Introduction

> "If we managed to use the power of modern science to its full capacity, we could provide for each and every person according to their needs."
>
> Nikolai Semenov, 1958

On February 28, 1956, the Council of Ministers of the USSR adopted a resolution obligating the Soviet Academy of Sciences to establish a research testing ground for the Institute of Chemical Physics (ICP). The ICP had actively participated in the Soviet nuclear project since 1946. So, when Nikolai Semenov, the institute's director and the first Soviet scientist to be awarded the Nobel Prize, requested a testing ground to promote research on new powerful explosives, the Soviet government quickly approved the construction. Several months later, construction began in a sparsely populated area located thirty-five miles to the northeast of Moscow, not far from the tiny village of Chernogolovka. By 1959, the testing ground had a twelve-apartment residential house, a two-storied hotel, and a cafeteria.

That same year, the first employees arrived in Chernogolovka. Almost all of them were young men and women, in their mid-twenties, with science and engineering degrees from the best Soviet universities. Some of them came directly from their undergraduate studies; others were finishing up graduate work. The vast majority of newcomers were physicists and chemists. In the early 1960s, once Semenov began to transform the testing ground into a scientific center, he also employed biologists and mathematicians. Originally, the lack of material comfort made Semenov worry that no one would want to come to this nascent settlement in the marshes. However, the testing ground grew rapidly. By August 1962, when the Academy decreed to establish a scientific center in Chernogolovka, more than 800 people had been successfully working at the Branch of the Institute of Chemical Physics (or the ICP Branch, for short). Of this number, 423 were scientists conducting pioneering research at the intersection of physics and chemistry. A decade later, Chernogolovka's population reached 8,000, making it one of the most vibrant centers for fundamental research in the USSR.

The establishment of the testing ground in Chernogolovka went unnoticed in the Soviet Union. Stalin's death on March 5, 1953, and the process of

de-Stalinization unleashed by the new collective leadership, threw Soviet society into disarray. The release of Gulag prisoners, the end of the Doctors' Plot, and the arrest of Lavrentii Beria, Stalin's notorious head of the secret police, all signaled the beginning of a new era. On February 25, 1956, Nikita Khrushchev, the First Secretary of the Communist Party of the Soviet Union, publicly denounced Stalin's crimes at the Twentieth Party Congress. The world that Soviet people had known for nearly three decades, with its rigid ideological control and cult of Stalin, was rapidly falling to pieces.

Soviet accomplishments in the scientific sphere were much less ambiguous, yet even more impressive. The launch of Sputnik into space on October 4, 1957, produced a hugely enthusiastic popular response, inaugurating the first triumphant decade of Soviet space exploration.[1] The construction of Akademgorodok, an interdisciplinary scientific center in the heart of Siberia, also received wide publicity in the Soviet press. From early on, Akademgorodok enjoyed steady support from the Soviet government, which saw science and technology as the key to constructing Communism and surpassing the economic production of the capitalist world. Khrushchev himself was involved in the project, making sure that Mikhail Lavrentiev, the founder of the Siberian city of science, received the best human and financial resources.[2]

Unlike Akademgorodok, Chernogolovka never really became a recognized symbol of de-Stalinization. The original budget allocated for Chernogolovka's construction was limited. So was its stated purpose: research on new powerful explosives. In contrast to Lavrentiev, Semenov did not rely on Khrushchev's personal support to get his project off the ground; nor did he promise the creation of an urban utopia that would contribute to Soviet economic development. Despite this, in six short years Semenov's military-oriented testing ground transformed into a full-fledged scientific center dedicated to fundamental research. Hundreds and then thousands of young scientists came to live and work in Chernogolovka in the 1960s and early 1970s. Many of them were put in charge of cutting-edge groups and laboratories, developing new directions of scientific research. They established research facilities and organized daily life in the town. The input of the first generation of Chernogolovka scientists was crucial for the success of Semenov's daring enterprise, which would have been unthinkable under late Stalinism.

