5 The Undoing of the OGAS, 1970 to 1989

No single actor could either make or undo the OGAS (All-State Automated System) Project. The hidden networks governing the Soviet state were far too complex and heterarchical to have had any single cause. (Most multiactor networks involve complexities that are impossible to express in linear form.) This chapter briefly outlines and analyzes the slow struggle over the political execution of the OGAS Project in the 1970s and its aftermath in the 1980s. The prolonged struggle and decline at the hands of various forces helps to reveal the complex heterarchical forces that governed the Soviet state and attempted to carry out economic and technological reforms. The commentary that follows speaks by analogy to modern observers who are concerned with attempts to reform complex political economic systems and also reflects on how attempts to create formal computer networks are sometimes thwarted by hidden social networks.

In this chapter, I chart the institutional apex, plateauing, and decline of the most ambitious attempt to provide the Soviet nation with its own form of networked socialism. The chapter begins by rehearsing the 1970 Politburo review of the OGAS proposal, the ministerial defiance and contingent institutional interests that extinguished its approval at the last minute, and the subsequent dozen years (1970–1982) of attempts by Glushkov and his team to revitalize state and then public interest in a networked socialist economy. The chapter then takes a detour through an unlikely case study before becoming reflecting on the central theme the military-civilian divide that separates hierarchical and heterarchical institutions in the Soviet Union. This case study examines how militarized strategic thinking—in the hands of one of the great Soviet chess masters—materialized into a stillborn attempt to plan the nation's political and economic strategies with early Soviet computer chess.

Ministry Mutiny

The strategic move that eventually stalemated the OGAS Project did not come from abroad. It came from within. By the summer of 1970, Glushkov, Ustinov, and others had mobilized enough support for a fresh review of the OGAS Project by the highest committees in the land. All signs, except one, suggested that the timing for an economic network renaissance was finally right. The Central Statistical Administration (CSA) could no longer delay its "finalization" review process for the OGAS proposal, which formally ended in 1966 but had lingered in approval limbo ever since. Simultaneously, the successful evidence of the local foundations of the EGSVTs (Unified State Network of Computing Centers) was gaining more and more support, especially as Party leaders searched for an untried approach to economic reform in the wake of the faltering Liberman reforms. By the time that Viktor Glushkov and Nikolai Fedorenko's partnership drifted into a rivalry over the wisdom of economic reform by macronetwork (Glushkov's OGAS) or micromodeling (Fedorenko's SOFE, or System of Optimal Functioning of the Economy), the EGSVTs had become such a promising project that established rivalries were reigniting over whose administration might best oversee its development and command the funding streams that came with it. By early in 1970, Vladimir Starovsky's Central Statistical Administration and Vasily Garbuzov's Ministry of Finance began to jockey for position to command the administration of the OGAS Project. These two powerful ministries began contending not just for the project but against one another in an effort to limit the competitor from securing massive funding.[1]

The most vocal opponent to the OGAS proposal in 1970 was also the man who officially had been charged with its care and finalization for the previous seven years. Vladimir Starovsky, the head of the Central Statistical Administration, "harshly objected to the whole project," Glushkov recalled in the late 1960s—out of opposition not to the economic reform but to the prospect that the Central Statistical Administration would have to cede control over some element of the governance of his administrative turf (economic statistics) to future OGAS directors. Starovsky rejected the remote-access portion of Glushkov's proposal (a precursor to "cloud computing"). If realized, the OGAS was going to provide access to information and processing power to any authenticated user anywhere on the network. Even though the permission hierarchy for authenticated users presumably could still reaffirm the strong hierarchical structure supporting his administration, Starovsky opposed what we now recognize as a cloud computing provision as being politically "unnecessary" because the Central Statistical

Administration was "organized by the initiative of Lenin" and already does everything that Lenin asked of it. Reversing Lenin's original question, "What is to be done?," Starovsky concluded that, because of Lenin, "Nothing needed to be done."[2]

From 1964 to 1970, as the CSA and Ministry of Finance were butting heads, another front of intellectual opposition arose against the OGAS Project from its own closest allies for economic reform—liberal economists. In 1964, a pivotal year for reform, Liberman, Belkin, Birman, and others were able to convince Kosygin that, in contrast with the nearly 20 billion rubles that the OGAS was predicted to cost, the cost of liberal economic reform would be "no more than the cost of the paper on which the resolution of the Council of Ministers would be printed."[3] Glushkov was caught unprepared for this counterattack, having already admitted to Kosygin that the whole network project would be net profitable but would prove to be more costly and complicated than the space and atomic programs combined. Nonetheless, the OGAS reform had the strategic advantage of not abandoning Marxist planning principles for liberal market ones and of promising to pay for itself quickly (and Glushkov foresaw a reimbursement of 5 billion rubles by the end of the next five-year plan).

The Day of Reckoning: October 1, 1970

Several factors led to the Politburo's review of Glushkov's OGAS proposal on October 1, 1970, which was the closest that the Soviet Union ever came to approving a national network of its own design. In the midst of a larger space and technology race, the unexpected revelation that the ARPANET—the first American civilian nationwide network—had gone online one year before, on October 29, 1969, suddenly hastened the search by top Party leaders for a viable local national network project. Knowing that the ARPANET was worrying Party leadership, Glushkov approached A. P. Kirilenko, then secretary of the Central Committee, to ask the committee to revisit the ideas in the previous proposal. Kirilenko welcomed the idea and asked Glushkov to "write down in detail what has to be done," said A. P. Kirilenko, "and we will create a commission." Glushkov wrote in reply: "The only thing I ask is not to create a commission. Commissions operate on the principle of subtraction of brains, not summation, and they can wreck any project."[4]

Nevertheless, Party leaders insisted on creating a commission. Glushkov declined to chair it, and so V. A. Kirillin, then chair of the State Committee for Science and Technology, was appointed as chair with Glushkov as his

deputy. The oppressive Soviet interventions in Czechoslovakia sent a wave of recentralization, or rather antidecentralization, criticism through the state, and some Gosplan officials openly criticized EGSVTs proposals. The Politburo also felt pressed to consider and approve meaningful reform projects for the drafting of the Twenty-sixth All-Party Congress and the starting of the eighth five-year economic plan in 1971. As a result, the Politburo twice reviewed and approved without change Glushkov's OGAS wordings for the draft portion of the Twenty-sixth Congress. A preliminary meeting of the same review commission (which had dragged its feet since 1964) concluded in 1970 that the full OGAS, including the economic management part, should be approved for top-level review, although who would steer it after it was approved remained strategically unresolved. In particular, it was left unclear whether further "finalization" by the Central Statistical Administration would be required.

This time only one person on the review commission did not sign onto the newly revived OGAS proposal—the minister of finance, Vasily Garbuzov, who was the primary opponent to the CSA. Garbuzov refused to sign because he did not want the OGAS to fall under the control of his competitor institution, the Central Statistical Administration, whose director, Starovsky, also temporarily withdrew his support for the same reason several years earlier. Glushkov and his team deliberated over how to proceed. He did not want to submit his proposal to the Politburo for review if it lacked unanimous support, but he also knew that he could not resolve Garbuzov's concerns. Thus hedging its bets and hoping that the U.S. ARPANET would sway the Politburo into action, the commission (unofficially led by Glushkov) submitted the proposal for review.

That fateful gathering took place in Stalin's former office in the Kremlin. As Glushkov walked into the long, red-carpeted room, Kirillin, one of Glushkov's supporters in the Politburo, leaned over to whisper that something had happened but he did not know what. Before he could clarify, Glushkov noticed that something was out of place: the seats of the two most powerful men who should have been in the room were empty. General Secretary Brezhnev and his prime minister, Aleksei Kosygin, did not see eye to eye about many things, but on the matter of network economic reform in the fall of 1970, they appeared to be ready to make an uneasy truce. As it happened, Secretary General Brezhnev, who was a technocrat with an engineering background and was favorably inclined to sweeping technocratic solutions (especially those that disadvantaged orthodox economic planners), happened to be away for the day in Baku attending the fiftieth anniversary of the Soviet rule in Azerbaijan. Glushkov might have

counted on Kosygin's support, but he too was away, pressing hands among the mourning crowds in Cairo at Gamal Abdel Nasser's funeral, who had died of a heart attack two days earlier. Both men—the first and second in command, including the economic reformer who was most likely to lobby for the OGAS Project—could not attend the fateful meeting because of calendar contingencies.

