fast-moving, energetic democracy and mistrusted the authority of their neighbors and equals,

> the purely practical part of science is admirably understood, and careful attention is paid to the theoretical portion which is immediately requisite to application.... But hardly anyone in the United States devotes himself to the essentially theoretical and abstract portion of human knowledge. (1990[1840]:42)

By contrast, the social space for "meditation," as Tocqueville puts it, is found only in aristocratic societies. Ironically, the world's first communist state appears to have produced what Tocqueville might have recognized as an aristocratic science. The security of funding and stability of personnel under the Soviet system after Stalin facilitated lengthy explorations, much as the wealth and leisure of aristocratic scientists did in the nineteenth century. Akademgorodok scientists often described this peculiar sense of "freedom" by quoting an aphorism: "What is science? The satisfaction of individual curiosity at state expense." Like Tocqueville, they recognize that "habits of mind" develop in particular economic, political, and cultural contexts, and that they are apt to change as the contexts do. Postsocialist Russian science, for all the ways in which it differs from its Soviet predecessor, has to a large extent continued these patterns: scientists point to a lack of accountability and a lack of money as creating a space for extended theoretical reflection.

Akademgorodok scientists characterize Russian science as overwhelmingly preoccupied with fundamental, rather than applied, questions, strong in theory but weak in practical application. Moreover, they value theoretical and abstract knowledge more than practical and applied knowledge. Science that has "depth"—that is, research that aims to uncover fundamental structures or laws in nature—is not only most highly valued, but is identified as a particularly Russian way of knowing. Like Tocqueville, Akademgorodok scientists often suggest that their Western colleagues—especially Americans—are interested only in understanding those specific aspects of nature that can be manipulated in some way or which are directly applicable to the solution of a particular practical problem. They, Russians, by contrast, see scientific problems as

wholes, which they imagine to be the deep structures of nature, the very foundations of the world. Seeing wholes is seeing down to depths. Marina, for example, who found her years in Europe and the US difficult because she lacked what she characterized as a typically Russian deep connection with other people, also found that the distinctiveness of Russian science was in its practitioners' ability to penetrate deeply to explore nature in ways that appear to others to be impossible, inaccessible, or impractical:

> For a long time people—our Russian people—have been accustomed to thinking through what can be done, what's interesting, and not very pragmatically approaching what we did. "We found this concretely, and we can find this," [Russians] think. Most likely not, "We can now show this." They think that following on this we can somehow move in some general ideological direction. They try to develop that idea. Of course, maybe from the outside we look like dreamers, because Western people are more used to calculating the budget they have, the concrete problem that has been set in front of them. And we, having almost no material base, dream up some kind of ideas to cultivate—relatively serious, fundamental [ideas]—of course for them that probably doesn't look very serious.

For Marina, the Russian style of science is not without "concrete" results, but those results are not necessarily aimed at a narrowly-defined practical problem. Rather, Russian research takes a more broadly-defined theoretical question and aims to answer it; practical applications can come later, and do not necessarily need to be taken into account in the formulation of research questions.

During almost four years working in Berlin, six months in England, and a semester in the US, Marina—a geneticist—often found that her Western colleagues did not share, nor did they understand, her conceptualization of what her particular research, and science in general, was about. She explained that her Western colleagues continually pressed her to formulate her research in terms of concrete questions and practical

applications, while she envisioned a broad-ranging exploration: "I say, there are no [practical applications], it's science, it's knowledge. It's necessary to know this in principle, for science, for humanity in general. Not just to exterminate insects." Practical applications—like exterminating insects—would emerge naturally or obviously from this deep fundamental knowledge of nature—or perhaps it was to be left to Westerners to come up with such applications. "Knowledge," however, was for all humanity, while applications were by their nature specific. Nikolai, a microbiologist working in Germany, suggested that Westerners were better suited for applied work:

> In the West scientists in fact depend less on their [own] ideas, so to speak. They sort of have to follow what's popular. In general, it's pop science. Pop science. You understand, the last Nobel prize in medicine was for Viagra.[3] It's all clear. In general, Western science is pop science. For popular things you get money.

From the other side, however, Western "pop science" looked practical, goal-oriented, and efficient. American researchers, while respectful of their Russian colleagues' scientific skills, sometimes saw them as impractical, inefficient, and unaccountable. An American NGO worker living in Akademgorodok told me about how she convinced a friend, a chemist working at a US firm, to contract with a chemist in one of Akademgorodok's institutes for a small project. At first, the agreement seemed beneficial to both sides: the American firm had highly skilled scientific labor at a low cost, and the Russian chemist had the opportunity to earn some money and make connections with US researchers in the same field. But the arrangement fell apart quickly: the American side began to ask for data and results, while the Russian chemist wished to explore the topic more deeply before drawing conclusions or offering up data.

Months went by as the American chemist continually called to ask for the data and the Russian chemist put him off, saying the data would be ready soon, just a little bit more needed to be done. The American became suspicious that there was no work actually going on in the Akademgorodok lab, and the Russian was suspicious of the American's apparently burning desire for unverified results that were incompletely understood. The relationship was terminated, both sides, full of mistrust, said they would not collaborate with Americans or Russians again, and the NGO worker who had arranged the whole thing was thoroughly embarrassed and blamed the Russian's incomplete grasp of the capitalist work ethic for the project's collapse. Such cases of misunderstanding were, however, fairly rare—I heard of only a handful—but they throw into relief the contrasts scientists, at least, see between national scientific communities and their approaches to scientific problems. This failed collaboration, as well as Marina's and Nikolai's accommodations to Western styles of science, echo Tocqueville's observation that "those who cultivate the sciences among a democratic people are always afraid of losing their way in visionary speculation" (1990[1840]:41). Exploration not directly aimed toward a definite goal is less valued in "democratic" than in "aristocratic" sciences.

In Japan, the contrasts between local and Russian science are different, though Russian science appears more or less the same. Russian scientists' claim to be interested in theorizing and generalizing about basic, fundamental natural phenomena contrasted with Japanese scientists' concern with accurately measuring and representing those phenomena. Andrei, the physicist whose residence in Tsukuba was discussed in chapter four, presented the differences between himself and his Japanese colleagues thus:

Andrei: In Russia...researchers want to build models and try to explain them, so there's a better understanding of phenomena. In Japan there is good equipment and good experimental data, and people try to get the best experimental data they can, and they don't care much about understanding it.

Amy: So is it more applied science there?

Andrei: No, it's not applied, it's... The main emphasis is on getting better experimental data and on the modernization of experimental methods, not on researching the physical phenomenon as such. Here people try to understand what constitutes the physical phenomenon itself.

Amy: Here it's a more theoretical orientation?

Andrei: Yes, they construct more theoretical models here and just discuss [theory] more.

Traweek (1988:71) shows that the emphasis on measurement in Japanese high-energy physics (a different field from Andrei's) is the result of particular Japanese patterns of building and using laboratory technologies—which, in turn, result from the particular arrangements by which state and corporate funds flow into and out of Japanese research facilities. I do not want to imply that Russian science's heavy emphasis on theory and abstraction is simply the result of its material privation—nor do I believe that Traweek is offering a materialist explanation for Japanese approaches in high-energy physics. While Akademgorodok's scientists frequently make contrasts between scientific communities, like theirs, that do not have modern equipment and those that do, like Japan and the US, these contrasts are not simply materialist observations about the relative financial conditions of national scientific communities. They link material means and Russian "national character," implicitly referencing discourses about depths, wholes, and Russian souls.

The claim that Russians think more deeply, even dreamily, about the essential nature of the world than do, say, Americans points directly toward the storied "Russian soul," though I rarely if ever heard scientists actually use the term "soul" (*dusha*) in this context. In fact, most Russians would say that *dusha* is the opposite of rationality, objectivity, and intellectualism—*dusha* is feeling, subjectivity, and emotion (see Wierzbicka 1989:54). Russian souls are understood to reveal a deep, spiritual, and hidden inner nature that is captured by neither the English "mind" nor "soul" (Wierzbicka 1989). It is, for example, what makes their everyday lives difficult when they are away from Russia and Russian people. In the lab, the tropes of depth, wholeness, and essences that make Russian souls unlike others also are used to make Russian science specific. I want to be clear: I am not arguing that Russian scientists' deep, spiritual souls enable them, in Dostoevsky's words, "to see everything, often to see it much more clearly than our most positive minds" (2001[1863]:32). Instead, soul discourse shapes how Russian scientists see themselves in the world; Russian souls are how Russians are differentiated from other nations in general, and Russian science is differentiated along similar lines and around similar key symbols. It is not that Russian souls make Russian science distinctive, but that the same symbols that distinguish Russian souls from others also distinguish Russian science.

In referencing their "Russian souls" even obliquely, Akademgorodok's scientists are not simply essentializing themselves; instead, they are actively imagining their changing place in the world and in Russia. Wierzbicka (1989) and Pesmen (2000) show convincingly that "Russian soul" is not a stable thing that people *have*, but "practices centered around beliefs in depth" (Pesmen 2000:267). Enacting "Russian soul" through

particular approaches to scientific problems or uses of technology does not mean that Russian science resolves into a coherent cultural whole, a microcosm of the nation, or a consistent system. It is a way of imagining differences that, in the context of global science, have the effect of allowing Russian scientists to move between the universal and particular, to bring together what incorporates them into global science and what separates them from it. The depth to which they claim access—deep, fundamental understanding of natural phenomena conceived as wholes—is a depth that makes their knowledge globally transportable and even marketable. The specificity of Russian science, strangely enough, makes its nationality fade away.

National Character and Historical Transformations

One reason why depth and wholeness can work toward such effects is that Akademgorodok scientists consistently historicize and de-essentialize these apparently innate and essential characteristics. Although, as we have seen, they construct something like a "national character" of Russian science, this is generally not a character embedded in the essence of Russianness, but produced by particular historical, political, economic, and social arrangements and conflicts during and after the Soviet period. Much as particular approaches to problems and ways of thinking were seen as supported by a lack of laboratory machines that developed under conditions of socialist and then postsocialist shortage, Russian science's emphasis on fundamental and theoretical problems was a historical phenomenon.

Lavrent'ev's plan assigned to fundamental and applied research complementary roles in reinforcing the rationality of a state deeply engaged in an all-out struggle for

modernization. While fundamental science would bring the international prestige of a staunch claim to the status of "modern," applied science would provide the means to produce the economic, industrial, and military trappings of modernity. Yet this ideal balance was never achieved, and Akademgorodok became renowned as a center of theoretical, fundamental research, especially in nuclear physics, catalysis, mathematics, and computer science.[4] The Akademgorodok laboratories and researchers who focused on applications of knowledge, as well as those who worked in fields seen as less "basic," enjoyed less prestige. One organic chemist said that when he was studying at Novosibirsk University in the 1970s, "We looked at physicists and mathematicians as though they were higher creatures." And a physicist recalled with amusement how he and his friends, students in NGU's physics-mathematics faculty, teased a friend who was studying to be an engineer.

Why, in the context of intense state pressure to produce industrial and military applications for scientific innovations, were Akademgorodok's institutes preoccupied with producing fundamental knowledge about nature? Certainly one factor was the idea, common among scientists in many countries, that theoretical science is more valuable than applied science because fundamental research more directly encounters truth, nature in a "pure" state: an Akademgorodok biologist explained that "a science approaching philosophy was considered more truthful (*bolee iskrennei*)." But Akademgorodok scientists also pointed out that there were historical, political, and economic reasons for the strength of theory in Soviet science and in Akademgorodok in particular.

Akademgorodok was founded in a climate of increasing separation between fundamental and applied research and increasing autonomy of fundamental researchers

over their work. In 1961—four years after the founding of the Siberian Division, when Akademgorodok was still only half-built—members of the Academy of Sciences were able to pressure the state to transfer responsibility for "technical sciences" from the Academy, where Stalin had located them, to industrial ministries. According to Josephson, "scientists had succeeded in weakening the Stalinist precepts of the unity of theory and practice, and of the lurking danger of idealism" (1992:607).[5] As a result of this separation of institutional responsibilities, the Academy and its divisions and branches tended to focus on fundamental research.

Moreover, it was never entirely clear to scientists—Akademgorodok's intended "innovation beltway" notwithstanding—how they might go about transferring their discoveries to the production line; there simply was no mechanism for doing so. One mathematician described the situation to me:

> Let's say, if in America, technology—the factories—and science are harmoniously linked: one is on a high level, and the other is on a high level, here there was a large separation. In science there were good results, but industry was on a poor level. So much for science—we don't know how to make computers. For military purposes, maybe somewhere, sometime, somehow they made one. But to mass-produce them? The same thing for agriculture. If biological work doesn't correspond to growth in agriculture, that's also bad. It's one thing to conduct research, but in the fields the harvests are poor anyway, animal husbandry is poor. It's badly linked. In America, I think, it's more tightly linked. Achievements in genetics, probably, are directly linked to growth in agriculture in America, in Western Europe, in Japan, in Israel. No, here the link was always purely in military production, for example military airplanes. That was linked tightly to science, and thanks to this, research in gas dynamics was linked to industry. But research in automobile construction was on a completely poor level. Military aircraft construction was on a high level, but automobile construction was on a low level. Or in nuclear physics: physics and the creation of atomic bombs are tightly linked, in my opinion, but simple, elementary televisions and radios—there was already a large separation. There was

> enough energy only for these kinds of industry: aviation and atomic weapons.

