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The Cultural Spaces of the Soviet Cosmos

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In the late 1990s, when I arrived as a postdoctoral fellow at the California Institute of Technology, I found the small Russian-language community of mostly graduate students in Pasadena holding its annual parties on Soviet Cosmonautics Day. Never mind that in the Soviet Union itself, the day of April 12, when Yuri Gagarin first flew into space in 1961—although remembered and commemorated—had not been a major official holiday or a day off for workers. The students who gathered to celebrate did not necessarily see themselves as Soviet or even Russian, coming as they were from different post-Soviet countries. But, in part because some of them worked and studied at the nearby Jet Propulsion Lab, and in part due to its continuing post-Soviet appeal, Soviet Cosmonautics Day served as a cultural marker of their community and of something they shared in background and identities, however else defined.

Upon my coming to Canada ten years later, a university colleague introduced me to the country by presenting a local newspaper clipping. The source's title and the exact date of the publication had been cut off, but the printed story reported the results of alleged research by the

British Association for the Advancement of Science about different nations' propensity for humor. According to a supposedly thorough three-month investigation with thousands of volunteers, of the roughly forty thousand jokes, Canadians liked the following one the best: "When NASA first started sending up astronauts, they quickly discovered that ballpoint pens would not work in zero gravity. To combat the problem, NASA scientists spent a decade and $12 billion to develop a pen that writes in zero gravity, upside-down, underwater, on almost any surface including glass and at temperatures ranging from below freezing to 300 C. The Russians used a pencil."[1]

To my own culturally shaped taste, the joke appeared more realistic rather than outright funny. But this episode also attests to the continuing mythological appeal of the Soviet breakthrough into the cosmos, which does not wane with the decades, even though its meanings have changed with time, place, and community. As the historical dust settles, *Sputnik* and Gagarin increasingly attain the status of the symbol of Soviet civilization in its moment of ultimate glory and historic accomplishment, similar to what for other civilizations, old and new, would be represented by the pyramids, the Great Wall, the *Santa Maria*, evolution, and the atomic bomb. As pertains to such myths, they are constantly rehearsed, retold in dogmatic or deviating ways, and often debunked and denied. This chapter sketches out some of the cultural and anthropological aspects of Soviet efforts related to space exploration as they developed over the decades.

Before *Sputnik*

In addition to his obsessive dream of space travel, Konstantin Tsiolkovskii had another dream that was almost as dear to him: he wished to own a cow.[2] The lifestyle of a schoolteacher on the outskirts of the provincial town of Kaluga was similar to rural life in many respects. Having a cow for Tsiolkovskii would have been, as for many Russian peasants in nearby villages, the sign of his large family's relative well-being, a guarantee his children would have a daily meal, and a security investment in case of emergency or disaster, especially during the turbulent and hungry years of the Civil War. This detail—related by Alexander Chizhevskii, Tsiolkovskii's good acquaintance, younger admirer, and biographer—reminds us that Russian dreams about space developed from the scarcity rather than abundance of resources. Indeed, they almost exactly coincid-

ed with the period of most severe deprivations caused by the social, political, and military crises of the first half of the twentieth century. Even the lavish expenditures of the more stable 1960s, when state enthusiasm for space programs reached its peak, exuberant as they seemed to Soviet contemporaries, by others' standards were meager at best.

Tsiolkovkii's commitment to his space dream reflected a kind of escapism that arose from the cultural context of the time. Historians have commented on various aspects on his philosophy—religious, scientistic, progressivist—but have not paid much attention to a recurrent theme of catastrophism in his writings. At least since the time of the revolutionary collapse of the old regime in 1917, Tsiolkovskii increasingly believed that the human race must be prepared technologically to leave the solar system by the time it, too, would be collapsing. Many others who, like him, had survived the combined dangers of World War I, the revolution, and the civil war were prone to obsessive thinking about the cataclysmic historical event they had lived through and often metaphorically exaggerated it into global and cosmic terms. Tsiolkovskii generalized the existential experience of his contemporaries into cosmic dimensions: the universe, for him, was eternal, but stars were not, and any particular solar system, including ours, was destined to die (or rather die and be reborn periodically).[3] The very survival of humanity in the long run thus depended on its mastery of spaceflight. Tsiolkovskii's younger friend Chizhevskii was also thinking in somewhat related ways, as he searched for an explanation and rationalization of contemporary events. In the early 1920s he developed a theory based on massive historical data that such global disasters as famines, epidemics, wars, and major social disturbances occurred periodically on Earth depending on natural causes: they peaked with solar activity, on average every eleven years.[4]

