Conclusion

InterNyet

This is the story—told for the first time in any language in book form—of a particular path not taken into the modern network age. Soviet scientists—led by Viktor Glushkov and his OGAS team between 1959 and 1989—could have developed a computer network project that brought about significant political, economic, and social changes. Had they done so, the current global network culture could have looked very different. Why did these network entrepreneurs not succeed? On what factors did the tragic twists of the tale we might dub the Soviet "InterNyet" hang?[1]

Faced with a struggling command economy, attempts to revitalize Soviet cybernetics, and a search for societal reforms after Stalin's bloody governance, Soviet researchers proposed as early as 1956 that computers should be used to control economic decision making. No one proposed that these computers be connected, however, until Anatoly Kitov, the military scientist who had "discovered" cybernetics in 1952, proposed in 1959 that civilian economists use existing military networks to solve economic problems, for which suggestion he was promptly dismissed from the army. At the same time as Kitov was making short-lived network proposals, Gluskov teamed with him and others to propose in 1962 a complex three-tiered hierarchical computer network that would transfer economic information along as many as, in its most ambitious proposal, twenty thousand local computer centers, several hundred regional centers, and one central computer center in Moscow. Over the years, this prohibitively expensive proposal was scaled down (and back up) to match the political climate. Nevertheless, the goal of this interactive, remote-access network remained the same—to reduce the coordination problems that had long beset the command economy. On and off over the next twenty years, Glushkov's OGAS team met resistance from at least five groups: (1) the military wanted nothing to do with

civilian affairs, especially when that meant fixing the command economy that already fed its coffers; (2) the economic ministries (particularly the Central Statistical Administration and the Ministry of Finance) wanted the OGAS Project under their control and fought to the point of mutiny to keep competing ministries from controlling it; (3) the bureaucrats administering the plan feared that the network would put them out of a job; (4) factory managers and factory workers worried that the network would pull them out of the informal gray economy; and (5) liberal economists fretted that the network would prevent the market reforms that they sought to introduce. Instead of a national network, dozens and then hundreds of local computer centers—or automated management systems (ASUs) were built in the late 1960s and 1970s, although they were never connected. Thus the dream of networking Soviet socialism into a brighter communist future did not come to pass. This conclusion remarks on why this never happened and then hazards a few concluding comments and pronouncements.

There are many reasons why there were no such Soviet networks. But first is a reason to care about this story. Soviet network history invites us to think about the historical conditions of national computer networks without the assumptions behind the rise of current global digital networks. In other words, the OGAS story is a test case in how network projects could have developed in societies that were not preoccupied with markets, democracies, and personal liberties. Network projects without political and economic liberal values are not condemned from the start. Instead, after these cases are examined on their own terms, they can help control for, challenge, and rethink the conditions of possibility that are assumed to govern digital global networks. The Soviet network projects did not fail because they did not possess the engines of particular Western political or technological values. They broke down for their own reasons.

And these reasons were not the popular Western misconceptions. The standard criticism of Soviet technological backwardness (technological "behindness" would be more accurate) cannot describe on its own what prevented Soviet civilian networks from developing because the Soviet military possessed functioning long-distance computer networks since the mid-1950s and local area networks were linking ASUs since the mid-1960s. The technical know-how was in place. Nor can it be that computer networks are somehow inimical to closed cultures because computer networks have been serving military, authoritarian, and cybersecurity cultures for decades. That said, the history of Soviet technology overflows with technical problems—such as a lack of interoperable hardware or software for ASUs. Almost never, however, does the root explanation for Soviet technological problems lie in

sheer technical incompetence. This advanced superpower state provided strong support for science.[2] The root problems with technology are anything but technological.

Beyond the Binary: Arendt and OGAS

Why was there no Soviet Internet? This book holds that leading Soviet scientists and their supporters—especially the OGAS team lead by Viktor Glushkov—tried repeatedly but could not network their nation with computers due to entrenched bureaucratic corruption and conflicts of interest at the heart of the system they sought to reform. McCulloch gives us a fresh term: *heterarchies* of conflicting private interests stalemated virtuous attempts to reform the hierarchical economic bureaucracy. If the Internet is not a thing but an agreement, as the phrase goes, perhaps the Soviet Internet is not a thing but a disagreement. (There is often more to learn from the latter than the former.)

