Would Trotsky Wear a Bluetooth?

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Magnificent, ornate subway stations; massive hydroelectric power stations producing copious quantities of electricity; collective farms with fields of grain stretching to the horizon; literacy, public health, and other campaigns that succeeded in a matter of years in increasing the well-being of all citizens; universal medical care and free higher education; and an end to unemployment—these achievements of the socialist nations of the twentieth century astounded many observers in the capitalist democracies because of the scale and speed of these feats. A number of observers worried that other nations around the world might succumb to the allure of communism, its unquestioned economic achievements, rapidly growing industrial output and agriculture harvests, as well as the seeming equality of all people, attendant atheism, collectivist ownership of property, and rejection of the sacrosanct profit motive. Yet the fall of the Berlin Wall in 1989 and the breakup of the Soviet Union in 1991 indicated that the socialist experiment failed to measure up to its promises of equality of men and women and minority nationalities, plentiful goods and services, an end to backbreaking labor, and industrialization without the human and environmental costs that befall England, Germany, and the United States in the nineteenth century.
Socialist leaders were convinced that the performance of technology under socialist circumstances—as Marx would say, with socialist productive relations—would far outdistance that under capitalism. They largely viewed technology as value-neutral, independent of the system in which it was created. Even if capitalist engineers and scientists remained politically suspect, the fruits of their labor—based on understandings and applications of universal laws of nature—could serve either the businessman or the proletarian. Indeed, technology was the main engine of progress. Bolshevik leader Leon Trotsky referred to technology, specifically the tractor, as a “cultural tugboat,” capable of bringing the peasant and worker into the modern era. For him, technology was the highest form of culture. Sergei Kirov, the Leningrad Party leader until his assassination in 1934 by order of Joseph Stalin, praised the internal combustion engine as worthy of prayer—and this in a nation of official atheism.

In spite of the centrality of modern technology to the economic successes and political legitimacy of the socialist experiment, and in the views of socialist leaders, we remain at an early stage of appreciation of its place in that history. The socialist economies—the Soviet Union, the countries of East Central Europe, North Korea, China, Cuba, and so on—all were at an early stage of economic development. Within a generation they succeeded, in one way or another, in catapulting themselves into the modern industrial world: in the case of the USSR, copying, importing, mimicking, or stealing advanced technology, often from the United States, Sweden, England, and Germany. The next generation of socialist nations drew heavily on the Soviet experience and sought to foster indigenous innovation and diffusion, with varying success, although alternative approaches were limited by the Red Army military occupation of Eastern Europe.¹

Because of the cold war, the history of technology under socialism has been skewed toward the consideration of military topics; to the space race, nuclear weapons, and nuclear power; and to issues of industrial development.² Some of this focus is understandable given the fact that the leaders of the socialist world incessantly touted rapid growth of heavy industry as the sine qua non of their political, social, educational, and ideological systems. Because of cold war competition between the two world systems, capitalist and socialist, many analysts have sought to prove that their technologies—their space shuttles, their rockets, their reactors, their concrete factories and smelters—were first to space, or largest in the world, or perhaps the most prolific in spitting out cubic meters and tons of ingots, prefabricated concrete forms, lumber, and so on. When scholars have considered engineering education, they have focused largely on
the contribution of technical specialists to increased output and other stratospheric achievements. They have given inadequate attention, therefore, to Marxist philosophy of technology, the attitudes of Marxian leaders toward technology generally and western technology specifically, and they have only indirectly considered the disjunction between the rhetoric of those leaders and the environmental and human costs of the chosen path to technological development. They have adequately investigated neither the worker’s relationship toward socialist technology nor how women workers, peasants, and white collar workers were confronted with the paradoxes of socialist technologies of work and home.

