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Blood, Water and Mars: Soviet Science and the Alchemy for a New Man

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BLOOD, WATER AND MARS: SOVIET SCIENCE AND THE ALCHEMY FOR A NEW MAN

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ABSTRACT

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The themes of blood, water and Mars in Soviet science and technology show the strong utopian and even religious foundations of Soviet society, which invariably centered around forging a new environment and, in so doing, a new variety of human to inhabit it. In the minds and experiments of some of the radical men behind Russia's Revolution, blood was to create a more advanced, biologically "equal" humanity capable of potential immortality, while water was harnessed with the millenarian aim of transforming the Soviet Union's vast landscape into fields of bountiful fertility, as well as cities of efficient industry. Mars represents an extended, sweeping metaphor for the revolutionary dreams that long outlived October; Mars came to symbolize all that Earth could hope to achieve through communism. Authors, philosophers, politicians, and scientists all took part in explaining utopian visions of Soviet man conquering the Earth and the cosmos in their writings and experiments.

The Bolshevik Alexander Bogdanov pioneered his revolutionary blood exchange experiments in his 1905 science fiction-utopian novel, *Red Star*. He founded Russia's first blood research institute in hopes of facilitating the "comradely exchange of life" through blood transfusions in hopes of curing disease, and even reversing the aging process. Water played a

paramount role in the communist dream of transforming man and his environment, via massive irrigation and canal projects, and lab experiments during the Stagnation years. Soviet scientists claimed the discovery of a "new" form of water called "polywater" that stoked Cold War paranoia in the U.S. Mars represented the Soviet urge to not only transform Earth, but other planets as well. Mars was often cast as the location of the socialist humanity of the future in science fiction throughout the Soviet years, and served as evidence of the wider transcendental aims of a communist utopia. These three subsets of Soviet science gave the New Soviet Man an unprecedented level of control over areas once reserved for God alone: possible immortality, apocalyptic transformation, and creation itself.

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CHAPTER I

INTRODUCTION

Science and Spirit

Marxism inarguably shaped the development of Soviet science after the Bolshevik Revolution of 1917. But utopian and metaphysical ideas from the prerevolutionary period also persisted through and beyond that watershed event. As was evident in Soviet science, from studies in agronomy to rocketry, Marxism fused with these earlier utopian currents, particularly concepts inherited from the Russian intelligentsia of the pre-revolutionary Silver Age (1890-1920s). The Russian Silver Age arose in the context of deep social malaise, and its writers and artists responded in a flurry of movements renouncing all past tradition. The period produced an abundance of occult and supernatural thought, but also marked scientific advancement. This was particularly true in biology, where advancements were aimed at "fixing" Russia and "saving" her population from a grim assortment of widespread maladies. Many of these illnesses were physical, but social, moral and "spiritual" illness frequently took the blame for the evils of Russian "backwardness."[1] The notion that Russia needed "saving" had existed among the intelligentsia since at least the 1860s, when "dreamers" turned to utopian-style musings of political and social engineering that they hoped would change Russia and her population for the better. In the age of Darwin, Mendel and Marx, the ambition of "saving" Russia was not only a battle to save the body, but one to save the soul of the nation as well.

Metaphysical elements existed alongside the latest biological experiments in turn-of-the-century Russia, but such elements permeated other fields of Soviet science. During this period many Russian revolutionaries regarded science and socialism as the fused *deus ex machina* that

[1] Maxim Gorkii, *Untimely Thoughts. Essays on Revolution, Culture and the Bolsheviks, 1917-1918*, trans. Herman Ermolaev (New York: Paul S. Eriksson, 1968), 7,14.

held the power to radically transform man and his environment, a force that would, ideally, save Russia from itself, addressing both physical and spiritual ills. In millenarian fashion, early socialists dreamed of abolishing death and creating a new man. Such an urge took root with the Bolshevik Revolution to come.[2] While science and socialism changed nature, it was believed, man would inherit the positive changes, and adapt accordingly.

Many Marxists were initially physicians, like blood transfusion pioneer Alexander Bogdanov, author Mikhail Bulgakov, founding Menshevik party member Feodor Dan, and *Narodnaia Vol'ia* (People's Will) leader Vera Figner. These were people who "began their 'love affair' with the people by learning to cure their physical illnesses."[3] Of course, all the medicinal cures in the world did not seem to fix the "spiritual illness" that revolutionaries often pointed to as one of Russia's most pressing problems. Famed socialist writer and five-time Nobel nominee Maxim Gorkii frequently elaborated on the perceived phenomenon of a widespread, innate Russian "disease" in his 1917 articles in the socialist newspaper *Novaia Zhizn'* (*New Life*): "In a country endowed with natural wealth and talent, complete anarchy in all spheres of culture has surfaced as a result of the country's spiritual destitution."[4] Gorkii blamed Russia's "spiritual destitution" on the "terrible legacy left to the Revolution by the monarchy," claiming that Russia's past was its greatest enemy since its conditions had formed backward, inhumane, anarchic people largely devoid of culture.[5] Widespread physical illness, combined with the ominous, though vague, spiritual sickness believed to plague early twentieth century Russia, led some doctors to take up revolutionary work. Amidst the backdrop of revolutionary sentiment,

[2] Andrei Sinyavskii, *Soviet Civilization: A Cultural History*, trans. Joanne Turnbull (New York: Little, Brown and Co., 1990), 44.

[3] Richard Stites, *Passion and Perception: Essays on Russian Culture*, ed. David M. Goldfrank (Washington, DC: New Academia Pub., 2010), 116.

[4] Gorkii, 6-15.

[5] Gorkii, 15.

famine, and wars spanning 1905-1921, socialism and science were often cast as the cures for Russia's physical and spiritual ailments. In the logical progression of Marxists and "dreamers" in general, socialism and the further development of the sciences would change the social and cultural environment of Russia, and in so doing form a new type of person who would be naturally endowed with the positive characteristics the rotten system had denied them.

While by no means the mainstream or the majority in revolutionary Russia, some scientists, Bolshevik intellectuals, and assorted dreamers constituted an influential group that brought more their more total brand of utopianism into academia and Soviet culture. Intent on making man, Russia, and the world at large better, these few melded Marxism with contemporary spiritual-scientific and occult movements like Cosmism and God-Building in order to bring about a communist utopia in the pending Soviet Union. Cosmism is a complex biopolitical utopian belief system built on both religion and science, founded by philosopher-mystic Nikolai Feodorovich Feodorov (1828-1903). Cosmism and its believers later influenced the Soviet culture-building movement Proletkult as well as Soviet rocket science, paving the way for the equations that made planetary orbit possible. Similarly, Anatolii Vasilievich Lunacharskii (born Anatolii Aleksandrovich Antonov, 1875-1933), member of Proletkult and the Soviet Union's first People's Commissar of Education, advocated God-Building as a socialist "religion of humanity," which sought to retain the psychological and moral provisions of a religion without religion's "other-worldly" elements.[6] Both Cosmism and God-Building stressed man's perfectibility and demanded changes to his environment to pave the path to perfection. Environmental changes in these philosophies ranged from melting the polar ice caps intentionally for their water to removing mankind from earth altogether. As ideological

[6] Anatolii Vasilievich Lunacharskii, *Religiia I Sotsialism* (Spb.: Izd. Shinovnik, 1908), accessed April 9, 2019, https://babel.hathitrust.org/cgi/pt?id=chi.27402008;view=1up;seq=3.

movements, both Cosmism and God-Building influenced scientists, writers and political thinkers of the revolutionary period and beyond.

Spiritual and anti-spiritual sensibilities also played a part in the evolution of Soviet utopianism. By the turn of the twentieth century, science had generally supplanted religion in Western Europe and the trend spread to Russia, albeit slightly late. As with the West, religion in Russia remained the dominant ideology in rural areas much longer than in cities. Silver Age intellectuals popularized the rejection of religion first in the Nihilist tradition, á la Bazarov in Ivan Turgenev's 1862 *Fathers and Sons*, and then as part of Marxism in the later nineteenth century. The *shestidesiatniki* immortalized in Dostoevskii's *The Possessed* and Turgenev's works triumphed radical utilitarianism and an end to unnecessary social niceties, which inspired early twentieth century revolutionaries like the poet Vladimir Vladimirovich Maiakovskii (1893-1930) to call for the destruction of all outdated notions of idealism, romanticism, and sentimentalism, even going so far as to fantasize about using the skulls of the old generation as ashtrays so they would at least be useful.[7] This rejection of the idealistic and spiritual was met by a renewed interest in exactly that, as cultural shifts formed equal and opposing reactions. New modes of thought, both nihilistic and idealistic, scientific and spiritual, took root amidst the problems of turn-of-the-century Russia; the Communist Revolution was kindling to some of these, and a wet blanket for others. In particular, Marxism bolstered scientific development, but in many ways even this was tinged with a spiritual element, based on the perceived ability of science to transform human beings on such a grand scale. In this way, science in Russia during the revolutionary period took on a partially religious profile. Most Bolsheviks invested not only transformative powers into socialist science but creative and moral powers as well.

[7] Sinyavskii, 44.