Here Akademgorodok's—and Soviet science's more generally—emphasis on fundamental science appears as the result of economic and institutional constraints and divisions between applied-military and fundamental knowledge created by a militaristic state during the Cold War. Importantly, scientists claimed it was not so much their valuing fundamental over applied science that produced this disconnection between science and industry, as Josephson (1992) suggests. Rather, they claimed that they would very much have liked to produce socially useful knowledge, but were prevented from doing so by the system of state-directed central planning. Soviet-era planning made the application of scientific innovation "incomprehensible" because there was no mechanism for doing so, while more overt state interference weakened biology in particular. Science in the context of capitalism better applied knowledge, but did not provide the same kind of space in which fundamental science could flourish:

> *Amy*: Why is fundamental science so well-developed in Russia?
>
> *Nikolai, biologist*: Well, it's an old Russian problem: it's difficult to apply in practice what you think up, practically impossible.
>
> *Ekaterina, chemist*: In any case, mathematics here was so far advanced by comparison with all of Europe and America, without a doubt. Physics too.
>
> *Marina, biologist*: Our biology was also very powerful, until the communists put their paws on it.[6]
>
> *Amy*: But how is it that it turned out that way?
>
> *Nikolai*: I think it's capitalism. It's all very simple, you understand.
>
> *Ekaterina*: And we have planning.

> *Marina*: Of course, if in the West most of the money goes to a company that produces something, that uses [scientific innovation] in concrete things right away, quickly, here, in the first place, it was completely incomprehensible how to quickly apply what you've invented.

In a way, then, scientists positioned themselves *against* the state, rather than with it in its modernizing project, with regard to who was to help achieve the projects of modernization, development, and enlightenment. Their strength in fundamental science, in scientists' view, developed because they were unable to produce workable practical research. So they served society—long the assumed obligation of the Russian intelligentsia—by producing the theoretical or abstract knowledge that marks a "developed" or "modern" society in national and global imaginaries. The archetypal twentieth-century "Russian scientist," in some respects, resembles the nineteenth-century European "Romantic artist," whose preoccupation with capturing the essential qualities of nature thinly veiled his disillusionment with social institutions (for the Romantics, it was the growing alienation and materialism of the industrial revolution; for the Soviet scientists, state control, planning, and repression) (Williams 1983[1958]:36). An emphasis on fundamental science, like the Romantics' emphasis on beauty, was in fact not a retreat from the world, but a particular way—a particularly Russian way, in scientists' view—of engaging it.

Through the years of postsocialist crisis, scientists have felt acutely the precipitous decline in the prestige accorded to them for their role in generating national modernity—the very existence of which is questionable, for most Russians. Their experiences with "the development of capitalism in Russia" ("It's funny, of course," added Nikolai) and travel abroad have highlighted differences in the relative

configuration and value of fundamental science in different national scientific contexts, crystallizing around a concept of "Russian science" as a particular and privileged variant of global, universal science.

While Russian science may be an historical development whose particular configuration of characteristics is changing (see chapter three), those historical configurations have given Russians access to what many scientists see as the things that unify science into something universally valid and valued. The immutable laws that govern nature and the unity of nature may be universally valid by definition, but the value placed on the search for them and the specific means of approaching them is something to which Russian scientists have laid claim. That some national sciences can have better access to these highly-valued universals than others suggests that "universal science" is in fact fragmented by hierarchies. And Russian scientists fear that their slippage down the international ladder of political prestige and economic power is also a slip away from "pure science" and "Russian science" alike.

Ranking Science: Levels, Opportunities, and Change

In ranking national scientific communities, Akademgorodok scientists were pointing to differences they saw as meaningful, making those differences meaningful, and appealing to ostensibly universal scientific values. Those who had worked in countries that they believed occupied a lower position than Russia's—for example, Brazil, Mexico, Malaysia, China, Vietnam, Turkey, Australia—usually responded to my questions about difference in science by discussing the low "level" (*uroven'*) of science in that country:

> The level of instruction—the purely scientific level—is significantly lower than here. (senior researcher, Institute of Mathematics, worked in Brazil)
>
> There is a very low level of scientific research, at least in my field. (chief researcher, Institute of Computing Technology, worked in Malaysia)

By contrast, when Akademgorodok scientists look up the hierarchy, toward the West or Japan, they usually talk about differences in terms of the "possibilities" or "opportunities" (*vozmozhnosti*) for scientific work—particularly the material and technological possibilities. There are no differences between countries in science as such, they would say, just differences in the possibilities for research. In distinguishing national sciences with low levels of research from those where there were few possibilities or opportunities for research, Akademgorodok scientists were positioning themselves within a shifting hierarchy. Russian science was on a high level, they claimed, but there were few possibilities for research. The standards they applied in making these distinctions were based on each national science's perceived ability to approximate a universal ideal, to be the "global" or "world" science against which others were measured, the standard, the unmarked. The rhetoric of possibilities and opportunities meant that there was potential, at least, for movement upward. When Akademgorodok scientists spoke of "levels" in looking down the hierarchy from their perspective—at places like India, Brazil, Mexico, Turkey, Malaysia, and China—they were evaluating not simply these national scientific communities' ability to produce knowledge recognized as universal and true, but their relative distance from and patterns of connection to the scientific center. These countries, perhaps even more than Russia, have significant "brain drains" to Western Europe and North America; they receive knowledge produced in the center and provide large numbers of personnel to work in

central knowledge-production enterprises, but knowledge considered "universal" is rarely produced locally. Akademgorodok scientists and analysts alike see a growing division of intellectual labor in the world, one in which the rich are getting richer (Simanovsky, Strepetova and Naido 1996:xii; Nekipelova, Gokhberg and Mindeli 1994:16). Russian scientists worry that they could find themselves, like these "low level" countries, separated from the creative aspects of science, which they see as their greatest strength, and proletarianized, turned into mere skilled laborers.

The specificity of Russian science—its "high level" by comparison with "world" standards—is threatened by its lack of "possibilities." The possibilities that Akademgorodok scientists see when they look up the global scientific hierarchy, toward the unmarked sites where universal knowledge is produced, are different from the "low levels" they see when they look down the ladder. Possibilities are what joins creative and mechanical labor, what makes a particular site able to produce knowledge. When Akademgorodok scientists speak of the "possibilities" for research in the US, Western Europe, or Japan, they are referring to a combination of economic and technological resources and organizational/social factors (like having the latest instruments and computers, good salaries, grants, and well-trained technicians) that many scientists consider necessary, but somehow also external, to the production of scientific knowledge. In other words, these possibilities are necessary for doing science—otherwise, Russian scientists could stay home—but they alone do not determine the level or the scientific validity of knowledge. An example of this is Australia, which an Akademgorodok computer scientist who had worked there described as the opposite of Russia—high possibilities, low level. That the national scientific communities at the top of the

hierarchy were differentiated not according to their approximation to the unmarked standard, but according to factors considered relatively superficial, speaks to the ways in which these communities were identified with the global, universal standard—difference was measured from them.

In the hierarchy of knowledge-producers, then, Akademgorodok scientists locate Russia at the place where possibilities and levels diverge—the possibilities for research are low, but the level (for now) is high. Russian scientists are tied to the center as knowledge producers, not as laborers; their emphasis on fundamental, theoretical science allows them to participate in "world science" and its labor markets in this way. As the dearth of possibilities gets worse, however, that position becomes precarious, and Russian science may become differentiated in terms of levels. Anxieties about Russia's position vis-à-vis "world science," then, are not entirely based on the ways in which Russian scientists are unevenly incorporated into Western structures—taking low-level positions that are undesirable to Westerners. This is not, in any case, uniformly true (though it is increasingly becoming the case as labor markets become saturated with emigrant Russian scientists [see Valiukov 1994:22]). The problem is the split they see between those who set the standards, the unmarked "world science," and those who must try to approximate those standards, the differentiated national sciences.

This is, of course, an evolutionary model: the national sciences at the bottom of the ladder develop toward the characteristics of those at the top. This is not to say that these communities are not "doing science"; Akademgorodok scientists recognize, even assume, that something that counts as "science" is going on in the places to which they travel—otherwise they would be unable to go there to do scientific work. The movement

from specific and local to universal and global does not entirely erase difference—Akademgorodok scientists, as we have seen, are very much aware of the differences that distinguish their scientific community from others. The top of the hierarchy—the unmarked "global science" produced in the West—is distinguished by the convergence of possibility and level, of institution and knowledge.

This model, which is based on a ranking of difference, is also one of encompassment. As Louis Dumont (1980) argues for an entirely different context—that of the Indian caste system—a unified system *requires* not just difference, but difference sorted, ranked, and encompassed. Dumont writes,

> In the hierarchical scheme a group's acknowledged differentness whereby it is contrasted with other groups becomes the very principle whereby it is integrated into society. (1980:191)

The unmarked, encompassing "global," "world," or "universal science," where local differences in structure and culture disappear into the universality of natural truths, relies upon differences to continually reinforce its status as the ideal, as the highest-ranked item in the hierarchy. Difference in world science, then, is not just about delineating inside from outside—science from nonscience. In differentiating between ranked approximations to the encompassing and universal, scientists reinforce the very universality of science.

Progress, Sciences, and Nationalisms

Globalization is often seen as a homogenizing force, and indeed, Russian scientists' desire for integration into "world science" reflects their desire to participate in

institutions and discourses they see as universal and international. In this sense, there is only one science, it "doesn't differ anywhere," and Russian scientists' travel and work in transnational contexts represent the unproblematic workings of this unified and undifferentiated science. The more completely they can participate in world science, the better. It means that they are doing good work comparable to that of the West, which has vastly more resources to work with. This is a source of pride, and many scientists identify it with progress.

But the apparent homogeneity of a globalizing world in some contexts stands in contradistinction to the ways in which these effects rely on differentiation in other contexts. The universal is more accessible from particular places, from particular nodes in webs of translocal connections—Western science, like Western commodities, has become the universal, encompassing standard.[7] Difference, then, is measured as a position relative to the standard, a pattern of connections to it, rather than a separation or "disjuncture" (Appadurai 1996). Bounded cultures and discrete places are imagined through their unboundedness, the ways in which they constantly exceed their own boundaries and connect with other such discrete units (see Wagner 1975; Clifford 1997). In this way, imagining the differences between sciences is central to the organization of global flows of people, ideas, and capital that make up "world science." The universality of "world science"—its disconnection from the particular contexts of its production—is constructed as much in peripheral sciences as it is at the center.

In their global reach and the ways in which they play on universality and difference, there is a broad parallel between science(s) and nationalism(s). Stacia Zabusky (1995:214) has shown that both science and nations claim to be based in an

immutable nature, outside of human activity, and both construct wholes—nations, cultures, and the objects of science. But beyond this, both science and nationalism are universals constructed out of multiple formally similar units, each ostensibly unique. This poses a problem for both because it reveals their embeddedness within human activity—pointing out the constructedness of scientific knowledge is like pointing out the invention of tradition (see Zabusky 1995:214). In Zabusky's study of the European Space Agency, bureaucracy successfully transforms national diversity into European unity; in Akademgorodok, a formerly powerful science both desires and resists integration into a universal determined by its former rival. For Akademgorodok's traveling scientists, the claim that Russian science is fundamental science is a statement about the global structures of scientific knowledge production, the meaning of science for nations, and where they see themselves in the world.

And here the parallels between science and nationalism become less important than the intersections and tensions between science and the imagining of nations. If sciences can be distinguished by their national contexts, how is science used to differentiate between nations? What do these claims mean in the context of anxieties about postsocialist Russia's national cohesiveness and international standing? Eduard Dmitrievich's dream of cold fusion, which brought global science into a local framework, was as much an encounter with these questions as it was an attempt to ameliorate an energy crisis and solve an intractable scientific problem.

Chapter Six

Civilization and its Insecurities: Global Science, the State, and National Progress[1]

> No civilized society can exist without science.
> —Vasilii Ivanovich, physicist, May 1999

Though Akademgorodok is located hundreds of miles within Russia's territory, its scientists move across international borders every day. As we have seen in previous chapters, many participate in international research groups; some travel abroad to jobs and conferences several times a year. Others stay at home and communicate by phone and e-mail with their colleagues and employers abroad. Nearly all depend in some way on foreign producers of equipment and reagents. Yet all this movement has not made borders—what lies within them, what lies without—any less meaningful for Akademgorodok's scientists or the state for which many of them continue to work. As Akademgorodok has become more international, anxieties about scientists' position in the Russian nation-state have also developed. In this chapter, I want to move across borders—from the story of an immigrant scientist in the United States to traveling scientists in Siberia—to open up a perspective on how former Soviet scientists are understood, perhaps paradoxically, as simultaneously essential to and threatening to the Russian nation-state. While it is easy to understand why traveling weapons scientists can be seen as threats to national security, the construction of civilian scientists as potential dangers to the nation requires an examination of the role scientists have played in constructing modernity in the Soviet Union and in post-Soviet Russia. In thinking about how scientists who move are simultaneously the focus of criticism and hope in Russia, I emphasize how a spatial narrative about the globalization of science shifts meanings as it

intersects with competing Soviet and post-Soviet temporal narratives about national progress and decay.