Elsewhere I have argued that the essential features of large-scale technological systems held across political-economic systems. American leaders insisted that their hydroelectric power stations, highways, railroads, and mining and smelting operations benefited the worker directly, reflecting democratic politics. Soviet leaders made the same claims. Yet what I called “brute force technologies” required brute force politics in both systems, and the social and environmental costs of technologies prevailed in both democratic-market systems and authoritarian-planned economic systems. In this book I again alert the reader to those features of technology that hold across systems. These include the leaders’ assertions that technologies served the masses, demonstrated the system’s superiority over other systems, and reflected democracy on the march. Technology in both systems was a symbol of progress and legitimacy.

Of course, in both capitalism and socialism the worker often paid the price for technological “progress” in low wages, poor housing, pollution, and perhaps even debilitating injury or death in the factory. Often, workers had to give up what was familiar and leave their homes in search of work, or they were forcibly moved to facilitate technology’s advance in a new road, railroad, or dam. Even more surprising, efforts to free technological development from unnecessary regulations led officials in several U.S. administrations to adopt policies strikingly similar to their authoritarian counterparts—postponing, weakening, or disregarding laws pertaining to worker safety and pollution control, redefining such ecosystems as wetlands, and so on—that put workers and the environment at risk.

Of greater importance to this book is how socialist technology differed from capitalist: what is socialist about socialist technology? My concern here is how the leaders of the socialist governments in Eastern Europe, the USSR, and North Korea failed to live up to their claims and rhetoric to create socialist societies of technological plenty and ease of labor, in which workers, peasants,
and managers alike engaged the production process in farm and factory with joy, and in which metaphorical sunshine prevailed rather than smoke and din. For a series of reasons, the technologies of socialism did not liberate the worker, and in fact the worker lived in greater squalor than his capitalist working brothers and sisters, in closer proximity to dangerous, highly polluting factories, and often without the right even to engage in job actions. First, technologies reflect relations of knowledge and power, so that the import, purchase, or theft of advanced western technology, in particular American and European technology, led to the import of unequal relations between worker and manager in socialism. Second, the socialist nations attempted to reach and surpass the technological West in one generation from largely poor agrarian to industrial societies. This led to investment decisions emphasizing industry over labor and heavy industry over light industry. Third, fearing imminent attack from fascist or other capitalist regimes, socialist leaders insisted on industrial development at all costs, ignoring investment in housing, schools, public health, and other sectors of the economy. Fourth, perhaps more than in other systems, socialist leaders saw large-scale technologies as symbols of their legitimacy that must be built by armies of laborers in short order. As a result (as the chapters in this book explore), they ignored worker safety; saw greater value in big dams, nuclear reactors, subways, and metallurgical factories than in housing and consumer goods (“concrete” not “kimchi”); and liberated women to work in factories but not from traditional family roles. They threw together dozens of smoke-belching factories that have destroyed the natural environment, leading to the creation of “industrial deserts.” Further, in developing client states, the USSR exerted a tremendous influence on the technological style adopted in other countries that often rivaled indigenous traditions and engineering practices.