Belying the purely political and social aims of building a Marxist state, there was a pervasive and messianic urge within Soviet culture to manipulate man's most fundamental makeup and create a "New Adam" for the Soviet "Eden." Begging the question, the creation of this new Eden was itself to be the impetus for the creation of a new type of person. Marxist ideology carried an implied acceptance of the inheritance of acquired characteristics (Lamarckism). It was widely believed that the Soviets' New Adam would be the result of radical changes to his environment. Augustinian Monk Gregor Mendel pioneered the theory of genetic inheritance in 1865 with his famous pea plant experiments and the theory became widespread by 1900. Russia, however, continued to favor Lamarckism well into the twentieth century. Lamarckism, in turn, validated Marx's ideas that environments shaped individuals and that changes to environments became heritable. Therefore, any communist utopia had to, by nature, accept the inheritance of acquired characteristics as the only scientific means of transmitting traits. Plus, Lamarckist scientists could offer "applied solutions to problems like agriculture, whereas Mendel-Morgan subscribers could offer only theory."[8] The active element of Lamarckism was critical to a Marxist transformation of the world and appealed particularly to the Bolsheviks, who also favored an applied, active approach to politics. By 1920, Lamarckism was pseudoscience to most of the Western world. Yet the debate surrounding epigenetic inheritance, the less-toxic phrasing for acquired characteristics heritable for at least a few generations, continues to play out in Russia even today because of the peculiar political and social landscape there that has shaped genetic science.[9] While scientists elsewhere are often reluctant to publish any findings that might validate epigenetic inheritance, in Russia there has

[8] Ibid., 25.

[9] Loren R. Graham, *Lysenko's Ghost: Epigenetics and Russia* (Cambridge, MA: Harvard University Press, 2016), 115.

been a recent enthusiasm to exalt such findings, in an attempt to retroactively justify decades of Soviet "pseudoscience."[10]

For many in both pre- and post-revolutionary Russia, only the complete subjection of nature to man's will and the corresponding forced evolution of the people, both individually and societally, could ensure the stateless, egalitarian utopia that had become the obsession of writers, politicians and scientists alike. This subjection and transformation of both man and his environment often cast Marxist science as Russia's long-awaited, "rational" and observable means to achieve what magic and religion had failed to make possible. In short, the transformation of man was meant to stop his never-ending struggle against his environment, against scarcity and subsequent hunger and disease, while at the same time transforming the social structure into an egalitarian model that would naturally produce morally better citizens. The New Soviet Man would be selfless, hardworking, and utterly committed to the welfare of society as a whole. The traits he would lack were just as critical to Bolshevik theorists; the New Soviet Man would be stripped of the "superstition" commonly attributed to the Russian peasantry, and he would no longer be a slave to old traditions and social norms, which revolutionaries believed kept Russia shackled to the past.

The positive changes produced from the new socialist environment could theoretically be passed on, making Lamarckism the science of biological progress that complemented Marxism's social and political progress. This concept far transcended the notion of parents instilling learned behaviors in their children. Many Bolsheviks and scientists believed that communism would change people on a fundamental basis and that these changes were heritable. As Loren Graham, the foremost scholar of Soviet science in the West, has pointed out, control over the environment and epigenetic inheritance in the Soviet context teem with irony. What was once posited as a

[10] Ibid.

"bloodless positive revolution" became a tool in one of the bloodiest processes of transformation in modern history.[11] In Soviet Russia, the metamorphosis of man and environment became degenerative and downward leveling—not progressive and upward.[12] The quest for equality ended up dragging most people down, not enabling them to pull themselves up. For instance, Bolshevik policies like Collectivization aimed at creating a communist work force out of the peasantry and those living in the steppe borderlands often made their situations worse. As the role of "the people" eclipsed the "the individual," Soviet citizens became "units," and other incarnations of such faceless terms.[13] Soviet equalization, in an effort to change people on a sweeping scale, often meant the degradation of all that which made humans "human."

Maxim Gorkii famously wrote in *Kanal imeni Stalina* (*A Canal Named Stalin)* that, "in changing nature man changes himself."[14] Though Gorkii's was the most famous name attached to the project, the book was a collective effort by over one hundred OGPU writers. It expounded the virtues of using gulag laborers to dig the canal because they were "rehabilitating" themselves in the process.[15] Despite Gorkii's legacy as a literary genius, *Kanal imeni Stalina* makes it "difficult not to question his integrity…even making a full allowance for [his] unbridled fancy."[16] The forced prison labor used to construct the White Sea-Baltic Sea canal (*Belomor*) was portrayed as an ambitious alteration to the landscape that would in turn change the prisoners into class-minded socialists. Soviet science was similarly understood as the means by which the modern-day alchemical transformation of humans and their environment became possible.

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[11] Ibid., 4.
[12] Ibid., 43-45.
[13] S. D. Tucker, *Forgotten Science: Strange Ideas from the Scrapheap of History* (S.l.: Amberley Publishing, 2018), 10.
[14] Stephen Brain, "Stalin's Environmentalism," *The Russian Review*, January 01, 2010, accessed April 11, 2019, https://www.jstor.org/stable/20621169?seq=1#page_scan_tab_contents.
[15] Bastiaan Kwast, "The White Sea Canal: A Hymn of Praise for Forced Labour," 2003, accessed April 11, 2019, http://www.iisg.nl/collections/belomorkanal/praise.php.
[16] Gorkii, *Untimely Thoughts: Introduction*, xv.

Science and technology, harnessed for vague and indiscriminate Soviet "progress," were conceived of in religious, even magical, terms; the Communists were the new God, remaking the world in their image through means only available to them because of their materialist understanding of human history.

As a whole, early Soviet science was so ideological and philosophical that it was often more religious or spiritual than scientific. Philosopher John Gray wrote in *The Immortalization Commission: Science and the Strange Quest to Cheat Death*, that Lenin and the Bolshevik regime perceived themselves as the enlightened "intelligent minority," capable of "leading humanity out of the chaos of history."[17] Such a task may have been scientific, but it was weighted with spiritual significance. Of course, not all Russian revolutionaries, or even all Bolsheviks, agreed on the means by which this transformation should take place, and some argued against the notion that any such "intelligent minority" even existed in Russia.[18]

The scientific-metaphysical efforts of shaping the new Soviet civilization reveal a preoccupation with three seemingly disjointed components: blood, water, and Mars. While blood, water and Mars may seem to be arbitrary filters, these three elements each have unique and fascinating roles in the history of Soviet science. Knitted together, they uncover some of the framework underlying the communist dream in Russia—the creation of a new type of man, the complete subordination of earth, and the cooptation of what was formerly the "Heavens." Gaining mastery over each of these elements would give New Soviet Man a control that no civilization had obtained before. Control itself is one of the most fundamental pieces of utopias.

I will be analyzing blood, water and Mars as thematic elements within Soviet scientific thought from the revolutionary years through the Stagnation in order to trace the strong utopian

[17] John Gray, *The Immortalization Commission: Science and the Strange Quest to Cheat Death* (London: Faber And Faber, 2012), 5.
[18] Ibid., 98.

heritage and millenarian currents that existed beneath the political surface of the USSR for most of its existence. Blood, water and Mars, as subsets of various Soviet scientific endeavors ranging from biology to chemistry to astrophysics, did coexist at times. Even when separated by decades, though, these topics were always linked by an enduring utopian streak in all fields of Soviet science. For example, the research into blood exchanges during the revolutionary years aimed at prolonging life was roughly forty years separated from the Soviet mega-engineering projects in the Central Asian Republics aimed at remaking nature and forcing the revolutionary collectivization of labor, a process which would theoretically usher in a new, more "advanced" species of man. These two projects were temporally and geographically quite separate, but the ideological (and spiritual) utopian underpinnings were the same. Likewise, the Soviet push into rocketry and space travel beginning with Konstantin Eduardovich Tsiolkovskii's astronautic theory in the early twentieth century bears little semblance to blood transfusions or expansive irrigation canals in the desert, yet all three themes hinged on a very real belief in the power of man to control and manipulate not only his own species, but to conquer nature and the Cosmos as well. While this urge had existed in Europe and beyond since the Enlightenment, nowhere did such ideas become the dogma of the ruling party of the state as they did in Soviet Russia.

Historiography

Historical research into Soviet science and pseudoscience is predominantly centered on Lysenkoism and Stalin's persecution of scientists during the Great Purge. This study focuses on the beliefs and trends from the early revolutionary period that shaped Soviet scientific efforts for the Union's entire existence, using the three concepts of blood, water and Mars as signposts. Of necessity, the chronological scope of this study is a large one, though it is hoped that the three concepts in the context of Soviet scientific and technological development will narrow its focus.

These three elements have never been isolated from wider Soviet science, or treated as part of a wider utopian, transformative trend that spanned the Revolution to Stagnation.

Richard Stites (1931-2010), Andrei Sinyavskii (1925-1997), Nikolai Krementsov (1957), and Loren Graham (1933-) have written the bulk of the body of work covering Soviet science, scientific utopianism in Soviet society, and the political influence that shaped scientific inquiry after the Revolution. Stites wrote from the late 1970s-2010, overlapping for three decades with the works of Sinyavskii. As a dissident author and successor to Pasternak, Sinyavskii was active 1959-1990, and sometimes published abroad under the name Abram Tertz. He served time in prison for "anti-Soviet activity" following conviction in the Sinyavskii-Daniil show trial of 1965, an event that indicated the shortcomings of Khrushchev's so-called "Thaw."[19] Krementsov and Graham have published more recently. Krementsov's *A Martian Stranded on Earth: Alexander Bogdanov, Blood Transfusions, and Proletarian Science* was published in 2011, and Loren Graham's re-evaluation of epigenetic inheritance in Russian history, *Lysenko's Ghost*, was published in 2016. Krementsov's work is the only English biography of Bogdanov to date and in it he traces the history of blood transfusion science in Russia, connecting it to wider social and political issues. It was only after Marxism could find a use for blood exchanges that Bogdanov's work was given serious attention, beyond the realm of science fiction. In *A Martian Stranded on Earth,* Krementsov looks at Bogdanov's three faces: Bogdanov the revolutionary, the scientist, and the author. Krementsov successfully weaves these three facets of Bogdanov's life and work together, with blood exchanges emerging as their ultimate common thread.[20] I also cite Krementsov's article "Off with your Heads: Isolated Organs in Early Soviet Science and

[19] Fred Coleman, *The Decline and Fall of the Soviet Empire: Forty Years That Shook the World, from Stalin to Yeltsin* (New York: St. Martins Griffin, 1997), 95.