After socialism, former Soviet scientists became, in the eyes of Western and Russian states alike, particularly vulnerable. On both sides, newspapers and legislatures worry that these highly-trained and cash-starved producers of knowledge might take "privatization" too far. Ex-Soviet scientists are portrayed as easily—though understandably, given their dire financial situation—tempted to claim ownership of and commodify the knowledge they produce, in a kind of nuclear version of the privatization-gone-wrong that has taken place throughout the former Soviet Union's economy. In the worst-case scenario, they would then sell their knowledge or the raw materials used in its production to what the US government has deemed a "rogue state," offering cash in exchange for the key to building nuclear or biological weapons. Only a handful of such cases have been reported among the thousands of former Soviet scientific workers who have traveled abroad in the past decade. Nonetheless, scientists—including those who work on civilian and fundamental research, as do the vast majority of Akademgorodok's scientific personnel—have become a focal point of anxieties not simply about the security of Russia's nuclear arsenals, but about the very form of the nation-state and the nature of modernity and progress in the absence of Cold War competition as driving force. These anxieties are not limited to Russia, but extend across the post-Cold War "securityscape," articulating with local constructions of nation, race, modernity, and science (Gusterson 1998). Weldes, Laffey, Gusterson, and Duvall argue that instead of assuming that security and insecurity are part of the natural environment of entities—nations, states, bodies—that are endowed *a priori* with ontological status, analysis should

focus on how "insecurities and the objects that suffer from insecurity are mutually constituted" (1999:10). Thus, I begin here from the assumption that the complex construction of "insecurity" that surrounds globally mobile scientists is intrinsic to the tandem histories of scientific knowledge and the nation-state (see also Fuller 2000:95; Prakash 1999).

It is not unusual for national aspirations to be couched in scientific language: Indian intellectuals, for instance, claimed India's uniqueness as a nation "by positing an indigenous science or by identifying indigenous cultural resources for science" (Prakash 1999:230), and "French DNA" unexpectedly became the object of a struggle over sovereignty and patrimony in the midst of a joint French-American diabetes research project (Rabinow 1999). More importantly for this discussion, however, science is also used as a powerful symbol of the nation's collective modernity, internal order, and coherence: for example, the Soviet Union claimed to espouse the principles of "scientific socialism," the European Space Agency was part of a political project in which it was "hoped...that integration would lead to a shared [European] identity" (Zabusky 1995:5), and nationalist elites in Tanzania brought high-modernist notions of order, rationality, and planning to compulsory villagization projects in the countryside (Scott 1998:234-247). When science, with its attendant rationalities and modernities, becomes central to nationalist visions of both past (as in the above examples from India and France) and future (as in the Soviet Union, the European Union, and Tanzania), scientists can come to be seen as important national assets, the guardians of the past or producers of the future.

Scientists as symbolic resources of the nation, however, simultaneously are central to the construction of national boundaries—local modernities, so to speak—and

transgress those boundaries by their participation in the ostensibly transcultural language and discourse of science. The uneasiness of the conjunction between these multiple contexts is exacerbated when, as in the former Soviet Union, the nation-state's coherence comes to be seen as unstable; science and scientists must be reincorporated, even if incompletely, into the national narrative. Indeed, Weldes, Laffey, Gusterson, and Duvall's argument about the mutual construction of insecurity and insecure entities resonates with Handler's analysis of nationalist discourse, in which he argues that a "negative vision" of disintegration and decay, in which "the conjunction of inviolable categories" is intolerable, and a "positive vision" of national coherence and boundedness work together to reinforce "the nation" (or, in this case, its security) as a salient category of cultural reality (1988:47-50).

In their complex critique of state policies, Akademgorodok's scientists claim to be both the constructive agents of a modern, "civilized," coherent culture and the victims of state-sponsored backwardness, fragmentation, and non-modernity. In postsocialist societies, contested reconfigurations of temporal conceptions are implicit in many political struggles (Verdery 1999:122). Scientists' claim to the role of agents in the positive vision of national progress simultaneously locates them within the negative vision of decay and dissolution, as threats to the nation and its security. While concerns for the security of weapons of mass destruction and the technologies of their manufacture can most easily be seen as concerns about boundaries, I argue that non-weapons scientists, such as the majority of those in Akademgorodok, are equally important to visions of national order, modernity, and progress. In postsocialist Russia, then, the "traveling scientist" has become an ambiguously-located, boundary-crossing figure

around which the construction of both "national security" and national (in)stability takes place, offering simultaneously the hope of progress toward an ever-elusive modernity and the fear of leaky boundaries, disintegration, and disorder.

Talking about Borders: From Los Alamos to Akademgorodok

About halfway through my fieldwork in Akademgorodok, we learned that a Taiwanese-American scientist named Wen Ho Lee, who worked at the Los Alamos National Laboratory—another site where the hopes of a nation had rested on the shoulders of scientists—had been arrested on suspicion of divulging information related to the design of a US nuclear warhead to Chinese intelligence agents. The FBI had become suspicious of Lee, it was reported, because he frequently traveled to China to attend scientific conferences and had failed to report his contacts with Chinese scientists, as was required by laboratory policy. The case, as is well known, set off a frenzy of reciprocal accusations. The FBI and Congress, on one hand, blamed Los Alamos and the Department of Energy for what was widely characterized as a cavalier attitude toward security procedures. Scientists and other critics fired back at the FBI and news media with charges that they were not only singling out and stereotyping Wen Ho Lee because of his race, but misunderstanding the contacts and conversations that are routine to the production of scientific knowledge in a global context. After nine months in solitary confinement, Lee plead guilty to one count of illegally gathering and retaining national security data. He did not admit the more serious charges of intending to harm the United States and aid a foreign country, charges that were then dropped. He was sentenced to time served and released, with an unusual apology from the judge on behalf of the United

States. Thus rehabilitated by the courts, Lee has published a book and signed a contract for a mini-series about his experience, though a cloud of media and Justice Department suspicion remains (see Purdy 2001; Purdy and Sterngold 2001).

I discussed Wen Ho Lee with an Akademgorodok scientist who has participated in the globalization of post-Soviet science in a variety of ways. Aleksei, a physicist, used to work on non-classified research with potential military applications, and he has collaborated with European researchers intermittently since the late 1980s. He traveled to France and Germany on short trips for scientific business several times. Sometimes he liked to portray himself as having been a near-dissident critic of the Soviet system, one who even outsmarted the KGB on one occasion, though by all appearances his was the same kind of everyday resistance engaged in by millions of Soviet citizens: critiques offered within a circle of friends around the kitchen table, "appropriation" of state property, interest in unofficial literature and music, and mischievous behavior (see, for example, Ries 1997:21, 80-82; Verdery 1996:23-29). He was a vocal critic of the Yeltsin government, at least in his own kitchen, and his political views tended toward a kind of liberal Siberian nationalism.

"People are calling science a 'sieve'," I told Aleksei after receiving in the mail a newspaper clipping about the aftermath of Wen Ho Lee's arrest. The article, from the *Washington Post* (Loeb 1999), named Russia, along with India and China, as "sensitive countries" whose cooperative relationships with Los Alamos and other US nuclear labs were suddenly under scrutiny by Republicans in Congress. According to critics alarmed by the Wen Ho Lee case, American scientists' international travel, the presence of foreign scientists at US laboratories, and many scientists' disinclination to concern

themselves with security issues (which they reportedly perceived as bureaucratic distractions from scientific work) combined to make Los Alamos a site where dangerous scientific secrets were highly likely to leak out.[2] I sat down at the kitchen table, set down the clipping from the *Post*, poured myself a cup of tea, and leaned back against the wall, settling in, I thought, for a familiar long diatribe on how the Russian state has abandoned science and it's no wonder scientists leave for other countries or sell their knowledge. I was surprised when I heard my friend insisting that scientists' primary obligation is not to open intellectual exchange across borders, but to the interests of the state in its own security. "Well, can't the scientists be trusted to police this themselves?" I asked, making the argument with which many Los Alamos scientists responded to the stepped-up surveillance of their activities, "Isn't it their responsibility not to reveal information they know is secret?" He surprised me again by responding that scientists, who were mostly interested in showing off their knowledge to other scientists, could not be trusted to protect national security. He insisted that only agents of the state could do this, that the state had a right—indeed, a responsibility—to control scientific exchanges and transnational flows of knowledge. He was puzzled by my lack of alarm at the situation at Los Alamos: "China *bought secrets* from your nuclear laboratories, you understand? A state must protect its security!"

At the time, I could not comprehend this response; I had expected Aleksei to be rather more sympathetic to Wen Ho Lee than to the FBI. Instead, he was shocked that I was not outraged by the apparently blasé attitude of American scientists toward national security, and I was puzzled by his unusually favorable view of state surveillance of transnational flows of knowledge. Apparently, scientists' views of the state were neither

consistent nor black-and-white. I began to pay attention to the contradictions and ironies inherent in how scientists were positioning themselves in relation to the state in various contexts, and to think about how that positioning was producing the sense that scientists as a category were potentially "insecure."

Globalization and Insecurity in Akademgorodok Science

In Akademgorodok, the Wen Ho Lee case was viewed with interest. It seemed to confirm people's suspicions that there were dangers inherent in the globalization of science. Scientists in Akademgorodok had, throughout the town's history, maintained ambivalent relationships with state intelligence services and particular configurations of national borders. The founder of the Institute of Nuclear Physics, Gersh Budker, "hated the secrecy and bureaucracy of Minsredmash [the Soviet ministry in charge of the country's nuclear research program] and vowed to avoid its characteristics." Budker decided to accept only money, not secrecy, from the Soviet atomic energy establishment—money that eventually went to more cooperative institutes in the country's closed nuclear cities (Josephson 1997:50, 62). Also, by contrast to the closed cities, and perhaps unexpectedly given its distance from Moscow, Akademgorodok was always a fairly international place. Western scientific delegations visited as early as 1963, and a Chinese graduate student was among the "aboriginal" settlers of the community, when it was little more than a few peasant huts along a creek (Marchuk 1997: 12, 42-47; see also Vodichev 1988; chapter two, this volume). On the other hand, Akademgorodok's institutes were deeply invested in state projects driven not by international cooperation but by Cold War competition; indeed, Khrushchev supported

the construction of Akademgorodok and other science cities in part because he believed that the United States was constructing cities of science, and that the Soviet Union needed to catch up (Josephson 1997:9). If, during the Cold War, Western science and Soviet science together set each others' standards, research agendas, and even institutional structures, driving each other toward "progress," then the postsocialist signification of integration into "world science" has changed, as even low-level Russian scientists move internationally in different capacities—for example, as migrant laborers.

Akademgorodok's civilian scientists and their knowledge move around the globe against the background of a deep fear about other categories of post-Soviet scientists taking their knowledge on the move. Scientists with expertise in nuclear, chemical, and biological weapons, particularly those in Russia's impoverished closed cities, are thought by many observers to be among the most vulnerable to seduction by "rogue states" interested in their knowledge as well as the raw materials—anthrax, plutonium—to which they have access (see, for example, Schweitzer 2000, Alibek 1999; Guillemin 1999; Moody 1996). The United States and the European Community—along with George Soros—have instituted various programs of grants, contracts, joint ventures, and visa waivers for scientists thought to be particularly at risk of emigration bearing dangerous knowledge or technologies. It was with precisely such a scenario in mind that the United States Congress passed the Soviet Scientists Immigration Act of 1992 (Public Law 102-509, 24 October 1992), which waived the job offer requirement for up to 750 former Soviet scientists having expertise in "nuclear, chemical, biological or other high-technology defense projects" and seeking entry to the United States. During the debate on the bill, Senator Edward Kennedy remarked, "Noted Soviet scientists who now feel

they must leave their country because they do not have jobs should be able to come here, instead of to Iraq or Libya" (*Congressional Record* 1992). In the late 1990s, however, many of these programs came under criticism on both the donor and Russian sides, and not a few have been discontinued (see Miller 1999).[3]

In Russia and the US, rumors swirled that North Korea, Iran, Iraq, and Libya were making impoverished former Soviet scientists offers they couldn't refuse. Typical of these suspicions was a question and answer printed in the national newspaper *Argumenty i Fakty* in August 1999, under the headline "To Iraq for 'Bucks'":

> Is it true that now many of our specialists find work in Third World countries, because there they are paid much more than in the USA, Germany, or France?
>
> —N. Mamontov, Riazan
>
> Indeed, if Russian specialists used to be limited to the USA, Germany, and Israel, now they go to work in South Korea, Australia, Paraguay, and Iraq. The salary of Russian specialists abroad depends directly on their qualifications. By some reports, the president of Iraq Saddam Hussein will pay our highly-qualified nuclear physicists up to 300,000 dollars a year.

In Akademgorodok I heard rumors—which, I stress, no one could actually confirm—that mysterious delegations of men—some supposed they may have been from Iran—wearing turbans and beards had visited the State Research Center for Virology and Biotechnology, known as Vektor, a former Soviet bioweapons research facility located a few miles from Akademgorodok in Kol'tsovo, which now houses the one of the world's two WHO-approved samples of smallpox virus. In these stories, only one of the men was said to speak as the delegation toured the facility. It was probably no accident that I heard these rumors at about the same time that the US and Russia were engaged in a

conversation over whether to destroy their smallpox samples in accordance with a WHO schedule; the question of biological weapons was in the air. While, again, I do not know whether any such visit actually happened, or, if it did, what its intent might have been—one of Vektor's new peaceful programs is the manufacture of diagnostic kits for HIV, which it sells in other countries—the rumors were part of a general discourse that characterized cash-starved Russian scientists as a threat, both to Russia and the West.

Yet to posit that the nature of the problem scientific travel poses for the Russian nation-state (and nation-states in general) is limited to practical concerns about weapons proliferation is to miss half the picture. The security of the territorial boundaries defended by weapons systems is only one of the stakes when scientists travel. I do not mean to dismiss the danger of the spread of nuclear, chemical, or biological weapons technologies from the former Soviet Union, but a focus on proliferation begs the question of why a similar rhetoric surrounds the travel of civilian scientists, working in open facilities on research with few or no military applications, and publishing in open scientific journals. Instead, the travel practices of civilian scientists are problematic because they draw attention to the prominent role scientists claim in producing progress, civilization, and modernity, the nationalist "positive vision" of order and coherence. Scientists who travel stand to threaten not just the geopolitical territory claimed by the nation, but the very content and existence of a "civilized" national future.