Despite these key empty seats, the meeting began well enough. Without Brezhnev and Kosygin in attendance, the meeting was conducted by the Stalinist-era Mikhail Suslov, who was famous for resisting radical changes as the "Chief Ideologue of the Communist Party" and a consummate behind-the-scenes operator with seats on both the Secretariat and the Politburo. Given this steely reputation, he began encouragingly by saying nothing against the proposal. Glushkov was then invited to speak, which he did briskly before responding to a series of questions to the apparent satisfaction of all involved. This went on for less than half an hour, until several higher-ups began to speak positively about the project. Baybakov, one of Kosygin's deputies, volunteered that if the Politiburo should make him head of the State Planning Committee (Gosplan), he would eliminate or merge three ministries so that staff could be found to support the OGAS Project. In this deft maneuver, Baybakov managed to relay Kosygin's enthusiasm and promote his own career. The Minister of Instrument Making, Automated Equipment, and Control Systems (Minpribor), K. N. Rudnev, had extolled the virtues of information technology in economic planning in 1963, signed the document, and commented off the record that the timing might be bad.[5] A chorus of voices countered these hesitations with unambiguous support of OGAS.

Just as it seemed that the committee might be nearing consensus approval, the minister of finance, Vasily Garbuzov, stood up. According to Glushkov:

[Garbuzov] entered the stage and addressed Mazurov, Kosygin's first assistant. He said that, well, he went to Minsk as directed, to examine the poultry farms. At the so-and-so farm, the workers designed a computing machine on their own. I laughed out loud. He shook a finger at me and said, "You, Glushkov, shouldn't laugh. We are discussing a serious issue." However, Suslov interrupted him: "Comrade Garbuzov, you are not the chairman here, and it's not up to you to control the proceedings of a Politburo hearing." He shrugged and self-confidently continued, "The machine can perform three programs—turns on music when the hen lays an egg, turns lights on and off, and so on. This increased egg production at the farm." So he suggested that first we should implement these machines at all the poultry farms in the Soviet Union and only then could we even begin thinking about silly projects like a nation-wide system.[6]

At that point, Garbuzov, who served as minister of finance for another fifteen years until his death in 1985, made a counterproposal. The OGAS should be released from the control of the Central Statistical Administration and put under the direction of a new institute that should develop (as the commission had insisted back in 1963 as no more than the EGSVTs barebones technical network) computers with lights that flash on and off. "Everything related to economics and the elaboration of mathematical models for the OGAS, etc.," Glushkov recalled, "was wiped off."[7] From a technical perspective, Garbuzov argued, the EGSVTs approach made political common sense. A technical network would avoid the minefield of economics, politics, and ideology without foreclosing the possibility of introducing relevant economic programming into that network in the future. This technical vision, Garbuzov argued, was the most risk-averse way forward.

Behind the veneer of Garbuzov's technical pragmatism lay a more self-interested motivation for this counterproposal. Having not been able to secure the OGAS for his own ministry, he preconditioned his technically reasonable counterproposal on the fact that a new institute should be developed to oversee the OGAS. If his ministry could not have the OGAS, then no other existing administrative entity should have it, he reasoned. After all, by what other way can a minister reduce the bureaucracy except by creating a new bureaucratic body to do so? By so specifying, Garbuzov sought to streamline the network development and submarine the chances that this competitor organization, the Central Statistical Administration, had of securing the massive funding streams and political gravity associated with commanding the management and automation of the command economy.

As the Politburo discussion ensued, the consensus slowly shifted from Glushkov's OGAS in favor of Garbuzov's EGSVTs counteroffer. At last Suslov intervened, concluding the discussion with executive authority: "Comrades, perhaps we are committing a mistake by not adopting the project fully, but it is such a revolutionary improvement that it will be hard for us to realize right now. Let us do it that way, and we will see later how to proceed." Suslov then asked what Glushkov thought, to which he responded pointedly, "Mikhail Andrevich, I can only say one thing: if we do not do [the full OGAS] now, then in the second half of the 1970s the Soviet economy will encounter such difficulties that we will have to return to this question regardless."[8]

Intrigue and unconfirmed speculation abound about how Garbuzov's Ministry of Finance managed to turn the Politburo against the OGAS that day. Prime Minister Kosygin, who probably would have pressed for a consensus in favor of the full OGAS, may even have chosen to attend

the Nasser funeral to avoid having to cast a negative Politburo vote on the OGAS decision. Two years after the decision, in 1972, Glushkov heard rumors about the apparent backstory behind Garbuzov's counterproposal. Before the October 1 Politburo gathering, Garbuzov purportedly sought a private meeting with Prime Minister Kosygin to convince him that if the CSA were allowed to govern the OGAS national project, the CSA would grow so powerful that it could wrest control over economic matters from Kosygin himself and the Council of Ministers, ceding it back to the Central Committee.[9]

If the OGAS was approved, the minister of finance argued to Kosygin, the Central Statistical Administration would surpass even Kosygin in economic power. Garbuzov almost certainly did not make this warning out of good will or concern for Kosygin's position. His ministry had done the most to undermine Kosygin's political reforms during the prior five years. Since 1965, the Ministry of Finance had informally refused to implement the Kosygin-Liberman reforms, thus encouraging discrediting criticism of the reforms before they could take full effect. The winning argument appeared to be a contradiction: Garbuzov contended that if Kosygin did not act to preserve the status quo, Garbuzov's competitor would strip Kosygin of the power to make economic reforms. Faced with that option and ceding the OGAS Project to the Ministry of Finance, Kosygin appeared stuck, although whether Kosygin actually believed Rudnev's argument does not matter compared to the result. From late 1970 until his retirement in 1980, Kosygin never moved to unmire the OGAS Project administratively.

Such were the moves and countermoves that were at work behind the administrative end game of the OGAS Project in the Politburo. A more generous reading upholds the possibility that Kosygin, the great liberal economic reformer, did not wish to yield to Garbuzov but nonetheless felt compelled to do so because a disgruntled Garbuzov and his ministry might sabotage any of Kosygin's future attempts to make economic reforms, whether or not the OGAS Project was governed by an independent administration. For Kosygin, the decision to neglect the OGAS could have been the best way forward in a lose-lose situation of mutually assured ministry mutiny between the CSA and the Ministry of Finance—short of risking his own power to make economic reforms. Because of the consequent ambiguities, every administrator had to engage in a form of entrepreneurial negotiation among their private plans, their competitors' plans, and the state plan. This tangled heterarchy at the top of the heap led every administrator with a stake in the decision into a competition with his neighbors. Historical contingency played a role, as well: perhaps there was to be no OGAS that

day simply because two seats were vacated by a general secretary who had to attend a planned celebration and a prime minister who had to attend a funeral. At least Kosygin could wash his hands of having to make any top-level decision to advance the OGAS.

The OGAS Project was neither fully rejected nor approved. Instead, the Twenty-fourth Party Congress in April 1971 agreed with the Politburo decision that the ninth five-year plan (1971–1975) would establish some skeletal semblance of the OGAS, including 1,600 ASUs (automated systems of management); expand computer production by 2.6 times; and establish a technical network, the EGSVTs, across the nation. The EGSVTs, in this iteration, were to connect all higher-level branches and departments in the planning administration, develop regional networks, and connect and consolidate the regional networks to the higher-level network. The proposed details in 1971 were scaled back closer to the initial 1963 EGSTVs proposal levels—with twenty to thirty regional centers and the piecemeal incorporation of the national economy lurking in the background.

The OGAS Project in Repose

Having secured partial approval for the second time in a decade at the hands of a top-ranking commission but being no closer to his goal, Glushkov soldiered on in his commitment to introduce some kind of technocratic economic reform. Despite the authorities (the three words that he used to title his memoirs), Glushkov and his team installed ASUs (automated systems of management) in local factories with the hope of one day connecting them. Between 1970 and 1977, Glushkov and his team offered up a variety of decentralized network designs, although these proposals never satisfied a wide range of relevant parties.[10] A Ukrainian computing pioneer, Boris Malinovsky—who for his technical and historical achievements should be remembered as the dean of Soviet computing memory—claimed that "Glushkov's monumental efforts constantly ran into a wall of indifference, misunderstanding, and at times, animosity in the top echelons of the command-administrative system." According to Malinovsky, the Soviet higher-ups who never publicly criticized Glushkov were Prime Minister Kosygin and Defense Minister Dmitry Ustinov, although the proposal also elicited resistance from lower-level figures.[11] Nonetheless, after years of politicking on behalf of the OGAS Project, Glushkov convinced the CSA to reinstate the word *OGAS* into the 1976 report on its "Main Directions"—and breathed new life into the core idea of a Soviet industrialist network that united automated control systems across national economic branches.