[20] Nikolai Krementsov, *A Martian Stranded on Earth: Alexander Bogdanov, Blood Transfusions, and Proletarian Science* (Chicago, IL: University of Chicago Press, 2011), 1-9.

Fiction," which discusses the link between Soviet science fiction and Soviet scientific experiments involving an "autojector," a machine used to circulate blood to disembodied organs.[21]

American historian Loren Graham's work on Russian and Soviet science has also been formative, both for the field as a whole and for my research. Graham has been a professor at Columbia, MIT and Harvard, and was one of the first Americans to take part in scholarly exchange programs between the USSR and the United States in the early 1960s. Researching the relationship between Marxism and the sciences, Graham has written numerous books on Soviet science. His work on epigenetics in Russia and the Soviet Union, explored in *Lysenko's Ghost*, and his preface to the 1989 publication of Bogdanov's *Red Star: the First Bolshevik Utopia* are cited throughout. The essay and preface to that edition were co-authored with another instrumental figure in my research: Richard Stites.

Stites' writings on Russian and Soviet culture, as well as his introduction to the reprinting of Bogdanov's *Red Star*, make his work among the most valuable for my thesis. *Revolutionary Dreams* is the most thorough treatment of the ideologies behind the Revolution that called for a complete transformation of man and society.[22] It looks at the Bolshevik party as just one group of "Russian and Soviet dreamers" that emerged at the turn of the twentieth century, many of whom sought to change everything about their lives and society. Stites views them all as sharing in the "utopian propensity" born from the conditions of life in pre-revolutionary Russia. Citing the pervasive struggle for daily subsistence, inequality, and underdevelopment, Stites claims that many of "the people"—whom he seems to broadly define as anyone not in the ruling elite—began to dream of a complete overhaul of "normal" and this often manifested itself in dreams of

[21] Nikolai Krementsov, "Off with Your Heads: Isolated Organs in Early Soviet Science and Fiction," accessed November 14, 2018, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2743238/.

[22] Stites, *Revolutionary Dreams*.

abundance and freedom to the point of anarchy. The rulers of Russia, on the other hand, dreamed of a world with order and control over the vast, disconnected and harsh landscape they had inherited. Stites gives particular attention to the ways people wanted to change their everyday relationships and habits, not just the larger governmental structure and the "future" in general. Stites examines writings from the time, most from "popular" sources, in illustrating the ways in which people aimed to merge their dreams with reality. The Revolution of 1917 gave many people hope that it was indeed possible to create this entirely new society, and Stites argues that the Bolsheviks as "visionaries and missionaries" took on a hugely important role in not only reshaping Russian/Soviet culture, but also inspiring a counter-culture of "dreamers" in the Soviet Union and beyond. One of the key concepts in Stites' argument is that "the dream" is essential for societies and its importance often leads to a blurred line between ideal and reality.

If Stites may be regarded as the foremost Western scholar of the phenomenon of "Soviet civilization," then Sinyavskii was his Russian counterpart. Sinyavskii's *Soviet Civilization* delves into the Bolsheviks' more spirit-oriented aims, like Commissariat for Enlightenment Anatolii Lunacharskii and Maxim Gorkii's God-Building ideas, and how these interacted with science and society.[23] Interestingly, in his collected essays on Russian culture *Passion and Perception*, Stites has expressed distaste for Sinyavskii's *Soviet Civilization*, claiming it is "anecdotal" and has no framework, or clear methodology. In the essay "Civilization on Trial," Stites challenges large aspects of Sinyavskii's book, but concedes that though he missed some of the facts, he managed to hit the truth. Regardless of how informed he was about Western scholarship on Soviet culture, Sinyavskii was able to convey something arguably more important—what felt true to the people living the Soviet experiment. Sinyavskii's *Soviet Civilization* is a unique cultural history that explores the major themes that have permeated the Soviet mentality and way

[23] Sinyavskii, *Soviet Civilization*.

of life from the October Revolution to the late 1980's, when the book was published outside the Soviet Union.

As someone who experienced the many "hallmarks" of life during the Soviet experiment, including prison sentences in Siberia and forty years of communal apartment living, Sinyavskii is able to provide vivid context for the features he evaluates in a candid, biting, way. While claiming that it was indeed a new type of "civilization" to emerge from 1917, with changed concepts of morality and even a renovated lexicon, it is clear Sinyavskii regarded the idea of Soviet civilization and everything it was built on as a kind of tragicomic failure; he expressed the inherent irrationality and even absurdity of the Soviet experiment, its rejection of basic human nature, and its self-destructive regime. This aspect of Sinyavskii's writing has been instrumental and formative to my treatment of the elements I will cover in my thesis, because his writings illustrate that a pervasive irony was visible to those living in the Soviet Union, not just to a Western writer with the benefit of years of hindsight. In looking at the themes, or metaphysics as he calls it, of Soviet civilization, the aim is not to paint a chronological history of the Soviet Union but to get at its soul; he wants to "explore the theory" of Soviet civilization. Sinyavskii work explores the themes of revolution, the making of a "New Man," and the ideas of utopia-dystopia, to name a few. These are enduring hallmarks throughout Soviet history, and the author links the October Revolution and the "State-Church" under Stalin to the fundamentally religious roots that belied the Russian idea of revolution in general. Sinyavskii weaves together these thematic elements, showing how they laid the foundation for a "new way of life," and from this new way of life the forging of a new civilization, the Soviet civilization, was underway. To analyze the "religion of communism" and the way this new Soviet civilization took shape, Sinyavskii also looks at popular literature, like the works of Blok and Bulgakov. Sinyavskii

asserts the value in looking "at Soviet civilization through the eyes of Soviet literature" because as a mirror it conveys the symbols of the culture. This is also something I hope to do with my treatment of *Red Star* and other science fiction stories in the chapter on blood.

Apart from Stites' and Sinyavskii's Collapse-era works, recently there has been renewed interest in Bogdanov as a scientific figure, with the opening of more Soviet archives and the publication of some of his works in English for the first time. Stalin struck much of Bogdanov's life and work from the Soviet scientific narrative and before the 1990s, Bogdanov was often referenced only in regards to his disagreements with Lenin over philosophy. Their falling out is always a point made by writers discussing the founding members of the Bolshevik party, but Bogdanov's life and work was largely ignored from the Stalin years through Gorbachev.

One reason for new interest in the topics of heredity and science from the Soviet years is the resurgence of these same topics in contemporary Russian media. Because there have been cases of verifiable epigenetic inheritance, right-leaning Russian media and the state-run papers (many of them) have printed stories claiming that Lysenko has been vindicated.[24] Bogdanov's work has resurfaced because the foundational theories of his blood exchanges implied the acceptance of the inheritance of acquired characteristics. In Putin's Russia epigenetics is linked to a more nefarious agenda than Lysenko's plant vernalization, however; it is used in arguments against natural homosexuality and, somehow, it is used to support creationism. Clearly the issue of "making" people better, whether by genetics or by changes to their environment that are inherited epigenetically, is one that will remain controversial long into the future, making the history behind these issues even more relevant.

In early 2018 a collection of essays that make up Boris Groys' *Russian Cosmism* was published, as there is also a new interest in Cosmism and other spiritual beliefs from fin-de-siècle

[24] Graham, *Lysenko's Ghost*, 120.

Russia, like Theosophy and Anthroposophy.[25] Some sources see this as solutions people are turning to in the face of the "Anthropocene age," the point we are arguably in right now, where the fate of humanity and the fate of the earth are completely intertwined and inform each other. The Anthropocene age is closely tied to the concept of the biosphere. Russian-Ukrainian scientist Vladimir Ivanovich Vernadskii's (1863–1945) concept of the "biosphere," which holds that life is essentially what changes and shapes earth's environment, crops up in the news as well as in academia today largely because of climate change debates and musings on artificial life-sustaining environments.[26] The biosphere concept echoes the so-called "Gaia Theory" that posits all life on Earth is self-regulatory and that environments and organisms co-adapt accordingly. The concept of accelerated and forced adaptation and evolution is a characteristic of Cosmist belief. Russia still has its share of Cosmists today, pushing for man's "active evolution" to the point of corporeal non-existence, at which point human intelligence will occupy the "noosphere," Vernadskii's term for the part of the biosphere made up of consciousness.[27] *Cosmism* includes invaluable primary sources by Bogdanov, Tsiolkovskii, Feodorov, and many others active in Soviet science and Cosmism throughout the last century.

The connection between Bolshevism and the occult is addressed in John Gray's (1948-) book on the Bolshevik quest to abolish death, *The Immortalization Commission.*[28] Gray, not to be confused with the pop psychologist of the same name who penned *Men are from Mars, Women are from Venus*, is an English analytical philosopher who writes extensively about atheism and politics. This work investigates the titular committee in charge of Lenin's funeral

[25] Alexander Bogdanov, et al, *Russian Cosmism*, ed. Boris Groys (MIT Press, 2018), 56-62.
[26] Vladimir I. Vernadskii, *The Biosphere* (Copernicus Springer, 2014).
[27] Mark Nelson, "The Science behind Biospheres and Its Importance to Our Future," *The Ecologist: Journal for the Post-Industrial Age*, October 08, 2018, accessed April 09, 2019, https://theecologist.org/2018/sep/06/mark-nelson-science-behind-biospheres-and-its-importance-our-future.
[28] Gray, *The Immortalization Commission*.

and preservation arrangements. Gray analyzes God-Building, the attempt to forge a new socialist religion from Bolshevism, and claims it was no coincidence that the many members of the Immortalization Commission were God-Builders with strong metaphysical beliefs and an infallible faith in science. The God-Builders were greatly influenced by Feodorov, who believed in literal resurrection and "had a magical faith in the power of science, which they believed could conquer death."[29] Gray describes the movement as "a kind of secular mystery cult, God-building was another part of the late-nineteenth-century European current in which occultism and science marched hand in hand…they believed a true revolutionary must aim to deify humanity, an enterprise that includes the abolition of death." [30] They were part of the early Bolshevik intelligentsia and included the writer Gorkii, Commissariat for Enlightenment Lunacharskii and the man put in charge of Lenin's remains, a Bolshevik "jack-of-all-trades" named Leonid Krasin. Krasin's attempts to freeze Lenin and the extensive care given to his cadaver were done with "the ultimate aim of returning him to life."[31]