A "Civilized Country": Past, Present, and Future

A broad discourse centered on images of a "normal" or "civilized" country or society frames scientists' international travel practices. Commenting on post-Soviet

indignities as diverse as the rising price of bread, rude treatment by shopkeepers, the proliferation of ultra-violent Hollywood action movies on television, the dismal state of public transportation, the lack of reagents and instruments for research, and official and bureaucratic corruption, Akademgorodok scientists tied these phenomena together into a narrative which pointed to an as-yet-unachieved "civilization." Images of disintegration and collapse—or at best, stasis—were widespread in tales of the absurdities one was forced to endure in managing everyday life—not to mention conducting scientific research—in conditions of rapid inflation, salary arrears, and above all, the state's unpredictable and unreliable responses to these circumstances. "If Russia were a civilized country..." or "In a normal society..." began so many of these narratives, which Nancy Ries (1997), writing about the economic freefall and political instability of the early 1990s, called "perestroika epics," particularized for the scientific aftermath of the August 1998 ruble crisis (see also Platz 2000 on a similar discourse in Armenia). One evening, Maria Nikolaevna, an English teacher at Novosibirsk State University, and I were heading to central Novosibirsk to see a play. Earlier that day, we had received the news that Boris Yeltsin had relieved Prime Minister Evgenii Primakov, a member of the Academy of Sciences and therefore quite popular in Akademgorodok, of his duties, replacing him with Sergei Stepashin. On the bus, Maria Nikolaevna and I discussed the firing of Russia's second prime minister in nine months. She was angry: "Has [Yeltsin] gone crazy? In a civilized country the president isn't able to fire a good prime minister on a whim." When Stepashin was replaced with Vladimir Putin only three months later, Maria Nikolaevna and I had nearly the same conversation once more.

The idea of civilization has a long history in competing temporal models of Russian nationalism. In the nineteenth century, civilization implied Westernization to both Westernizers, who saw the civilizing process as progressive, a leap forward in time, and Slavophiles, who saw civilization and modernity as a threat to Russian culture's "natural" temporal cycles (Meyer 1952a, 1952b; Kingston-Mann 1999:187-189; Porus 1998:17-21). Civilization was both the endpoint in a universal narrative of progress and a force destructive of locality. In the Soviet Union, culture (*kul'tura*) took on some of the universal and progressive connotations of civilization (*tsivilizatsiia*) without the implication of Westernization (Meyer 1952b). Soviet rule was to "raise the cultural level" of the society not toward an idealized Western civilization, but toward a modern communist utopia (cf. Grant 1995; Verdery 1999:117), and it was to do so largely through the application of "scientific socialism": rational planning and scientific and technological means. The reimagining of the Soviet era under postsocialism has breathed new life into the language of Westernizers and Slavophiles again, and civilization in the guise of the universal West has again become both beacon of progress and harbinger of national death. In many of these formulations, "Soviet culture" appears as a detour, or even a step backward, on the route to universal/Western civilization.

Akademgorodok scientists and non-scientists alike invoke "civilization" as a potential, rather than actual, state. In such formulations, "civilization" is not a state of grace that had once existed and then disintegrated, but rather was always only an illusion that has now lifted, though it could eventually be achieved. This is a strange twist on the "snipping out" of the socialist past happening all over the former socialist world (Verdery 1999:116). Scientists cannot easily dismiss the Soviet system that promised them

cultural relevance in the construction of modernity; they cannot easily turn back the clock to the "pure" pre-Soviet past. Even more, their experiences of postsocialism suggest that its promises of progress are equally illusory, like another extended detour away from civilization. The elusiveness of Russian "civilization," always seemingly receding not into the past, but into the more and more distant future, emerged from the contradiction between a discourse in which Russia was undergoing a "transition" to a "higher" stage of development, i.e., capitalism and democracy, and one in which the country was sliding backward, standing still, or falling apart at the seams.[4] Akademgorodok scientists' post-Soviet experiences of disillusionment with Soviet modernity resembled that of the Zambian mineworkers James Ferguson describes: "This is modernization through the looking-glass, where modernity is the object of nostalgic reverie, and 'backwardness' the anticipated (or dreaded) future" (1999:13). But unlike the Zambian mineworkers, Akademgorodok scientists' nostalgia for modernity is a nostalgia for a modernity approached but never achieved, and their anticipation of future backwardness leaves room to anticipate other futures, too. Time can be turned around again.

Yet, much as Pesmen (2000:282-287) found in Omsk, where people both bemoaned their "backwardness" and incorporated it into their notions of what it is to be Russian, scientists in Akademgorodok emphasized not only the disorderly conditions under which they had to work, but also their ability to find order in this chaos. They took a kind of pride in relating how their seemingly absurd tales of hardship and endurance were met with disbelief by Western colleagues. "To this day our colleagues abroad don't believe it. They don't think it's propaganda, because communication is supposed to be free. But they don't believe that a doctor of science, a professor can earn less than 100

dollars a month and somehow live. They look at you suspiciously, like you're a little crazy, like maybe this person is making something up," a hydrodynamicist told me. Scientists frequently related—not without pride—how they jury-rigged instruments with scrap materials, assembled and repaired their own computers, and performed complicated calculations with paper and pencil, all the while "maintaining the level" of their research. Having once felt more or less secure in the essential progressiveness and modernity of their country, the painful "discovery" that those goals had not yet been achieved did not seem to make Akademgorodok scientists, deeply committed to scientific notions of progress, any less desirous of them. "With twigs and strings," they said, they were making progress despite the decay all around.

Scientists as Bearers and Agents of Progress

Civilian scientists like those traveling in and out of Akademgorodok are understood to represent the nation's economic and spiritual "potential" for future progress. The ubiquity of the idea of "potential" in discussions of "brain drain" reflects an implicit association between scientists and national progress—or, conversely, the absence of scientists and national retrogression and backwardness. This link between national progress—even existence—and scientific strength was formulated clearly in the headline on an open letter to President Yeltsin, published in *Literaturnaia gazeta:* "To let science perish is to destroy the country" (Shnol' 1998). The letter was written by a researcher in the biology city of Pushchino, near Moscow, but Akademgorodok scientists repeated similar formulations over and over as well. Scientists in Akademgorodok in the late 1990s often made the claim, echoing Soviet models, that they—or, rather, the

knowledge they produce, appropriately applied by the state—were the engines driving the nation toward modernity and progress.[5] A molecular biologist, visiting Akademgorodok from his position in a German university, explicitly connected the exodus of scientists—like himself—with an exodus of culture (in the high-culture sense) and civilization: "It's precisely the cultured layer of society that is leaving. In principle, the people who are leaving are the ones who have carried the cultural load." Vasilii Ivanovich, quoted in the epigraph, continued on, "With regard to Russia, I think that it has powerful scientific potential, regardless [of the emigration of scientists]. And I think that without it [scientific potential] society in general cannot exist."

Akademgorodok scientists cited the sociological, economic, political, and symbolic functions of science to back their assertions that, without scientific knowledge and scientists as a group, the nation could not overcome its present state of backwardness. Some argued that scientists, as part of the intelligentsia, tend to be a force for progressive political change: an organic chemist became excited nearly to tears as we sat in her kitchen one spring afternoon, saying, "Why did we support Gorbachev? Why the intelligentsia in particular? We suffered most of all, but the intelligentsia more than anyone supported Yeltsin and Gorbachev, because these people understood that your own material well-being is not the most important thing in life. The most important thing is the future! The most important thing is movement forward!" In fact, the Russian intelligentsia has historically claimed the role of mediator between the people (*narod*) and the state, caught between identification with and contempt for both. Called upon both to humanize the state and enlighten the benighted *narod*, intellectuals characterized themselves as the bearers of an enormous responsibility: "The privileged few who had

access to distant, expensive knowledge thought of themselves as conduits of light and felt a grave personal responsibility for their country's ultimate fate" (Gessen 1997:7; cf. Kagarlitsky 1988). The characterization of intellectuals as somehow between the state and the people positions them as the builders of the nation and the agents of progress.

Others suggested that without science to develop technological innovation and map out how it could be incorporated quickly and efficiently into production—an "old Russian problem," they emphasized, that the Soviet system of central planning had failed to solve—Russia's industrial economy would continue to stagnate. And others believed that a country that produced cutting-edge science projected an international image of modernity, progressiveness, and future-orientation, which would undermine the West's (and their own) images of postsocialist Russia as a backward and corrupt country. One writer, for example, suggested that the state, in its socialist-paternalist manifestation, made science dependent on it, but is now run by "criminal elements" and "former nomenclatura" with no interest in science's fate. If this "criminal" state should let science collapse, he argues, it will have allowed itself to become an "antinational force" (Semenov 1996:12).

Analysts of brain drain also formulate the danger to the nation posed by mobile scientists by linking the level of future social development to today's potential:

> The erosion of the educated elite undermines the possibilities of the workforce, weakens the intellectual potential of the nation, and in the end the possibilities for social reformation.... In the long term the outflow of a significant percentage of the scientific elite may lead to a genetic weakening of an entire generation of Russia's population. (Ikonnikov 1993:54-55)

Though such arguments about the weakening of Russian genetic stock are rare, the characterization of scientists as the bearers of the nation's culture—past, present, and future—is at the center of discourse on brain drain. Three Moscow sociologists characterize brain drain as a deceptive kind of problem, because its effects are not immediately apparent, but may take years to be recognized:

> Although at the present day the process of "brain drain" from Russia...has not acquired serious levels, its effects fading against the background of the cataclysms the country is enduring, the situation in this area could attain a significantly more dramatic character in the not-so-distant future. It must not be forgotten that the economic crisis affecting the country will, sooner or later, be overcome, and that for the future dynamic development of society the science that seems unnecessary now will be needed. A special demand will exist for specialists in the fields of knowledge that are today the main bearers of scientific and technical progress, of the major transition to a new technological order: biology, medicine, ecology, informatics, microelectronics. (Nekipelova, Gokhberg, and Mindeli 1994:17)

Such characterizations of scientists as the agents—practical, ideological, even genetic—of culture, civilization, progress, and modernity makes their border-crossing potentially subversive of future cultural coherence, already widely understood to be under threat, if not already destroyed, after a decade of postsocialist crisis.

Gendering a Scientific Nation

It is worth noting that when scientists appear as culture-bearers and progress-generators, the unmarked "scientist" is usually assumed to be male, and indeed, it is mainly male scientists who travel and emigrate from Akademgorodok (one reason may simply be that men are numerically superior in the natural sciences, except biology). A particular emphasis on the loss of young scientists and the disinterest of young people in scientific careers—widely bemoaned by scientists and policy makers alike—suggests

moreover that the agents of the nation's future progress are young males. That it is young male scientists who are the focus of anxieties about boundary-crossing science—that is, that the greatest risk of "brain drain" is the loss of young male scientists—follows from parallels in how scientific and nationalist discourses make use of gender imagery. For example, Carol Delaney (1995) shows that nationalist images of "motherland" and "fatherland" are not simply interchangeable terms that represent the nation as metaphorical ancestor, but are in fact hierarchically-arranged symbols of the different roles imagined for men and women as (re)producers of national substance. While women are thought to be the passive vessels who nurture and give birth to the nation, men are understood as the creative force behind national reproduction, who carry and pass along national identity.

Gendered images of male agency, creativity, and reproductive force and female passivity and nurturance have been central as well in science since its early modern origins. Evelyn Fox Keller (1995:38-40) shows that in the seventeenth century, Francis Bacon's philosophy of knowledge rested on a gendered distinction between the active, knowing male mind and passive, known female nature.[6] In more contemporary science—and particularly relevant to this discussion of national security—cultural analysis has shown that the language of nuclear scientists and defense strategists frequently uses images of "male birth." Such imagery, according to Carol Cohn (1987:699-702) and Hugh Gusterson (1996:161-164), tames the destructive power of nuclear weapons by transforming them into a life-giving, rather than life-taking, force. Moreover, in gendering male the processes of generation and birth, both scientific and nationalist discourses emphasize male agency. As anxieties about brain drain center

around scientists as agents, generators, or reproducers of national progress, those scientists most central to the vision of progress are assumed to be male.

The negative vision of the loss of the reproductive agents of a (potential) national future discursively parallels the more frequently discussed nationalist focus on the loss of a pure, essential cultural past. While the anxieties about cultural disintegration work in parallel ways in both instances, in this case the nationalist negative vision intersects with and works in concert with scientific discourses about progress and development. Scientists both reference the Russian scientific "traditions" of state sponsorship and theoretical prowess and the potential for future progress. At this confluence of progress and decay, temporal movement across eras and spatial movement across national boundaries come to be seen as congruent, such that scientists can claim that their transnational movement makes them simultaneously agents in the construction of a national future and bystanders to a state-sponsored national retrogression.