Neither of these views squared very well with the official Soviet ideology. Chizhevskii's theory was explicitly criticized as non-Marxist; many of Tsiolkovskii's millenarian ideas had to be censored when reported in the official press. The meaning of his preaching that could be publicly endorsed in the early Soviet decades was restricted largely to pedagogy, science fiction, and popularization. As an amateur inventor in the fields of aviation and rocketry, he remained throughout his entire life rejected by professional and academic elites. But as the historian James T. Andrews has described in his newest book, *Red Cosmos,* Tsiolkovskii's enthusiasm for space travel inspired many younger students and children, encourag-

ing their general interest in science and technology. In his earlier work Andrews revealed the novelty of approaches and the impressive scope of Soviet efforts in education, propaganda, and popularization of science among the masses during the revolutionary decades.[5] As part of these highly valued and politically supported activities, Tsiolkovskii's devotion and lifelong enthusiasm for flight in the air and in space received official endorsement as exemplary and inspirational, especially for the younger generation, albeit without mentioning that many of his concrete designs and proposals had not been found practical or developed enough to be actually realized.

But inspiring they were, and the culture of the 1920s supported a genuine popular enthusiasm for science fiction and travel to other planets. Similar attitudes developed in several other countries contemporaneously, but in the Soviet Union they enjoyed a particularly strong appeal due to their resonance with other utopian temptations of the time—be they political, social, or technological.[6] Young kids growing up in revolutionary Russia did not have the same existential experience as Tsiolkovskii and were more likely to partake in the dream of space travel as part of the general optimistic vision of humanity's bright future on Earth, rather than as a way of escaping to other worlds from an unavoidable cosmic calamity.[7] A few of them were not only reading and dreaming but also tinkering and materializing some of Tsiolkovskii's ideas in metal, assisted by whatever little infrastructure the Soviet educational establishment could provide for youth activities in the field of amateur technological creativity. Several local groups of engineering students engaged in small-scale rocketry construction as an after-hours hobby, while occupied with more respectable and practical topics in their regular class assignments. Thirty years later, some of these young amateurs would become the leading designers of the Soviet space project, including Valentin Glushko, Sergei Korolev, Mikhail Tikhonravov, among others.[8]

Their utopian fervor receded considerably after the early 1930s, with enthusiastic visions of a bright but distant future overshadowed by the much nearer and frightening prospect of the looming war. With the threat of a military conflict with Nazi Germany becoming ever more real, an increasing part of all thoughts and activities in the Soviet Union turned toward military preparations. Discussions about future travels to other planets, and even science fiction as a literary genre, almost disappeared for about two decades, while practical or more precisely military aspects

of rocketry came to the forefront. The German army had developed a serious interest and investment in rocketry research in the 1920s during the Weimar republican period, already before Hitler came to power, because this branch of weaponry was not explicitly prohibited under the terms of the Versailles peace. The Soviet military started showing its interest later, possibly alarmed by the German efforts, but the status of rocketry research remained somewhat controversial. In particular, the notorious tendency of rockets to stray off the course made many military experts skeptical about their potential use as anything more than an auxiliary weapon. To some, especially among artillery professionals, shells looked like much more reliable and useful projectiles.

Nevertheless, the Soviet command gathered existing amateur rocket tinkerers into a special institute/design bureau, thus for the first time granting them professional recognition and institutionalization. The very same military priorities, however, reoriented rocket engineers toward technological tasks and designs quite different from the ones needed for spaceflight. Opinions clashed over which possible weapons were practical and realizable under severe time and resource constraints as the war drew nearer. The routes actually taken reflected important differences in technological culture between Russia and Germany. The German project invested heavily in the technically daunting task of solving the problems of guided and long-distance flight. The resulting famous missile, generally known as the V2, could fly several hundred kilometers and stay more or less on target if the latter was roughly the size of London. This engineering feat constituted a true technological revolution with great potential and promise for the future, yet as far as the ongoing battles of World War II were concerned, was still largely impractical as a weapon and a waste of resources.[9] Prewar disagreements among Soviet rocketry specialists ended up in favor of a different weapon choice, colloquially known as *katyusha*. A battery of trucks, each equipped with a couple dozen small rockets, could fire in salvo thousands of unguided projectiles over a distance of only a few kilometers across the front lines. As much as this design was technologically primitive, cheap, and less prestigious from the engineering point of view than the V2, it proved much more effective as an actual weapon during the war, in particular in situations where large concentrations of troops made precision less important than area coverage, such as the Stalingrad and the Berlin operations.[10]