What does it mean that a town like Chernogolovka emerged at that particular moment of Soviet history? What made it possible, and what does it contribute to our understanding of how Soviet society changed and

[1] James T. Andrews and Asif A. Siddiqi, eds., *Into the Cosmos: Space Exploration and Soviet Culture* (Pittsburgh: University of Pittsburgh Press, 2011), pp. 4–5.
[2] Paul R. Josephson, *New Atlantis Revisited: Akademgorodok, the Siberian City of Science* (Princeton: Princeton University Press, 1997), p. xvi.

how it functioned after Stalin's death? What can we learn from this case study about the stability and longevity of the late Soviet system? This book sets out to answer these questions by placing the history of Chernogolovka in the context of the complex transition of Soviet society from Stalinism into the post-Stalin era. I argue that the revitalization of socialism through scientific development was at the very core of Khrushchev's reforms, popularly known as the Thaw. In stark contrast to his predecessor, the First Secretary recognized that the Soviet Union needed to stop stifling innovation in order to progress. The regime also acknowledged that to build a modern, affluent society and to compete with the capitalist world in the economic and military spheres, it had to bring the scientific intelligentsia on board. Under Khrushchev, scientists became elite members of Soviet society and leading figures in the future construction of Communism. They regained the professional autonomy they had lost during Stalin's rule.[3] Prominent scientists such as Semenov initiated, and headed, the construction from scratch of dozens of scientific towns across the USSR. By the mid-1960s, many of these towns came to represent the best of what the late Soviet model of socialism, or mature socialism, had to offer. Residents of these towns enjoyed generous and consistent state funding of their research, as well as privileged material conditions, including modern housing, free health care and education for their children, and better food supplies. They could travel abroad for scholarly exchanges and scientific conferences. They also enjoyed relative professional and personal autonomy, as long as scientists avoided openly dissenting against the system. While the Khrushchev regime failed to deliver Communism to the majority of the Soviet population, it was more successful in producing "a happy society of creative and highly educated people"[4] within strictly limited boundaries.

Khrushchev's promise to reinvigorate socialism through science provoked an enthusiastic response among the first Cold War generation of Soviet scientists. Hundreds of thousands of Soviet citizens who had joined the ranks of the scientific intelligentsia in the late 1950s and the 1960s were not merely bought off by the Soviet state. They bought *into* the idealism and social optimism of the late Soviet regime that claimed science would play a crucial role in the construction of Communism. Scientists did not manipulate the post-Stalin system. They lived and functioned successfully within this system, and were eager to contribute to the country's scientific and technological development. Privileged and isolated from the outside world, Chernogolovka offered

[3] In the field of genetics, the Soviet regime continued to interfere in scientific affairs throughout the Khrushchev era. On scientists' struggle to free biology from Lysenkoism, see Josephson, *New Atlantis Revisited*, pp. 82–119.

[4] Vladislav Zubok, *Zhivago's Children: The Last Russian Intelligentsia* (Cambridge: The Belknap Press of Harvard University Press, 2009), p. 123.

outstanding opportunities to the first Cold War generation of Soviet scientists who had flocked into the profession after World War II. It allowed scientists to escape the miserable conditions of their youth, which was scarred by mass repressions and the Great Patriotic War. More importantly, it allowed them to have fulfilling lives under Khrushchev and Brezhnev.

Far from being in opposition to the system, many Chernogolovka scientists were proud of their closeness to a powerful state. Some of them contributed to building up the Soviet military–industrial complex, creating solid rocket propellant and new powerful explosives. The vast majority, though, worked on non-military topics in materials science, combustion science, organic chemistry, and polymer production. Many shared the regime's belief in the progressive development of Soviet society on a scientific basis – one of the key tenets of Marxism – and saw their work for the Party-state as a necessary part of that effort.

Remarkably, Chernogolovka scientists' idealism and professional autonomy did not come to an end after Khrushchev's ouster in 1964. The early Brezhnev era oversaw the rapid expansion of the local scientific community, including the establishment of new research institutes, the emergence of informal cultural organizations, and lively residential development. Although by the late 1970s some scientists had grown critical of the economic failings of the Soviet system, most members of Chernogolovka community continued to identify with the regime's proclaimed goal of building a "just and egalitarian" society with the help of science and technology. Surprisingly, rather than undermining their core beliefs, the collapse of the Soviet Union made them even stronger.