State, Science, and Civilization

State sponsorship and direction of science were understood to be critical to the achievement of Soviet modernity, as this paragraph from an early-1960s text about Akademgorodok's construction attests:

> The Twentieth Party Congress laid out the grand prospects for the construction of communism in our country. It assigned a special, paramount role in its plans for the construction of communism in the USSR to the eastern regions.... The rich land needed patient, courageous, and strong people, ready to engage in a struggle with harsh nature: explorers and prospectors for minerals, builders of roads, tractor drivers and lumberjacks—anyone who was ready to set out on the difficult march to the East. Scientists were summoned to play not the last role in this march. Without them it is impossible to master the immense riches of

> Siberia and raise the culture of this land in the short period envisaged by the Communist Party. (Migirenko 1962:7-8)

Scientists often pointed to the state's role as the predominant sponsor of science as the characteristic that distinguishes Russian science from that of other countries. In such formulations, science supported by the state and directed toward the state's developmental goals, while hardly free from conflict, is Russia's "traditional" mode of producing science. One laboratory head located the origins of this tradition at the very moment when Western science was brought to Russia, when Russia began to "indigenize" a Western discourse:

> You see, with respect to science, we have our own traditions in Russia. When the Russian Academy of Sciences was founded [in 1725], it was from the beginning included in the state system, and the state supported it.... And we live not at the expense of the university, but at the expense of the state budget. Well, if Peter the Great decided it that way, then to some extent this tradition should continue.... It seems to me that this tradition, which was formed several centuries ago under the support of the state, should continue.

Another laboratory head in the same institute echoed this use of "tradition" to describe the relationship between the state and science: "In Russia science has traditionally been state science." Although some scientists referred "tradition" specifically to the system of state science that existed before 1917, more often they pointed to the particular patterns in which the relationship between scientific institutions, scientists, and the state developed during the Soviet era (which in turn had marked ideological and structural continuities with pre-revolutionary science [Graham 1993:173-196]). Scientists characterized science in the context of the modern(ist) Soviet state as the engine of

progress and development, suggesting that science is indeed a social force for solving the practical problems not only of industry, but also public health and education.

Yet within this progress-oriented framework, it is the Soviet and then Russian states that have ruined the nation's science by effectively forcing scientists beyond the country's borders, thereby postponing the achievement of Russian society's "civilization," that is, its achievement of Western-style universality. Scientists cited bloated bureaucracy, a heavy hand directing certain aspects of scientific research, and a poor system for integrating scientific and technological innovations into industrial production, as ways in which the Soviet state, despite the narrative of the party-state-directed march toward modernity, had in fact constructed post-Soviet non-modernity. Scientists described the failure of Soviet science as one of planning and of militarization—and used "the world" (Western Europe, North America, and Japan) as the reference point for a truly rational, orderly science and economy leading to ever-expanding progress.

Inefficient linkage of science and industry was only one of the problems with Soviet science; other scientists, particularly geneticists, pointed to overt state interference in their fields as having set them back decades by comparison to the West. The post-Soviet Russian state had exacerbated these problems, scientists argued, through its financial neglect and failure to mobilize and direct the nation's scientific resources. A conversation between two Akademgorodok scientists in 1999 contrasts profoundly—and perhaps consciously—with the Soviet-scientific tale of progress, order, discovery, and control, in short, all the markers of state-sponsored modernity (see Scott 1998):

> *Galina, chemist:* [They say] the situation will improve, but it's not improving, it's stabilized on a very low level, and even getting relatively worse, because the government gives us nothing. You can wait for improvement, hope that things will get better, but... Now I see clearly that in the next 15 years there won't be a good salary here. I was more optimistic when I returned from Germany [in 1995], but now I see clearly.
>
> *Oleg, biologist:* I think that in Russia... I could say what I think *should* be, but I'll tell you what *will* be: it will be like in India, very weak science.... Science will be just as sickly as in India.
>
> *Galina*: Actually, in India it's very, very uneven.
>
> *Oleg*: Well, let's say in comparison to Europe.[7]

In short, scientists make use of a kind of discursive negation of the Soviet emphasis on progress to frame their current circumstances as decidedly "non-modern." Galina and Oleg referenced this contrast between state-constructed modernity and non-modernity in the opposition between "India" and "Europe." In their view, Russian science was becoming weaker—rather than stronger, as a narrative based on constant and inevitable progress might predict—with the passage of time. While Soviet science was about active movement forward—marching, exploring, prospecting, expanding eastward, comparing favorably to "world" or Western science, and being the agents of development—post-Soviet science is about standing still, waiting, moving backward, comparing unfavorably to Third World science, and becoming the passive citizenry of an "undeveloped" country. Scientists are, in a sense, reappropriating the temporalities of Slavophiles and Westernizers for an era of transnationalism and time-space compression; in the process, they also reposition themselves as agents.

Even though their despair about the future of Russian state-supported science has led them to engage non-state and non-Russian sciences for support, Akademgorodok

scientists have mobilized a link between national scientific achievement and state power into a critique of the post-*perestroika* decline of Russian science. The state, they asserted, has a central role to play in the promotion and direction of science, particularly fundamental science—a configuration which, many argue, is historically and culturally particular to Russia (see Semenov 1996:14). The state's responsibility was to provide for science, which in turn served as the engine of progress and constructor of modernity. But scientists understood these mutual obligations to have been violated—the state, either willfully or through neglect, had declared the "contract" null and void. "[Support for science is] so low that it seems the state endlessly robs you and humiliates you," said a chemist, who was hoping to find work abroad, "The state doesn't fulfill any of its obligations to us." If the state would fulfill its obligations, scientists asserted, Russia could begin to move forward toward that ever-elusive "civilization" again. Those obligations, from scientists' points of view, were many and various, including, for example, reforming the structure of the Academy of Sciences, improving tax collection (and thereby funding for scientific research), regularly paying salaries above the state-designated living minimum, providing money to buy instruments, equipment, and reagents, restoring science's cultural prestige, freeing the administration of corruption, setting research agendas and priorities, finding socially beneficial applications for scientific work, and fostering international exchange programs that did not lead to brain drain.

Scientists' talk of movement backward and disintegration, therefore, plays on an older logic in which progress and modernity are produced by the state directing science, and science working toward the goals of the state—both, ostensibly, for the good of

society. But the old tension between the intelligentsia and the state also resurfaces: scientists and the state seem to be in a struggle over who gets to generate national progress, and how. The Russian state's abandonment of Russian science (from scientists' point of view) is in fact an abandonment of the nation and its future, for which scientists then claim responsibility. Once again, scientists' characterization of themselves as agents of progress—in this case, agents both opposed to the state and to which the state bears certain obligations—cuts two ways.

Scientists' narratives of "anti-progress," then, combine with the suspended hope of future civilization in a kind of doubling-back in time that turns on science. Science, in this logic, is the engine of progress and modernity, which seem to be receding ever farther, asymptotically, into the future. In this view, Russian history is a series of recursions in time; linear progress is always interrupted or deferred by an event that turns time back, only to start on a linear progression again (Figure 6.1). Bruce Grant has described how the recent construction of state-sponsored storybook-fantasy monuments in Moscow represents, in part, "a *deferral* of expectations for a rise in standards of governance and standards of living among many Russian citizens" (2001:351; emphasis in original). Grant's point resonates with the ways the deferral of Akademgorodok scientists' hopes for future "civilization" have been incorporated into a claim on state resources and state responsibility, while leaving open the possibility—even probability—that they may never be fulfilled.

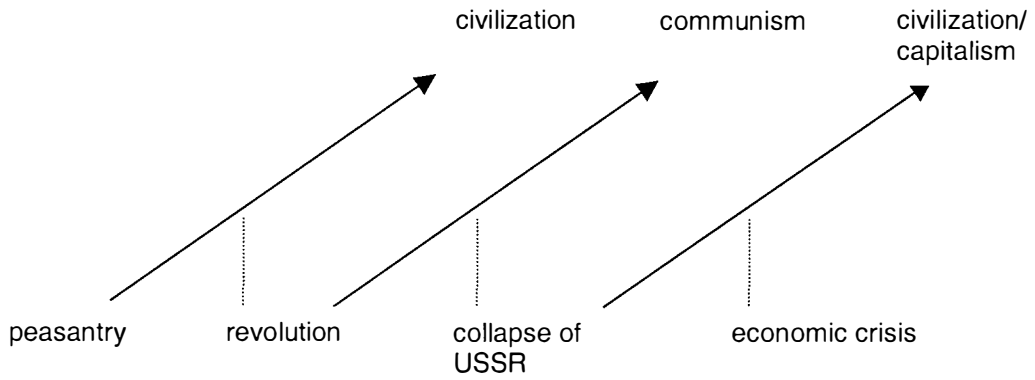

Figure 6.1. Russian history as interrupted or deferred progress.

In fact, such claims were often characterized by a kind of melancholy or irony, because scientists were, even as they ascribed a central social role to scientific knowledge, well aware that science was hardly driving anything—the economy, politics, or "national progress"—in postsocialist Russia. As a mathematician concluded his list of proposals for everything from improving tax collection to structural reform of the Academy of Sciences, he sighed, "But for the present, this is all from the realm of sweet dreams."

The Progress of Global Science

Rather than simply writing off scientists' claims on the state as wishful thinking or the nostalgia of the newly-irrelevant, I suggest that we should attempt to understand what it meant that Akademgorodok's scientists were mobilizing models of the relationship between science and the state that they, at least at some level, understood to be unrealistic in the present context. What did it mean to make claims on the state that were not about to be answered, that scientists were circumventing anyway by engaging

transnational capital and globalizing their local science, and about which, in fact, they were often ambivalent? How were these claims incorporated into the construction of traveling scientists as insecure? In thinking about these questions, I turn to the ways in which spatial configurations of "world science" attended Soviet and post-Soviet temporal narratives of progress. The mapping of spatial distinctions onto temporal ones was, in a sense, nothing new: the idea of "civilization" emerged during the Enlightenment, roughly contemporaneously with the idea of "Eastern Europe" as the West's backward and uncivilized other (Wolff 1994:12). But postsocialist scientists imagined a transnational Russian science not simply as an indication of how far backward the Russian state had allowed its science to slide, but also, paradoxically, as a sign of science's central role in generating progress toward a reconfigured, global modernity and universal "civilization." Playing on these apparent contradictions, scientists countered claims that their global travel was necessarily generative of national insecurity.

Soviet science's drive toward modernity during the Cold War included a prominent role for international competition—and sometimes even outright duplication of effort by the superpowers—in industrial production, space exploration, and the nuclear arms race—all in the service of the state.[8] Despite Neil Armstrong's pronouncements from the moon about "giant leaps for mankind," whether a scientific fact, achievement, or technique was Soviet or American mattered during the Cold War (see Karash 2001; Letokhov 2001). Yet Soviet science's relative isolation from "world science"—exemplified by restrictions on travel, small readership of Soviet journals abroad, and even, according to some Western historians and sociologists of Soviet science, the proportionally fewer Nobel prizes awarded to Soviet scientists—is now framed by

scientists as having been, despite its successes, something of a distortion, both scientifically and politically. Scientific travel, in this view, is the natural state of science: international collaboration—and competition—are beneficial to both Russian and "world" sciences, indeed essential to their proper functioning, insofar as they entail lifting, rather than imposing, certain barriers to "free" communication between scientists.[9]

> [Travel] is a source of new ideas; you get new information that you might not have gotten here. So in general, you can't say that the reforms of the past eight years have been especially negative. The most important thing is that they gave scientists freedom. And thanks to that we can stay home and work here, because we can go abroad for contract work from time to time, or just for short term trips sponsored by the other side. So the state has already done the main thing, a very big thing, having given scientists freedom. (senior researcher, Institute of Mathematics)

> In our country there was a so-called Iron Curtain for many, many years. And we didn't know what went on abroad. They always taught us that people there were hostile, that they didn't like Russia, that they were trying covertly to do harm to our country as a whole and to our people. And I'm a person who went abroad and returned. And I saw that just the same kind of people live there, with their virtues and their faults. That possibility is a very great blessing that's been set before us. I think that's a very great advantage of this restructuring, that they gave scientists the opportunity to go and see with their own eyes. (senior researcher, Institute of Organic Chemistry)

The ways scientists use their new-found "freedom" to find opportunities to work abroad on temporary contracts, for example, both allow them to continue to act as progressive agents in the face of state neglect and produce circumstances in which they can be construed as "insecure." Though they may characterize scientific exchanges as having become "free," they hardly travel around the globe unfettered; they encounter financial, bureaucratic, and cultural barriers to the free flow of scientific knowledge.

Although Akademgorodok's researchers—usually those who occupy high positions such as laboratory head, division head, or even member of the Academy of Sciences—sometimes are able to obtain positions abroad by going through "blind" bureaucratic processes like grant applications, lower-level scientists more often use personal contacts with foreign colleagues or with Russian colleagues already working abroad to gain access to positions. Whole institutes, too, use personal connections to access sources of foreign capital: for example, the Institute of Nuclear Physics, Akademgorodok's flagship, relies heavily on cooperative research projects with and apparatus manufacturing contracts for foreign high energy physics research facilities, such as CERN in Switzerland, SLAC, Fermilab, and Brookhaven in the US, and KEK in Japan. IIaF listed 33 ongoing cooperative agreements with foreign labs in its 1997 annual report (Budker Institute 1998:235-236), and the deputy director of the institute told me that about 10 million dollars a year—80% of the institute's income—now comes from sources other than the Russian state (that is, the portion of the federal budget allocated for science plus contracts with various government ministries). Many of these international collaborations are facilitated by former IIaF researchers now living and working abroad.[10] That scientists are in effect bypassing the Russian state in linking up to global scientific structures supported by other states, corporations, and NGOs allows many of them to continue their research—indeed, many look to them as a means of "saving" Russian science in general or Akademgorodok as a particular kind of scientific community—but also create the conditions under which, as a category, they can be seen as potentially undermining national boundaries and state security.