Yet even before the katyusha system could prove its value in battle,

many from the leadership and staff of the military rocketry institute were executed or arrested as part of the broad purges in the Soviet military in 1937 and 1938. Several key engineers survived, but Korolev and Glushko spent the war years as arrestees working on aircraft design—apparently aviation was a better established and recognized (hence also less risky politically) technology on which to work.[11] Soviet science and engineering in the wartime could barely afford the luxury of long-term, grand, and uncertain endeavors and focused primarily on improving mainstream technology that was crucial for the ongoing conflict, rather than future wars. Large-scale and forward-looking projects of the kind exemplified by the atomic bomb received full attention and support in the USSR only after the end of the war. In 1945 the Soviet rocketry team reassembled, too, this time in occupied Germany, to study the enemy's experience and war trophies. The German breakthrough with the V2 then inspired the Soviet Union as well as the United Kingdom and the United States to launch their respective programs that aimed first at replicating and then developing the guided missile technology further.[12]

The best of the war bounty—the chief engineers from the German missile team along with most of the surviving V2s—was acquired by the United States in Operation Paperclip. Having obtained much less, the Soviet military relied mostly on its own engineers, who began by studying the remaining fragments of equipment and documentation in Germany, and in 1946 they moved to a secret research center in Kaliningrad, near Moscow. Despite the initial handicap, in ten years the Soviet team managed to surpass its German-American rivals in developing the world's first intercontinental ballistic missile (ICBM). Part of the explanation comes from the urgent importance of rocketry for the Soviet side due to the asymmetrical strategic balance during the earlier half of the Cold War. American bombers from airbases located in Europe and Asia could deliver their nuclear payloads to cities deep inside Soviet territory, while the USSR lacked any forward bases from which aircraft could reach American shores. In an attempt to accelerate the development of an alternative delivery system, the Soviet officials set the target payload for a future nuclear ICBM as early as 1953, before they actually knew the exact mass of the hydrogen bomb, on the basis of an approximate higher-end estimate of three tons.[13] The assignment pushed Korolev's team to leapfrog several incremental stages and proceed directly to developing the powerful two-stage missile R7 with a seven-thousand-kilometer reach.

This machine was capable of flying to the American continent, thus offering for the first time some possibility of retaliation and deterrence against nuclear bombers targeting Soviet cities.[14]

At least some of the engineers at this juncture had not entirely forgotten their youthful dream of space travel that decades earlier had brought them into the then amateur field of rocketry design. They understood their chief mission to be about strategic defense of the Soviet homeland, not cosmonautics. But a missile with the R7 characteristics was also perfectly capable of delivering its payload into a space orbit. While the missile was still under development, Tikhonravov's small group started working on parallel designs for sputniks and manned-space missions. In 1956, at an opportune moment when Nikita Khrushchev inspected and happened to be particularly pleased with the work on the R7, Korolev requested permission to use one of the future missile tests for a sputnik launch. The Soviet leader needed reassurances that such a distraction would not delay in any way the fulfillment of the main job, but he agreed to reward scientists and engineers in their desire, even if it might appear somewhat childish.[15]

The space race did not exist yet in the minds of most politicians and the public, but Korolev and his top engineers worried about possible American competitors. They decided to forgo the wait for more sophisticated equipment and to go ahead with what their internal documentation referred to as the "simplest sputnik"—a rump satellite able to confirm, besides the fact of the space launch itself, the possibility of radio communication from orbit back to Earth through the ionosphere.[16] The R7 was still at a stage when approximately every second launch encountered some problems, but the one with the first sputnik happened smoothly on October 4, 1957, just six weeks after the first successful military test of the R7 as an ICBM. Even the engineers who knew that they were about to accomplish something important could not anticipate the enormity of the political tsunami that followed. Overnight, *Sputnik* became the chief world media sensation and a public fixation. The dream about the cosmos entered a different cultural realm—no longer a monopoly of science-fiction fans and a few engineers, but a matter of primary attention for the political establishment, mass culture and media, countless children and their teachers, and much of the general population across the globe. Rocketry and space travel became relevant for various areas of cultural life, endowed with many new and changing meanings and uses.