Several collections of essays have been helpful in detailing occult, spiritual, and environmental elements throughout Russian history, namely *The Occult in Russian and Soviet Culture* (1997), and *Meanings and Values of Water in Russian and Soviet Culture* (2017). *The Occult in Russian and Soviet Culture*, edited by Bernice Glatzer Rosenthal, is a collection of essays on the occult revival of turn-of-the-century Russia and the role of occult symbolism in Soviet art, literature and culture.[32] Glatzer Rosenthal asserts that the occult had always been present in Russian culture, referencing the *dvoeverie* of peasant folk belief and religious mysticism, and that the occult endured through the Revolution and the Stalin years, merely

[29] Ibid., 158-159
[30] Ibid., 141.
[31] Ibid., 159.
[32] Bernice Glatzer Rosenthal, ed., *The Occult in Russian and Soviet Culture* (Ithaca, NY: Cornell University Press, 1997), 2.

taking on different forms and expressions. For instance, the Symbolist movement of the Silver Age and the Avant-Garde's fascination with the Fourth Dimension were among the ideas adapted by the Bolsheviks to serve early Soviet Utopianism, as people who had "once vested their hopes in religion and magic turned to science and technology instead."[33]

Meanings and Values of Water in Russian and Soviet Culture is an edition that situates water among the most important symbolic and literal elements throughout Russian history.[34] Particularly useful to the second chapter of my thesis, the book includes an essay on water as a form of Soviet power during the Five-Year Plan canal constructions. Water was harnessed to reshape landscapes, which was an integral part of the wider drive during the 1930's to subdue nature, according to the will of the Soviet government in its quest to form a socialist society.[35]

In addition to these, I have consulted books that focus on pseudoscience throughout history, and many of these feature lengthy sections on the USSR. Two of these books, though not specifically about Russian/Soviet history, have been very insightful: *Diamond Dealers and Feather Merchants: Tales from the Sciences* by Irving Klotz, and *Impossible Possibilities* by Jacques Pauwels and Louis Bergier. These two works are compilations of stories and experiments that, for better or worse, push the boundary of what constitutes "science." Though both books examine fields of scientific inquiry and new theories (at the time of publication) that fell beyond the realm of "normal" possibility, the authors present this material in opposite ways. Klotz stated his aim was to "provide a tour through a few of the galleries of science to view other people's fallibilities, to explore facets of temperament, personality, and social, political and

[33] Ibid., 2.
[34] Jean Costlow and Arja Rosenholm, eds., *Meanings and Values of Water in Russian Culture* (S.l.: Routledge Studies in Modern European History, 2018), Electronic.
[35] Ibid., 4.

religious environment that led them to make monumental misjudgments."[36] In *Impossible Possibilities*, Pauwels and Bergier argue that, "in many areas of human knowledge and creation our general philosophy of life either fails us or turns out to be inadequate. These are the areas we want to probe and investigate…we want to see in history links with the world of tomorrow."[37] It is not an accident that Soviet science is so prominent in both books; though they were by no means the only nation that seriously entertained (and adopted) ideas from highly speculative forms of "science," both books acknowledge that the USSR was by its very nature especially susceptible to belief in the fantastic and "impossible." In reference to science in the Soviet Union, Klotz focuses on the polywater scandal and other stories related to the role of water in Soviet science. Pauwels and Bergier discuss many facets of Soviet science, including Pavlov's establishment of psychic research in Russia, telepathy, and mind control experiments. University presses did not publish these, but they have been a starting point for further research and contain other sources to look into.

Another helpful anthology of bizarre and unlikely tales from the history of science was S.D. Tucker's *Forgotten Science*. It includes numerous examples of Russian and Soviet scientific eccentricities, including blood transfusions and the hope of achieving immortality.[38] Tucker places these scientific trends in the Soviet utopian context; the underlying aim of changing mankind and the planet, ultimately extending into space, is never far from the anecdotes about Soviet scientists dreaming of harvesting organs from human vegetables or from science assuming religious significance. The underlying dream of change and control of man and the environment, however, resulted in the devaluing of human life to a tragic degree.

[36] Klotz, 1.
[37] Louis Pauwels and Jacques Bergier, *Impossible Possibilities* (London: Mayflower, 1980), 18.
[38] Tucker, 254-277.

Chapter three focuses on water, Soviet mega-engineering projects, and the environmental changes that ensued. The book *When the Rivers Run Dry* by Fred Pearce of *New Scientist* journal is a valuable account of the Aral Sea disaster and its relation to the Soviet urge to change the environment, and, by extension the people.[39] Pearce examines the Soviet urge to modernize and transform semi-desert areas in Central Asia into massive cotton fields, an obsession which led to many "successes" in terms of Soviet production and technology, but also to ecological and biological failures that are permanent.

Organization

The themes of blood, water and Mars in Soviet science and technology tell of the strong utopian foundations of Soviet society, which invariably centered around forging a new environment and, in so doing, a new variety of human to inhabit it. The scope of Soviet science from the Revolution through the Stagnation years was all encompassing, and seemingly religious in scale. Bettering the biology of human beings, the transformation and subjection of the natural world, and gaining the power to move freely across all of space illustrate the aims of Soviet science through increasingly broad and complicated lenses.

Chapter I offers an introduction to the themes I will be analyzing, and provides the grounding for Marxism's role in Soviet science.

Chapter II provides a more in-depth background on the troubled atmosphere in pre-revolutionary Russia that gave rise to intellectual and political dissent. I examine the various utopian strains that existed in Russia from the nineteenth to twentieth centuries. While utopian currents existed in Russia before the Revolution, the Bolsheviks were the first to be able to institute their Marxist utopia from the top down, at the highest level of government.

[39] Fred Pearce, *When the Rivers Run Dry: Water - the Defining Crisis of the Twenty-first Century* (Beacon, 2018), 201-216.

Chapter III focuses on the important role blood played in utopian Soviet science. In the minds and experiments of some of the radical men behind Russia's Revolution, blood exchanges were to create a more advanced, biologically "equal" humanity capable of potential immortality. As a transferrable and "universal" human tissue, blood became central to "proletarian biology" following the Bolshevik Revolution. Alexander Bogdanov pinned his hopes of forging a communist society scientifically via the use of blood exchanges. Blood exchanges in this context also help reveal the Soviet understanding of heredity and acquired characteristics, which fit with the ideas of Marxism.

Chapter IV looks at the various Soviet scientific and technological uses of water in the far-reaching efforts to create a productive, socialist utopia throughout the Soviet Union. Water was harnessed with the millenarian aim of transforming the Soviet Union's vast, but often desolate, landscape into fields of bountiful fertility, as well as cities of efficient industry. This chapter discusses the irrigation of the so-called "hungry steppe" of Central Asia with massive canal systems, Stalin's White Sea-Baltic Sea canal project during the first Five-year Plan, and the various Thaw and Stagnation era projects that attempted to change water's chemical structure or make a new form of water altogether. All of these vignettes illustrate the wider utopian aim of changing mankind through changing his environment, and in so doing, appropriating control over nature and the elements.

Chapter V briefly examines Mars and the broader role of the cosmos in Soviet science and ideology. Mars represents an extended, sweeping metaphor for the revolutionary dreams that long outlived October. Authors, philosophers, politicians, and scientists all took part in explaining utopian visions of Soviet man conquering the Earth and the cosmos in their writings

and experiments. Mars figured prominently in many of their works.[40] Mars and space in general came to symbolize a grandly designed "better future," and all that Earth could hope to achieve through communism.

[40] Bogdanov, Groys, et al, viii.

CHAPTER II

THE REVOLUTIONARY INTELLECTUAL LANDSCAPE

Utopias and Scientific Possibility

Following the October Revolution, the Bolsheviks began to institute a maximalist interpretation of Marxism as the ultimate science, one that was capable of at long last bringing about a utopia for Russia and curing all the ills of the dismal past. In this transformative process, many Revolution-era intellectuals regarded science as playing an all-important, miraculous part. Such far-reaching utopianism and the making of a better world for all of course called for the rationalization of any mistakes or desperate measures in the process. Whatever occurred along the way, both the government and those captivated with the carnivalesque process of turning society upside down deemed the anticipated end, the communal utopia promised, as worthwhile. Because of its scale and inherent contradictions, Soviet utopianism often carried with it the seeds of its own destruction.

Arguably all utopias bear such a cross, as the word literally means "not places" and their existence in reality is in itself paradoxical. It cannot be overlooked, however, that the Soviet brand of utopian ideology included irony of apocalyptic proportions. This trend began before Russia had even experienced a revolution; Marx claimed that of the places on Earth least likely to have a communist revolution, Russia ranked near the top of the list. When Russia did experience a communist revolution, however, the Bolsheviks had the chance to will into reality all that the radical intelligentsia had been dreaming of. Revolutionary democrat Nikolai Gavrilovich Chernyshevskii wrote about such a utopian society in his iconic 1863 "revolutionary handbook," *What Is to Be Done?*[1]

[1] Nikolai Chernyshevskii and Michael R. Katz, *What Is to Be Done?* (Cornell University Press, 2014).