My aim in writing this book has been to provide a human face to the story of late Soviet science, and in particular to explain how scientists in closed academic communities such as Chernogolovka managed to have fulfilling lives under Khrushchev and Brezhnev. Relying on newly available archival materials and an extensive oral history project, I set out to reconstruct the outlooks of an idealistic cohort of scientists who enjoyed the rare privilege of living in a closed community dedicated to scientific research. Chernogolovka scientists' personal stories run through the narrative. I track the histories of individual people from their coming of age during late Stalinism to their decision to join the ranks of the scientific elite in the mid- to late 1950s. I examine scientists' everyday lives, and the transformation of their political outlook during the Khrushchev and the early Brezhnev years. I also explore scientists' experiences traveling abroad in the 1960s and 1970s, trying to shed light on how and why the scientific intelligentsia came to identify with the late Soviet project. But what *was* the Soviet project after 1953? What would take the place of Stalinism?

The Soviet Project After Stalin

The legacy of the Stalin era, both domestic and foreign, was terrifying. Rapid postwar reconstruction and the stunning success of the Soviet nuclear program masked the fact that entire areas of the economy had been woefully neglected. Heavy industry and the military–industrial complex continued to dominate the Soviet command economy during the last decade of Stalin's rule, while consumer-oriented industries and housing remained in short supply. By the early 1950s, most sectors of the population, especially the party elite and the intelligentsia, had been terrorized and paralyzed by fear, expecting a new wave of repressions. Several million prisoners were still languishing in the Gulag, many of them serving sentences based on false accusations. The international situation was equally dire. As the Cold War kept escalating, the ageing, and increasingly paranoid, dictator came to alienate both Soviet enemies and friends.

Yet, when Stalin died, abandoning socialism could not have been further from the minds of the new collective leadership. From 1953 to 1956, a furious power struggle unfolded in the Kremlin among Politburo members. Nikita Khrushchev, who emerged victorious, saw the revitalization of socialism uncorrupted by Stalinist excesses as his main priority. He made this clear at the Twentieth Congress of the CPSU in February 1956, when he attempted to disconnect Stalin's crimes from Leninism, the Communist Party and the Soviet regime. "We are fully confident," the First Secretary claimed at the end of the secret speech, "that our party, guided by the historical decisions of the Twentieth Congress, will lead the Soviet people down the Leninist path to new successes and new victories."[5]

Born in 1894, Khrushchev was a child of the Russian Revolution and had fully embraced its creed and its values, including the promise of economic liberation and unending progress. A true Communist believer, he was convinced that socialism was superior to capitalism because it provided a better life for ordinary men and women. The Soviet model, Khrushchev preached, could produce "a happy society of creative and highly educated people." The Soviet people would naturally follow his lead, once he showed them what genuine socialism, purified of its Stalinist distortions, had to offer.[6] In hindsight, it might appear that the return of Gulag inmates, the "Thaw" in literature and arts, and the re-opening of Soviet society to the West were inevitable, since many members of the collective leadership acknowledged the need for reforms. Still, Khrushchev's personality, with his distinctive blend

[5] *Doklad Pervogo sekretaria TsK KPSS tov. N.S. Khrushcheva XX s'ezdu Kommunisticheskoi Partii Sovetskogo Soiuza "O kul'te lichnosti i ego posledstviiakh"* (Moskva: Novaia gazeta, 2008), p. 71.

[6] For a comprehensive portrait of Nikita Khrushchev, see William Taubman, *Khrushchev: The Man and His Era* (New York: W.W. Norton, 2003).

of pragmatism and utopian faith in Marxist–Leninist ideology, significantly shaped the contours and pace of de-Stalinization.

While Khrushchev believed that the sacrifices of collectivization and industrialization were necessary to transform the Soviet Union into a modern industrial power, he also was convinced that after Stalin's death Soviet society entered a new stage of socialist construction. The revolutionary struggle, he argued, was in the past. Satisfaction of people's material needs should become the main priority of the Soviet government. In his memoirs, recorded several years after his fall, Khrushchev wrote that it pained him that workers in the Soviet Union were worse off than workers in tsarist Russia before 1917: "The idea of socialism and communism, developed by Marx, Engels and Lenin, is correct. But it is only an idea, and you cannot make soup out of it."[7] Socialism was meaningless if it could not provide people with basic material comforts, such as sufficient food and adequate housing. After forty years of deprivation, struggle, and suffering, the First Secretary promised, Soviet people could finally reap the fruit of their labor.