After *Sputnik*

In his contribution to this volume, Asif Siddiqi has reminded us that the umbilical cord linking the ostensibly peaceful exploration of the cosmos with military programs remained its essential contradiction and continued to produce tensions between sometimes conflicting priorities. One can argue that precisely this link, often as unmentionable in public as it was self-obvious, made the space race a useful political trope and a powerful symbol for the rivalry between the Cold War superpowers. By talking about space, one could also symbolically invoke military might and threats without explicitly naming them. Political authorities in the USSR and the United States understood the major importance of *Sputnik* for the strategic balance in the world as well as for the world of public relations immediately, if only post factum. Typically the Soviets looked dismissively on the Western media's propensity for sensationalism, but in this case they found it working in their favor and started supporting it with their own propaganda tools. Soviet spokesmen promoted the achievement nationally and internationally as a demonstration of socialism's advantage over capitalism.

After the triumph of the first sputnik, Khrushchev was asking Korolev for further spectacular achievements in space scheduled around the days of two major Soviet holidays, November 7 and May 1. The American leadership initially tried to downplay the event but was also worried about the changed dynamics in Cold War technological competition. In 1945 the Soviets were regarded as inherently backward, but they had caught up in the development of the atomic bomb by 1949, pulled even with thermonuclear weapons by 1953, and actually surpassed "the West" in missile design by 1957.[17] The public interest aroused by *Sputnik* and the Cold War mentality thus transformed the idea of space travel from an idiosyncratic obsession of some into a chief political priority for the existing and eventually other aspiring superpowers. The space race began in earnest, primarily aiming at the first human flight, but as Amy Nelson has reminded us in her chapter in this volume, also involving animal heroes.

From a military perspective, as the most visible side effect of the ICBM development, the Soviet space launches signified a gradual shift toward the ever more symmetrical stage in the Cold War's strategic balance, with the USSR achieving a modicum of nuclear counterthreat (al-

though the latter would take several more years to develop from a largely symbolic to a sufficiently serious one). The loss of unchallenged nuclear supremacy was hard for the U.S. leaders to swallow, which produced the dangerous outbreak of the Cuban Missile Crisis.[18] Eventually it had to be accepted as a fait accompli and resulted in a relatively stable state of growing mutual awareness that an all-out thermonuclear war would bring about suicide for all of humanity and could not be won in principle. The Soviet leadership's acceptance of this conclusion earlier, already by 1956, allowed Khrushchev to announce publicly that world wars had become avoidable and to proclaim the policy of "peaceful coexistence" with capitalism as the official Soviet strategy on the world arena.[19]

Another aspect of the war mentality proved unchangeable, however. The generation of Soviet officials who had seen their country half destroyed, hanging by a thread, and just barely surviving in the war against Nazi Germany, could not settle for mere capacity for serious counterstrike as an adequate form of military deterrence. Their experience derived from World War II demanded nothing less than relative parity with the United States—that is, roughly the same actual numbers of warheads and delivery means. At this point the military and space priorities began to part ways, because after the R7 their respective demands required different technological systems and increased competition for resources.[20] The Soviet political and military leaders chose as the country's first priority to catch up with the United States in nuclear capabilities—rather than to compete seriously in the militarily and economically useless moon race. Their culturally defined notion of strategic security required mass production of newly developed missiles that were different from those used in the space launches. A major commitment of efforts and resources toward this task dominated the entire decade of the 1960s. They finally saw such relative strategic parity achieved by the beginning of the 1970s, albeit at a quite burdensome price for the national economy. Such parity in turn created the grounds for détente and for the first serious negotiations with the United States on limiting the arms race.

The space race continued to play a major role in the public perception and the superpowers' propagandistic bickering, where both states celebrated different "firsts" as their respective ultimate victories. The Soviets claimed the main prize on April 12, 1961, when a modified three-stage version of the R7 carried the capsule *Vostok 1* with the first cosmonaut, Yuri Gagarin, who orbited the Earth once and landed safely after

the 108-minute flight. In the USSR, as well as in post–Soviet Russia, the success of the first manned flight has been valued as the ultimate victory in the space race, higher than any other possible achievement in space, including *Sputnik*, and commemorated annually as Cosmonautics Day.[21] In the United States the frustration over the defeat made President Kennedy announce the next national priority for country: send a man to the moon. Having committed tremendous resources toward this task, the United States accomplished it with the moonwalk by Neil Armstrong on July 21, 1969. After this triumph or consolation prize, political emotions cooled down somewhat.

Today, fifty years later, the public fixation on manned flights can probably be understood as a misperception, because their actual purpose, economic usefulness, and longtime prospects—apart from the ever declining propagandistic value—have remained as yet rather uncertain. Sputniks, however, proved their practical utility almost immediately with spy, meteorological, and communication satellites. They have become, in the meantime, irreplaceable and invaluable by having changed the essential ways of human life, from allowing for global communications and the Internet to fostering environmental awareness of our common fate on the Earth. In hindsight, it would probably be more appropriate to recognize and celebrate the first little sputnik as humanity's revolutionary breakthrough into space, humble as most true moments of great exploration.