I use the word socialist because, in spite of their claims, no socialist society achieved fully the essential features of communism, including a classless society and an end to alienation of the worker from the machine. Indeed, Nikita Khrushchev caused his successors great embarrassment by promising to achieve communism by 1980 in the Third Party Program passed under his chairmanship at the Twenty-Second Party Congress in 1961. Feeling embarrassment over the realization that the USSR would not come close to the 1980 target, Leonid Brezhnev nevertheless proudly defined another stage of economic development on the road to communism: “developed socialism.” This engendered the Soviet joke that yet one more stage awaited on the way to the glorious communist future: alcoholism.
In these essays I intend to begin a conversation to consider what was *socialist* about socialist technology and, in comparison with the technological experience in the West, primarily that of the United States, to determine what we can learn about the always crucial issues of safety, efficiency, justice, gender, environmental degradation, and so on, that are intimately tied to the development and diffusion of any technology but have surely been overlooked by analysts of the socialist experience. Socialist leaders and engineers recognized that technology has politics. They used technology as a tool of state power and legitimacy in their headlong pursuit of industrial growth and military might. During the cold war, spokespeople of the capitalist and socialist worlds insisted that their technologies were the best, fastest, and most efficient; that they benefited all citizens; and, in rhetoric if not in reality, that they demonstrated the ideological superiority and legitimacy of those regimes. Yet socialist leaders did not fully recognize—or publicly admit—that the paths they chose to achieve high output or to record great tonnages required a subservient relationship of the citizen to their plans and technologies. The socialist leader, engineer, and manager claimed equality of all citizens before technology, and they insisted that the worker would relish labor in clean, well-illuminated, and safe facilities. They believed that liberation of women from exploitation and patriarchal institutions would also accompany the diffusion of socialist technology. But the exhausting and dangerous experience of the worker in the factory, the deadening experience of the housewife/laborer at work and at home, and the subjugation of indigenous peoples to an inflexible ideology of modernization based on the unhesitating embrace of technology revealed quite another politics. In this book I investigate the rhetoric and reality of socialist technology in a series of settings and decades to evaluate the human and environmental costs of the technological experience.

**The Russian Revolution and Technological Culture**

Marxist philosophers, theorists, and leaders generally held a determinist view of modern technology as the engine of social progress and of its inevitable advance as the key to the transition from capitalism to socialism. Vladimir Lenin and Leon Trotsky saw technology as a panacea for the unfolding socialist society. Surprisingly, Lenin, Trotsky, Kim Il Sung, and other communist leaders shared the views of their American counterparts about the place of technology in modern society. It was, perhaps tautologically, an engine of modernization that enabled rapid transformation of agrarian societies into industrial powerhouses. It
freed workers from arduous labor. Rather than the smoke-belching, dark, and dangerous factories that existed under capitalism, well-illuminated, spacious, well-ventilated, and safe factories would arise under socialism. Crucial to the building of the socialist factory was the production of copious amounts of electricity; electricity would power agriculture and forestry as well. Other Marxist scholars stressed the apolitical nature of technology; the same technology that alienated workers in capitalism would liberate them in socialism. The productive relations, not productive forces, were the crucial factor. Did Marx and Engels share this enthusiasm for technology?

Marx and Engels argued in many places in their voluminous writings that the development of the productive forces—the means of production, tools, implements, machinery and equipment, and “technology” generally—drives the development of society. Adopting a seemingly technologically determinist argument, they put great store in socialism arising inevitably from capitalism when the productive forces have reached a given level of development. G. A. Cohen argues that Marxism is economically determinist, with the economy the driving force of history. Donald MacKenzie has taken exception with this view, concluding through a careful reading of *The German Ideology, Capital, Grundrisse,* and other works that relations of production can and do hold back the forces of production; people do matter in history. Further, according to MacKenzie, Marx argues that capitalism arises not from changes in technology, but from changes in social relations, for example, in the emergence of a class of propertyless laborers. MacKenzie notes that the technological form of labor of mill workers (the mill) had not changed; the fact that they did not own it had changed their relationship to the technology. A number of Marxist scholars eventually voiced critical evaluations of the place of technology in modern society. For example, Herbert Marcuse argued that technology was a potential tool not only of liberation but of enslavement in both capitalist and socialist systems that tended toward convergence. But while MacKenzie effectively demonstrates that Marx did not argue that “machines drive history,” one can argue that, according to Marx, technological change impels social change, and that transformation of the material basis of society is crucial to the socialist future. More important Soviet writers sanguinely asserted that machines do drive history. They expected to drive on tractors and other machines powered by electricity off into the socialist sunset.