Not unexpectedly, given the reconfiguration of "abroad" that has taken place since the disintegration of the Soviet Union, travel to certain locales may make scientists seem more insecure than travel to others. The most insecure places vary, of course, based on one's position. World science is not monolithic and homogeneous, as Russian scientists are painfully finding out, and there is hardly a place on earth that they can go to avoid being charged with insecurity. In the West, concern about "brain drain" from Russia centers on Russian scientists' potential travel to "rogue states"—enemies of the United States, mainly.[11] Russian anxieties, however, focus on the West; though integration into Western science may be desirable, it also signifies just how far behind Russian science has fallen. The most insecure location, from the Russian point of view, is also the one most potentially generative of progress.

Again, sociological discourse on brain drain also echoes the notion that temporary travel can be taken not only as a sign of postsocialist progress, but also a means toward the development of a deferred modernity—provided it does not lead to permanent emigration. Echoing the rationales of many of Akademgorodok's traveling scientists, for example, Stanislav Simanovsky, Margarita Strepetova, and Yuri Naido (1996:14) assert that "through foreign trips and missions the country not only disseminates new knowledge and known R&D results, but also gains an access to scientific and technological achievements which it needs." Other Russian sociologists have pointed out that "optimists" on the brain drain question view "the exit of scientists from the country [as] an indicator of the deep integration of particular sectors of Russian science into world [science], and that Russian scientific potential corresponds to (and sometimes exceeds) the world level" (Nekipelova, Gokhberg, and Mindeli 1994:16). Another

Moscow-based sociologist notes that "returning professionals can become a necessary element in the integration of Russian science into the world scientific community" (Ikonnikov 1993:56).

Not only do scientists and analysts alike often think that integration into world science is a positive and progressive development for Russian science, both in practical and ideological terms, they also sometimes make the argument that temporary migration may actually save Russian science from complete collapse—even as they simultaneously focus on the irreparable loss to the nation of its greatest modernity-generating minds. Those who travel temporarily return bearing not only new knowledge and experience, but also grants, publications, reagents, contracts, and contacts. In Ekaterina's former lab in the Institute of Organic Chemistry, discussed in chapter four, German contracts allowed research to go on, while before the contracts were obtained, there were not enough reagents to work. A Russian research oncologist living in the US even suggested to me that "brain drain" could save Russian science simply by saving scientists' lives: the life expectancy for men in Russia was dropping every year, he explained, and living abroad may help Russian (male) scientists live healthier lives and, therefore, have longer and more productive careers.

There are, then, two threads in the logic that characterizes scientific travel as movement toward, rather than away from, elusive civilization. First, travel restores an ostensibly transcultural science (and, by a metonymic extension, the nation) to its "natural" state of engagement with the rest of the world. Second, travel provides Russian scientists with a means of supporting and developing their specific national science, thereby ensuring its survival for the future progress of Russia, even if Russian scientists

are currently working for other states or private interests. In this sense, scientists often characterize even long-term travel as a step toward progress, rather than away from it, even as they criticize the state neglect that drives them to seek work abroad. A physicist from the science city of Troitsk, in Moscow Oblast', summed it up neatly: "'Brain drain' is a means of maintaining Russian talents over the long term under the given emergency conditions" (Letokhov 2001).

In these ways, post-Soviet scientists have begun to imagine their engagement with and integration into "world science" (read: Western science) as a means of overcoming what they see as state-sponsored non-modernity throughout Russian society. Scientists use the Soviet-era promise that a link between science and the state would produce progress (whether toward communism or civilization) to critique the ways in which they see the state as having arrested Russian development and built an illusory modernity. The state's production of backwardness is all the more devastating because it should be producing progress. Scientific travel, in this context, becomes a fraught signifier of both the ruin of post-Soviet science as a metonym for the condition of post-socialism—in which Russians are forced to seek from abroad what their own country can no longer provide—and of a faith in a less-isolated Russian science to achieve a deferred, internationalist modernity. The Westernizer-Slavophile dichotomy—Western civilization as progress *or* as decay—has not resolved, but has transformed into a paradox in whichh both sides are claimed simultaneously—Western civilization represents *both* progress and decay.

Scientists in Akademgorodok insist on their importance to the nation and to representing order—social and natural—within national boundaries. Moreover, they

insist that, by traveling, they are part of producing this order, the achievement of which has been postponed indefinitely by the state's actions and inactions. Yet scientists' participation in a transnational scientific community—largely arranged through personal, rather than state-directed, contacts—only very problematically overlaps with the nation. This spatial incommensurability, combined with a temporal narrative of progress running backward to the non-modern, foregrounds the negative vision of boundarylessness (*bespredelnost'*), disorder (*besporiadok*), disintegration (*raspad*), and ruin (*razrukha*) . The particular ways in which Russian scientists are engaging transnational flows in their reconfiguring of a collapsed state science are understood, paradoxically, as simultaneously productive of progress and insecurity. Traveling scientists, with or without missile plans or lethal viruses in their suitcases, are problematic for the continued, though deferred, progress of the nation-state, even as they imagine themselves to be the only hope left for that progress.

In the end, Russian scientists' peculiar predicament is an effect not just of the collapse of Soviet state-sponsored science, but of the common histories of science and the nation-state. Both are the products of a modernist notion of an ordered, knowable world with clear boundaries between its domains, between nature and culture. But if science's power as an explanation of, model for, and manipulation of the natural world lies in its presumed cultural universality—its indifference to local models of reality—that very quality stands to threaten the constructed, though naturalized, world of nations and states into which the globe is ordered. Sciences are not only local knowledge systems, nor are they unproblematically transcultural; they exist, rather, in a space somehow between the local and the global, shifting and changing in different contexts. There is, and perhaps

can only be, an uneasy and complicated truce between a boundary-crossing science and one that reinforces commonsense understandings of the existence of bounded nations.

Postscript

By the spring of 2001, the Russian state was tightening control over international scientific contacts. In late May, the radio station Ekho Moskvy made public an Academy of Sciences order requiring scientists to report all contacts with foreign researchers, including grants, contracts, trips by Russian scientists abroad, and visits by foreign scientists, and to submit for prior approval all articles for publication outside Russia. While George Soros, a long-time financial backer of Russian science, threatened to pull his philanthropic activities out of the country in response, at least one official in the Putin government denied the existence of such a directive (McLaughlin 2001; Associated Press 2001; Wines 2001). As early as March of 2001, out of the blue, in the middle of an internet chat about our families, the stormy love life of a mutual friend, the slow progress of Siberian spring, and the new American administration, a friend in Akademgorodok wrote, "You think that's bad? Here they are tightening the screws again." I shuddered and typed, "What do you mean?" She answered that scientists were now required to report the contents of all conversations with foreign researchers: "Even if you are talking about your kids, your vacation, you have to report it. I've seen the order myself." "Who?" I asked, "all scientists, or just those working on classified projects?" "People working on sensitive topics, but so many topics could be considered 'sensitive,'" she replied. I reminded her about Wen Ho Lee, whose failure to make such reports cost him months in solitary confinement; was American science any less the property of the

American state? "What will you report about this conversation?" I asked. She changed the subject.

Chapter Seven

Conclusion:
From Physics to Folk Art

I have tried to make the case in this dissertation that science is a key symbol through which the relationships between the local, national, and global are configured, and that the local, national, and global are, in turn, important in understanding how scientists imagine their scientific work. Seeing science in this way—as a cultural domain embedded in and alongside others—is a difficult task, because our common sense, and the common sense of the people whose stories are told here, still want to hold science apart somehow. I have argued that this holding-apart is not only constructed in particular historical and cultural contexts, it is in fact central to the operation of science as a simultaneously national, global, and local institution, symbol, and set of practices.

Like science, art is often understood as transcendent of locality. The value placed by aesthetics on truth and beauty is held to be singular and universal. Aesthetic truths, like scientific truths, are thought to be universally true (though some social groups—affluent Euro-American males, for example—may be better able to access them than others); in fact, ideas about universal, transcendent truths have been used by various artistic movements (Romantic and avant-gardist alike) as a critique of local social conditions (Marcus and Myers 1995:5; Williams 1983[1958]). Moreover, the universality of both science and art is constructed out of a modernist ideology which emphasizes unmediated experience. The scientist and the artist, each in his or her own way, encounters "nature," "reality," or "truth" outside of local semiotic systems; both science and art have their own versions of what Haraway (1991) calls the "god-trick,"

which lifts practitioners out of culture and, in parallel, strips the domain—art or science—of its cultural location as well. The value distinction between "fine arts" and "crafts" is one in which the universal encompasses the merely local; Marcus and Myers (1995:6) have argued that the cultural processes by which "fine arts" are set apart, both from "crafts" and from other cultural domains, need to be understood in ways that avoid simplifying "the complex internal dynamics of conflict within art worlds over the issue of autonomy."

Anthropology's holistic and relativistic approach has challenged the autonomy and boundedness of both artistic and scientific worlds. The anthropology of art has been concerned primarily with issues of identity, authenticity, and the global flows of art as commodity, as collection, and as embodiment of otherness; similarly, the anthropology of science has focused on the embeddedness of scientific discourses and practices in projects of domination, hegemony, and the production of raced and gendered subjectivities. In this dissertation, I have shown that many of these issues are at stake as Akademgorodok scientists travel in global scientific networks. For Akademgorodok scientists, the cultural identity of knowledge and the mode of its production (as commodity, as state property) matter, insofar as they highlight the proximity or distance of their local science from the ultimate goal of transcending locality.

Reading across cultural domains, Yanagisako and Delaney argue, is an important anthropological technique in the holistic analysis of "complex" cultures as well as "simple" ones. These readings may seem "sacrilegious or foolish...to the natives" (1995:13), but "reading across" the sacredness of science and into other domains, such as art, helps us to understand how certain configurations of power and meaning are attached

to science. In the changing context of postsocialist Russia, such holistic analyses are essential to understanding how meaning is produced in the context of everyday experience and how we might avoid teleological models of progress and liberation. I want to be cautious here, keeping in mind that science and art are not interchangeable or parallel worlds, but to show how, in the play between them, patterns often turn out to be more like paradoxes. I want to conclude, therefore, by switching gears to look at the career of an Akademgorodok scientist who has become a folk artist, in hopes that the issues raised by the invention of a new traditional art form will shed some light on the dilemmas faced by scientists and on the experiences of postsocialism in general.

Folk Art, Social Crisis, and Transnational Markets

Valerii began crafting boxes, jewelry, photo frames, and trays from birch bark in the early 1990s, during the worst crisis of inflation and instability. He had seen in shops in Novosibirsk the birch bark items being produced by a reconfigured toy factory in Tomsk, admired them, and thought that he could do just as well. He had no artistic background, having concentrated on physics from an early age, though he enjoyed photography. He obtained some bark from a birch trunk that had fallen in Akademgorodok's forest and began to experiment. Eventually, he developed a technique for cutting fine designs out of the bark, and he developed and made the necessary tools. No one taught him or even advised him on what to do; Valerii "reverse-engineered" the whole process.

Valerii's birch bark items are assembled from two to four layers of bark, each cut separately from sheets of bark. The process begins with bark collection: during the

summer, birch bark is saturated with enough moisture that it can be peeled quite easily from the trunk of the tree. Valerii collects bark from trees that have freshly fallen or, more often, heads deep into the forest surrounding Akademgorodok once or twice a summer to cut down a tree. The bark must then be cut into manageable pieces and pressed flat before it can be used.

The work of stamping, cutting, and assembling the bark into the finely-decorated items Valerii favors is very tedious—it reminded me of embroidery. It is difficult to do by lamplight, not only because the colors of the bark are hard to judge under incandescent light, but also because the shadows make the patterns impressed in the bark almost impossible to see. One's hands cramp after long periods pressing blades into bark, one's eyes water, and one gets rather bored—though it is sometimes possible to do the cutting in front of the television. There is a fairly clear division of labor in the process: Valerii does the bark collecting and design work: he generally stops at creating the aluminum patterns that transfer the paper drawing to the bark. Liuba, his wife, begins with cleaning the bark and does the rest of the tedious cutting and decorating. They both assemble the items, and Valerii controls the addition of all the details. Their three daughters used to help more than they did when I lived with the family—Nastia, the oldest and the one who enjoyed the work the most, had married and moved away, and Alena and Ania did not enjoy the work and were busy with school and friends, though they helped out sometimes when they needed some cash.

It was not long after his beginning to work with birch bark that Valerii was exhibiting his work in local fairs and shows. It didn't sell much—people didn't have much money for luxuries—but he was always more interested in the process. The whole

family was featured on local television—the interview was conducted the day Valerii was released from the hospital after problems with high blood pressure. There was an emerging community of folk artists in Akademgorodok and Novosibirsk, many of whom were doing various things with birch bark; others painted *matrioshki* and icons, wove baskets, or embroidered textiles. Valerii began to make connections with these others through the existing arts institutions—the House of Folk Arts (*dom narodnogo tvorchestva*) and the Museum of Regional Lore (*kraevedcheskii muzei*).

When his institute was connected to the Internet in the mid-1990s, Valerii began to use e-mail to connect with people abroad who might be interested in the work. He signed up for woodworking and basketweaving e-mail listserves, and his computer crashed repeatedly from all the hundreds of messages sent to the lists. He wrote fluently in French, and in English with the help of a dictionary and with some difficulty, making contact with woodworkers in the US, France, and the UK. Eventually, an American woodworking club's newsletter printed a brief article and a few photographs of Valerii's work. In 1996, the magazine *American Woodworker* contacted Valerii about an article. A one-page piece entitled "Siberian Birchbark Boxes" and authored by Valerii appeared in the magazine's February 1997 issue (Efimov 1997). It features one column of text and two color photos. One photo showed Valerii and Ania in the forest of Akademgorodok, with Ania looking pretty miserable, dressed in a red *sarafan*, a traditional peasant jumper, and holding a birch bark tray with three large and elaborate boxes; the other photo was a close-up of a series of four boxes—my favorites of all Valerii's work—entitled "The Four Seasons."