The recent resurgence of popular interest in the Soviet space story in contemporary Russia has brought about new cultural meanings. For example, feature movies by two leading contemporary directors—*Cosmos as Anticipation* by Alexei Uchitel and *A Paper Soldier* by Alexei German Jr.—set their respective plots against the historical/mythological background of the early space launches, which serve as a metaphor for Soviet civilization as a whole.[22] In the latter film the main protagonist, a young physician helping to train the first group of cosmonauts, is torn apart by inner insecurity. He sees in the realization of the space dream the desperate last chance to redeem the Soviet project and return to its original idealistic values after the excesses and distortions of Stalinism, yet unconscious doubts torture him and eventually lead him to death. Artistically interesting, both movies also reveal how hard it has become in the post-Soviet, anticommunist cultural climate, to understand and represent the beliefs and attitudes of the Soviet generation whose for-

mative years of youth coincided with and were greatly influenced by the dawn of the space era and Khrushchev's liberalization. That generational group went by the self-appointed name *shestidesiatniki*, or the 1960s generation (roughly applicable to those who in 1960 were in their twenties), to whom the historian Donald J. Raleigh has also referred as the "Soviet Baby Boomers" and "Russia's Sputnik generation."[23]

Coming of age almost a decade earlier than the American baby boomers, the Soviet shestidesiatniki developed a similarly strong generational mentality to distinguish themselves from older folks. Born mostly before the war, a great many of them were raised by single mothers and without fathers, who were serving or had been killed at the front. Many experienced great deprivation and hunger as young children during the war and the immediate postwar reconstruction, but they also witnessed fifteen years of tremendous improvement in living standards from utter poverty to normalcy and even relative prosperity by the 1960s. This explains the popularity of belief in Soviet values and exuberantly optimistic views of the future. Science-fiction books and futuristic literature were once again the rage, and even Khrushchev may be said to have been carried away by the visionary mood of the time when he foolheartedly promised the Soviet citizen Communism in twenty years.[24]

They saw excesses of Stalinism as violations of the idealistic values of socialism, which Khrushchev had promised to restore. The shestidesiatniki grew up with those values naturally, learning them in school as an already established and settled social norm, without too much of an alternative. Unlike the older generation, the shestidesiatniki were mostly too young during the Stalin years to have been personally forced into difficult moral compromises when those values contradicted with the violent practices of dictatorship. They could thus see themselves as relatively uncorrupted by Stalinism and, living in peaceful time, could optimistically and sincerely believe in a harmonious combination of Communism, morality, and nonviolence.[25]

If this description reminds the readers of Mikhail Gorbachev, it is no accident, for he belongs to the same generation and his views were quite typical of the shestidesiatniki. What is somewhat less usual about him, however, is not the value system itself, but that Gorbachev was able to retain it throughout all the subsequent years deep into the 1980s. Many of the first Soviet cosmonauts came from that very same age group, and as exemplary heroes during the 1960s, they were subject to the cultural ex-

pectations of the time. Cosmonauts acted as public promoters of the Soviet values of atheism, feminism, and scientism. Truth and truth-telling received particular praise as the most desirable and required virtues during de-Stalinization—especially by those who had not had to burden their consciences with unavoidable lies during the earlier era by virtue of their youth.[26] Mass consumerism (in its modest Soviet version) emerged in the 1960s as a relatively new phenomenon. Goods were still scarce, but the absolute amounts mattered less than the rapid upward trend, which the generation of the 1960s had enjoyed for the great part of their still very young lives. As Cathleen S. Lewis aptly tells us in her chapter in this book, the little collection items that became consumer goods, such as stamps and *znachki* (enamel pins) with space symbolism, served as markers for an important social shift.

The cultural nexus of the 1960s would not last very long—it was already disintegrating by the middle of the decade. Economic growth slowed down considerably, while de-Stalinization and other reforms did not go as far as many had hoped and finally stalled, leading to widespread disillusionment and loss of optimism. In subsequent decades some of the typical shestidesiatniki would lose their naïvete and turn cynical or alcoholic; others would become open or closet dissidents; yet others maintained their beliefs quietly, waiting for more opportune times, like Gorbachev and some of his perestroika team. But by the time they marked their presence in the upper echelons of Soviet power and tried to reform it, popular disillusionment with the regime had already gone too far. Believers in its rehabilitation soon found themselves in an absolute minority. With the removal of censorship and deepening economic crisis in the late 1980s, the public mood quickly surpassed the reformist stage and proceeded toward the wholesale rejection of the system. Soviet cultural heritage, however, proved of much more lasting value than the political regime per se. Some of its parts have also been lost or rejected, while others, including space culture and its mythology, have survived and continue to develop in Russia and other post-Soviet countries, even if not necessarily labeled as "Soviet" anymore.