Khrushchev's "New Deal" soon produced impressive results. Beginning in 1953, the Soviet government carried out a massive housing program that allowed millions of people to move into new, separate apartments for the first time in their lives. The regime also significantly increased investment in education, pensions, health care, and consumer-oriented industries. These new policies laid the foundations for "a better-off society with social safety nets and of a state with greater responsibility for material standards of its citizens."[8] The initial success of Khrushchev's reforms was facilitated by the rapid economic growth that had begun in the USSR during the last several years of Stalin's rule.

Repudiation of mass violence marked Khrushchev's second major break with Stalinism. In 1959, the First Secretary solemnly proclaimed that the Soviet Union had completed the "full and final construction of socialism."[9] This led him to reconsider the relationship between the Soviet regime and society, rejecting the use of mass violence. One major accomplishment of socialist construction, Khrushchev stated, was a growing consensus within society. Since the new generation of Soviet citizens had come of age under socialism, the time had come to extend trust to all major groups of the population and to build relations between the regime and society on the basis of greater mutual confidence.[10] Rehabilitation of the victims of

[7] N.S. Khrushchev, *Vospominaniia: Vremia. Liudi. Vlast'. T. 4* (Moskva: Moskovskie novosti, 1999), p. 161.
[8] Zubok, *Zhivago's Children*, p. 124.
[9] N.S. Khrushchev, *O kontrol'nykh tsifrakh razvitiia narodnogo khoziaistva SSSR na 1959–1965 gody* (Moskva: Gospolitizdat, 1959), p. 7.
[10] Alfred B. Evans, Jr., *Soviet Marxism-Leninism: The Decline of an Ideology* (Westport: Praeger, 1993), p. 59.

Stalinism was one important consequence of this new policy. Equally exciting was Khrushchev's belief that mobilizing the Soviet people and rekindling their revolutionary enthusiasm could work miracles. The new Soviet leader had especially high expectations of Soviet youth, which he assumed was not only ideologically pure, but also better trained and educated. The Virgin Lands campaign,[11] launched in 1954, was a potent symbol of Khrushchev's attempts to reinvent the relationship between Soviet rulers and the ruled on a more reciprocal basis.

Khrushchev was no liberal, of course. Neither was commitment to liberalization a central hallmark of his rule.[12] To some extent, he was forced to become a reformer by the political struggle, social unrest, and raised popular expectations in the wake of Stalin's death. At the same time, as a true believer in socialism, Khrushchev was convinced that once the Soviet system was liberated from the extremes of Stalinism, it could overtake and surpass the most advanced capitalist countries. At the 1959 Party Congress, which proclaimed the complete victory of socialism, the First Secretary stated that Soviet economic development had achieved such a high level that the country was now ready for the full-scale construction of Communism.[13] "It is very likely that in the near future we will be able to fully satisfy the needs of the Soviet people in food, housing, and clothes within reasonable limits," he told the Congress delegates.[14] The transition from socialism to Communism soon became the crux of the Twenty-Second Party Congress that took place in October 1961. The Third Party Program, adopted at the Congress, confirmed the imminent crisis of the capitalist system and the inevitable, peaceful victory of socialism around the globe. The program defined Communism as a classless society in which all people would be equal and jointly own the means of production. It stated that under Communism "labor for the common good would become the first necessity," and the great principle of Communism would finally come true: "from everyone according to his abilities, to everyone according to his needs."[15] The party pledged to complete the construction of Communist society in the Soviet Union within two decades.

[11] On the Virgin Lands campaign, see Michaela Pohl, "From White Grave to Tselinograd to Astana: The Virgin Lands Opening, Khrushchev's Forgotten First Reform," in Denis Kozlov and Eleonory Gilburd, eds., *The Thaw: Soviet Society and Culture during the 1950s and 1960s* (Toronto: University of Toronto Press, 2013), pp. 269–307.

[12] See, for example, Polly Jones, ed., *The Dilemmas of De-Stalinization: Negotiating Cultural and Social Change in the Khrushchev Era* (London: Routledge, 2006), p. 12; Stephen V. Bittner, *The Many Lives of Khrushchev's Thaw: Experience and Memory in Moscow's Arbat* (Ithaca: Cornell University Press, 2008), pp. 9–11.

[13] Khrushchev, *O kontrol'nykh tsifrakh*, p. 15.

[14] Khrushchev, *O kontrol'nykh tsifrakh*, p. 110.

[15] *XXII s'ezd Kommunisticheskoi Partii Sovetskogo Soiuza (17–31 oktiabria 1961 goda). Stenograficheskii otchet*. T. 3 (Moskva: Gospolitizdat, 1962), p. 274.