The brief article makes abundant use of natural and national imagery. It begins by pointing out that "the birch tree is a national symbol of Russia" with "deep roots in the life of the common people" (Efimov 1997:96). It describes Valerii gaining inspiration from walks through Akademgorodok's forest taken as "a pleasant diversion from my work as a physicist and experimenter"—a passage which Valerii told me did not appear in his version of the article and was purely made up by the American editors. And he reminds the reader that "birch bark crafts are actually more traditional than the *matrioshka* dolls that tourists often buy." (Many people in Russia attribute the origin of the *matrioshka*, the emblematic Russian nesting doll, to Japan).

Valerii was surprised at the reaction he received from the article. He received several letters from American readers who admired his work, and even sold a box or two. He exhibited his work in Akademgorodok's House of Scientists. One American man, a basketweaver and outdoorsman from Michigan named Richard, particularly admired Valerii's work. Richard used birch bark in his work, and he had even built a birch bark canoe. Richard became committed to promoting Valerii and his work, and even bought a computer so that he could correspond with Valerii by e-mail. In 1998, when I was in the field, Richard invited Valerii to participate in the Association of Michigan Basketmakers' 1999 convention, where Valerii could sell some of his work and also teach classes in his birch bark art. To pay for the trip, Valerii applied to ArtsLink, a program sponsored by George Soros's Open Society Insitute, and, after much sweating on his part and mine over an English test, won a grant.

In the meantime, Valerii also continued to correspond with French woodworkers, especially the editor of a magazine called *La Passion du Bois*. The magazine sponsored a

biennial exhibit in Grenoble, and the editor invited Valerii and Liuba to participate in 1999; the magazine would cover their airfare from Moscow to Paris, transportation to Grenoble, and provide a place to stay while they were there. They went to France for two weeks in March. Valerii had been in France several times before, working on cooperative scientific projects; Liuba had never been outside the borders of the former Soviet Union.

Valerii had also assumed a leadership role among the local artisans. He worked closely with the *dom narodnogo tvorchestva* in Novosibirsk and was chosen vice-president of the Novosibirsk Association of Artists and Artisans. He was determined to make his trips to France and the US benefit not only himself, but also other artists, particularly those working in birch bark. He offered to take their pieces along with him to France to sell, and made up a catalog on his computer, with a page on each artist. And he used his savings to buy a large amount of the birch bark boxes produced by a former toy factory in Tomsk (where the birch bark 'tradition' apparently began) from a local art historian named Viktoria Grigor'evna, who was a collector and dealer of birch bark art.

The relationship with Viktoria Grigor'evna was never easy. Valerii often felt as though Viktoria Grigor'evna was dismissive of his work because it was not purely "traditional," and indeed, Viktoria Grigor'evna was critical of Valerii's use of unconventional forms and techniques. She was more interested in the use of certain forms that were modeled on utilitarian items that used to be used in peasant households, like wooden plates decorated with birch bark or a type of bark thermos called a *tues*. She admired work that was less elaborate and intricate than Valerii's. He equated simplicity with "not art," with the minimalist, modernist abstraction of Kazimir Malevich's painting

"Red Square" (*Krasnyi kvadrat*), his favorite epithet for art he didn't like. She was never afraid to stand on her authority and education in commenting on his work, and he didn't hold back from reminding her that she was a critic who never produced any art herself, and so the two actually got along fine.

Valerii was becoming more and more interested in the forms Viktoria Grigor'evna identified as "traditional," however. In the summer of 1998 he managed to make a set of birch bark Easter eggs, inspired by the famous Fabergé eggs made for the tsar. He was particularly proud of the engineering behind the eggs, which were made entirely of birch bark; others who made eggs used a solid wooden egg form and glued the bark on top. "If I weren't a physicist," he often said, "I could never have made those eggs." He spent much of the winter of 1998-99, leading up to the trip to France, making a *larets*, a large box with a five-sided lid, traditionally used by unmarried girls as a kind of hope chest for linens and jewelry. It was, by far, the largest and most elaborate project he had ever attempted—about 12 inches on each side and eight inches high, entirely covered with layers of intricately-carved birch bark. The preparation of the *larets* took months, right up until a day or two before the departure for France, and it mobilized the whole family. As I helped with stamping and burning designs onto the bark, we laughed and wondered how the European audience would feel if they knew that an American had helped make this traditional Siberian folk craft.

Valerii traveled to Michigan in November 1999, about a month after I returned from Russia. At the basketmakers convention he was a big hit; he gave the keynote address, sold quite a bit of his work and that of others, and also taught some classes. He became fascinated by Native American birch bark crafts, some of which bear a

remarkable resemblance to those of indigenous Siberian peoples, and plans to research and write a book about these connections. He then traveled to Philadelphia, where he met with some craftsmen at the Wood Turning Center, a meeting which resulted in another published article, a translation of one published the same year in a French magazine. The content in this case focused not so much on the birch as a Russian national symbol, but on the transformation of religious art into tourist souvenirs under the Soviet regime: "With the beginning of perestroika new folk arts started to develop, while at the same time old folk traditions were revived, including the making of traditional Easter eggs" (Efimov 2000:20). In this case, the freeing of tradition after repressive politics, rather than its grounding in nature, represents the art's authenticity. In the spring of 2001, Valerii and Liuba traveled to France for a second time, this time with a local icon painter. Valerii was making Easter eggs that opened to reveal icons inside.

Valerii's growing engagement with international arts and crafts organizations and markets presented him with two dilemmas: the demands of commercialism and mass production versus originality and his own aesthetic values; and tradition and authenticity versus innovation. Like traditional craftsmen everywhere, he finds that Western art markets demand more "tradition" than local ones. Although he represents his work in foreign publications and speeches as traditional—inspired by peasant material culture or reclaimed from Soviet kitsch—local art critics like Viktoria Grigor'evna, who see themselves as the arbiters of tradition in folk art, do not see Valerii's work as traditional or continuous with older traditions at all. He has not adapted his aesthetic to these demands much, but rather has sought ways in which he can situate it within the "traditional." In other words, rather than make his art look more traditional, he has tried

to define tradition in such a way that it fits his art. That Valerii is also a physicist makes his persona as a traditional craftsman more interesting on these foreign markets, but it is also a constant, and sometimes uncomfortable, reminder of the growing economic and political inequalities between Russia and the West.

Despite the likelihood that he could sell many more of his boxes in the West than he currently does, Valerii resists mass-producing his work. He likes to make only one or two examples of a piece, then move on to something else. For the trips to France and the US, he did make about 15 or 20 identical small round boxes, about two inches in diameter and one inch high, but he refuses to turn his workshop into a factory. Some local birch bark artisans have done so, and he often remarks that he cannot understand how they can stand it. He resists the temptation to fulfill market demand by producing many identical items simply because he is not tempted by it; he finds mass-produced art, in the end, not art at all.

I have seen birch bark crafts—mostly from the Tomsk factory—in some unlikely places, suggesting that they are slowly beginning to become more widespread in the market for "ethnic" crafts in the US. In a women's clothing and accessory shop in Roanoke, Virginia, a few small birch bark boxes were displayed alongside some silver jewelry from Indonesia. The saleswoman had no idea where the boxes were from or what they were made of. I also spotted a small wood box, decorated with birch bark and bearing the imprint of one of the Tomsk factories, in the office of one of the cultural anthropologists at Radford University; she had received it as a gift from a friend who had traveled to Russia, and also did not know that it was made of birch bark.

Valerii continues to work at the Institute of Semiconductor Physics; although he finds his birch bark work more fulfilling creatively and financially, he has no intention of giving up his scientific job. He often says that if he weren't a physicist, he would never have ended up working with birch bark. By this he means not only that he learned to work with the bark using an "experimental" method or that his understanding of the physical properties of birch bark helps him work with the material, but also that the collapse of science in Akademgorodok has opened up a space in his life for art. One day, after I returned from an interview in a successful chemistry lab that had a number of foreign contracts and grants, he said, "I'm glad I'm not a chemist. If I were, I'd still be doing science, and I would never have started with birch bark."

Science and Art: Points of Contact

Science and art in Novosibirsk intersect not simply because scientists have been "pushed" into other income-generating activities by the lack of money for science. People working in both fields face similar paradoxes and dilemmas. In different ways, both scientists and artists are increasingly participants in international markets, and both find that "Russianness" sells. For scientists, a claim that Russians have developed a specialty in theoretical or fundamental science makes them desirable workers in Western scientific structures where flexibility is becoming more and more important. But incorporation into those Western structures both threatens and promises salvation for Russian ways of doing science. The short-term, narrowly practical focus of "capitalist" research promises to keep Russian scientists in science, if not in Russia, and to provide an alternative and more generous source of funding than the state. But Akademgorodok

scientists worry that precisely the things that make them desirable on the world market will disappear as the nature of their research adapts to the styles of research prevalent in the West and in Japan. It seems to many that Russian science—not just science in Russia—is destined to become a colony either way.

Anxieties about the market are certainly not uncommon for artists; both in the West and in other contexts the demands of markets and capitalist production are generally thought to be opposed to the values of art—beauty, truth, purity. Marcus and Myers (1995:21-24) see these anxieties as contests over "high" art's essential autonomy from local meaningful worlds. By contrast, as folk and "primitive" arts move into contexts other than those of their production, whether as ethnographic objects in museums or tourist souvenirs sold in airports, they lose some meanings and gain others (Price 1989:78). "Authenticity"—embeddedness in an ostensibly "pure" and often "primitive" culture—becomes the salient operator for these categories of art. In this sense, the opposition between "art" and "the market" is much like the opposition between "science" and the market: can Russian science remain "Russian" in a world where scientific knowledge is increasingly produced by corporations? Does science as universal compromise its autonomy and truth-value as it becomes embedded in capitalist structures? Science here appears as parallel to both "art" and "craft"—it stands to lose both its authenticity and its universality. In the context of postsocialism, the negotiations individuals make between art, science, and market implicates changing cultural imaginings of the world and of Russia's place in it.

For both scientists and artists in Novosibirsk, Siberianness is increasingly important, especially in transnational contexts. Both understand that Siberia is a mythic

place in the West, an exotic and harsh region where bears roam city streets (a common local stereotype of Westerners' stereotypes). They identify themselves as Siberians as often as they do as Russians, though Siberia only became a political unit in 2000. Both groups are attempting to build transnational networks and connections that do not lead through Moscow. Tensions between center and regions are shaping much of Russian politics and economics—the ongoing war in Chechnya is only the most dramatic example. Both science and art must move between Russia and the world and between Siberia and the center, and both movements shape the meanings of the two domains.

In a sense, the cultural meanings of science and art have reversed under postsocialism. While during the Soviet era the "traditional" was either disparaged, destroyed, or appropriated—even a high modernist, revolutionary state has a use for tradition—it is now valorized, reclaimed, and reinvented. People are interested in folk arts and religious arts, at least judging by the attendance at exhibits and fairs in Novosibirsk. The reinvention or reclaiming of Russian folk and religious art has come to be seen as a sign of postsocialist progress, of a break with the repressive past. Science, by contrast, which was once so meaningful as a symbol of progressiveness and modernity, has become suspect, has seen its boundaries encroached upon by a variety of "pseudosciences," and has lost much of its prestige. Scientists in Akademgorodok feel doubly peripheralized—as Siberians and as scientists. In many ways, science has come to represent the decay and degeneration of postsocialism, while art is its success story.

Even though scientists claim to participate in a specifically Russian scientific tradition, 300 years of Russian science has left them as only partial and problematic members of the nation, because no matter how Russian their science is, in the end, it is

always global. Science in the context of the modern nation-state claims simultaneously to be nationally specific and to be globally mobile and transcendent of nation altogether; to be global, a science must first and always be local. Yet, oddly, in the hierarchy of science-producing nations, one's national science achieves greatness only when its nationality fully dissolves into the unmarked, universal science, located nowhere and without history. For Akademgorodok scientists—in a town where a sense of place was of such importance, in a country whose history has been so trying—this goal is one about which they can only be, at best, ambivalent.

Notes

Chapter One: Introduction

[1] In his 1998 book, Graham modifies or clarifies his stance. He asserts that social and cultural factors must be used to explain Soviet science's successes as well as its failures, and that Western science is equally culturally mediated. But he continues to measure successful science in any cultural context by the criteria of empiricism and accuracy, which more committed constructivists would argue are themselves culturally specific—and Western—values.

Chapter Two: A Space for Science in a Backward Place: Soviet Modernity, Siberian Otherness, and World Science in Akademgorodok's First Years

[1] This summary of Akademgorodok's origin is compiled from several sources: Lavrent'ev 1980; Marchuk 1997; Josephson 1997; *Pravda* 1957; Goriushkin 1993; Ibragimova and Pritvits 1989; Ibragimova 1997; Migirenko 1962, and my own interviews.

[2] Josephson (1997:5-8) provides a brief biography of Lavrent'ev, arguing that Lavrent'ev's Western-oriented education under the mathematician Nikolai Luzin, who came under fire in the 1930s for privileging Western science over Soviet, was the reason why Lavrent'ev was able to critically evaluate the deficiencies of post-WWII Soviet science.

[3] See Efimov 2000.

[4] *Rus'* is an ancient name for Russia.

[5] *Mikroraion* is often translated as "superblock," though Ernst May's German term for the concept as applied in Magnitogorsk was *siedlung*, settlement or housing estate (Kotkin 1995:109). I am using the English "microregion" both because it is more literal

and because "superblock" completely fails to capture the human, intimate scale of the housing in Akademgorodok's upper zone.