Most Soviet leaders and political theorists never explicitly addressed technology from a philosophical, social, or political standpoint. We may infer from
some of their pronouncements that many of them believed that technology was the highest form of modern culture, and that engineers and specialists would contribute centrally to the construction of the socialist future. Accordingly, they recognized that America, with its assembly lines and mass production of so many different goods and services, and with its high degree of standardization of processes, possessed precisely this highest technological culture. Certainly Lenin, Trotsky, and a number of other leaders had no problem borrowing from the West, let alone stating the obvious: that the USSR lagged behind Europe and America in technology. What remained was to acquire that technology, through importation, copying and reverse engineering, turnkey agreements, espionage, and theft. In the Soviet period, leaders and engineers fetishized standards and mass production, with five or six basic designs serving most apartments and other construction. They created a unitary system where, for example, only two factories, Elektrosila and the Kharkiv Turbine Works, produced virtually all of the large turbogenerators for the entire empire, another three all of the tractors, and even one, Atommash, was designed to mass-produce eight pressure vessels and associated equipment for 1,000 megawatt (MW) electric reactors annually à la Henry Ford. There would be no wasteful competition or foolish duplication of effort.

The followers of Stalin had a more narrow view of technology and its masters. Socialist leaders grew to fear not only those bourgeois experts on whom they relied to ignite the engine of socialism, but ultimately those engineers who were entirely trained within the socialist system. They orchestrated show trials to punish engineers for alleged “wrecking” and sabotage of projects. They arrested and shot many of them. They worried about the technocratic impulse that had given rise to such phenomena as America, Incorporated, in the United States in the 1930s. Still, they recognized the need to industrialize rapidly on the basis of the world’s most modern technology. They established educational and research institutes to foster indigenous innovation, but they created so many planning, bureaucratic, and other obstacles to innovation that they often had to import critical technologies from the West or to reverse-engineer many systems, from airplanes to computers, with the result of a built-in and persistent lag. Because of the fear of financial, professional, or even criminal punishments, engineers were often afraid to push innovations with long-term promise if they meant short-term failures to meet output targets, and this hesitation led in a number of cases to rudimentary designs and inadequate consideration of safety or pollution features.
Marxist revolutions succeeded in agrarian economies, not industrial economies as Marx and Engels had anticipated. This had an impact on Soviet technological style by often requiring socialist engineers to play catch-up. Lenin asserted in *The Development of Capitalism in Russia* (1895) that Tsarist Russia had achieved the capitalist stage, a working class had formed, class struggle between the bourgeoisie and proletariat had intensified, and the nation was ripe for revolution. Yet many fellow Marxists disagreed with Lenin. Marx and Engels anticipated revolutions in industrial economies of plenty, not agrarian economies of want, where it would be an easier matter to create the workers’ paradise. Many Russian Marxists, most importantly the Bolsheviks’ major prerevolutionary rival, the Mensheviks, argued that it was premature to seize power and attempt to build socialism given the poorly developed industry and infrastructure, the relatively small and certainly unskilled workforce, and the fact that the vast majority of citizens were illiterate peasants who eeked out existence with traditional hand tools.

Modern science and technology, which were central features of industry and agriculture in such countries as Germany, England, France, and the United States, had had only a minor impact on the Tsarist economy. Russian industry to a great extent relied on technology transfer from Europe and still largely produced raw materials while importing finished goods. The backwardness of Russia’s military, transportation, and other sectors became fully noticeable during World War I. As for agriculture, no such thing as land-grant universities or systematic research existed. In country after country where Marxian revolutions succeeded, this lag in science, technology, and industrial development handicapped the attempt to build societies of plenty. The efforts to build modern industry; collectivize agriculture; fight off perceived internal and external enemies; establish social welfare nets, universal literacy, and education; and redistribute wealth fell short in so many ways. Granted, the USSR industrialized rapidly under Stalin, achieving in a few decades what may have taken longer in Europe. In spite of such achievements as production of iron and concrete, and later of *Sputnik* and tokamak fusion reactors, the workers remained poor, often lived in overcrowded and foul-smelling communal apartments if they had housing at all, and stood in lines for basic goods and services.