A year later, in 1977, the state decided to declassify the OGAS Project, meaning that the OGAS was no longer a state secret. This decision reflected the project's declining strategic significance to the state as well as a shift in Glushkov's long-term campaigning. Before 1977, promoters accepted the ban on public discussion in part because it meant that the secret project was vital to the highest political echelons. But this secret classification also served its opponents in the state because public circulation and promotion of the OGAS could have curried public favor for what could prove to be a career-threatening reform. After the lifting of the top-secret clearance, however, this could change, and Glushkov successfully petitioned *Pravda* newspaper editors to begin a campaign to promote the network project with his article titled "The Matter of the Whole Country" in 1980 (although Malinovsky notes in the English translation of the dual-language *Store Eternally*, without clarification, that the published version of the title was actually "For the Whole State").[12] The article's publication in *Pravda* implies a mixed public relations victory because appearing in the nation's flagship newspaper meant that its editorial board, the Central Committee itself, had deemed the project to be worthy of public discussion and not one of its prized state secrets. (The conclusion to this chapter returns to the issue of public discussion.)

With a sizeable audience for the first time, the OGAS Project diversified quickly into a number of complex possibilities in the hands of leading academics such as Glushkov, V. A. Myasnikov, Yu. A. Mikheev, and others. Under their leadership and assignment to build a technical network that connected local factory control systems, a number of associated subprojects arose, including the ACPR (the automatic system of planning accounts, or *avtomatizirovannaya sistema planovyikh raschetov*), ASGS (the automatic system of state statistics, or *avtomatizirovannaya sistema gosstatistiki*), the ASUNTP (or automatic system of management of scientific-technical progress, or *avtomatizirovaanaya sistema upravlenia nauchno-tekhnicheskim progressom*), and the ASUMTS (automatic system of management of material-technical supply, or *automatizirovannaya sistema upravleniya material'no-tekhnicheskogo snabzheniya*).[13] The subsequent multiplication of associated ASU systems and subsystems in the late 1970s and early 1980s attests to two underlying trends—first, a general academic (public) interest in the OGAS Project across planning, statistics, science-technological revolution, and supply institutions; and second, a splintering or at least division of that overlapping interest into subsystems according to preexisting complex relations between branch, regional, and national economic planning interests.

The movement to "ASUify" the nation in the 1970s never met with considerable success. Given that the introduction of an ASU to a factory or

enterprise costs on average about 800 thousand rubles (or roughly just over $1 million U.S. in the 1970s or over $4 million U.S. in 2016), ASUs were introduced slowly and steadily in the late Soviet Union. According to one account, as few as twenty-nine ASUs were introduced between 1971 and 1975, thirty-two between 1976 and 1980, and thirty-four between 1981 and 1985. Another report holds that from 1971 to 1975, the number of ASUs grew almost sevenfold, although, even if the OGAS Project were suddenly approved, they could not easily be unified.[14] Other accounts mention even higher numbers, including one that claims that between 1966 and 1984, approximately 6,900 ASUs of different configurations were established throughout the USSR.[15] This vast discrepancy underscores the point that whatever systems were developed under a sweeping state mandate to advance information technology throughout the country, they were done so without the benefit of any organized coordination from the state. The lack of coordination hurt the effectiveness of the OGAS Project. Official statistics determined that the computer technology that was in place fulfilled no more than a sixth of its projected capacity in the affairs of local economic management.[16] The introduction of more computing processing power in the form of third-generation computers adopted from abroad significantly altered these modest growth trends in the managing of the command economy. The effort to network local enterprises and factories was met with resistance from workers and managers. There was brooding factory floor–level discontent with the local factory computer control installments, which were the local nodes that someday might be connected to form the EGSVTs and OGAS.[17] The workers did not feel empowered by their access to the circuitry of the state's master plan because the master plan exercised managerial oversight over only local factories. As in early computing industries elsewhere, the simultaneous development of different core computer systems in different systems led to protracted interoperability problems and technical delays.

   The state secrecy that characterized the OGAS Project from 1959 to 1977 facilitated a kind of boundless technocratic imagination about the possibilities of networked computing that was not tempered by the humbling revelations of practical experience. Although the early developmental period of the OGAS saw profound accomplishments (including the launching of satellites and astronauts in space, the harnessing of the atom, and the advance of problem-solving machines), when those technological innovations were applied to everyday routine operations and tasks (such as sending and receiving economic information across the command economy and developing automated programs for deciding what to do with that information),

the experience of networked computing in the late Soviet period revealed just how modest the accomplishments of most science and technology are day to day. This widening breach between the grandiose intellectual possibility and the modest applied practicality was central to Glushkov's local-global approach to practical universals, but it had the unwanted effect of dampening public and institutional enthusiasm for the unmet expectations of the OGAS Project. Accusations flew among stalwart Communists, who blamed the internal divisiveness and infighting among the top levels of government on the interventions of skilled enemies, especially American capitalists. However overgenerous to enemies' prowess for subterfuge this may be, one sympathizes with their frustration while doubting the utility of such countercounter measures.

In their discursive move and countermove, the public debates about networks in the 1970s are not exceptional for the period and place. Just as Kitov, Lyapunov, and Sobolev had done in their initial article by claiming that anticyberneticist Soviet philosophers had fallen victim to the machinations of a subtle pro-American disinformation program, Glushkov occasionally partook in that classic cold war move of blaming the cunning enemy for one's internal problems. Glushkov, for example, once blamed an unnecessary political battle in the 1972 All-Union Conference on a "disinformation campaign skillfully organized by the American secret service, which was directed against the improvement of our economics." No matter how fueled by the fumes of international conspiracy, such claims appeared to work at home. Once, Glushkov reports, he was able to soften the blow of an internal attack on his local automated system of management (ASU) work by asking the Soviet scientific adviser in Washington, D.C., to issue a report on how the competitors to his proposed computer were becoming less popular in the United States. The report was read widely in the Politburo and had its intended effect, leaving Glushkov's project on the table and scuttling his competitor's.[18] The positive corollary abounds in practitioner memoirs, where a colleague compliments an associate by attributing retroactively visible similarities between friend and foe to the friend. For example, "as a thinker, V. Glushkov distinguished himself by the scale and the depth of his works," notes the president of the Ukrainian Academy of Sciences, Borys Paton (whom Glushkov served as vice president from 1962 until his death), and he continued that "he predicted many things that appeared in the Western information society much later."[19] While traveling abroad, Glushkov once declined a lucrative salary offer from IBM, which also stands as a badge of honor. In both, rivalries imprinted images of personal hopes and fears onto the faces of doppelganger foes.

Few among the technocratic optimists or the disappointed practitioners were prepared to make the more general observation that the OGAS experience is not unusual in how its bold technocratic inventions and pronouncements were followed by plateaus of technological innovation that swept through the long story of Soviet history of technology and science. The real story about Soviet computing networks has far less to do with the technology itself than with the institutional, political, economic, and social networks that made up the knowledge base and innovation infrastructure in a country and culture.