Favoring a peasant-style commune within an industrialized society, Chernyshevskii wrote about a world where the intelligentsia's role was to commit themselves selflessly to socialism and to the education of the working class. This effort would bring about an egalitarian society free from class, traditional gender roles, and capitalism. Affectionately likened to a "Mexican soap opera" by some Russian intellectuals, *What is to Be Done?* follows Vera Pavlovna's liberation from her strict family and her escape from an arranged marriage with the help of her brother's tutor, Lopukhov.[2] Like any true revolutionary, Lopukhov supports equality between the sexes and progressive women's rights, encouraging Vera's establishment of a seamstress co-op run by women. Her business is a model of a utopian workspace, and through Vera's conversations and dreams, Chernyshevskii illustrates a much larger utopian, communal dream of life in "the crystal palace," where absolute freedom and work for the benefit of the whole are the only government. Lopukhov is so progressive in fact that he willingly steps aside so Vera can have an affair with Kirsanov, one of his classmates, and the pair lives happily ever after. Though sometimes met with smirking derision in modern audiences, who dig deep for such acclaim as "simple," and "long," the book's direct link to the Russian Revolution secures it as one of the most influential titles of all time. Joseph Frank of *The Southern Review* wrote that:

> No work in modern literature, with the possible exception of *Uncle Tom's Cabin*, can compete with *What Is to Be Done?* in its effect on human lives and its power to make history. For Chernyshevsky's novel, far more than Marx's *Capital*, supplied the emotional dynamic that eventually went to make the Russian Revolution.[3]

The book's influence was such that some critics place the Russian Revolution squarely at its door. Revolutionaries like Lenin and Russia's Women's Section (*Zhenotdel)* leader Alexandra

[2] Dr. Volha Isakava, "Censorship and Resistance in Russia" (lecture, Ellensburg, WA., April 2016).

[3] Nikolai Chernyshevskii, Michael R. Katz, "What Is to Be Done?" Amazon, January 20, 1989, https://www.amazon.com/dp/0801495474?,encoding=UTF8&isInIframe=0&n=283155&ref_=dp_proddesc_0&s=books&showDetailProductDesc=1#product-description_feature_div.

Kollantai praised *What is to be Done?* and took great inspiration from it. Lenin called Chernyshevskii "the greatest and most talented representative of socialism before Marx."[4]Authors like Tolstoy and Dostoevskii, however, wrote their own treatises in response, pointing out the dangers of such a dream, and the potential outcomes of embracing radicalism over moderate reform.[5] To some, Chernyshevskii's utopia was something to bleed for, fight for, and die for if necessary. For others, the prevention of such a world merited those same actions. The thin line between utopia and dystopia is often barely visible, and this was especially true in the Soviet transformation of man and his environment.

Before a discussion of utopianism in the Soviet science concerned with blood, water and Mars can take place, the philosophical and spiritual underpinnings of these concepts in turn-of-the-century Russia must be addressed. In addition to blood's hoped-for role in fostering a new Soviet civilization, physical manipulation of the land would socially and culturally help bring about the New Soviet Man, a concept akin to communist gods fashioning themselves a new Adam. Writings from revolutionaries like Lenin, Gorkii, and Alexander Alexandrovich Bogdanov (1873-1928) serve as the strongest evidence for their understanding of the Marxist Revolution as a messianic event; the language of totality, inversion, genesis and apocalypse appears in various concentrations both before and after 1917.

The "Russian George Orwell" Andrei Platonov (neé Klimentov 1899-1951) thought that the communist aspirations of the Soviet Union could "only be understood in Feodorovian terms," echoing the idea that the New Soviet Man would be Adam to a new Eden.[6] Nikolai Feodorov pioneered Cosmism and claimed immortality and the freedom to move across all of space

[4] Ibid.
[5] Gorkii, *Untimely Thoughts*, 186.
[6] Tucker, 270.

eternally to be mankind's "common cause." Feodorov wrote about complete control over and manipulation of Earth's environment and the atmosphere, including the weather, in his *Astronomy and Architecture,* and the posthumously published *Philosophy of the Common Task*.[7] Soviet science also sought such control. Feodorov influenced some of the most notable communist thinkers and Futurists of the Revolution, as well as many Russian scientists and writers, counting Tolstoy, Dostoevskii, and rocketry pioneer Konstantin Tsiolkovskii among his disciples. Feodorov helped inspire the Soviet "Eden" obsession with his dreams of establishing a new paradise in Turkestan, where he believed the Biblical Eden may have once actually existed. For Turkestan's desert to once again become mankind's Eden, Feodorov advocated radical intervention in and manipulation of the environment via technology.[8] This included control of the weather, melting the polar ice caps, and human evolution to the point of incorporeal existence—as particles of an "All-Spirit" present throughout the universe.[9] Feodorov's utopian visions were also apocalyptic; the idea of apocatastasis (the concept of a universal "reckoning" when the planets align and return the cosmos to its prehistoric state) is an underlying theme in Cosmism. Feodorov's desire for humans to transcend physical and temporal boundaries also hinted at the then-undiscovered "God particle," or the Higgs boson particle, believed to be "an invisible energy field present throughout the universe that imbues other particles with mass."[10] Discovered in 2012 to the chagrin of theoretical physicist Stephen Hawking, the Higgs boson

[7] Bogdanov, Groys, et al, 56-62.
[8] Tucker, 270-271.
[9] Bogdanov, Groys, et al, 147-149.
[10] Kelly Dickerson, "Stephen Hawking Says 'God Particle' Could Wipe Out the Universe," LiveScience, September 08, 2014, accessed April 11, 2019, https://www.livescience.com/47737-stephen-hawking-higgs-boson-universe-doomsday.html

particle gives scientists clues to how the universe began, and also how it could end, in essentially a vacuous quantum bubble that destabilizes Earth's energy.[11]

The Russian neurologist Vladimir Bekhterev (1857-1927), like the father of Soviet space travel Tsiolkovskii, favored Feodorov's infinite reincarnation concept (imagined as autotropic cloning) and claimed to have found scientific proof that "the soul lived on eternally as a particle of universal human creativity" if not individually, then in the collective manner of French positivist philosopher Isidore Marie Auguste François Xavier Comté's "Eternal Man."[12] Platonov also favored a Cosmist reshaping of the environment, meaning man's active role in subjecting all earthly phenomena to his will, and he was also part of the God-Building movement with *Proletkult* Bolsheviks Leonid Krasin and Anatolii Lunacharskii. To these men, "God was just another term for the socialist humanity of the future."[13] Cosmism was scientific and spiritual at once. Feodorov was committed to Russian Orthodox ideas even though some of his followers claimed to be professed atheists. The Cosmist philosophy influenced Soviet science, even after Stalin's purge of such idealists in the late 1930s. In a desire to focus on the immediate, practical aims of realizing communism, Stalin targeted many "stargazers" in both science and literature, claiming that their utopianism was not helping the concrete aims of communism. Ironically, at the same time, Stalin embarked on some of the most utopian projects to reshape landscape and manipulate human nature. Cosmism was not necessarily the intellectual mainstream, but it continuously reappeared throughout the Soviet Union's lifespan in various experiments, well into the 1990s.

[11] Ibid.
[12] Tucker, 270-271.
[13] Ibid.

Despite anti-religious and anti-superstitious rhetoric, the religious and supernatural characteristics invested in science during the Soviet years illustrate the heavy burden weighing upon science: the burden of a religion. Science was not only the religion of the future, but the means by which religious ideas could be achieved in the real world; the Christian offering of eternal life was rebranded as a scientific aim, not a spiritual one. Science's perceived role in changing the world, changes that were always imagined to be for the better, arose directly from Marxism's self-proclamation as "the most scientific science."[14] The term "science" in the early twentieth century carried with it, as it still tends to carry today, an air of certainty and infallibility—science is elevated to something beyond human error that is absolute and universal. Only time and hindsight get to determine what parts of "science" endure, and which are relegated to a somewhat embarrassing and comedic collection of former truths. In their "exclusivity," absolutism and status as something nigh beyond reproach, science and communism in Russia both shared many characteristics of a religion.[15] Reading works by Gorkii, Lenin and Bogdanov that describe the power and value of science over everything, even creation, one is reminded of a medieval manuscript by any of the Latin Church fathers writing about God. Their faith in science, as if it were the Second Coming, is absolute, unshakable, and emotional. Several scholars have noted the range of similarities between communism and religion, something not lost on revolutionaries of the time. In fact, they were actively aware of the connection and some endorsed it emphatically. Lunacharskii even wrote a two-volume manuscript, *Religion and Socialism* (1908-1911), discussing the connections and interactions between socialism, revolution and religion.[16]

[14]Gorkii, *Untimely Thoughts*, 46-47.
[15] Sinyavskii, 6.
[16] Lunacharskii, 3.

The works of poets like Blok, Maiakovskii and Esenin are thick with language that frequently substituted religion, God, and the apocalypse with the October Revolution. For example, in his poem "Our March," the preeminent revolutionary poet Maiakovskii evoked the ethos of change in biblical proportions, claiming that with the Revolution:

> We'll wash the world with a second deluge,
> Now's the hour whose coming it dreads.
> Too slow, the wagon of years,
> The oxen of days — too glum.
> Our god is the god of speed,
> Our heart — our battle drum.[17]

Here, the Bolshevik Revolution is a "second deluge," another Great Flood seemingly sent from above to change everything. Radicals welcomed these changes, while the old order feared and dreaded this metaphorical Second Coming that would usher in a new epoch. On a cosmic scale, the apocatastasis present in Feodorovian Cosmism was prophesied in Jewish and Christian theology as bringing about another flood after stellar and planetary alignment. This flood would reset all of civilization. Maiakovksy's poem exalts a swift, shocking transformation of the world, even a destructive one, amplified by the exuberant emotions that Maiakovskii's works are so known for. The poem suggests that historical progress has simply been too slow and too inadequate; active, impassioned intervention has therefore become necessary. Maiakovskii puts this intervention, divine in nature in many ways, into the hands of the Revolutionaries, attributing to them control and authority over the world to come.