A number of leading liberal and leftist members of the Russian intelligentsia worried about the “backwardness” of the masses. By backwardness they meant the entire worldview of the peasant, his superstition and orthodox religious beliefs that made him resistant to change, his poverty, his lack of education, and
other impediments to improving agricultural production and extending the market from local to national and international arenas. They believed that modern, western science was a major tool in the struggle with backwardness. The playwright Maxim Gorky joined with the agronomist Klement Timiriazev in 1916 to form a mouthful of an organization, the Free Association for the Development and Dissemination of the Positive Sciences (known by its Russian acronym, SARRPN), with the stated purposes of overcoming the muzhik’s (peasant or, better still, country bumpkin) narrow worldview and making him a citizen in a world of unlimited horizons. In East Central Europe and North Korea communist leaders encountered similar challenges of economic lag and conservative resistance among peasants.

Because of the lag in technological acumen among the masses, the Bolshevik state became the prime mover behind the deployment of the machine and the factory, with the resulting technological style that placed the machine above citizen and had a decidedly negative impact on nature and worker alike. This attitude and impact spread inexorably from Moscow and Leningrad to Warsaw and Nowa Huta, Poland; Sofia and Dimitrovgrad, Bulgaria; Budapest and Szatmárnémeti, Hungary; Pyongyang, North Korea; and beyond. The central role of the state in technological development persists in post-Soviet Russia in the space and nuclear power programs. Technologies designed and imposed impatiently without citizen input worked with brute force, not efficiency, leaving behind huge, hulking factories, open pit mines, clear-cut forests, polluted rivers and streams, filthy air, and hazardous waste. The worker—both the male and female worker—was supposed to be the beneficiary of socialist technology but remained the exploited afterthought.

One can make a strong case for overriding similarities in the embrace of modern technology in the capitalist and socialist states of the twentieth century. In both systems state power was crucial to the processes of research, development, innovation, and diffusion. In both, large-scale approaches predominated in most sectors of the economy, from transport to energy, from mining to metallurgy, from food production to education. Engineers and scientists, as products of the Enlightenment, viewed nature with a longing to improve it for the benefit of humankind, and they did not lack modesty about their ability to do so, what I have described as “technological hubris” elsewhere. Many of them see technology as a panacea for the various ailments of society: poverty, scarcity, hunger, illiteracy, poor health, and so on. Drawing on the history of a variety of technologies in the socialist world, I investigate these utopian aspects of modern
technology, how socialist leaders ran smack into the realities of nations that lagged far behind their European and North American counterparts, how overriding political considerations deflected them from goals of using technology to benefit citizens equally, and yet the tremendous accomplishments of socialist states from East Central Europe to the USSR to Korea in transforming economic, educational, and social institutions literally overnight. In some cases, I offer implicit and occasionally explicit comparisons with the capitalist world.

Another question is to what extent technological choices facilitated or handicapped the efforts of socialist leaders, planners, and engineers to build socialism. Given that most of them believed that technology was value-neutral, a tool of great promise that might be abused (in capitalism) or used for the benefit of man and woman (under socialism), they believed it paramount to borrow technology liberally from the West, in particular from the United States and the European industrial powers, for application in hydroelectricity, metallurgy, transport, agriculture—virtually everywhere. They reveled in Fordism and Taylorism to increase production and productivity of labor. When they imported western technology, did they also import such constraints as labor-management disputes, problems in the training of personnel, problems in the effective operation of machinery and equipment, and so on? And, in developing “socialist technology”—what was socialist technology?—in what ways was it distinct from capitalist technology, if at all? The breakup of the USSR and the fall of the wall across Eastern Europe permit consideration of these and other questions, given the ability to engage in extensive field research, gain access to archives that were closed, and visit libraries and local and regional museums, all to get a better understanding of the social, political, and cultural contexts for technology. Recently, the leaders of North Korea have also permitted greater access to the nation, although it remains largely a closed society.