This thesis, which expands on the standard interpretation, can be taken further. The history of the OGAS Project is akin to the history of a miscarried effort to perform an IT upgrade for the corrupt corporation that was the USSR itself. USSR, Inc., in other words, functioned as the world's largest corporation, and its private interests were internal market capture, the avoidance of the transaction costs of the capitalist market, and the concentration of power to itself. The political need for the OGAS Project appears to represent the grander inability of the hierarchical state structure of socialist politics since Marx to build and sustain innovation and reform in the age of industrial and information capitalism that the Soviet Union straddled. The network reform effort did not take into account its own effects on the formal command economy because the OGAS Project ran against the private interests of those who governed within an informal mixed economy. The perpetual conflict of self-interests that were internal to the Soviet system helps describe the continuous institutional tumult, frequent and ineffectual reforms, and currency of informal influence that underwrote the supposedly staid Soviet bureaucracy. The root problem here appears to be not the cold war binary between international economic systems but the binary that was internal to the Soviet economic system. Hidden, informal, and often vicious administrative networks prevented public, formal, and potentially virtuous computer networks from taking the Soviet Union online.

This view that the Soviet Union can be understood as a corrupt corporation also has its limits. In theory, it reads Soviet network history as it would read a Western state. In practice, it risks using the liberal economic values of

market, state regulation, and individual interests to criticize socialist values of state-managed economies and collectivized interests—in effect, rehearsing the very political economic divide that it seeks to revise. This view falls short of explaining the motives and behaviors of other relevant actors. Although it depicts the perspectives of both the internal reformer (especially the scientists and administrative supporters of the OGAS Project) and the external critic, the interpretation does not describe why the militarized state, economic bureaucracy, and citizen workforce actively opposed ideologically faithful network projects. Why were their private interests in play at all, how can that question be described without rehearsing the exhausted cold war showdown between markets and states, and how might our answer to that question help focus critical attention on the contemporary scene?

Let us tweak our terms to state the situation more clearly. The OGAS Project could not achieve its end goal of reforming the Soviet economy because the hulking households of private power—the military, the corporation, and the state—compelled it into serving their private economic, not public political, interests. Consider the language of Hannah Arendt's *The Human Condition*—a landmark work of political theory that introduces its disenchantment with normative liberal values with a discussion of *Sputnik* and the nuclear age, the two ingredients that, once combined, could spell instantaneous planetary annihilation. For Arendt, the distinction between the public and the private is not the liberal economic opposition of the public state and the private market[3] but a classical (Aristotelian) distinction between the public as an expression of the *polis* (where actors gather "to speak and act together") and the private as an expression of the *oikos* (Greek for *household* and the root of the word *economy*) (where actors inhabit a domain of animal necessity and are compelled to pursue their own interests for their survival). For our purposes here, the *oikos* includes several institutional actors that usually are thought to be "public" yet that seek private interests for their own survival: the Soviet military men, with state backing, wielded the threat of nuclear destruction and personalized violence on the modern world; the Party leaders pursued their own interests independent of the people; the economic bureaucrats secured their own welfare apart from the welfare of the economy; and the citizen workers tried make ends meet in their private lives. The *oikos*, or the domain of the private, saturated the larger OGAS situation, and the history of modern networks, including but not limited to Soviet attempts, can be reread as a tale of private forces run amok.

These terms reframe our portrait of the challenges that were faced by Soviet network projects. The problem was not that the state failed to regulate private interests but that (according to Arendt) Marx put on a pedestal the

speechless laborer (*animal laborans*), not the enlightened actor. The socialist state served and scaled up the most private and basic of human needs but no more. For Arendt, the equality of workers is tautological in the sense it equates people on the basis of animal need, and the equality of citizens should be sought by leveling unequal humans to create a better common world. She also targeted elsewhere the teleological violence rendered by Hegelian historical ideologies, such as Marxist-Leninist dialectical materialism: any state convinced of its own historical path is sure to bring ruin to itself and others.[4] In fact her critique of what she calls the rise of the social cannot be reduced to the ruinous rise of socialism (whether Soviet, German national, or other form) because her terms describe a range of modern advanced states that have led the ongoing global scientific-technological revolution.