Scientific Intelligentsia and the Thaw

From early on in his rule, Khrushchev viewed the scientific intelligentsia as his natural ally in the struggle to revitalize socialism and infuse new life into the Soviet project. The First Secretary found scientists and engineers to be less intimidating than members of the cultural intelligentsia who, he worried, would put their own interests over the collective good.[16] Scientists were self-motivated, yet they were willing to work with the Soviet regime to advance their shared goals. The scientific intelligentsia was also more likely to provide practical payoffs for the economy.[17] Not only would scientists help build up Soviet military superpower; the new leader believed that science would also play a crucial role in solving Soviet economic and social problems, and eventually secure the USSR's economic superiority in the escalating Cold War.[18]

Khrushchev's support of scientists was hardly a new paradigm. Russian rulers had relied on science and technology to modernize Russia's economy since the time of Peter the Great. After the October 1917 Revolution, the Bolsheviks claimed they would build a modern industrial socialist state on the basis of science. In May 1918 Vladimir Lenin warned that socialism could not be achieved without the scientific data and help of technical and scientific specialists of the pre-Revolutionary era.[19] Despite the fact that the Bolsheviks distrusted many scientists and engineers educated prior to 1917, they enthusiastically relied on their knowledge and expertise. It is revealing, for example, that in the first several years of their rule, with the bloody Civil War under way, the Bolsheviks sanctioned, and supported financially, the creation of more than forty new research institutes in applied science and technology.[20] In the absence of a national science policy at the time, the initiatives to create research institutes often came from scientists themselves, and were not a result of a grand master plan.[21] By the mid-1930s, however, scientists' professional autonomy came to an end.[22] Stalin's

[16] Sergei Khrushchev, *Nikita Khrushchev: Trilogiia ob ottse*. Tom 1: *Reformator* (Moskva: Vremia, 2010), pp. 567–568.

[17] On Khrushchev's reliance on the scientific intelligentsia, see, for example, Taubman, *Khrushchev*, p. 130; Vladimir Shlapentokh, *Soviet Intellectuals and Political Power: The Post-Stalin Era* (Princeton: Princeton University Press, 1990), p. 106.

[18] Paul R. Josephson, "Atomic-Powered Communism: Nuclear Culture in the Postwar USSR," *Slavic Review* 55.2 (1996), p. 298; Josephson, *New Atlantis Revisited*, p. xvii; Taubman, *Khrushchev*, p. 378.

[19] V.I. Lenin, *Polnoe sobranie sochinenii*. T. 36 (Moskva: Gosizdatel'stvo politicheskoi literatury, 1962), p. 381.

[20] Kendall E. Bailes, *Technology and Society under Lenin and Stalin: Origins of the Soviet Technical Intelligentsia, 1917–1941* (Princeton: Princeton University Press, 1978), p. 53.

[21] Paul R. Josephson, *Physics and Politics in Revolutionary Russia* (Berkeley: University of California Press, 1991), p. 71.

[22] Interestingly, Douglas Weiner argues that some autonomous social organizations survived even during the Stalin period. See Douglas R. Weiner, *A Little Corner of Freedom: Russian Nature Protection from Stalin to Gorbachev* (Berkley: University of California Press, 1999), pp. 2–3.

assault on "bourgeois specialists" aimed to create a new, loyal Soviet intelligentsia and to put science under rigid ideological control. Hundreds of scientists were fired and arrested; some were executed. While World War II and the success of the Soviet nuclear project improved the relationship between scientists and the state, the late Stalinist regime remained highly suspicious of the scientific elite.[23]

Khrushchev rejected some key features of Stalin's science policy, even though he readily embraced others, including the nuclear program and the regime's reliance on large-scale technologies. Crucially, the new government recognized that the Stalinist view of science, with its focus on tight ideological control and narrow utilitarianism, was detrimental to Soviet economic development. The Soviet Union needed to stop stifling innovation in order to progress. Under Khrushchev, for the first time since the 1920s, the Soviet government allowed, and even encouraged, the input and autonomous actions of the leaders of the scientific community. This provoked an incredibly enthusiastic response from many talented and ambitious people, who saw the Thaw as an opportunity to implement their scientific visions and to fulfill themselves professionally. Nikolai Semenov, whose own scientific career had blossomed in the late 1920s and early 1930s, skillfully maneuvered in this new environment to expand the research carried out at the ICP.