Artists and intellectuals often conceived of the October Revolution in religious and apocalyptic terms, but as the people musing about the pending utopia equated it with scientific advancement and certainty, utopianism in Russia was not generally seen as mindless fantasy or

[17] Vladimir Maiakovskii, "Our March," *The Poems of Vladimir Maiakovskii*, accessed April 09, 2019, https://www.marxists.org/subject/art/literature/mayakovsky/1917/our-march.htm.

"star gazing."[18] It was an earthly goal within man's grasp. Marxism was not only a way of understanding the world and its history, but for changing it through the fusion of theory and practice. For revolutionaries, this fusion was something real and immediately applicable to the situations of life in Russia. Citing the Revolution's power to facilitate a new kind of positive evolution, Gorkii wrote in a *Novaia Zhizn'* article that, "The Revolution was made so that man might live better and so that he himself might become better."[19] It was no longer enough to understand or even to know; the socialist humanity of the future existed to change everything.

As scientists stepped into God's shoes, most of them consciously doing so, experiments and theories concerning total transformation and unqualified control over people, the elements, and the heavens emerged. These had both hopeful, positivist qualities, as well as delusional shortcomings. While most scholars argue that Stalin's Revolution from Above stifled the utopian dreams that gave birth to the revolutionary fervor that swirled around 1917, there were still utopian, metaphysical elements in science well into the Stagnation years and even beyond. Just one massive example of this was Stalin's 1948 Great Plan for the Transformation of Nature, which sought to control and alter water routes, change the climate, and the face of the USSR.[20] However, these later plans largely bordered on the "delusion" side of the scientific divide, in which charlatans pandering to the Party line supplanted genuine belief and experimentation. For instance, there is a sharp distinction between Alexander Bogdanov's experiments at achieving possible immortality in the 1920s and agronomist Trofim Lysenko's biological, silvicultural pseudoscience from the 1930s-70s. A philosopher, physician and author, Bogdanov has been called a pioneer of blood transfusions and organizational systems thinking (cybernetics), which

[18] Richard Stites, *Revolutionary Dreams: Utopian Vision and Experimental Life in the Russian Revolution* (New York, NY: Oxford University Press, 1992), 9.

[19] Gorkii, *Untimely Thoughts*, 24.

[20] Stephen Brain, "The Great Stalin Plan for the Transformation of Nature," *Environmental History* 15, no. 4 (2010): doi:10.1093/envhis/emq091.

both figure prominently in his science fiction novel *Red Star*. Bogdanov wholeheartedly believed his experiments might bring about more widespread longevity, and effectively gave his life in the pursuit of it. Lysenko, it is known, fabricated many of his own experiments' results for political expediency and sacrificed others in his maintenance of scientific power in the USSR.[21] Simply put, he knew his "results" were false. Bogdanov, as far as evidence suggests, did not try to delude himself or others with the outcomes of his experiments. This is the difference between dream and delusion that serves as a metaphor for the evolution (though most would say *de-evolution*) of Soviet science throughout the twentieth century.

From Bogdanov's belief in the possible halting of aging through blood exchanges, to experiments during the Stagnation years that claimed the ability to "make" a new form of water, to a space race born of the Cosmist desire for a new expanse in which to house their innumerable dead, utopian visions for the Soviet Union's future were often so grandiose in scale that they centered on that which was once the realm of God alone—overcoming death, resurrection, and creating life out of nothing. And while God may have been dead to the communists, they intended to make a new one. This type of utopian thinking was prevalent among Bolshevik intellectuals because maximalist utopianism fit with Marxist ideology; if communism was the last and therefore most advanced stage of human development, then the Communist Revolution in Russia constituted not only the beginning of a new Eden, but the end of the "old" one.

The ultimate irony is that the attempt to create Marx's end-stage communist society in Russia/the USSR looked less like a "birth" than an extinction event: the efforts at making man immortal existed against one of the most fatal backdrops in Russia's history, as the more people were killed during 1917-1921 than had been under the tsars of the preceding three centuries

[21] Graham, *Lysenko's Ghost*, 67.

combined.[22] Mega-dams and Soviet engineering works meant to create vast swathes of abundance in semi-desert landscapes instead created severe enough desert conditions to kill a sea. The Bolsheviks never got to make a *Red Star*-style utopian society on Mars like Bogdanov had depicted, but they did somewhat unintentionally succeed in turning parts of Earth into arid, empty Martian hellscapes.

The religious quality that saturated Soviet scientific advancement gave the varied attempts at reaching Marx's final utopian stage messianic significance. Everything was a step towards a finality, a point at which there could be no further steps, no greater advancement, and no higher achievement. This can be thought of as "the tragedy of totality." This is essentially another way of putting Hegel's dialectic of the "Absolute Idea," when no further synthesis can take place and there is an end to history.[23] Alexander Sukhovo-Kobylin (1817-1903), who may or may not have murdered his mistress with a candlestick, translated Hegel's works into Russian. Sukhovo-Kobylin believed Hegel's "Absolute Idea" entailed man's advancement to the state of angels that existed only of pure thought, a theory very reminiscent of Feodorov's Cosmism.[24]

The scientific efforts surrounding blood, water and Mars are some of the clearest examples of the steady Soviet march into totality, the utopia that carried with it accidental Armageddon. Yet for all of its flaws both inherent and accidental, revolutionary utopianism in Russia fostered scientific advancement and, even more importantly, a spiritual and cultural optimism that illustrated what philosopher Ernst Bloch termed "the "principle of hope" in his anthology of utopian thinking. According to Bloch, utopia was indeed a possible reality, the seed of man's Not-Yet-Conscious aspirations. This anticipation of a better future was necessary for

[22] Tucker, 273-274.
[23] Ibid., 92-93.
[24] Ibid.

man to survive in an unimaginable and impossible world.[25] Particularly in Russia, it was not the utopia that was unthinkable; it was reality. Utopia was not just escapism or daydreaming, it was a psychological survival mechanism. Revolutionary Russia perfectly illustrated Bloch's utopia-as-survival-mechanism, considering the stark contrast between Russia's reality in the early 20th century and the intelligentsia's visions for a "better future."

The Crystal Palace

When considering the long tradition of utopian thinking and literature, not only in the Russian context but also in the West, it is always staggering how swiftly and easily the idealized worlds of tomorrow morph from dreams into nightmares. Of course, one man's paradise is often another's prison, but even when the efforts of many are put towards willing an agreed upon "utopian" vision into reality, the process of its making and the end results are typically a complete inversion of the original vision. This phenomenon of inversion, "a world turned upside down," bears eschatological significance; there seems to be an alarmingly short distance separating utopia from the apocalypse, the beginning from the end. This theme is evidenced in Russian and Soviet utopianism, but it is implicit in the wider ideology of utopia itself.

Thomas More's foundational *Utopia* of 1516 anticipated some of the paradoxes the Bolsheviks faced in forging their own utopia, many of which blurred beyond distinction the line between utopia and dystopia. *Utopia* features a communal island in the shape of a crescent moon, disconnected from the coast of the New World by a man-made canal—engineering that figured prominently in Soviet attempts to control and harness the natural environment. More's island's location was inspired by one of the many hypothesized locations of the lost continent of

[25] Stites, *Revolutionary Dreams*, 10.

Atlantis, which Plato situated in the "Sea of Atlas."[26] In More's vision, there is no private property, no locks on the doors, and all have access to free hospitals and collective dining.[27] A simplified judicial system renders lawyers useless. This utopia is not synonymous with freedom and equality, however. People have roughly four professions to choose from; women are relegated to traditional domestic work and must confess to their husbands monthly; and slavery exists. Foreshadowing Foucault by more than three centuries, More describes a world devoid of privacy. Constant surveillance was believed to produce model behavior on the imagined island. Russia's most important utopia, the Crystal Palace, as depicted in the fourth dream of Vera Pavlovna in Chernyshevskii's *What is to be Done?*, drew heavily on the idea of perpetually public life as fundamental to utopia.[28] Ideally, no one would want or need privacy because everyone would want that which was best for all. Lenin was influenced by Chernyshevskii's work, even titling one of his most famous treatises after Chernyshevskii's opus. As much as Lenin may have divorced himself philosophically from the dreams of immortality that some Bolshevik scientists endorsed, it cannot be denied that Lenin himself was a dreamer. He believed in radical transformation, brought about by force if necessary. Ironically, Lenin's embalmed corpse remains a reminder, withered and waxy as it may be, of the early Soviet dream of immortality.

Generations of the Russian intelligentsia grew up on Chernyshevskii's utopian novel. Chernyshevskii's Crystal Palace was pervasive in Russian utopianism and carried over into science. There is proof of this in Tsiolkovskii's plans for colonizing other planets by using 40-centimeter-thick quartz greenhouses as living spaces. He discussed the idea practically and

[26] Benjamin Radford, "'Lost' City of Atlantis: Fact and Fable," LiveScience, February 28, 2018, accessed April 15, 2019, https://www.livescience.com/23217-lost-city-of-atlantis.html.
[27] Thomas More, *Utopia* (United States: Feather Trail Press, 2010).
[28] Chernyshevskii, 84.

scientifically in *The Future of Earth and Mankind,* published in English for the first time in 2018.[29] These were literal crystal palaces complete with plans for growing vegetation, and a speculation that no one need wear clothes in the future. Such models would enable the spread of socialist humanity throughout the universe. [30] Tsiolkovskii's greenhouse and Vernadskii's biosphere concepts influenced scientific endeavors far and wide, into the late twentieth century. American researchers in Arizona created Biosphere Two in the 1970s. This was a self-contained ecosystem in a glass greenhouse, called "the most significant scientific project of all time" in its day.[31] Biosphere Two collapsed in 1993 after sustaining inhabitants for over twenty years, when oxygen levels dropped, cockroaches took over, and "then Steve Bannon showed up," (this was when he was an investment banker offering Space Biosphere Ventures a buyout).[32] Like Tsiolkovskii's designs, one of the ultimate goals of this artificial biosphere was to create habitable areas on other planets or the moon. The idea of controlling life and atmosphere is the central thread of the crystal palaces, quartz greenhouses and Biosphere Two projects of the world, all of which can trace their heritage to the utopianism of revolutionary Russia.