For the purposes of this book, the rise of state and market as parts of a larger private household suggests the purpose of the command economy in both theory and practice. In theory, it collapses private economic interests into matters of state, and in practice, the state bureaucracy collapses into the institutional turmoil of private actors. We can also see that Communist Party leaders worked feverishly to secure their own power above all other concerns and that the military shielded the Party, spied on foe and friend alike, cannibalized resources, and separated itself from the national economy. The name of the Komitet Gosudarstvennoi Bezopasnosti (KGB) (Committee for State Safety) is similar to the name of the Committee of Public Safety during the Reign of Terror in the French Revolution, except that the Soviet version openly protected the state, not the public. The minister of defense made a related point in 1965 when he rejected any collaboration with the nascent OGAS Project. He identified the "healthy body" that his military served not as the public but as "the government mechanism," calling the economic welfare of the nation "a scab."[5] In view of the divisions in the Soviet *oikos*, this odd metaphor that the military was the mind of the state body (not that the state was the mind of the economic body) appears suddenly sensible.

Arendt's concerns about the escalation of private interests over public ones also explain why the OGAS story was not a people's history and why Glushkov addressed his last book to children, admitting that the workers were not prepared for the OGAS. Soviet citizens lacked mechanisms for mobilizing political will at scales larger than the dinner table, dacha, and press editorial, so they had few chances to observe a public hearing of the OGAS Project and far fewer chances to live a public life (or *vita activa*, as Arendt fancied it). By rotating the private-public distinction from one of market and state (and the state-market contradictions of the cold war

economic order) to one of survival and political action, our vocabulary maps onto more private divisions in the Soviet household. The problems besetting the modern human world are far bigger than can be understood from any particular pole of the cold war and may even be shared between the two, as Arendt observed while she was in the middle of it.

Her argument comes with limitations. Like most political theory and commentary, it offers no concrete proposals for reforming the current situation. It idealizes a *polis* of ancient Greece that did not exist. It also gave no credit to the meaningful, vibrant, and even mischievous private lives that Soviet citizens experienced in the workplace, such as the Cybertonia case study (although Arendt notes that social gatherings that aggregate private interests can be charming but never glorious, a fitting summary of almost all virtual worlds and social media ever since). Moreover, her framing of the rise of the social cannot be used to describe the asymmetric inequalities of capitalism and social wealth because of the limitations of her founding image of the *oikos* as rooted in the private household. That image of the *oikos* would need to be subjected to a feminist philosophical critique of the power inequalities that are buried in the history of the household and domesticity—a critique that falls outside the scope of this book.[6]

To admit disillusionment with the normative values that organize modern society is not necessarily to despair of the modern world itself, which has brought with it extraordinary and positive advances. But it is an attempt, like *Sputnik*, to glimpse new perspectives of the modern networked world and then to rejoin the search for ways, like Soviet cybernetics, to harness private power into the service of improving the human condition. A few general comments on the modern world and its networks follow.

Contingency, Failure, Politics

Not only could our networked world have been otherwise—it can still be otherwise today. One of the values of negative histories such as this one is the reminder that most technological projects "fail" or never come to a decisive end (perhaps both failure and repair occur in the long run).[7] The history of technology shows that most technological projects are not consequential at all—at least in the conventional sense. Technological designs are continuously not realized in operable material form and reproducible prototypes, and the social processes that sustain scientific discovery rarely arrive at a clear consensus. The historical record layers documentation of the fossils and footnotes of "dead" media and their iterant afterlives.[8]

This great apparent failure rate in innovations should help shape our considerations of the causes and consequences of modern technologies, such as computer networks. Contingent histories also help focus public debate better than do popular histories of technology that parade about hackers, geniuses, and geeks marching to the Whiggish beats of technological progress. In negative histories, failures, even epic breakdowns, are normal. Astonishing genius, imaginative foresight, and peerless technical wizardry are not enough to change the world. This is one of the lessons of the OGAS experience. Its story places the conventional concepts of technological successes and failures on the wobbly foundations of the accidents of history. The historical record is a cemetery overgrown in short-lived technological futures: stepping off its beaten paths leads us to slow down and take stock before we rush to crown the next generation of technologists as agents of change.