Bureaucratic Barriers

Glushkov was clear about the sources of the frustration to his life work: cunning enemies were not infiltrating his life work from outside the nation, but cunning competitors from within were doing so. After the Central Committee's partial rejection of the OGAS Project in 1971, rumors circulated that his local enemies were conspiring against him. In 1972, the pilot of a plane that Glushkov was flying in had to make an emergency landing and discovered that the fuel had been tampered with. It was rarely cloaks and daggers for prominent Soviet mathematicians, however. The most common obstacle was the pragmatic apathy that prevailed against his ideas for technological reform. In response to the proposal for an electronic office, for example, a commentator expressed doubt: "if it takes a month and a half to act on a letter to a Ministry, no automatic letter opener is going to change anything."[20] In his memoirs, he calculated the malaise that characterized his meetings with government officials with a characteristic precision: "Unfortunately, my organizational efficiency coefficient … did not exceed four percent. What does that mean? It means that in order for a problem to even be considered by the government, I had to speak with twenty-five officials."[21] An inefficient bureaucracy was both the obstacle to as well as the target of his technocratic reforms. In 1972, he illustrated this with an eye-catching statistic: according to his estimates, at 1 million operations per man with an adding machine, it would take "10 billion persons" "to solve all of today's management problems." The same operational burden could be handled by men and women at 25,000 to 30,000 Minsk-32 computers (at 30,000 operations per second), and even that number would quickly decrease as processing power continued to increase.[22]

Antibureaucratic sentiment is not uncommon among highly skilled technical workers and even among other bureaucrats. In Glushkov (whom Hoffman once described as "probably the most forceful Soviet advocate and

the bluntest critic of computerized communication in the USSR"), it took a particularly acute form. Again, recall that after the Central Committee heard that the ARPANET had gone online and effectively granted Glushkov a blank check, the secretary of the Central Committee asked Glushkov to "write down in detail what has to be done," said A. P. Kirilenko, "and we will create a commission." Glushkov's response is reminiscent of Baran before he withdrew his network project from consideration by the U.S. military. Both insisted that, whatever else happened, their network projects not be handed over to the available administrative entities."[23]

In over a dozen interviews that I conducted with scientists who were associated or familiar with the OGAS Project, they unanimously complained that bureaucratic infighting was the primary obstacle to their project. There was something dreadfully wrong with the bureaucratic administration of the national economy and the handling of the OGAS Project. But Glushkov's critique looks beyond the bureaucrats themselves. Given a Weberian understanding of bureaucrats as depoliticized professionals, many people who held positions in the command economy and state were not rational bureaucrats at all. They affected an "iron cage" of bureaucratic petrification when convenient and waged war with other local deities. The problem does not belong to all modern bureaucracy. Some bureaucracies do not result in this kind of incessant, internecine Hellenistic competition among the gods. Some administrations, including Soviet military ones, have successfully managed to fund, develop, and launch megaprojects, and most large-scale modern institutions are administered by functional bureaucracies.[24] Where lay the difference?

Glushkov believed that a successful bureaucratic system could be reformed and improved with information technological upgrades, but only with commensurate social and economic reforms. In other words, technical reforms to administrative systems without behavioral changes were condemned to fall into a kind of double-bind: no minister could manage a complex economy by paper, and yet no one with control over the papers at hand would agree to switch to a "paperless" virtual economy, which Glushkov had championed in the 1970s. Because the "chief content" of the computing revolution was no less than a cybernetic fusion of information-processing people and their machinery (in other words, "the appearance of an essentially new man-machine technology for processing information"), the success of any technical system reform would depend on social and organizational changes: "Since the circular flow of information is the basis for the functioning of any organization, [the information revolution] must be viewed primarily as a revolution in organization and management."[25]

For its main theorist, the OGAS Project could not meaningfully upgrade to the command economy technologically without also simultaneously reforming the organization and management of economic information. Unfortunately, this separation of reforms is what the Central Committee had repeatedly requested when it insisted that Glushkov begin with the technical computer network EGSVTs before developing the automated system of economy management that was central to the OGAS Project. He frequently warned that without commensurate structural and behavioral transformations of the economy, the introduction of information technologies would *slow* economic growth:[26]

The conservatism of the traditional technology for processing planning and management information leads to the intensification of "disorganized complexity" in the national economy and erects informational-organizational barriers to planned economic growth.... The problem, of course, is not just in the technology of organizational management. The economic mechanism plays a large (indeed a primary) role here.... However, it is important to emphasize that economic mechanisms (especially under socialist conditions) do not work by themselves in isolation from the organizational management system.[27]

In other words, perhaps the most direct cause for the failure of the OGAS to develop, according to Glushkov, was rooted in the same motivation that drove him to develop the OGAS in the first place—the observation that the effects of the modern information science and technological revolution cannot be separated from the social, economic, and organizational conditions that shape them. The lot of networked computing cannot be understood without the networks of institutions that first attempted to usher technological networks into being.

This approach identifies at least two complementary organizational barriers to the success of any attempt to systematic reform—centralized self-interest and the decentralized status quo in Soviet society. First, had networked computing been integrated into the fiber of Soviet society (which it was not), it would have compelled broad-based systematic social changes that could not have easily been isolated (as they usually were) to the military industries.[28] Because military interests maintained a strong self-interest in preserving military power (and not social or economic progress), these same organizations also actively resisted encouraging the development or sharing the benefits of networked computing technologies outside of narrow military applications. It was clearly in the military's self-interest to maintain centralized control over networked computing innovations.

Second, at the same time, the decentralized network of competing interests that governed nonmilitary administration also ensured that attempts

to introduce networked computing into social and economic planning would break against well-organized centralized resistance from the military and broad-based and haphazard resistance from anyone in a position to benefit from the status quo. Because the OGAS threatened to reorganize the social and economic spheres of life into the kind of rational planned system that the command economy imagined itself to be in principle, it threatened the very practice of Soviet economic life: networked computing, in Hoffmann's analysis, "creates more choice and accountability and threatens firmly established formal and informal bases of power throughout the entrenched bureaucracies."[29] These two threads of analysis met in the friction between a formal centralized hierarchy and an informal, decentralized heterarchy. Both the military powers and the decentralized network proposed by Glushkov were clearly hierarchical in operation. But the actual workings of Soviet economic and social power were neither hierarchical nor market. They were heterarchical, dynamic, and continuously reconstituted in the interwoven political networks of social relations in the economic bureaucracy facilitated by the Communist Party.

When asked why he thought that the OGAS did not take, Glushkov responded with a comment that distinguishes military (space and atomic) programs from the civilian administration:

S. P. Korolev ("the chief designer" of the Soviet space program) and I. V. Kurchatov (the father of the Soviet atomic bomb) had a guardian on their side in the Politburo, and they could approach him and immediately resolve any question. Our trouble was that we had no one, and our questions were even more complicated because they involved politics and any mistake could have tragic consequences. For that reason, a connection with any of the members of the Politburo was that much more important.[30]

Aleksandr Stavchikov, historical secretary of the Central Economic-Mathematical Institute (CEMI), also commented on why the EGSVTs did not develop successfully. According to his unpublished notes and personal interviews, Stavchikov retroactively faults "the romanticism" of the institute for the "globality" of its early network designs, observing in hindsight how Glushkov, Fedorenko, and others agreed early in the 1960s that any attempt to plan the national economy in its entirety would have to be done at the national level: "Certainly, an attempt to plan the national economy of such a huge country on the foundation of one hugely proportioned economic-mathematical model," Stavchikov admits, "would be doomed to failure from the start."[31]

As for why the network was designed hierarchically, Stavchikov intimated that the cyberneticists had no better choice. The reasoning for the

hierarchy—and not, say, a fully distributed design or even an unevenly decentralized or heterarchical model—was a matter of reading the writing already on the wall: Nemchinov and Fedorenko decided to "build the country's unified net hierarchically—just as the economy was planned in those days."[32] (The institutional histories of CEMI and the Institute of Cybernetics conspicuously leave out the names of Glushkov and Fedorenko, respectively, although evidence of the early alliance abounds in personal memoirs and interviews.) Justified by a grand cybernetic analogy between the formal design of the command economy and the formal design of the computer network, Stavchikov reasons, any other network design would have been politically unviable in a formally hierarchical command economy. The network visionaries had no choice but to design a computer network that matched a system that did not exist except, like the networks, on paper free from the informal competitive practices of administrative-economic reality.