In the following chapters I explore the place of technology under socialism as a symbol, an engine of progress, and an all-too-real force of political, economic, and cultural change. I highlight the utopian aspects of the quest for modern technology to solve economic and social challenges that faced such nations as the Soviet Union, the People’s Republic of North Korea, and the newly socialist countries of East Central Europe in the postwar world. I evaluate the technological experience in the USSR, Eastern Europe, and North Korea according to the rhetoric of socialist leaders, not according to some arbitrary, universal standard, nor in order to prove that capitalism is a better system, yet implicitly and explicitly in comparisons with the technological experience in the
United States, in large part because those nations often measured their success in relation to the United States. Leon Trotsky certainly measured Soviet achievements against those of the United States. He saw uses for the most modern technology of his day—the airplane, the radio, the railroad, and especially the assembly line—as a panacea for Soviet backwardness. He used the printing press and the locomotive to secure victory as he rushed from breach to breach during the civil war as Commissariat of War and organizer of the Red Army.

Did modern technology liberate the socialist worker? Did the quality of life improve? Did the worker not gain universal health care, overcome illiteracy, abandon superstition, and become a citizen in civic society? Did a new ruling class form with new beneficiaries and new sufferers? Were local peoples and indigenous peoples and peasants forced to conform to new ways of life? Furthermore, weren’t the social, environmental, and cultural costs of the headlong push to modernize as great as those under capitalism? If this was the case, what does this tell us about the power of technology to shape our lives?

Shockingly, the socialist states failed to live up to the rhetoric of their claims that technology serves the masses in ways that are more complete and better than in capitalist systems. Rather, the socialist citizen endured a lower quality of life or standard of living, less attention to worker health and safety, and inadequate concern about housing, the environment, and health care. In chapter 1 I answer the rhetorical question about whether Trotsky would wear a Bluetooth. Yes, Trotsky believed that the embrace of advanced technology was the path to communism. It would raise industrial production, overcome the abyss between city and countryside, and promote a modern worldview among the peasantry. Trotsky’s writings remain largely ignored because of the successful effort by Stalin to excise him from Soviet history. But an examination of his views reveals that Trotsky was not alone in recognizing how far the country lagged behind the West. Yet if other leaders shared this view, they achieved no consensus as to what steps to take to overcome the lag. During the Stalin era, if the Bolsheviks worried about the lag and insisted on making it up within a few short years, they also adopted autarkic economic relations that handicapped the effort to industrialize rapidly.

 Millions of Ukrainian peasants perished during the collectivization campaign. Millions of others perished in gulag labor camps intended to provide cheap labor for road construction, forestry enterprises, and mining and smelting operations. Although the human and environmental costs of industrialization and collectivization were undoubted, Soviet leaders insisted that the East European client states follow the same paths. The similarities concerning rapid in-
Industrialization in Poland, Hungary, Bulgaria, and other countries extended to technology—machinery, equipment, factory organization, urban planning, and so on—everywhere, but especially in newly built “hero” or “production” cities dedicated initially to Stalin (chapter 2). As a consequence, political choices, resource constraints, and fascination with mass production conspired to create a landscape eerily recognizable to anyone who has visited socialist spaces in Hungary, Bulgaria, Romania, Poland, or Eastern Germany, even fifteen years after the fall of communism. A kind of grayness of life prevailed east of the Elbe River because of the “proletarian aesthetics” of the technologies of life and work. Grayness extended to modern nuclear technologies as well.

Stalin’s legacy spread far beyond the borders of the USSR to technologies and countries into the twenty-first century, particularly on the Korean Peninsula (chapter 3). Great Leader Kim Il Sung embraced large-scale technological systems for the Democratic People’s Republic of Korea that reflected the Stalinist emphasis on heavy industry, massive scale, and collectivized agriculture. This emphasis resulted in depravations that rival Stalin’s depravations of the Ukrainian peasant in the 1930s. Rather than provide good, inexpensive housing or adequate food, Great Leader emphasized the need for independence from all economic entanglements. This required tremendous self-sacrifice in housing, health care, transportation, and food. Metaphorically, the citizen had to give up kimchi, the hot pickled vegetable delicacy of Korean culture, for concrete structures.