Perhaps the most hopeful reminder to would-be agents of social change is also the hardest: the OGAS team understood that technological reform is also political reform. A well-connected, talented team spent a generation fighting for the political life of a significant project—and those efforts were not enough. Pity the scientists (and popular observers of science) who believe that because we can isolate technical values in our minds, memos, and mathematics, the alchemies of technological development will triumph. Technologies are both artifacts and agents of change—a point that has been made since Max Weber's elective affinities (between Protestantism and capitalism) and Ludwig Fleck's social construction of science.[9] In the multivariable calculus of social reform, the only thing more certain than the injunction that one must try to change the world (and media technologies are one among many ways to do so) is to admit there is no guarantee that any given effort ever will.

A Nod toward Comparative Networks

How does the Soviet case compare to others? The OGAS tale intimates that among the many variables in midcentury network projects—in this case, Soviet socialism, cybernetic science, and decentralized networks—the most important is the institutional environment for technological development. Local institutional behavior is the concrete or quicksand into which the history of networks is poured. Unlike the civilian-oriented Soviet OGAS Project, the Chilean Cybersyn Project, and the (commercial) French Minitel network, the military-initiated U.S. SAGE and ARPANET projects had major effects on civilian industry and society. If there is a virtue to the postwar American military-industrial-academic complex, perhaps it is that the

complex allowed for cross-sector knowledge exchange and innovation transfer. The failure of the Soviet knowledge base was arguably that the Soviet military consumed resources and hoarded innovations from the civilian economy.

Secondary to that argument, international communication networks precede international computer networks. Without international cybernetic science discourse, the local dialects of systems science in the USSR, Chile, and the United States could have taken different paths and perhaps found design analogies for national networks other than the human mind (for example, the socialist network as a nervous system in the body of the nation and the liberal network as a neural network in the brain of the nation).[10]

The other huge socialist state anchoring the Eurasian steppe makes a good comparison point. The People's Republic of China is, like those states in the former Soviet territories, a socialist state that is now devoted to developing mixed capitalist markets without democracy. Both China and Russia today operate according to informal networks of influence (*guanxi* and *blat*) and are commercializing international computing innovations. The sleek Baidu search, Youku video, and Sina Weibo microblogging platforms imitate and improve the functionalities of Google search, YouTube video, and Twitter. Both states also implement state controls to control national computer network traffic. The most impressive of these is the "great firewall of China," which permits elites and technical experts an escape hatch from the Chinese walled-garden version of the global Internet.

International communication networks also helped to jumpstart and also consign to limbo local computer network projects. This account highlights three case studies: first, Anatoly Kitov's discovery of Norbert Wiener's *Cybernetics* in a secret military library set into motion an internal transition in Soviet scientific discourse; second, Donald Davies and the British Telecom industry prompted the U.S. government to revisit Paul Baran's RAND research on distributed packet-switching networks; and third, news of the ARPANET going online in 1969 prompted the Politburo to revisit the decade-old OGAS proposal in 1970. In each case, international communication networks (even when they were closed or secret) initially prompted internal institutions to revisit concurrent innovations closer to home. As it is in war, so it is in technology: rivals mimic each other mimicking each other. Even so, cold war research networks were evidently too fixated on the international exchange of knowledge among distant friend and foe. Baran openly published his research in the early 1960s, for example, which appears to have delayed his supervisors from attending to his work for several years. Soviet scientists would have discovered Wiener's *Cybernetics*

years earlier, and likely to far less sweeping effect, had the book not been banned (and had Stalin not repressed enemy sciences so vigorously). The OGAS proposal probably would have received a fairer public hearing had it not been a secret state project (and had there been a robust Soviet public to share it with). Stretched between contending households that were fueled by the same knowledge anxiety, cold war communication research networks left few researchers with honor in their own lands. In cold war science research, it appears that the more distant and closed the discovery, the easier our narcissism; the closer and more open the discovery in states of emergency, the easier our negligence.