Design logics can be compelling—too compelling at times. The cybernetic analog between hierarchical economy and network also fit the political values of the period. Fedorenko and Glushkov felt they had no other choice: they had to align their technical national architecture with the political system architecture. They also appear to have wanted to do so. All evidence suggests that these leading cyberneticist entrepreneurs were committed believers and practicing promoters of the official socialist rationales of the command economy, which also made them reformist critics of the irrational status quo. For these network entrepreneurs—Fedorenko, Glushkov, Kharkevich, and Kitov—the heterarchical competition at every administrative level was the signal problem that was in need of a sociotechnical fix. According to CEMI Secretary Stavchikov, "In this, [Nemchinov and Fedorenko] planned to use extant economic-mathematical methods, allowing [them] to guarantee mutual conformity, the very best interdependence of the numerous units of the hierarchy downward and horizontally—between the units of one level, as well as to develop new units."[33] In other words, according to Stavchikov, these economic cyberneticists decided to model the structure of the network after the structure of the socialist economy, in essence invoking the well-established trope of cybernetic thought that technical systems share common information structures with social systems—including mind-computer, body-machine, and society-media systems. The hierarchical form came as cybernetic analogic impulses such that the decentralized network proposal was designed, according to Stavchikov, to "guarantee mutual conformity" and "interdependence" between the formal Soviet economic hierarchy and its technical network.[34] The cybernetic instinct to design the OGAS after a nervous system for the national

economic body and not the nation as a brain follows from this felt obligation to "mutual conformity" between the national economic and network hierarchies.

The choice of the national hierarchy as the basis for their network design was both the industry standard and necessary for those who were looking to streamline a command economy that was both hierarchical on paper and heterarchical in practice. The contradiction that was central to the breakdown of the Soviet economic-administrative system lies between the formal hierarchical design of that state and its own informal heterarchical networks of management as practiced by those who administered the state. The endgame of the OGAS Project was found not by strategic problem solvers who were seeking to solve or finish the game but by those who were seeking to extend perpetually their turn at the table of administrative power.

This is a distinct argument that is separate from the standard historical accounts of the collapse of the Soviet network projects and sociological accounts of the collapse of the Soviet Union itself. Most accounts posit that the basic problems were one of a rigid, top-down hierarchical state. Noted scholars since the 1990s have argued that the Soviet state and command economy were fundamentally incompatible with the emergent, flexible information networks.[35] I believe that I have shown why that is wrong and why it misses the greater problem. Instead of a fundamental incompatibility between vertical states and horizontal networks, the heterarchical ambiguities of Soviet administrative networks reveal too much, not too little, flexibility in its capacity to generate organizational dissonance crisscrossing and overlaying economic hierarchical structures with lateral conflicts of private interest. The Soviet state was too familiar with the unpredictable dynamism of competing informal networks (the same kinds of networks celebrated by Internet commentators in the 1990s) to be able to carry out systematic reform and infrastructure upgrade to bring the Soviet state into the current network information age.

The Red King's Book, or Botvinnik and the Soviet Case of Computer Chess

If war, in Carl von Clausewitz's famous phrase, is a continuation of politics by other means, then perhaps the most visible continuation of cold war politics by means of a game is chess (second to Go, the world's most popular war game). This classic thinking man's game is synecdoche for cold war confrontation, complete with two diametrically opposed rational strategists plotting the endgame of the other.[36] It is no surprise that the Soviet Union,

which reigned as chess hegemony for most of its existence, took its strategic chess, computer, and long-term planning thinking seriously. Among those thinkers stands Mikhail Moiseevich Botvinnik, who, although not quite the brightest star in the constellations of Soviet grandmasters, is nonetheless remembered as the patriarch of Soviet chess for innovating and institutionalizing rigorous systems for gameplay. As this section explores, with the support of Glushkov and others, Botvinnik even programmed his own end game for cold war chess itself. His *Pioneer Project* stood as an attempt at computer chess programming that he felt would bring the Soviet Union one step closer to triumph in strategic political economic planning.

Raised in St. Petersburg, the son of a dental mechanic who had earned the right to move beyond the Pale of Settlement, and married to a ballerina (the other superior Soviet art of elegant maneuvers), Botvinnik (1911–1995) came to chess at the late age of thirteen and left the chess world a different place seventy years later.[37] In 1935, at age twenty-four, he became the first Soviet grandmaster, and by 1957, under his guidance, there were nineteen Soviet grandmasters, with roughly twenty new masters emerging every year. As a figure astride Soviet chess history, Botvinnik is remembered today for establishing "the Soviet school of chess"; for mentoring world-famous chess figures Anatoly Karpov, Vladimir Kramnik, and Gary Kasparov; and for promoting disciplined chess training (a cross of physical and mental exercise). He was also a theorist of long-term strategic planning who pioneered Soviet computer chess and chess schools based on his notational system for recording chess play. That notational system preceded what is now known in the chess world as "the Book." A fascinating character on his own right, Botvinnik figures here because he is an early Soviet network visionary. Like the other distinguished scientists and long-term strategists who were committed to the Soviet way of life, he proposed that the state use computers to optimize and resolve its long-term planning problems in economic and political spheres.

Botvinnik's combination of professional success and political notability was a rare distinction for advanced Soviet chess players, whose demanding careers as civilian celebrities rarely left time for anything else. He even was awarded a national medal of honor for his work as an engineer at the same time that he was establishing himself as a world chess grandmaster. In 1954, six years after defeating the reigning American to win the world championship, Botvinnik came as close to a public icon as the Soviet Union had then (the superstardom of cosmonaut Yuri Gagarin came later). Botvinnik received spontaneous standing ovations on entering movie theaters and was one among few other than members the Party elite who had a private

car and driver. Buoyed by such a reputation, he wrote a strong-willed letter to *Pravda* in 1954, the year after Stalin's death, detailing a long-term strategy for world domination without having to go to nuclear war. His suggestions involved calculated moves and countermoves through which the socialist leaders would grant the masses of petty capitalist owners their material wealth in exchange for their acceptance of the socialist revolution without atomic combat.[38]

For such a brazen public stunt, the political secretariat rebuffed him and threatened to throw him out of the Communist Party. In the 1960s, he publicly repented and avowed his Communist credentials by publishing *Computers, Chess, and Long-Range Planning*, which describes how the domination of the Soviet school of chess over the Americans was an expression of superior long-range socialist planning. In 1968, having been influenced by Claude Shannon's less well-known 1950 work on computer chess, Botvinnik published *An Algorithm for Chess*, which successfully demonstrated how to algorithmically organize attacks against an opponent's position from challenging tactical positions. Even though his algorithm excelled in solving technically stressful positions, it also had the frustrating tendency to overlook the simplest tactical moves.[39]

Backed by major cyberneticists and computer engineers including Viktor Glushkov and his colleagues—such as Bashir Rameev (who developed the Ural computer series), Viacheslav Myasninkov, and Nikolai Krinitskiy in the 1970s and 1980s—Botvinnik poured his energies into what he called (drawing on the Stalinist vocabulary of his youth) the Pioneer Project, a computer chess program that was designed to imitate how the brain of a grandmaster works.[40] The OGAS Project algorithms were designed to ignore the bulk of all computationally possible moves and instead to concentrate on the most probable moves. Attempts were made to develop an algorithm with a long-term intuitive "feel" for the board. The brute force approaches (which calculate all possible moves in branching decision trees) eventually won out with the arrival of faster computers in the 1970s, outpacing Botvinnik's selective but theoretically more sophisticated approach. Nonetheless, his prodigies in training—Kasparov among them—remember their surprise at hearing that Botvinnik was confident that his selective program would one day consistently beat them all. Nevertheless, it—much like Glushkov's attempt to develop intuitive macroprocessing and natural language programming that mimicked the neural processing and speech patterns—bore fruit in other spheres of application. For example, Botvinnik, in his career as an electrical engineer, reconfigured his Pioneer algorithm into planning maintenance repair schedules for power stations across the Soviet Union.[41]

The Pioneer Project and the OGAS Project shared more than a common organizational framework and set of state-of-the-art computers. At core, they shared a commitment to organize the real-time management of scarce computational and economic resources. In the early 1980s, Botvinnik tried to salvage the national economy with another proposal that he sent to Party leaders. It contended that the Soviet economy should be regulated by a software program that, like his Pioneer chess algorithm, would take a generalizable approach to reasoned decision making. Botvinnik thus stands out as the last of major Soviet figures (with Kitov, Kovalev, Fedorenko, and Glushkov) to propose using computer software to salvage the command economy. Available records do not speak to his proposal's reception, except that it was rejected at the highest levels. By the mid-1980s, Gorbachev's reforms had already sufficiently introduced market elements into the formal command economy to render impossible any future systematic management of the economy. In the early 1990s, shaken by the collapse of the Soviet Union and years from death, Botvinnik reached out one last time with strategic advice for Yeltsin's government but to no avail.[42]