[6] As elsewhere in the former Soviet Union, the names of Akademgorodok's streets seem to change continuously. For the sake of clarity, I use the names of streets at the time of my fieldwork in 1998-99, though most of them were different at some point in Akademgorodok's history.

[7] Akademgorodok was neither the first nor the only Soviet new town to have single-family, stand-alone houses for local elites. Magnitogorsk, a Stalinist steel town built in the 1930s and designed by German architect Ernst May, also had a region of "cottages" for the "high society," including visiting American specialists, and was also planned into microregions. See Kotkin 1995: 125-127; Collins and Sprague 1974:23.

[8] Ol'ga Marchuk writes, "If you turn left off Academic Street, you will end up in the region of cottages spread out in a pine forest. Twenty-four cottages were inhabited by the families of academics and future academics. For the sake of fairness I must say that there were other cottages near the Institute of Geology, in which lived the administrative bosses of the constructors and the Presidium" (1997:35).

[9] Of course, this is not dissimilar to the Western scientific perception that physics and mathematics are the most fundamental sciences.

[10] These social clubs and cafes were not open to junior scientists, or were available to them only occasionally, after making reservations months in advance.

[11] Gordienko, Eremin, and Pliusnin (1997:56; Eremin, personal communication, 1998) argue that open exchange between scientists, which they characterize as *dayu-beru*—"I give, I take"—was in fact "a positive side of the strict formal organization of Soviet

science," and note that this interaction is one of the things Akademgorodok scientists often miss when they work outside Russia.

[12] *Gulag* is an acronym for *glavnoe upravlenie ispravitel'no-trudovykh lagerei*—Main Administration of Corrective Labor Camps.

[13] These remarks may have been referencing the Stalin-era *sharashki*—special prisons for scientists and engineers, which operated as research institutes. See Solzhenitsyn 1968.

[14] In turn, Akademgorodok may have inspired other countries to build science cities, notably Japan's Tsukuba (Traweek 1988, 1992, 1995) and the Mubarak City for Scientific Research under construction in Egypt (Stone 1994). Interestingly, both of these cities are located in rural or peripheral regions of their respective countries.

Chapter Three: Is Science Disappearing? Crisis, Capital, and Connections

[1] Sharon Traweek (1988:83-84) shows that a similar ideal, in which the scientist is wholly devoted to science without regard for everyday concerns, exists among high-energy physicists in the United States as well. Traweek notes that there is a gendered dimension to this model of scientists: male physicists tended to be married to women who choose not to pursue their own careers because of the perceived importance of the husband's. The wife of a physicist, then, shoulders the mundane concerns—housekeeping, childrearing—that the scientist cannot be asked to occupy himself with.

[2] Not everyone sold their *own* produce. One day I arrived at a friend's apartment with a large shopping bag full of corn I bought from a young man in the market near her house. He was the only one among the many sellers who had corn, and I was excited to have found it, as fresh corn on the cob is not so commonly eaten in Russia as it is in the US. In

fact, I bought all the corn he had—about two dozen ears. My friend laughed and told me that the corn must have been stolen under cover of night from a state farm, since in her experience individuals did not grow corn in their own *uchastki*.

[3] Verdery (1996:212) notes that such arrangements, in which bureaucrats and managers ("entrepratchiks") of the party-state created "parasitic companies" attached to former state enterprises, which then drained state subsidies and resources into private coffers, are common throughout the former socialist countries.

[4] Fuller (2000:119) points out that this is a problem in Western peer review systems as well, and notes that if they had faced peer review, scientific outsiders like Einstein, Darwin, and Faraday would likely have never been awarded funding.

[5] The economic logic by which socialist systems worked, and which resulted in a deep disconnect between production and consumption, is detailed in clear and compelling fashion in Kornai 1992.

[6] Other funding and logistical support, according to OSI's website, came from RFFI, the Russian State Committee on Higher Education, the Siberian Division of the Russian Academy of Sciences, Novosibirsk University, the Institute of Nuclear Physics, and the US National Aeronautics and Space Administration (NASA).

[7] Sassen (1999:51) notes that, among scholars of cyberspace, non-Internet users—particularly European intellectuals—tend to be more pessimistic, or at least less romantic, about the democratically subversive potential of the medium.

Chapter Four: Temporary Migration in the Permanent Crisis: Choosing Between Science and Nation

[1] Not only the Soviet state restricted scientists' international movement. Jessica Wang

(1999:274-279) discusses how, at the height of anti-communist hysteria in the US, the State Department, citing the McCarran Act of 1950, denied passports to US scientists (including Nobel prizewinning biochemist Linus Pauling) and visas to foreign (especially French) scientists who had been engaged in progressive-left political activities.

[2] One mathematician told me that many people joined the Party specifically so that they could travel abroad and expand their circle of scientific contacts.

[3] Armstrong visited Akademgorodok's Institute of Nuclear Physics on May 30, 1970 (see Krugliakov 1998:34). Aleksei was able to get close enough to Armstrong to take some close-up photos by posing as a journalist—apparently no one on the security detail that day thought to check identification.

[4] Shinkarev (1978: 377), for example, cites a similar reaction from Lehigh University physicist Raymond Emrich.

[5] The least mobile sector of the population was collective farmers (*kolkhozniki*), who were prohibited from leaving the farms permanently without explicit permission from the managing committee of the *kolkhoz*, which was in most cases difficult to obtain. In addition, enterprises were prohibited from employing *kolkhozniki* who did not have permission to work off the farm (Humphrey 1998:133). Although these rules were sometimes evaded, Humphrey notes that they did have the effect of making collective farms more or less stable communities through time (1998:132).

[6] Internal movement is still somewhat restricted, as residence permits are still required, and are difficult to obtain for large cities. Particularly in Moscow, there are vast numbers of illegal residents who have developed elaborate strategies for evading the police.

[7] The numbers of part-time "unfaculty" in teaching positions are even higher: in 1992,

nearly 45 percent in some disciplines, especially the humanities (Pratt 1997:265).

[8] In addition, teachers often find language to be more of an obstacle than do researchers (see Ninetto 2002).

[9] Ekaterina originally planned to buy a two-room apartment, but after the August 1998 crisis, real estate prices plummeted to such an extent that she was able to get an additional room for the same amount of money.

[10] Nikolai used the English word *friendly* here.

[11] *Toska*, which I have glossed as "homesickness" in this context, has a wide array of possible English translations, most connoting loss, sadness, and desire or longing. The 14th edition of Smirnitsky's *Russko-angliiskii slovar'* (page 641) offers, for example, melancholy, depression, yearning, anguish, agony, weariness, boredom, longing, grief, pining, and nostalgia, as well as homesickness. Ozhegov's widely-used *Slovar' russkogo iazyka* defines *toska* as "spiritual anxiety, despondency (*dushevnaia trevoga, unynie*)" and "boredom, and also (conversationally) something very boring, uninteresting *(skuka, a takzhe (razg.) chto-nibud' ochen' skuchnoe, neinteresnoe*)" (page 803). Thus, the word *toska* in its sense as "missing" someone or something can connote both anguished suffering and bored ennui. The sense of "homesickness" is often rendered by the phrase *toska po rodine*, or literally "longing for the motherland."

Chapter Five: Cold Fusion: Negotiating Universal and Particular in Russian Science

[1] For sociological accounts of the uproar surrounding the claim of University of Utah chemists Martin Fleischmann and Stanley Pons to have produced cold fusion in 1989, see Taylor (1996), Toumey (1996), and Collins and Pinch (1993).

[2] Palladium, used in most experimental cold fusion cells, is abundant in Russia. Its latticelike structure is too small for two deuterium molecules (contained in heavy water) to fit through; theoretically, according to cold fusion researchers, forcing deuterium with an electrical current to pass through a palladium lattice would overcome the forces that hold the deuterium nuclei apart, causing them to fuse. Eduard Dmitrievich's work on chemical transformations in minerals under geologic pressure probably led to his interest in cold fusion, as some geologists have claimed that nuclear fusion may occur at very low levels in rocks under great pressure deep in the earth.

[3] The 1998 Nobel prize for medicine was awarded to Robert Furchgott, Louis Ignarro, and Ferid Murad, American pharmacologists who discovered that nitric oxide acts as a signalling molecule in the cardiovascular system. The Nobel committee cited a number of potential applications of this knowledge, including treatments for atherosclerosis, sepsis, and cancer, diagnosis of inflammatory diseases such as colitis and asthma, and support of the lungs of intensive care patients, but the first and most well-known application has been in the impotence drug Viagra. (www.nobel.se/medicine/laureates/1998/press.html)

[4] In using the term "fundamental" I am lumping together theorists and experimentalists who work on problems aimed at producing models of nature without any specific practical application or goal in mind (following a local distinction between fundamental or basic [*fundamental'naia*] and applied [*prikladnaia*] science), but I am aware that the distinction between theorists and experimentalists is more salient in some, primarily "basic" fields, like high-energy physics (see Traweek 1988; Pickering 1984).

[5] Fundamental science had come under attack in a number of fields during Stalin's

regime. In particular, theoretical physics (especially quantum mechanics) and genetics were denounced as, variously, "bourgeois," "formalist," "Jewish," and "idealist." See Josephson 1991, 1992; Medvedev 1971; Krementsov 1997.

[6] Marina is referring to the dominance in Soviet genetics of the theories of agronomist T.D. Lysenko, who claimed to have proved that acquired characteristics are heritable, a position that, while scientifically unsupportable, fit nicely the Soviet state's efforts to effect a rapid and total transformation of individual consciousnesses. From 1937 to 1964, Mendelian genetics was in effect banned from the Soviet Union. Many dissenting geneticists were arrested as "enemies of the people," and Stalin's unquestioning support of Lysenko's theories led directly to large-scale crop failures. The Lysenko affair is generally blamed for a lag in Russian genetics by comparison to the West, the effects of which linger to the present. See Medvedev 1971, Krementsov 1997, Graham 1993:121-134.

In Akademgorodok, geneticists were chipping away at the authority of Lysenkoism somewhat earlier than in the USSR as a whole. The first head of the Institute of Cytology and Genetics was Nikolai Dubinin, who was invited to the post by Lavrent'ev himself. Dubinin and his colleagues were anti-Lysenkoists who "had bided their time in obscure posts throughout the empire in Lysenko's shadow" (Josephson 1997:83). Khrushchev, defending Lysenko, fired Dubinin and drove the institute's Mendelian geneticists underground: "Deprived of its own facilities for six years, the institute was forced to lead a half-legal existence in shared quarters" (Josephson 1997:83). Despite the survival of genetics during the years of Lysenko's dominance, Josephson argues, "decades of Lysenkoism and of access to rudimentary experimental

apparatus never allowed genetics to prosper" in Novosibirsk (1997:83). Now, "brain drain" is decimating the institute; the popularity, authority, and profitability of molecular biology and genetics in the West has attracted many of the institute's researchers.

[7] Patico (2001) discusses the ways Russian consumers distinguish between "Eurostandard" and Russian goods.

Chapter Six: "Civilization" and its Insecurities: Global Science, the State, and National Progress

[1] An earlier version of this chapter was published as Ninetto 2001.

[2] Gusterson (1996:68-100) shows that the practices of secrecy at Lawrence Livermore National Laboratory are very much a part of the habitual, everyday practices of scientists, even if the official system of security rules and regulations is "enforced ambiguously and complied with erratically" (1996:79). What may appear as a blasé attitude to outsiders may, Gusterson's analysis suggests, be the internalization and routinization of discipline under conditions of constant surveillance.

[3] It remains to be seen whether there will be a renewed interest in such programs after the September 11, 2001 attacks in New York and Washington and the anthrax-laced letters mailed to media and government later that fall.

[4] Caroline Humphrey (1991) and Katherine Verdery (1996) have astutely examined what it might mean to imagine the Russian "transition" as leading not to capitalism, but to feudalism.

[5] Porus (1998:12) argues that after Chernobyl, Russians can no longer unproblematically link science and progress in the ways they used to. Scientists themselves appear to be an exception to this rule.

[6] Martin (1991) suggests that little has changed in the way contemporary cell biology ascribes cultural models of male aggression and female passivity to sperm and egg cells, respectively.

[7] Pesmen (2000: 285-286) discusses Russians' common use of "Africa" and "Papua" to code "backwardness;" in their comparisons between Russia and these imagined wild, exotic places, Russia usually comes out looking the worse. Here Oleg uses "India" in the same way, most likely because Galina studied in India on an exchange program for four months just after graduating from university.

[8] Andrei Sakharov's (1968: 71-72) well-known "skiers" analogy suggests that national sciences engaged in competition with one another may be fundamentally incomparable. Sakharov gives the example of two skiers: the first gets off to a fast start, but must break through fresh snow and quickly tires; the second skis faster and gains on the first, but has the advantage of the first skier's tracks. Sakharov concludes that it is impossible to judge which skier is the stronger, as their respective tasks are so different.

[9] The roots of the Western ideology of scientific communication as open and free extend back to the early modern origins of experimentation. See, for example, Shapin and Schaffer 1985.

[10] The Institute of Nuclear Physics has a long history of international collaborations, going back to the 1960s (Josephson 1997; Krugliakov 1998).

[11] Russian scientists working in the US, as a category, do not seem to raise any particular security concerns, especially by comparison to Chinese scientists, as the Wen Ho Lee case shows. A few Akademgorodok scientists, though, did feel as though they were under particular surveillance or that their advancement and numbers were limited when

working in Western labs; a physicist told me about a US lab, where several Russian scientists were working, that had posted a sign in the elevator: "Russians: Please Do Not Speak Your Native Language In The Lab."

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