Making Modern Network Culture Strange

The story of the OGAS Project reveals a network culture whose design values—the cybernetic nervous system of the nation, socialist technological utopianism, and decentralized computer networks—now appear to be peculiar to its own time and place. This sustained glance at the strangeness of socialist network projects helps make familiar the foreignness of the modern network culture in historical relief. Consider a hardy perennial of new media thought, the politics of technological utopia, for the OGAS Project was nothing if not a projection of an intrepid socialist future. Socialist politics are no strangers to expansive, sometimes wild flights of imagination about the bounteous blessings of technology. Although technological utopianism belongs to social projects of all types, the socialist tradition boasts a special breed of thinking, including the French socialist utopian thinker Charles Fourier (whose early interests in architecture and engineering were thwarted and who later worked briefly in Paris as head of the Office of Statistics), Karl Marx (who theorized about a socialist revolution near the end of the Industrial Revolution in London), Nasser in Egypt, Tito in Yugoslavia, Nehru in India, the Fabian Society and Labor Party in the United Kingdom, Allende's Cybersyn Project in Chile, and most recently the (independent) Pirate Party of Sweden.[11] In each of these cases, the socialist impulse seeks to flatten out social relations, structurally reorganize society, automate and ease labor, roll out statistical (state) accountability, and gather knowledge that lightens, lifts, and liberates people (even though the effects of such technological utopianism often leans toward shades of dystopia).[12] By imagining the OGAS as a means to a brighter networked Communist future, its architects brought upon the project the full brunt of the *oikos*-led inequalities that drove the administration of Soviet socialism. Perhaps the cardinal mistake of the socialist imagination of technology is not to dream the celebrated

dream of social justice but to bulldoze the rutted world of human relations with the private interest logics of the *oikos* (military, corporations, states, and individuals that seek only their own survival).

The Soviet OGAS figured out the "why?" (socialist utopia) but not the "how?" for their large computer network projects, and researchers at the U.S. ARPANET knew the "how?" (packet-switching networks) but not the "why?" of modern networking. The Soviets' missing "how?" lasted for the duration of the project, and the absence of the Western "why?" remains both its historical attraction and the contemporary challenge to computer network culture.

The Western network "how?" has sped many unfinished attempts at answering the network "why?" The technical openness of packet-switching networks to diverse actors has afforded the Internet astonishing and well-documented successes of technical energy, commercial innovation, and cultural creativity. At the same time, the open-ended "why?" that has permitted such generativity has also tolerated the entrance of private forces that are interested in seizing possession of the operating systems and communication infrastructures that mediate the globe. What Arendt observed in the age of *Sputnik* still holds true in the age of smartphones: our technological capacity exceeds our political will to negotiate the terms of that capacity. Our networks are no longer flat (if they ever were) but rather are a consequence of network openness. Our lot, like that of the Soviets, is to live in complex heterarchical power arrangements. Open network cultures are slouching toward tethered devices, nonportable applications, walled gardens (closed platforms), mobile contracts, and much else online and off. At the individual level, these developments further feed and speed the parallel encroachments of private communication forces worldwide, especially the recently documented unprecedented surveillance of national and international communication networks by governments and corporations in the United States and the United Kingdom. Surveillance is the massification of private attention and the antithesis of public attention (the first is a form of global private labor, and the second, personal action).

Two generations ago, a few Soviet actors thought that the OGAS was a good idea. Many more thought that it was a bad idea, and the many won out. A generation ago, many Western observers thought that the Internet was a good thing. The many this time were wrong. The Internet is not a good thing, and it is not a bad thing. It is not a thing at all. The Internet is many things, and many of those things are far less pleasant than cat videos (cat videos feature creatures that, like many human spectators online, enjoy the asocial separation that the screen affords them from their viewers).[13]

This time, however, a few complex private forces are winning out, despite the delusions of digital utopianism or quietism. Whatever else the Internet is (interoperable, generative, nonproprietary, a platform for other platforms), it is not public. As the history of the OGAS indicates, when the public will to confront the high costs of modern network cultures is absent or abused, private forces gladly rush in.