There is a truism in the history of science that science serves many specific social purposes but basic research need not begin with any single goal in mind. Biologists, for example, run test on fruit flies—or *Drosophila*—not because they are particularly devoted to improving the life of fruit flies; they do so because fruit flies are convenient test subjects that reproduce quickly and cheaply. Computer chess has been called "the drosophila of artificial intelligence" (Alexander Kronrod's phrase, popularized by American computer scientist John McCarthy) because it is thought to stand in as an affordable test case for larger strategic programming projects, which include both artificial intelligence as well as planning the Soviet command economy.[43] Kronrod, himself a distinguished Soviet mathematician and computer scientist, also collaborated with Kantorovich on the computer planning of the economy and with Botvinnik on the algorithm that defeated the Kotok-McCarthy American chess program in 1966 and 1967.[44] The unexpected joy of computer programming lay in finding new applications for old techniques, which in many ways was the same allure that fascinated general-purpose computer programmers since Turing. Although OGAS, EGSVTs, ESS, ESAU, and even Botvinnik's Pioneer Project "failed" on their own terms, they also should be remembered for their contributions to ongoing macrolevel experiments in rational planning, administration, and policy making in a world of global information networks.

As these cases suggest, the consequences of the current networked information revolution cannot be easily anticipated. The chess community has

long concerned itself with the advancement of computer chess programs, which grew exponentially more sophisticated from 1970 through 1989, when Gary Fields was first defeated, and then again until Deep Blue's controversial victory over Kasparov in 1996. Since at least Wiener in 1964, critics have contended that superior computer chess programs were inevitable but would diminish the value of chess as a human activity.[45] The situation led early computer chess critics to bemoan their state with the defeatism of the final scene in the 1980s film *War Games*. After all, if the heirs of Botvinnik's Pioneer program dominate the best players today, the human will to be the best has already been undermined. What is the point of playing, the chess enthusiasts worried, when everyone loses every game?

Such handwringing by chess purists against the artificial intelligence community has since been sidelined—and by neither the triumph of technology over humanity nor the triumph of humanity over technology. Chess as a human pastime has not dwindled in the face of virtually indomitable computer programs. Instead, networked computers have sped the spread and growth of the global chess community. The number of online human-to-human and human-to-computer chess has exploded since Kasparov's defeat for unrelated and seemingly mundane reasons. No longer encumbered with the burden of serving as a shadow stage for cold war intrigue, long-distance chess in real time over computer networks is now an everyday reality.

Botvinnik's influence on networked computers and chess continues to surprise. It is not Botvinnik's sophisticated computer algorithm but his foundationally basic notational system that has had the most lasting effect on the now globally networked game of chess. Thanks to well-codified chess notation systems that were popularized by Botvinnik, computer record-keeping capacities have allowed millions of games of top-level chess to be catalogued into a database known as "the Book." Recently, for example, a German company named ChessBase has been scrutinized for its widely used database of chess moves that organizes prior games, new move opportunities, and errors in human play, which effectively reduces chess games to enormous decision trees of known and unknown pathways of game progression. Critics have accused its founder, Frederic Friedel, of having "ruined chess" because few games now occur that include new combinations of moves that are not found in "the Book."[46] The result is a new cold war tension of human players against the book, in which top chess players and their opponents know that, given almost any chess board arrangement, the best game they can play is played out in "the Book." Botvinnik's secret

library of index cards that recorded global grandmaster games, saved exclusively for study by students at his Soviet school, did not migrate online, but it modeled what has become the global networked norm. Top players worldwide now memorize tens of thousands of recorded games and positions. All chess competitors now play aware of the networked heir of Botvinnik's book and the humbling fact that most chess sequences have already been played before. The introduction of networked computing is driving a curious situation (however common when new media become mainstream) in which Botvinnik's dream has now been achieved (for example, since 2005, the best software programs routinely trounce the best humans at chess) without appearing the affront to humanity its critics predicted it would be. In fact, global communication networks have made correspondence chess (with humans and computers alike) more popular. Perhaps the enduring attraction to strategic pastimes reveals, with a gesture to Walter Ong, that there may be nothing more human than artifice. (Consider the complex rules and recipes behind baseball and apple pie.)[47]

Computer cold war chess offers a view of the historical preoccupation with global and long-term planning strategies from Liebniz to modern-day generals.[48] The reformist efforts of Kantorovich, Glushkov, Fedorenko, Kovalev, Kharkevich, Botvinnik, and many others are not exceptional. Rather, the introduction of the digital network in socialist cybernetic planners and the sharing of "the Book" in chess underscored something that was at once peculiar yet normal. Networks make knowledge generalizable or at least generally shareable and remixable—whether a dataset shared by network or a playbook shared within a chess school. The consequence of that record, after it was repurposed from the secret index files of Soviet libraries into open-access public repositories, in turn is purported to do nothing less than remake the chess world. Such a grandiose sentiment outlines the strong intellectual affinity between Soviet cybernetwork visionaries and the modern preoccupations with network-enabled public recordkeeping and its automated extension, surveillance.

Simultaneously, the experience of Soviet computer chess also underscores the critical fact that, although military and civilian projects in the Soviet Union suffered from being strongly separated, the cold war culture—especially cybernetic tools, game theoretic strategic thinking, and the computational management of limited resources—has spread the influence of military and strategic thinking far and wide into everyday matters of politics and economics. In chess as in planning, the separation of military and civilian administration offers no guarantee of the same in modern society.

How Hidden Networks Unravel Cybernetworks

This chapter has introduced and advanced an argument based on the informal character of the Soviet system outside of the centralized military command. The dynamic vitality of the system—unregulated competition with unpredictable promotions and demotions—did not always benefit the well-positioned and talented network entrepreneurs and system reformers, as a number of case studies have shown. As Kitov's Red Book show trial demonstrates, military superiors were free to punish their own best and brightest for suggesting that networked computing capacities should be shared beyond narrow military applications. His superiors formally accused him not of displaying generosity toward civilian concerns but rather of going outside formal military communication channels, which underscores the depth of the structural military-civilian divide behind the Soviet networking story. The early partnership between Glushkov's Institute of Cybernetics and Fedorenko's Central Economic-Mathematical Institute illustrates something of their double-edged situation. Glushkov and Fedorenko faced opposition from the centralized military command of the Ministry of Defense, which denied them access to military networks and the institutional knowledge base that supported those military networks. At the same time, they also faced a more subtle institutional obstacle to OGAS that came from the civilian economic sector. The unpredictable currents and institutional drift of the state bureaucracy, including a flush of untethered funding, pulled their young, growing, and capable research staffs in divergent directions—including a focus on macroeconomic reform under Glushkov in Kiev and a focus on microeconomic reform under Fedorenko in Moscow.

Near the end, Glushkov reflected on the sources of the obstacles that his team faced when they were developing the OGAS, the EGSVTs, and national economic reform. His sense of disappointment with his own generation was particularly acute, and his last book that was published while he was still alive targeted schoolchildren as its audience—*What Is the OGAS?*[49] In 1983, while on his death bed and suffering from an apparent tumor of the medulla, Glushkov proclaimed that the OGAS was his "greatest life work," after over twenty years of dedicated effort and a long list of significant accomplishments in other major scientific fields.