Interestingly, some of the more profound cultural legacies of the Soviet opening into the cosmos can be found internationally. Whereas in the domestic Soviet context the propagandistic potential of Sputnik and other successes in space mostly supported and reaffirmed the already well-established values, on the global arena it served as a vehicle for spread-

ing these ideas into new territories. The highly publicized achievements in space exploration changed the Soviet Union's international image during the 1960s from an "underdog superpower," however promising, to a technologically advanced one, roughly equal in imagination to the United States. The overall attractiveness of the Soviet model increased significantly, influencing many of the cultural reforms and changes in the world of the 1960s.

When Soviet cosmonauts delivered their political message about the advantages of socialism over capitalism to Soviet audiences, they were preaching mostly to the converted. But when they traveled all over the world, then steeped in the process of decolonization and battles over civil rights, they also brought with them a powerful message supporting ongoing struggles for national and racial equality, independence and anticolonialism, modernization and social justice. For girls in the USSR, as Roshanna P. Sylvester has noted in her chapter in this book, the achievement of the first woman in space offered a powerful inspiration and an affirmation of the socialist commitment to educational and professional equality. For women in Europe and North America the Soviet feminism of the 1950s and 1960s, however incomplete by today's standards, served as an example of accomplishments that were not yet available to them, especially in the public sphere and education, and provided models to follow. Ideological adversaries, too, became affected by parts of the Soviet cultural model, as was evident (even if not explicitly acknowledged) in the post-*Sputnik* changes in educational and science policies in the United States, such as dramatically increased federal support and job opportunities for scientists, government funding for science and engineering education, gradual expansion of racial and gender diversity in science, the establishment of NASA as a centralized (Soviet-type) state agency overseeing research and development, and the decline of the ideology of pure science.[27]

The discussion of space exploration has traditionally focused on the issues of technological competition, Cold War politics, and bickering. Cultural aspects of the story have arguably had a much more important and long-lasting impact on our lives but have as yet remained considerably understudied. This book opens up new questions and helps shift directions of research away from the traditional terrain toward yet unexplored topics, including popular and material culture, social movements, and global cultural change.

and De-Stalinization of Consumer Taste in the Soviet Union under Khrushchev," *Slavic Review* 61, no. 2 (Summer 2002): 211–52.

21. For an insightful analysis of the changes in the field of Soviet history as a result of archival research, see Donald J. Raleigh, "Doing Soviet History: The Impact of the Archival Revolution," *Russian Review* 61 (2002): 16–24. See also the articles in the same issue by Lynn Viola and Norman Naimark: Viola, "The Cold War in American Soviet Historiography and the End of the Soviet Union," 25–34, and Naimark, "Cold War Studies and the New Archival Materials on Stalin," 1–15.

22. For useful summaries of the recent literature on the history of Soviet science and technology, see Alexei Kojevnikov, "Introduction: A New History of Russian Science," *Science in Context* 15 (2002): 177–82; and Jonathan Coopersmith, "The Dog That Did Not Bark during the Night: The 'Normalcy' of Russian, Soviet, and Post-Soviet Science and Technology Studies," *Technology and Culture* 47 (2006): 623–37.

23. Some historians have argued that Sergei Korolev, the dean of Soviet rocketry under Khrushchev, can be considered the "father" of Soviet rocketry, while Tsiolkovskii was the luminary and inspirational "grandfather" in the Soviet iconic pantheon. See Andrews, *Red Cosmos*.

24. For an early sociological and theoretical analysis of the process of self-fashioning, see Erving Goffman, *The Presentation of Self in Everyday Life* (Harmondsworth, U.K.: Penguin, 1971). See also Andrews's analysis of Tsiolkovskii's attempts to fashion his own autobiography relative to the Soviet state in his *Red Cosmos*.

25. Fitzpatrick's work is particularly valuable for elucidating the rituals and practices that were a normative aspect of Soviet citizens' lives as they "worked the system" to fashion their identities. See Sheila Fitzpatrick, *Tear off the Masks: Identity and Imposture in Twentieth-century Russia* (Princeton, N.J.: Princeton University Press, 2005).