Consider the consequences of this Arendtian argument for modern debate about publicity and privacy. It suggests one way of rereading the term *privacy* in light of rise of the private logics of the *oikos*. Just as the English term *publicity* now belongs to the corporate practice of public relations, so too does the term *privacy* (well before its legal coining as the right to be left alone in 1890) belong to the private concerns of the state and the market, not the person.[14] In this sense modern privacy is not about the proper spacing of the individual self and the other. It is about the sum of private institutional interests that adjudicate the proper spacing of their institutional homes (*oikos*) and the public. War rooms, closed sessions of the Senate, and boardrooms are where modern-day "privacy" resides, in the sense that these are the institutions most interested in "the state of being privy to" the lives of the public. Perhaps due to a mistaken understanding of privacy that emphasizes the individual, not the institution, scholars find the term in "disarray" almost unintelligible outside a particular institutional context, and other languages have trouble translating the English-language lexeme. Perhaps we have misunderstood the term *privacy* all along.[15] It is not what Soviet citizens, under surveillance, never enjoyed. It is the rise of the compulsive power of private forces themselves, which the USSR (among other modern states) was permeated with. Private parties (including *the* Party) and private secretaries (no matter how general or particular) directed organizational forces (however informal, decentralized, and unpredictable) that were bent on securing their own survival at the cost of others. The term *privacy* has not been refeudalized so much as it stands for the colonial expansion of the fiefdoms of institutional power.

Perhaps privacy scholarship should not seek to recover lost individual privacy (the right to control the disclosure of personal information or alternately the right to be left alone) but should critique the malignant growth of institutional privacy (the right to own and its expansion to immortal entities) whether the all-seeing eyes and ears of Google, the National Security Agency, an OGAS-led command economy, or other institutions engaged in massive amounts of information processing (in each example, the economic liberal distinction between private corporation and public state obscures more than it reveals). Glushkov's computer networks would have made the *oikos* of Soviet state-corporation even more privy to the

work lives of the Soviet people. In a sense, this is precisely our lot now: the networks that organize *oikos* powers are not hierarchical or decentralized (like the institutions that check them). They are ambiguous, multiple, and heterarchical. They vie for our attention, time, and action. In a time when corporations roam the earth as legal persons, the shadows of Soviet networks are cast on the walls of the present. We might add to Adam Smith's famous warning that businessmen seldom meet without plotting against their consumers: generals, politicians, and the clerisy fare not much better when rolling out the privatizing logic of domination and need. With few exceptions, large networked organizations are inclined to restrain each other only when they interfere with one another in the common race to privatize—or to use—the user. Since before *Sputnik*, our skies, screens, and social lives have been filling with the drones of private network power.

Then and now, the polity and policy landscapes are not identical, and we should not imagine them to be so. The private interests that kept computer networks from being built in the USSR have since hijacked democratic potentials in global networks. The basic institutions that stitch together the social and political fabric of democratic society—the rule of law, functioning courts, equitable tax compliance, Madisonian checks and balances, human and civil rights, an independent press, and private institutions—underlie the often ambiguous and always limited moral foundations of all modern information societies and economies, even informal economies.[16] The patronage socialism of the Soviet Union (like the crony capitalism of modern-day Russia) was missing many of these elements (it had no rule of law, no predictability of procedure, no regulated financial environment, no bankruptcy law, no antirust law, no courts for managing property disputes, and no virtuous regulation of inseparable market and state), but this routine criticism risks ignoring the bigger picture.

Perhaps the choice in the era of cybernetworks has never been between the state and the market as the dominating metaphor for modern networks. We need not accept as final either Glushkov and Cooley's analogy of the state as a nervous system (and the nation as its economic body) or McCulloch and Baran's analogy of the nation-state as a brain (and the network as its neural net). Perhaps the way forward begins with criticizing both cybernetic network analogies for privileging the image of the private mind as supreme. The dominant metaphors for midcentury networked economies—market and state—move us no further than the cybernetic, and ultimately human, hubris that the human mind organizes the world.