During the last nine days of his life, while constrained to his hospital bed in the Kremlin, Glushkov insisted on working—just as he had done back in his hospital bed in 1962. During those final days he dictated his life memories to his daughter Olga and received as a guest the deputy of

Dmitry Ustinov, one of his staunchest supporters in the military. Ustinov, Glushkov reflected, had managed to do in his military career what Glushkov could not do in the civilian sector—rise from the chair of the Supreme Council of the National Economy under Khrushchev to wield power to reform the Ministry of Defense as its minister and marshal of the Soviet Union. Ustinov's deputy listened to the dying man's account of the "long ordeal" of his constant skirmishes with state bureaucracy before asking what the minister of defense could do to help. Glushkov, wrapped in the tubes of respiratory support, sat up and growled a memorable deathbed witness to military might and its remove from civilian concerns, "Let him send a tank!" Before an excessive growth in his own nervous system could bring down this champion theorist of the Soviet economic nervous system, Glushkov tried to comfort his grieving wife, Valentina. In his hospital bed in the Kremlin, he turned to her and spoke about the possibilities of immortality: "Be at ease," he said. "One day the light from our Earth will pass by constellations, and on each constellation we will appear young again. Thus we will be together forever in the eternities!"[50]

After Glushkov died on January 28, 1982, the OGAS vision continued to radiate outward and did not immediately fade from state discussions, social networks, and print media. Anatoly Kitov attempted to reanimate the proposal by writing directly to General Secretary Gorbachev in October 1985. Kitov, then the chair of the Department of Information Technology at the Plekhanov Moscow Institute for the National Economy (part of the Russian Academy of Sciences), recounted the history of the OGAS Project— the scattered development of unconnected ASUs in the 1960s and 1970s, Kitov's repeated appeals to the state for support, the subsequent disappointment with the spread of ASUs and the potential for networking them, the lack of state coordination over technical as well as administrative matters (especially the cooperation problem among separate ministries), and the fact that "we do not have modern reliable personal computers." "I think that this report constitutes an objective analysis of the last thirty years of developing information technology," Kitov concluded in the letter: "may it bring specific benefit and capacity for further decisive action."[51]

This time, Kitov's 1985 letter was not intercepted, although his reclamation of the OGAS situation came to the same effect as his Red Book letter did almost thirty years earlier: nothing would be done. The way that he was told this, however, reveals a crucial look into the inner workings of the administrative state. On November 11, 1985, Kitov received a phone call from Yu. N. Samokhin, a representative from the economic division of the Central Committee that had reviewed his letter to General Secretary

Gorbachev. Kitov's notes record that he was told two things: first, he was to be thanked for his contributions, and second, "not everything in the letter is supported by the economic division." The Politburo and the Central Committee, he was told, "had other functions, not those of the automatic management of the command economy." The Politburo was already supporting the creation of a state committee of information technology, and at the moment, that, not the economy, was the state's priority. Kitov, at the end of the telephone conversation, asked to receive the reply in writing and was told that the Central Committee did not provide written replies.[52] The likely reason for not offering a reply in writing was that the Central Committee did not want to proliferate in writing its own contradictions—in this case, that the economic division of the governing body of the Soviet state does not concern itself with the automatic management of the economy. No doubt Kitov felt that this reply was begging the question: that, it seemed, had been precisely the problem all along.

Such telephone revelations, however, did not keep the state, one year later in 1986, from pronouncing with the force of law that the economy actually would pursue the following Glushkovian demands over the coming five years (in the twelfth five-year plan): it would double the level of automation, organize the mass production of personal computers, increase the installation of computers by 100 to 130 percent, build computer centers for collective use, create integrated information banks, and significantly increase research in information theory, cybernetics, microelectronics, and radio physics.

The passage of time has allowed some reflection on the sources of these challenges. In 1999, Fedorenko contemplated the stubborn fact that decades of CEMI efforts to develop macrolevel economic models had born very little fruit in part because "the problem was too multidimensional and multifactorial." But "the very hardest," Fedorenko admitted without clarification, "was the 'human factor.'"[53] Three decades earlier, the problem was effectively the same. In 1968, Kitov summarized his own frustrations in a personal letter to Lyapunov, not so much as a problem of human personalities or specific personnel but as a problem of cultural resistance to reform in the institutions:

The top leadership realizes the importance of [the introduction of computers into the national economy] but takes no effective measures in support of such work, while responsible officials from the ministries and other government agencies … display no interest in the automation of management for the optimization of planning. The problem is apparently rooted not in their personalities, but in their positions and in the overall traditions, which change very slowly.[54]

Here Kitov faults not the top leadership of the country but the institutional logic of administrators in the middle levels of ministries. Kitov's complaint holds that middle managers habitually reaffirmed the status quo (as is also the case in many large organizations) and that the dynamics within such conservative institutions were paradoxically nonsystematic. As countless Soviet officials have observed: "Having different ministries is like having different governments," and the battle between civilian ministries often flares into nothing less than internecine civil war.[55]

The paralyzing competition between these dynamic, unregulated ministries constrained the possibilities of both systematic institutional growth and purposeful reform. Interministry cost-sharing and cooperation rarely happened. Whenever high-ranking Soviet administrators wanted to promote a major project (such as a national network), the primary avenue for action available to them, as Garbuzov's counterproposal anecdotally indicates, was to create an entirely new institute within preexisting administrative silos. Thus, the attempt to create a supervisory institute for a particular sphere of responsibility (such as finance, statistics, or the OGAS) created intractable points of competition between those institutes. Instead of easing the conflict among administrative standards, every new umbrella institution introduced a new competitor and exacerbated the power skirmishes. The attempt to create a hierarchical bureaucracy to resolve conflicts of administrative interest often generated more, not fewer, opportunities for infighting among neighboring bureaucracies. So the chasm between military and civilian administrations was perhaps not entirely insurmountable: while the military kept the country ready for war with the enemy, the civilian bureaucracy was already at war with itself. Unable to receive the same preferential state treatment as the military, the Soviet economic bureaucracy militarized itself against itself.

The uneven economy of those administrative silos often pivoted around surprisingly few well-placed administrators and veto points. Consider, for example, that the tenures of the chair of the Council on Cybernetics Aksel' Berg and the mathematician Mstislav Keldysh, president of the Academy of Sciences of the Soviet Union (1961–1975), coincided with the rapid growth of Soviet cybernetic academic preoccupation in the 1950s and 1960s. Together, Keldysh and Berg personally facilitated the creation of all four main institutes featured previously, including the Computation Center 1 that Kitov directed following his optimistic report about the future of computing technology in 1953, the Institute of Cybernetics in Kiev under the directorship of Viktor Glushkov (1962), the Central Economic-Mathematical Institute in Moscow under the directorship of Nikolai Fedorenko (1963), and

the Institute for Telecommunications in Moscow under the directorship of Aleksandr Kharkevich (1963).[56] Given the immense reach and corresponding tangle that is Soviet cybernetics, a disproportionate amount of its administrative growth took place at one or two degrees removed from these men's signatures and oversight. In the institutional growth period of Soviet cybernetics from 1953 to 1964, the roles played by supporting administrators like Keldysh and Berg helped extend the argument that Soviet institutions often experienced periodic spikes of exceptional growth followed by long periods of underdevelopment.[57] Perhaps the most striking record of the explosive state imagination for computing technology, at least as of 1963, that propelled Soviet cybernetics, CEMI, the Institute of Cybernetics, and the associated OGAS Project into the mainstream of Soviet political system is in the recently uncovered Party resolution published on May 21, 1963. This resolution, issued by both the Central Committee and the Council of Ministries, declared that the Soviet state would advance nearly twenty nationwide new or transformed tasks and institutions involving computing technologies, including the reform by computer network of the command economy.

Even so, the economic bureaucracy proved less resolute about embracing such sweeping technological reforms. As a house divided, the bureaucracy was unpopular with practically everyone, including the underserved public, scientists like Glushkov and Liberman, and politicians (such as Mikahil Gorbachev) who publicly ran against the bureaucracy not in earnest hope of reforming it but to ensure their own political popularity with the public.[58] In the main, the old guard of orthodox planners who administered the system benefited from it, although it would be a stretch to say that they approved of how it functioned. Crisscrossing structures, personal favors, and impartial administrative reforms plagued the hierarchy that held together the national, regional, and local planning committees. This ensured that, despite the state's approval of a single national plan, there were as many contested plans as there were administrators of the single plan. (No plan can plan away its own private interests.)

By the time that Gorbachev's perestroika and glasnost policies were introduced between 1985 and 1989, the national economy could no longer mobilize around mathematical economic reforms. Official statistics hold that between 1986 and 1988 the economy grew by 2.8 percent and in 1989 by 2.4 percent, although in practice real economic progress, like official economic statistics, was not meaningful. By 1985, after perestroika's decentralizing reforms (according to M. S. Shkabardni, one of Glushkov's colleagues), the idea of an economy that was rationally decentralized by OGAS "interested no one. Everyone had forgotten about it. No one even

thought about it."[59] The Party leadership had many more pressing worries to consider, including the high capital investment that would be required if the economy were to be reformed by networked computers amid a rising stream of affordable personal computers from the West. The OGAS had long appeared a prohibitively expensive "hero project," but now even the more modest EGSVTs network could be built out by individual citizens who were working on Western computers. In a sense, that is what happened: large state network projects were abandoned, and in the late 1980s, a few Soviet citizens joined in purchasing and connecting personal computers to globalizing communication networks. By 1989, private Soviet citizens began logging onto early Internet chatrooms, by which time the OGAS Project, like the Soviet state, was slipping into history.