There were not only direct connections between Chernyshevskii and Tsiolkovskii, but also between More and Lenin. Similarities between More's *Utopia* and the Russian revolutionary dreams of the early twentieth century were pointed out in Lenin's own time, and it is suggestive that *Utopia* was first published in Russia in 1903. After the Revolution, the Menshevik Boris Isaakovich Gorev (1874-1937) published *From Thomas More to Lenin* (1922), in which he discussed More and Lenin as purveyors of an analogous socialist dream built on communalism,

[29] Bogdanov, Groys, et al, 127.
[30] Ibid.
[31] Carl Zimmer, "The Lost History of One of the World's Strangest Science Experiments," *The New York Times*, March 29, 2019, accessed April 1, 2019, https://www.nytimes.com/2019/03/29/sunday-review/biosphere-2-climate-change.html.
[32] Ibid.

work, and the lack of private property.[33] It is also likely that Alexander Bogdanov read Francis Bacon's work, and possibly his 1627 utopia *New Atlantis*. In Bacon's *New Atlantis*, a group stranded on an island creates a utopian community with science as the new religion after claiming to have found the Philosopher's Stone.[34] One of their goals is to prolong longevity by using the stone to eradicate all disease.[35] Clearly, utopianism existed long before the Bolshevik Revolution and some of their ideas were drawn from centuries-old sources (perhaps immutable human desires).

The key difference between utopianists of all places and eras and the Bolsheviks is that the latter were the only ones able to foster and implement some of these utopian ideas at the national level. More importantly, their utopia was to become the whole, not a withdrawn group separated from it. The scale of Soviet utopianism dwarfed that of earlier ideologues who sought utopian enclaves within a "normal" society. For the Bolsheviks, utopia was to become the normal.

Of course, the power of the Russian state is difficult to ignore, in any era. Lenin was not the first to attempt to bring utopia to the national level in Russia. Peter the Great and successive Gatchina Tsars of the Enlightenment Age attempted to institute small-scale authoritarian "military utopias" in order to remake a section of society in an arranged, efficient, Prussian-style manner. These were entirely top-down movements whose "aim was to bestow order and welfare upon an unwilling population, to dress them, schedule them, dragoon them, use them…to reify them into human toys for the enlightened amusement of the toymakers."[36]Alexander I's military commander Aleksei Arakcheev's early 19th century estate at Gruzino is a prime example of this.

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[33] Stites, *Revolutionary Dreams*, 168.
[34] Francis Bacon, *Bacon's Advancement of Learning, and the New Atlantis* (London: H. Frowde, Oxford University Press, 1906).
[35] Tucker, 79.
[36] Stites, *Revolutionary Dreams*, 19.

Arakcheev redesigned his estate with symmetry and adherence to strict geometric forms meant to bring discipline and regimentation to the peasants living on his land, many of whom were transformed into soldiers for this model community. He very nearly persuaded the Tsar to make over all of Russia in this way. "Administrative utopias" like Arakcheev's Gruzino and Catherine I's even earlier "Potemkin Villages" were part of a pre-existing urge from above to refashion Russian society at the base level, in this context attempting to Westernize and eliminate Russia's "backwardness."

Popular utopia existed in the countryside, too, differing from the administrative utopian villages of St. Petersburg. Peasants throughout the Russian Empire sometimes favored Old Believer utopian communities, withdrawn from society into religious enclaves subject only to the local authority of elected elders and priests. Sectarian communities were insular and xenophobic, distrusting officialdom and urbanites alike. These communities exalted communalism in the broad sense of the word, some living without currency, with all property shared in common.[37] They valued *vol'ia* above all else and trusted this value to bring justice and stability. *Vol'ia* is often loosely defined as total freedom of the peasants, but with the element of religious order within the village.[38] There were various religious sects webbing from the Old Believers, but the Vyg settlement of Old Believers was the longest lasting utopian community of these, from the 1690s-1850s.[39] *Vol'ia* influenced early revolutionaries as well; the People's Will movement (*Narodnaya Vol'ia*) during the late 1800s included radical intellectuals advocating terror tactics in order to achieve freedom in Russia. Interestingly, the Bolsheviks were intrigued by religious communalism in societies like the Vyg establishment, and Lenin exhibited a generally tolerant attitude towards them. His and other Bolsheviks' perception of the religious sects' grassroots

[37] Ibid., 16.
[38] Ibid., 4.
[39] Ibid.

communal tendencies echoes the Populist fascination with the peasant way of life that they did not understand, as was evidenced by the invariable failure of the "To the People" (*Narodniki*) campaigns of the 1870s. It is arguable that sectarian utopian settlements like the Vyg influenced revolutionaries' views of how a communal utopia would and could function in the "real world."[40]

Though there were already native utopian traditions in Russia, it was only with Marxism that the aim of a radical transformation of state, ideology, people and landscape took place on a total scale in Russia and territories that became part of the Soviet Union. In administrative and popular utopias, there was separation from society, while socialism aimed at the whole society as the utopia. As the doctrinal foundation of those who seized power in October 1917, Marxism was the only utopian ideology ever in a position to be enacted on a sweeping scale at the behest of the state. At the highest government level, as both political and social policy, Marxism was poised to bring about a new type of environment in Russia, and a new type of person to inhabit it: the much-debated "New Soviet Man."

Another key difference between Marxism and the previous administrative, religious or popular utopias of Russia was that Marxism came packaged with a plan to will its utopia—the final historical stage of communism—into reality. It anticipated an active, dynamic revolution of the proletariat. After that, socialism and then communism were believed to naturally emerge. The Soviet plan was predicated on science. Hardline Bolsheviks and revolutionaries regarded the social, economic and philosophical composition of Marxism as the absolute science for the coming age; it was science that made a Marxist utopia appear calculable, designable, and attainable. As such, Marxism shaped the development and interpretation of nearly every field of scientific thought for a majority of the Soviet Union's lifespan. It was Marxism's curious

[40] Ibid.

connection with the sciences (and with its own status as science) that created a reciprocal relationship between them; each became a tool for validating and "proving" the other.

CHAPTER III

BLOOD

"Still Alive Day"

In 2007 *The Onion* published a farcical, biting atlas of the world.[1] The publication devoted four pages to a thorough treatment of Russia's culture, history and landscape, offering a comedic glimpse into what is generally associated with the vast land of extremes, stained red in much of collective memory for the last century. Some of the satirical observations and "facts" about Russia are laughable for their stereotypical nature, but mostly because of their unsettling resemblance to reality. Such "facts" seem amusingly absurd precisely because they are not absurd, but because they are rooted in truth. For example, Russia's National Grain is listed as "vodka," for National Religion they just wrote "Nah," and the Traditional Russian Practical Joke is "loading the gun with blanks." It is the over-identification with the truth that actually allows these lines to be jokes. The most poignant of these though, from the perspective of a Russian-Soviet historian, is the entry for the National Holiday, termed "Still Alive Day." There is perhaps nothing more immediately linked to Russia in the popular psyche than a long tradition of death and suffering. For many people of the former Soviet territories, the cataclysmic loss of life during the entirety of the "Soviet Experiment" remains the defining trauma of their lives, even for generations that experienced wars, famine and terror only secondhand via their parents' or grandparents' memories. "Still Alive Day" certainly suggests the duality of tragedy-resilience pervasive throughout Russian and Soviet history.

Yet even before Soviet history began, before there was a Soviet Union to speak of, revolutionaries and intellectuals of fin-de-siècle Russia were well aware of the general national struggle with simply "not dying," largely then a battle against environment. Staying alive was

[1] The Onion, *Our Dumb World: Atlas of the Planet Earth* (New York: Little, Brown, 2007), 183.

only the most pressing and basic concern within the framework of the much broader and seemingly impossible task of "fixing" Russia. It is striking how profound of an effect the "not dying" struggle had on the formative years of Soviet society and scientific endeavors, and what Bolshevik revolutionaries, philosophers and scientists did in their assorted efforts over the next half-century to address this enduring problem. In the context of omnipresent death, it is understandable that a uniquely Soviet fascination with granting mankind power to extend human life into immortality emerged from the visions of the utopian "dreamers" who were set on "fixing" Russia.

Before eternal life could be addressed however, the intelligentsia had to first contend with the political, economic and social situation in Russia in the early twentieth century—all that needed "fixing." Would-be revolutionaries and reformers of the age were faced with a crumbling autocracy, large-scale revolts, diseases of pandemic proportion, and the harsh reality of the lives of the peasants, who were the bulk of Russia's population. The average Russian life expectancy in 1913 was thirty-two years.[2] The failed revolution of 1905 and the Russo-Japanese War compounded these social and economic problems, leaving a disillusioned citizenry and military in their wake and exacerbating the intelligentsia's desire for radical change.

At the turn of the century, the Russian intelligentsia was caught between nihilism and idealism, still trying to answer Chernyshevskii's haunting question *What Is to Be Done?* Referencing Russia's social, political and economic crises following the freeing of the serfs in 1861, elites took to educating and sometimes mobilizing the peasantry and burgeoning working class, especially as translations of Marx's works spread all over Europe. Members of the Russian intelligentsia fused their utopian idealism with Marxism, which was not only an economic

[2] Barbara Khwaja, "Health Reform in Revolutionary Russia," Socialist Health Association, September 16, 2017, accessed November 06, 2018, https://www.sochealth.co.uk/2017/05/26/health-reform-revolutionary-russia/.

philosophy but as the supreme "science of all sciences."[3] The utopian vision of stateless equality and freedom seen in *What Is to Be Done?* left an indelible mark on pre-revolutionary Russian intellectuals, like Alexander Bogdanov and Maxim Gorkii, who were looking to "save" Russia from itself via popular revolution.