A surprising continuity exists in socialist technologies in Russia in the twenty-first century. For a variety of reasons, the Russian nuclear ministry, RosAtom, is striving to rejuvenate the nuclear industry that stagnated after the Chernobyl disaster. The reasons include a geographical disjunction between fossil fuel resources, mostly in Siberia and the Far North, and population and industrial centers, mostly in European Russia, and a desire for continued status as a nuclear power among Russian leaders. Indeed, nuclear technology is one of the few technologies that Russia can sell on international markets, and it is a major actor in the development of the Iranian civilian nuclear power industry. Even more, Russian engineers maintain Soviet-era hubris about the promise of nuclear power. The design and construction of floating nuclear power stations, with the promise of sales to Morocco, Namibia, and elsewhere, suggest great continuity with the Soviet past, while greater openness in dealing with nuclear safety indicates changes in practices and attitudes. As a comparison with the nuclear industry in the United States shows, however, in order to be viable, engineers must
address openly and honestly the problem of waste disposal (a sixty-year-old problem); the need to site reactors far from population centers for safety; and the true costs of construction, operation, and transmission. Without a strong state and government subsidies, nuclear power may simply not be economically viable (chapter 4).

Nuclear power was only one of the major contributors to a dreadful legacy of pollution and hazardous waste. The legacy of socialist technology is most obvious in its environmental impact, especially in metallurgical and mining operations. From Eisenhüttenstadt in Eastern Germany to Pyongyang, from Murmansk and Severomorsk on the Arctic Sea to the Aral Sea of Central Asia, the socialist worker toiled not in the glorious garden of plenty but amid dumps of radioactive waste, heavy metals, and petrochemicals, not in field rows of grain, but in erosion. The engineers who brought about this situation had a variety of fields of expertise—including pipe fitting. They carried out a self-proclaimed war on nature to force it to operate according to plan. The result was industrial deserts—vast regions devoid of much vegetation yet home to millions of people—in such regions as the Ural Mountains, whose industrial development is the focus of chapter 5.

Chapter 6, on historical, cultural, and psychological aspects of worker safety and risk in Soviet society, asks why the metaphorical hard hat found no role in socialist industry. The Stalinist emphasis on industrial production ensured that the workplace, the public sphere, and the home would all permit risky practices and behaviors not tolerated in other systems. Both manager and worker came to see accidents as unavoidable, if unfortunate. Their fatalism contributed to an epidemic of injuries and to their indifference toward the frequency. Perhaps no one seriously believed that greater safety would result from greater “discipline” in the face of crippling machines and exhortations to stop drinking. The call for discipline reflected an effort always to blame the worker, not the machine, while drink made monotonous and dangerous work occasionally bearable.

And what of the female worker, the female collective farm laborer, the housewife whose responsibility it was to get the drunken man off the sofa and out the door to work, to dress the children and get them to school, and to provide a communist upbringing on the way to raising pliant, devoted citizens? What of the dual role of the socialist woman to maintain the home and hold down a second full-time job? I am a novice on questions of technology and gender, but I have tried in the last chapter of this book to engage the reader on the paradoxes of socialist liberation, pro-natalist policies, and technology in Stalinist Russia.
In violent worker demonstrations in East Germany in 1953, in revolutions of 1956 in Hungary and Poland and in the Prague Spring of 1968, and in a series of lesser known uprisings in the USSR, many workers and socialist intellectuals sought the establishment of “socialism with a human face.” They wished to build socialist society on the foundation of modern technology. They believed that true equality of all peoples, and of men and women, would arise on this foundation. Perhaps their goals were utopian, as were their views of the way technology would liberate them from poverty and want, darkness and cold, even despotism and control. The lesson of these chapters is that public involvement in decisions about investment of scarce resources may be the only path to the creation of technologies with a human face. We must also have openness—greater openness—about the place of technology in all polities if human and environmental rights are the goal. Yet for such Bolshevik leaders as Lenin and Trotsky, Poland’s Boleslaw Bierut and Bulgaria’s Georgi Dimitrov, and of course North Korea’s Kim Il Sung, technology was no more and no less than a solution to the great problems facing the early USSR.