In summary, the OGAS Project was shipwrecked on the capricious unregulated conflicts of self-interest that occupied the civilian knowledge base (including but not limited to the economic bureaucracy) of the Soviet system. It fell prey to the conflicts of interest that it sought to set aside with automated networks. The sources of those conflicts arose from the yawning disconnect between the formal plan for the civilian sector, which was clearly hierarchical, and the massive gray economy of informal exchange and personal favors. Each layer of the command economy—the national, regional, and factory planners and managers—benefited from a slack and informal freedom that allowed them to solve problems outside of the plan's commands. By rationalizing, making explicit, and automating those resources, Glushkov's vision directly opposed the informal economy of mutual favors that oiled the corroded gears of Soviet production. In the end, the OGAS Project fell short because, by committing to rationalize and reform the heterarchical mess that was the command economy in practice, it promised to encourage the rational resolution of informal conflicts of interest—which worked against the instinct to preserve the personal power of almost every actor that it sought to network.

Conclusion

The portrait of the final chapter of the OGAS Project that is presented here fills out and begins to complicate the conceit with which this book began—that global computer networks arose from collaborative capitalists, not competing socialists (or in light of the OGAS Project, not from the unregulated conflicts of self-interested socialist institutions). This surely is no plain victory for any political order, nor is it only a plea for virtuously regulated market-state interactions. Self-interest has been a recognized engine of

human behavior since at least the ancient Greeks and found in any economic order. (I understand self-interest here to be an ambiguous quality that is more basic than any particular economic order. It can range from a virtue as distinct from selfishness as satisfaction is distinct from hedonism to, as the Gautama Buddha taught, a signal vice of enduring dissatisfaction in life.)[60] The Soviet socialism that the Project sought to reform never worked as it planned in part because of the economic administration's mismanagement of its own conflicting internal egotisms and mutinous ministers. Its political economic tragedy lies in the flooding of the gray economy with the informal self-interests that the planned interests of the command economy—especially a technologically rationalized one—could never accommodate. It was not the absence but the presence of vibrant unregulated markets of conflicting forces driven by self-interested administrators that kept the Soviets from networking their nation and command economy. In another sense, the Soviet networked command economy fell apart not because it resisted the superior practices of competitive free markets but because it was consumed by the unregulated conflicts among institutional and individual self-interests—including the institutional rivalries that sprung up between Glushkov and Fedorenko's competing efforts to network and model the economy, the ministry mutiny over funding between the Central Statistical Administration and the Ministry of Finance over the network plans, and the adhocracy of the Politburo.

There is a problem, however—not with the history but with the ends of such critical analysis that inverses the role of regulated capitalist states and unregulated socialist economies. In so doing, it recapitulates the liberal economic coordinates for imagining the state as the site for public interests and the market as the site for private interests. The conclusion to this book outlines several reasons that such an analysis, although tempting, cannot hold on its own. Before that conclusion, let us summarize a few larger points that previous chapters have built toward.

First, the Soviet economic system did not work—except for when it did, which was mostly for highly centralized militarized projects. It is reasonable to presume, as social scientists and cyberneticists alike have been doing, that the Soviet formation of socialism cannot be separated from the economic and political woes that arose due to underlying structural contradictions. For the most part, those contradictions have been framed in terms of private (usually market) interests that were in competition with public (usually state) interests. Given this framework, the history outlined above may prompt defenders of private (market) interests to offer reminders about how, in the Soviet Union, private and public sectors managed at

best an "uneasy coexistence" or about how four decades after collectiviza-
tion, private (market) plots that comprised 3 percent of Soviet agricultural
lands managed to produce nearly 30 percent of the gross value of Soviet
agriculture.[61] To argue that market solutions would work better does not
begin to describe or distinguish what I believe the OGAS Project history
reveals to be the depth and range of private interests at work in human exis-
tence. It is just as easy, in what prominent economist Igor Birman endorsed
as Soviet "anecdotal economics," to list examples of how the same kind of
private self-interest that put bread on the table of starving peasants also cor-
rupted socioeconomic life elsewhere. Anecdotes from everyday economic
life relate that 80 to 85 percent of gasoline, according to some estimates,
turned up on the black market;[62] construction workers built new apartment
buildings to state specifications but refused to connect the toilets to the
sewage systems until *vzyatki* and *podkupki* (bribes) were paid; maternity
nurses extorted 200 ruble notes from birthing mothers before using a sterile
needle and anesthetic; grieving families had to pay 2,000 rubles to bury
their mother, despite the guaranteed "free" state funeral and burial. The
fact that most numbers were anecdotal suggest how actively corrupt Soviet
economic life already was.

Self-interested corruption is so much a feature, not a bug, of Soviet eco-
nomic life that it cannot be the result of market absence or state failure
alone. Anecdotes of administrative cunning (not incompetence) abound.
In Grossman's phrase, "the Four B's: barter, black market, *blat*, and bribe"
summarize the economic engine of Soviet self-interest run amok.[63] An
entire biscuit factory once went underground in Georgia, producing four
times its planned quota through hidden informants, bribery, and social
screens;[64] a seat on the trade committee in Moscow sold for 50,000 rubles
in 1990 (and current prices for other positions can be found online today);
and Central Committee members filled foreign bank accounts by extracting
bribes from officials in the trade ministries.[65] The Soviet joke puts it well:
Brezhnev is showing his mother how well he's done, and he shows her his
suite in the Kremlin, his dacha in the country, his Black Sea villa, and his
Zil limousine. "All very nice, dear," she says. "But what will you do if the
Bolsheviks come back?"[66]

These anecdotes constitute what we might call revolts in miniature. They
are an expression of private unrest—of local resistance to a society whose
public institutions did not have to serve the public. A liberal economic
analysis to these problems might describe the informal networks of com-
peting private interest as variously productive or rent-seeking, depending
on whether the activity at hand created or depleted economic resources.

Varied critics of the Soviet economy have interpreted the collapse of the public interests of the state and the private interests of the market into the command economy to be a hallowing out of means for Soviet citizens to seek their own self-interest through formal mechanisms.[67] Consequently, informal means, whether creating islands of penny capitalism or engaging in systematic corruption, are all that is available.[68] The liberal economic critique accuses the public state of systematically smothering and driving underground private self-interest. Applied to the OGAS case, the standard critique follows: the OGAS Project could not hope to reform the command economy because its very purpose ran counter to the interests of those who held hostage that economy in need of reform.

The argument advanced in the conclusion to this book seeks to go one step further. It seeks to rearrange our thinking about cold war networked culture by twisting the standard liberal economic distinction between public states and private markets to feature a classical distinction between public *polis* (community) and private *oikos* (household). Instead of seeking to place blame on either the state for publicly stifling private self-interest or the individual bureaucrats for seeking to protect their professional self-interest by opposing reform projects, I suggest that the OGAS history reveals a third approach to social reform. The OGAS Project sought technocratic reform that is both public in its relationship to the market and private in relationship (or privy) to the state. It does not matter whether one faults the public state or the private market elements in the command economy that the OGAS Project tried to reform because they belong to the same classical category of private interest. Both state and market actors, collapsed into the Soviet command economy, sought their own private self-interests with certain consequences for how social and technological networks shape one another.

As the Soviet network stories show us, cold war economic orders prove more compatible in practice than in liberal economic theory, if for nothing other than their shared liability to collapse without careful regulation. Neither American-style capitalism nor Soviet-style socialism should be considered a sufficient philosophical banner for making our way into a networked world. If there is a shared baseline, it must be found in the agreement to regulate and restrain self-interest that is common to the visions of both Smith and Marx. The social necessity of restraining self-interested competition unites, not divides, the modern legacy of cold war socialism and capitalism. The following conclusion explores a few consequences for reintroducing a search for the role of *public* interests, in a classical sense of the term, in Soviet as well as contemporary network worlds.