26. Jochen Hellbeck, *Revolution on My Mind: Writing a Diary under Stalin* (Cambridge: Harvard University Press, 2006).

27. See Natalia Kozlova, "The Diary as Initiation and Rebirth: Reading Everyday Documents of the Early Soviet Era," in *Everyday Life in Early Soviet Russia: Taking the Revolution Inside*, edited by Christina Kiaer and Eric Naiman (Bloomington: Indiana University Press, 2006).

28. Alexander Etkind has taken on the recent Soviet subjectivity school by arguing that, although sincere, some of these edited and resurrected "Soviet life-stories" fail to fully highlight the limited alternatives available to these authors; see Alexander Etkind, "Soviet Subjectivity: Torture for the Sake of Salvation?" *Kritika* 6, no. 1 (Winter 2005): 171–86.

29. Susan Reid, "Toward a New (Socialist) Realism: The Re-engagement with Western Modernism in the Khrushchev Thaw," in *Russian Art and the West: A Century of Dialogue in Painting, Architecture, and the Decorative Arts*, edited by Rosalind P. Blakesley and Susan E. Reid (Dekalb: Northern Illinois University Press, 2007).

1. The Cultural Spaces of the Soviet Cosmos

1. "Forget the pen, pencil it in," newspaper clipping; the publication title and the exact date are unknown.

2. Aleksandr L. Chizhevskii, *Na beregu vselennoi: Gody druzhby s Tsiolkovskim. Vospominaniia* (Moscow: Mysl', 1995), 96.

3. Konstantin E. Tsiolkovskii, "Zhizn' vselennoi," in *Shchit nauchnoi very* (Moscow: Samoobrazovanie, 2007), 207–48.

4. Aleksandr L. Chizhevskii, *Fizicheskie factory istoricheskogo protsessa* (Kaluga: 1-ia Gospolitografiia, 1924).

5. James T. Andrews, *Red Cosmos: K. E. Tsiolkovskii, Grandfather of Soviet Rocketry* (College Station: Texas A & M University Press, 2009); and James T. Andrews, *Science for the Masses: The Bolshevik State, Public Science, and the Popular Imagination in Soviet Russia, 1917–1934* (College Station: Texas A & M University Press, 2003).

6. Richard Stites, *Revolutionary Dreams: Utopian Visions and Experimental Life in the Russian Revolution* (Oxford: Oxford University Press, 1991).

7. Thus the first Soviet science-fiction film, *Aelita* (1924), based on a 1923 novel by Aleksei Tolstoi, combined the ideals of space travel and a social revolution on Mars. The mentality of the revolutionary Soviet youth in the 1920s and their fascination with technology are vividly recalled in B. E. Chertok, *Rakety i liudi: Fili, Podlipki, Tiuratam*, 3rd edition (Moscow: Mashinostroenie, 2002).

8. On the first amateur groups of rocket engineers, see Yaroslav Golovanov, *Korolev: Fakty i mify* (Moscow: Nauka, 1994), 113–63.

9. It has been estimated that there were fewer direct casualties from the V2 launches than among prisoners of war and forced laborers who died while manufacturing those missiles. See Michael Neufeld, *The Rocket and the Reich: Peenemünde and the Coming of the Ballistic Missile Era* (Cambridge: Harvard University Press, 1996).

10. The ultimate (if impractical) example of a synthesis of the highly advanced and primitive technologies was arguably achieved in the design that had a pair of small rockets mounted on and launched from horses.

11. Golovanov, *Korolev*, 223–329.

12. For the most comprehensive account of the Soviet ballistic missile development and space programs, see Asif Siddiqi, *Sputnik and the Soviet Space Challenge* (Washington, D.C.: NASA, 2003); and Asif Siddiqi, *The Soviet Space Race with Apollo* (Washington, D.C.: NASA, 2003).

13. Andrei Sakharov, *Memoirs* (New York: Knopf, 1990), 180–81.

14. For works on the R7 and its testing, see B. E. Chertok, *Rakety i liudi: Fili, Podlipki, Tiuratam* (Moscow: Mashinostroenie, 2002), 142–201.

15. Sergei Khrushchev, *Nikita Khrushchev: Krizisy i rakety. Vzgliad iznutri* (Moscow: Novosti, 1994), 1: 97–114.

16. Golovanov, *Korolev*, 532.

17. On political and media reactions to the first sputnik in the United States, see Walter A. McDougall, . . . *The Heavens and the Earth: A Political History of the Space Age* (New York: Basic Books, 1985), 141–56; and also Paul Dickson, *Sputnik: The Shock of the Century* (New York: Walker Publishing, 2001).