The effort to mobilize the labor force and yet to plan every aspect of economic, political, and ideological life led to a series of inherent contradictions in the economies of East Central Europe. They became economies of shortages, lines, and bottlenecks, and then campaigns to solve the bottlenecks. The planned economies that so faithfully strove to embrace advanced technology gave birth to a new dialectic, for a campaign in one area meant a shortage in another; a shortage in one area led to criticism of economic managers and party leaders now “responsible” for that shortage who might be accused of malfeasance, deviations, or even sabotage and wrecking; and all of this exacerbated tension between the center and the localities, the managers and the workers, the workers and the peasants, and anyone else who was paying attention. The worker and the peasant paid attention to the glories of socialist technologies and the shortages of necessities that accompanied their construction.

Socialist technology differed from capitalist technology literally and figuratively in a variety of ways and for a variety of reasons. Socialist leaders directed it toward solving industrial, extraction, smelting, grinding, pouring, and other important tasks that they placed before the worker. They paid less attention to housing, road, sewerage and water treatment, communications, medical, and other technologies. Choosing autarky under Stalin, they had to seek indigenous sources of innovation. They succeeded in areas of importance to the power of the state—rocketry, nuclear power, metallurgy, and so on. They employed rudimentary but functional designs and approaches. But they often failed to embrace
designs that placed emphasis on safety and environment. They were fearful of the
influence of so-called bourgeois experts and of continued reliance on the West
for the innovative push. When they turned to capitalist technology through
trade, espionage, and reverse engineering, they committed the economy to playing
a constant game of catch-up and surpass—or “reach and surpass,” as the Stal-
linist slogan exhorted them. They generally resorted instead to campaigns to
make the best of capital and labor inputs without considering how they might
employ either input more rationally. If a tractor, skidder, hoist, turbine, or some
other technology worked, then it worked well enough. The pressure on engi-
neers to meet targets discouraged them from seeking innovations that might slow
plan fulfillment in the short run but would have paid dividends in the long run.

It may be that the employment of slave labor in the gulag system of the 1930s,
1940s, and early 1950s convinced leaders and engineers alike of the expendabil-
ity of human life and of the feasibility of relying on brute human power equipped
with hand tools and insufficiently provided with machines. How else can we
understand the fact that Russian historians and chroniclers of the construction
of the White Sea–Baltic Sea Canal to this day praise the slave laborers for fig-
uring out how to organize themselves to use wheelbarrows and sledgehammers to
cut and move stone?

Of course, functional technologies have universal attributes based on various
laws of physics and chemistry, geology, hydrology, heat engineering, and so on.
Strength, weight, durability and availability of materials, local climatic and geo-
physical conditions, and so many other factors require that all successful canals,
dams, buildings, airplanes, reactors, steel mills, etc., resemble each other or they
would not work. Thus, when Stalin and his followers insisted that socialist tech-
nology existed, he meant that it served the worker, not the exploiting class, and
that it could be mastered in a short time for universal application within the
countries of socialism. But in this way, once again, the socialist system discour-
aged innovations that took into consideration geographic, seismological, cli-
matic, and other differences. Leaders feared spontaneity not only in politics, but
in engineering, and thus contributed to the belief that one technology was ap-
propriate not only for an entire sector of the economy but for the entire country
and the entire socialist world. This led them frequently to run roughshod over
local, regional, and national programs, and roughshod over the worker, male or
female, as they tried to force them to conform to technological norms estab-
lished in Moscow, Warsaw, Kyiv, Leningrad, Budapest, and Sofia state commit-
tees for standards, construction, and engineering.