Although the landscape between the OGAS Project and the Internet today varies widely, our hopes and despairs pivot on the same things that

concerned the creators of the OGAS Project. There is a potential moral authority in institutions and communities to check or caution the large and unscrupulous actors that are intent on networking the world with the creeping private logics of domination. We face new challenges, even as we continue to target the cruelty, corruption, and compulsion of the world that bears us—in every desire to limit the private mind of the *oikos*, there is already a drop of our common human condition.

The OGAS story, therefore, is not only a tale that took place long ago and far away. It can be seen as an allegory of our own lot today. The private forces that were hard at work in the OGAS story are also hard at work in the modern media environment. Informal networks abound, for better and worse. We should not gaze at the OGAS Project from a comfortable distance but realize how close its story hits to home. A world of difference separates all allegories, but looking in the rearview mirror of history, the distance between networked private powers is often closer than it appears.

Coda: A Contingent Legacy of Modest Networks

Beneath the modern imagination of smooth steel-brushed machines interlinked by wires, signals, and smart protocols pulse the vibrant social networks of relations whose virtues and vices have long been part of the human condition. To understand modern networks is at root an exercise in social self-discovery. Our network world shares with the fate of the OGAS Project the vices of self-interest, apathy, back-stabbing, vain imaginations, stupid conceit, *poshlost'* (roughly the "self-satisfied vulgarity" of the petty businessman and administrator, such as Chichikov in Gogol's *Dead Souls*), and all the rest. At the same time, it also shines brightly with generosity, engagement, visionary insight, genius, *byitie* (another untranslatable Russian term meaning roughly "being," "apperception," or a higher state of conscious reality that is resonant with Heideggerian being and scriptural genesis), and much more. The networks binding the human condition can be neither separated nor reconciled. Modern observers can no sooner state the optimal conditions under which humankind has or will best enter the age of global computer networks than we can solve the puzzle of the human condition itself, although the attempts to solve the puzzle are worthwhile. Given that there is no magic solution to these questions, we might do best to seek a modest and cautious perspective on the causes and consequences of the Soviet network experience.

Let us return for a moment to an earlier sense of the word *technology*. In English usage until the early twentieth century, technology was not the

hard stuff of tractors and circuits boards but was the study of industrial arts, crafts, and techniques that organize, reveal, and frame the modern world.[17] The suffix *-ology* in the term *technology* also appears in the term *biology*, the study of life. Perhaps by understanding *techne-* as the artifacts of acculturated human culture (behavior, gesture, oral, literate, print, industrial, mass, and information media and much else), the term *technology* gives momentum to the study of the crafts of social life.

The Soviet network history teaches several lessons. First, the ambitious, far-seeing faith in the social consequences of technology is no guarantee of technological change in the modern information age. Presentists who look back at the science fiction, fact, and factions of Soviet cybernetics may divine in these pages prophetic prefigurations of modern-day cloud computing, e-commerce, big data processing, and much else. Opportunists may be tempted to enthuse about recuperating the unrealized possibilities of macroprocessing, natural language programming, a self-governing economy, and perhaps even digital immortality, although they will do so in their own tones and cadences. Second, Marx got the point of technology wrong. He wrote that the relations of production—the social relations that all people must enter into in modern life—are fundamental to all else. Another lesson of the OGAS Project is that far more substantial than the hard stuff of technology (cotton mills, industrial factories, hydroelectric dams, nuclear power plants, and the factory and federated computer networks examined here) are the subtle, mundane techniques that continuously work themselves out in the complex relations that constitute being social. Finally, the critic Raymond Williams was right to attend to what might be called the means of sociocultural production, not just the means of industrial production. We can push the point further: the technological means of world production are not just the mass media of newspaper, radio, television, and computer but every commonplace device, understated technique, and learned skill—from a baby's first vocalization to the experienced insider's knowledge of a bureaucracy's peculiarities. These technologies and techniques, creatively read, produce and manage a more genuine base for understanding the arrangement of relations in modern society.[18]