18. Aleksandr Fursenko and Timothy Naftali, *One Hell of a Gamble: Khrushchev, Castro, and Kennedy, 1958–1964: The Secret History of the Cuban Missile Crises* (New York: W. W. Norton, 1998).

19. David Holloway, *Stalin and the Bomb: The Soviet Union and Atomic Energy, 1939–1956* (New Haven, Conn.: Yale University Press, 1994), 337–45.

20. Siddiqi, *Sputnik and the Soviet Space Challenge*, 212–19.

21. The official TASS (the news agency of the Soviet Union) announcement of the first-in-the-world human flight into the cosmic space (April 12, 1961), reprinted in *Bor'ba SSSR za mirnoe ispol'zovanie kosmosa, 1957–1985: Dokumenty i materialy* (Moscow: Politicheskaia Literatura, 1985), 1: 42–43. On Kennedy's reaction, see McDougall, *Heavens and the Earth*, 317–19.

22. The titles of the movies in their original Russian are *Kosmos kak predchuvstvie* (2005) and *Bumazhnyi soldat* (2008).

23. Donald J. Raleigh, *Russia's Sputnik Generation: Soviet Baby Boomers Talk about Their Lives* (Bloomington: Indiana University Press, 2006). This generational issue, and the entire decade of the 1960s, has only recently become the focus of a growing number of detailed investigations by professional historians of the Soviet period.

24. The best existing account of the Soviet cultural 1960s (which actually started around the mid-1950s and ended by the middle of the following decade) is a journalistic and somewhat impressionistic book by Petr' Vail and Aleksandr Genis, *60-e: Mir sovetskogo cheloveka* (Moscow: Novoe Literaturnoe Obozrenie, 1996).

25. In their turn away from glorification of the righteous violence, the shestidesiatniki generation appears to radically differ from the youth that had been similarly traumatized by memories after World War I.

26. After 1954 the public cult of science and computers profited enormously from their association with truth-telling, see Vail and Genis, *60-e: Mir sovetskogo cheloveka*, 100. Also see Slava Gerovitch, *From Newspeak to Cyberspeak* (Boston: MIT Press, 2002), chapter 4.

27. Alexei Kojevnikov, "Russian Science: The Little Ball Made Science Bigger," *Nature* 449 (2007): 542; and "The Phenomenon of Soviet Science," in *Osiris* (Chicago: University of Chicago Press, 2008), vol. 23, *Intelligentsia Science: The Russian Century, 1860–1960*, 115–35.

2. Getting Ready for Khrushchev's *Sputnik*

1. For an overview of Russian utopian thought and the popular cultural crazes of the 1920s, see Richard Stites's monumental study, *Revolutionary Dreams: Utopian Vision and Experimental Life in the Russian Revolution* (New York: Oxford University Press, 1989), 167–89. For a look at aeronautics and its role in popular culture within the context of Soviet exploration of the north, see John McCannon, *Red Arctic: Polar Exploration and the Myth of the North in the Soviet Union, 1932–1939* (New York: Oxford University Press, 1998). Also see Scott Palmer, *Dictatorship of Air: Aviation Culture and the Fate of Modern Russia* (Cambridge: Cambridge University Press, 2006).

2. See I. A. Slukhai, *Russian Rocketry: A Historical Survey* (Moscow: Academy of Sciences of the USSR, 1965).

3. See V. N. Sokolsky, *Russian Solid-fuel Rockets* (Moscow: Academy of Sciences, 1961).

4. Ibid. Sokolsky has argued that these celebratory events were problematic before firework technology was better perfected in the nineteenth century.

5. Michael Stoiko, *Soviet Rocketry: Past, Present, and Future* (New York: Holt, Rinehart and Winston, 1970), 6–7.

6. Evgeny Riabchikov, *Russians in Space* (Garden City, N.Y.: Doubleday & Company, 1971), 115–16.

7. For his collected lectures and information on his rocket designs and interests, see K. I. Konstantinov, *O boevykh raketakh* (St. Petersburg, 1864).

8. For an example of his analysis of rocketry and warfare, see K. I. Konstantinov, "Boevykh rakety v Rossii v 1867," *Artilleriiskii zhurnal*, no. 5 (1867): 6–8.

9. For an elaboration of Gerasimov's design, see A. A. Blagonravov, *Soviet Rocketry: Some Contributions to Its History* (Moscow: Academy of Sciences, 1964).

10. For his classic analysis of dynamics and rocket projectiles in motion, see I. V. Meshchersky, *Dinamika tochki peremennoi massy* (St. Petersburg: Imperial Academy of Sciences, 1897).

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