The emergence of dozens of scientific towns in the late 1950s and early 1960s should be viewed in the context of this shifting national science policy, which I discuss in Chapter 1. Scientific settlements had existed in Soviet Russia since the late 1930s. Zhukovskii, Korolev, Dzerzhinsk, and Friazino came into being as a result of a specific state assignment, such as the creation of the Soviet aviation industry.[24] After the launch of the Soviet nuclear project in 1943–1945, the Stalin regime invested extensively in building scientific towns that were tightly integrated into the Soviet military–industrial complex and were dedicated to building up the military potential of the emerging superpower. Arzamas-16, or present-day Sarov, where the Soviet nuclear bomb was created, was at the epicenter of the "white archipelago" of atomic institutes and plants scattered around the country.[25] Ozersk, a secret nuclear town established in the southern Urals in 1945, became a pioneer in plutonium production.[26]

[23] David Holloway, *Stalin and the Bomb: The Soviet Union and Atomic Energy, 1939–1956* (New Haven: Yale University Press, 1994), p. 366; Ethan Pollock, *Stalin and the Soviet Science Wars* (Princeton: Princeton University Press, 2006), p. 6.

[24] G.M. Lappo, P.M. Polian, "Naukogrady Rossii: vcherashnie zapretnye i poluzapretnye goroda – segodniashnie tochki rosta," *Mir Rossii* 17.1 (2008), p. 2.

[25] Holloway, *Stalin and the Bomb*, p. 202.

[26] Kate Brown, *Plutopia: Nuclear Families, Atomic Cities, and the Great Soviet and American Plutonium Disasters* (New York: Oxford University Press, 2013), pp. 83–91.

Under Khrushchev, a new generation of scientific towns came into existence. Their main purpose was to spur Soviet economic growth, facilitate modernization, and, in the long run, contribute to building a Communist society – Khrushchev's most cherished and ambitious goal. The construction of Akademgorodok, for example, was broadly advertised as part of a larger national plan to develop the productive forces of Siberia and the Far East.[27] It became a major scientific success of Khrushchev's rule. The establishment of the physics centers in Dubna and Troitsk, a biological center in Pushchino, and a center of microelectronics in Zelenograd were all part of the Soviet government's efforts to mobilize the scientific intelligentsia and to put science in the service of building "the material-technological basis of Communism."[28]

Chernogolovka belonged to this new type of scientific town. Although the initial funding for the testing ground came from the Ministry of Medium Machine-Building, which was in charge of the Soviet nuclear industry, by the early 1960s the town transformed into a burgeoning center for fundamental research, financed by the Soviet Academy of Sciences. In addition to research on combustion and detonation, young scientists at the ICP Branch worked on advancing materials science, organic chemistry, biomedical research, and polymer production. In 1963, the Institute of Solid State Physics (ISSP) was founded in Chernogolovka. It quickly became a leading national center for research on solid state physics, a field that had been previously neglected in the USSR, but that held much promise for creating new, advanced materials for Soviet industry. Two years later, the Landau Institute of Theoretical Physics (ITP) was established. It employed dozens of the most capable theoretical physicists from across the USSR. In the 1960s and 1970s, their research on superconductors, magnetism, and the theory of phase transition received wide recognition, both in the Soviet Union and in the international arena.

Chernogolovka's first residents enthusiastically embraced the regime's promise to reinvigorate socialism through scientific development and innovation. Born in the 1930s, a decade of rapid industrialization, many grew up with a strong faith in the progressive development of the Soviet economy and society on a technological basis. The vast majority of them were too young to remember the human costs of Stalin's industrialization. They had vague recollections of the Great Terror, which their parents did their best to conceal from them. Chernogolovka scientists' tender age also spared them from direct participation in the Great Patriotic War. Having survived the hardships and deprivations of wartime and the immediate postwar years, the town's young

[27] Josephson, *New Atlantis Revisited*, p. 11.
[28] See, for example, Paul R. Josephson, "'Projects of the Century' in Soviet History: Large Scale Technologies from Lenin to Gorbachev," *Technology and Culture* 36.3 (1995), p. 540; Steven T. Usdin, *Engineering Communism: How Two Americans Spied for Stalin and Founded the Soviet Silicon Valley* (New Haven: Yale University Press, 2005), pp. 189–209.