That subtle and modest techniques hold sway over sophisticated information technologies is a clear moral to this story. Letters to leadership found their own random paths in the packet-switching labyrinth of Soviet state. Everything—sudden success, interception and dismissals, evasive telephone calls—came in reply. In fact, the first civilian-military national network proposal anywhere was scuttled because a supervisor did not intercept one letter but did intercept the next (such was the post in the Soviet military). The

early institutional alliances between the Central Economic-Mathematical Institute and the Institute of Cybernetics drifted apart over differences about the scale (micro and macro, respectively) at which the mathematical techniques for modeling economic relations should be carried out. The OGAS Project—the ambitions of technocratic economic reform by network—was nearly approved and funded except that two chairs at a committee meeting went unoccupied. National technical networks connecting factories were approved but never realized at the same time that local computer centers in those factories were built but never interconnected—all because of coordination problems (our coordination problems are as great today as their solutions are subtle). Sophisticated chess algorithms outmaneuvered long-term national planning methods and even the occasional chess master, but never to the same effect as a simple notational system kept on index cards (and now online databases). Ministerial ecosystems of paperwork collided and proliferated, and the committee meeting—that omnipresent black box of bureaucracies (even written minutes leave opaque the logics of small-group decisions)—remains among the most undertheorized and delicate techniques governing modern private power networks. Trains and telephone calls were taken and missed; doors opened and locked; hearts and minds pushed to their limits—and sometimes beyond.

The history of Soviet networks showcases something more enduring, powerful, and subtle than a plumbing and sounding out of the stately heights of electronic socialism (although it also does that). It reveals the modest media on which our social relations turn—labyrinthine committee reports and paper trails, bureaucratic and budgetary categories that scrimmage careers, the semantic vagaries of public press releases and precise accounting, empty chairs and scattered letters, accidental meetings in hallways and dachas, and all the other errata of the constant communication and infrequent communion that arrange our lives. When I set out to research the Soviet networks, I hoped for historical insights into the media of tomorrow, but what I found instead were dusty, derelict, and sometimes dispensable residual artifacts of a technological vision for a labyrinthine state now largely forgotten. Not only was I wrong to look for a peek into the future in the archives of the past, I was wrong to think I had not found them. Because the techniques of paper knowledge and print culture continue to accumulate in the scattered anecdotes and artifacts that make up our societies and the stories we tell about them, they too will likely endure as the media of tomorrow. These are the media technologies, writ large, that govern the computer networks and other props of the current information age; theirs are the modern media networks that matter most.

The OGAS Project, like most information age projects, has more of bureaucracy than bits to it. The history and perhaps the future of the current information age will have less to do with the next generation of futurist technologies than it will with the networks of actors and institutions governing the conditions of social relations and the use of knowledge. It would be a mistake to conclude that this far-seeing generation of Soviet scientists and technologists did not realize a network that was capable of changing the world. Their dreams and ambitions were realized not in the networks of steel and silicon chips but in the networks that long have and will continue to govern our lives. The All-State Automated System Project lives on as a story refracted in the records of print culture. In the end, the story told here tells its own moral and method. It asks us to distinguish and extract it from the swirling and glorious strangeness of all scientific ambition that buoys the modern world, exert good will to tolerate it in its oddities, critique it not for what it has not accomplished but for its courting of the irresistible enchantment of modern-day network visions, and finally perhaps even to grow used to it, to wait for it, and to have one day admitted its passage and place into the greater living network of ideas and institutions that make up the modern world.

Such is the uneasy history of Soviet networks. Networks are not the application of a theory of networks, nor are they the children of hard gadgetry and pragmatic engineering. They are the technical arrangements of social relations that have and will continue to change the world. Much remains appropriately and implicitly contingent and unpredictable in the historic making and unmaking of global networks. May the story of the Soviet networks and their troubled paths into an alternative information age stand as sentinel cautions for our networked times. It is not in the nature of daring ideas and the routines of history to come to an end, although such is the lot of books.