In addition to revolution, science (newly liberated by Marxist ideology from the capitalist stranglehold) was posed as a solution to the problems that had plagued Russia's history. Capitalism put science at an inherent disadvantage, according to Marxists. As dissident scientist and author Zhores Alexandrovich Medvedev (1925-2018) explained, dialectical materialism, it was believed, would "help to reveal new laws of nature which were closed to bourgeois scientists working empirically."[4] There was a general belief that science in capitalist countries was yoked to the generation of profits for companies, and thereby corrupted. Science could therefore never achieve that which was to the benefit of all in such places. Communism was thought to be science's "freeing" force that would allow for experiment and advancement without being motivated and hence warped by corporate interests. For Soviet Russia, "proletarian biology" was Marxism's most infamous, though not entirely negative, outcome within the realm of science.[5] Historian Roy Alexandrovich Medvedev (1925-), twin brother of the aforementioned scientist and author, would disagree; his *Let History Judge* became a cornerstone of glasnost under Gorbachev, disclosing many unpublished memoirs of the crimes of the Stalin Years. Of course, history (and everyone else) has judged the Soviet experiment. Harshly.[6] While it largely has warranted its own trial by fire in both academia and public opinion, the Soviet Experiment was at

[3] John Holloway, "The Tradition of Scientific Marxism," *Marxist Myths and Legends*, 2002, accessed April 11, 2019, https://www.marxists.org/subject/marxmyths/john-holloway/article.htm.

[4] Zhores Medvedev, *Soviet Science* (Oxford: Oxford University Press, 1979), 31.

[5] Krementsov, *A Martian Stranded on Earth*, 11.

[6] Roy Aleksandrovich Medvedev and George Shriver, *Let History Judge: The Origins and Consequences of Stalinism* (New York, NY: Columbia University Press, 1989).

its inception predicated on hope and transformation. Soviet science was the main tool that emerged as a way of fulfilling "the experiment's" lofty promises.

Gorkii explained the advantages of science put to a Marxist directive with the carnage of World War I obviously fresh in his mind, citing the destructive outcomes when capitalism, militarism and imperialism dictated scientific advancement to "serve the business of mass annihilation of people."[7] The unsaid implication was that without capitalism there would be no future wars. Many socialist revolutionaries could agree, if on nothing else, that the First World War was a senseless bloodletting in the name of empire and capitalist gain, and the Provisional Government's decision to remain in the conflict sealed its fate. In Soviet Russia, the government as sole director of scientific inquiry was initially perceived of as a way of protecting the sciences from corporate misuse and elitism, and also from turning Europe again into a "continent of murderers and corpses."[8] Government-controlled science and academia came with its own hazards, of course.

As is immediately clear from the numerous quotation marks deemed necessary in books about the history of Soviet science, where often the word "science" itself ends up in quotations, the science of the Soviet Union was a historically unique creation. Because this science was specific to the social, political and cultural atmosphere of the revolutionary period in Russia, it was laced with utopian ideologies, struggling to exist and define its tasks amid the dynamic and devastating environment of World War I, the Revolution and the Civil War years. This climate of social and political unrest and the heavy influence of Marxism permanently shaped scientific discourse and experimentation, even into the period of Soviet collapse when such utopianism had long been out of vogue in political discourse. Remnants of miraculous, transformative, religion-

[7] Gorkii, *Untimely Thoughts*, 13.
[8] Ibid., 9.

shattering ideas (such as the spontaneous creation of life) cropped up in experiments well into the 1990s. Such experiments were still directly tied to the utopianism of the revolutionary "dreamers," many of whom were founding members of the Bolshevik party.

Biology remained the science most touched by the heavy hand of politics and ideology throughout the course of Soviet history because it had the distinction of being the field with the most potential to change man and his environment. This is especially true given that Russia never viewed the inheritance of acquired characteristics as incompatible with Darwinian evolution; Darwin himself did not fully reject Lamarckism.[9] Yet scientific journals that poked holes in some of Lamarck's theories were often not fully published in Russia in the late nineteenth and early twentieth centuries, and therefore awareness and understanding of Mendelian genetics notably lagged behind in Russia.[10]

Regardless of the rate of scientific exposure to Mendelian genetics, the ideology of revolutionary Russia would have naturally favored Lamarckism anyway, given Marxism's connection to it. For Bolshevik dreamers, the satirical "Still Alive Day" could have been a very real future holiday that celebrated not only endurance through one's natural life, but the indefinite extension of it through science, which would be the crowning achievement of communism as well. In fact, Alexander Bogdanov wrote a short story in 1912 about the millennium celebration of man's triumph over death, entitled *Immortality Day*, which, ironically, is the day on which the main character realizes the implicit paradoxes and tragedy involved with living forever, and decides to take his own life.[11] Even Bogdanov, who sought to extend life with blood exchanges, seemed to understand that life had such great meaning only *because* it ends. Still, paralleling the Russian preoccupation with simply "not dying" alongside a future

[9] Graham, *Lysenko's Ghost*, 20.
[10] Ibid., 24.
[11] Bogdanov, Groys, et al., 224.

questioning of the value of human life is the most prophetic and apt depiction of Soviet science's journey from utopia to dystopia. The contrasting ideas of "Still Alive Day" and *Immortality Day* also hint at the impact of revolutionary fervor, idealism and maximalism on the more radical supporters of the Revolution: no longer content to merely survive and swept up with hyper-optimism from the "success" of October, the theme of dramatically extending life seemed more plausible given the new scientific foundations of the state under Marxism-Leninism. In all aspects of post-revolutionary life there was an urge to skip transitional periods and jump far ahead to the better "tomorrow" they had been imagining for generations. Lenin thought Russia should telescope through the capitalist stage Marx had believed essential in order to form a true communist society. Lenin's ambition represents this fervor in place at the highest level of government after the October Revolution.

Blood and Sacrifice

In fact, revolutionary "fervor" might be putting it too mildly. In 1917, peasant-born poet Vladimir Timofeevitch Kirillov (1890-1937) wrote a poem exalting the violent destruction of everything about "old Russia," praising the purveyors of revolutionary ethos as "drunk with a rebellious, brutal passion."[12] Author Nikolai Alexandrovich Berdiaev (1874-1948), a supporter of the moderate Kadet (Constitutional Democrat, KD) party before the Revolution, wrote that the KD's moderate stance would inevitably be its downfall:

> Social Democracy conveys a religious pathos which grips the heart of the masses, enthralls the youth. Politics is a religion for the Social Democrats, a religious act. How can the Constitutional Democrats counter this…they offer no spiritual nourishment and their desire to offer material nourishment is dubious.[13]

Social Democrats, and particularly the Bolshevik faction, had the power of emotional and religious rhetoric on their side, which played well to the masses that wanted something to believe

[12] Sinyavskii, 8.
[13] Ibid., 9-10.

in. Berdiaev claimed that this was because, "As fate has it, Russia is given to the power of extremes, the black and the red are holding sway."[14] Red referred to the Bolsheviks and black referred to the radical anti-Semitic organization, the Black Hundreds. While admitting the essentialism of Berdiaev's claim about the Russian people as naturally predisposed to extremes, it cannot be denied that Bolsheviks and others capitalized on pre-existing maximalist currents in society which were magnified by the spiritual significance attributed to a Marxist coup. In Gorkii's *Novaya Zhizn'* article from December 23, 1917, he celebrated maximalism: "I consider ideological maximalism very useful for the undisciplined Russian soul; it must cultivate great and bold demands in this soul; arouse a long-needed capacity for action."[15] To many revolutionaries, maximalism and the taking of all ideas to their most extreme degree was the only way for Russia to change rapidly. Therefore, it seems only natural that people in a state of such delirium got "carried away" with over-zealous plans for transforming the world, given the watershed success of the proletariat in Russia in October 1917.

The rhetoric of religious passion and an almost mystical power and nobility attributed to violence during the Revolution further illustrates the links between communism, religion and utopia. Any extreme measures to get Russia to the infinitely better communist state of the future were not only considered worth it, but lauded as noble, selfless acts in service of the global revolution that would one day liberate everyone. Revolutionary fervor and euphoria also serve as at least partial explanations of why the new Soviet society rushed headlong into a distant future with little regard for the present, skipping over the "how" of it all in favor of the outcome.

Early Soviet science fiction literature, like Bogdanov's Mars series and its 1921 antithesis *We* by Evgenii Zamiatin, focused on societies long after communism had already been

[14] Ibid., 10.
[15] Gorkii, *Untimely Thoughts*, 105-106.

established.[16] *Red Star* looks hopefully at this utopia, whereas *We* presents the dystopian inverse of Bogdanov's Mars: there are no relationships, names have been replaced with numbers, and sex is by scheduled by appointment. Though these stories present end stage communism in opposite ways, both skipped immediately to communist society already at its peak or, arguably, declining. While revolutionary fervor and a desire to keep hope alive after 1905 served as Bogdanov's inspiration, Zamiatin was spurred on by severe distaste, distrust and anxiety about the future of the new Marxist state. In both cases, there is a push to "jump from behind, over the present, directly into a radically more advanced future."[17] Of course there were wildly conflicting visions of what the "radically more advanced future" should look like and what means were acceptable in attaining it.

Science was put immediately to use in revolutionary Russia to help bring about a more advanced communist utopia. But even before the Bolshevik Revolution, utopian thought concerning man's dramatic refashioning was prevalent among the intelligentsia in Russia. One of the most fascinating examples of this was Alexander Bogdanov's blood exchange theories and experiments. Bogdanov believed that blood carried an inherent "vitality," and that therefore the blood of the young possessed qualities that would rejuvenate an older person. Likewise "older" blood had immunities and antibodies that could benefit a young person. Bogdanov exchanged blood between old and young, healthy and sick, using intravenous lines between the donor and recipient in the direct transfusion method. Blood was passed at the same time and in equal amounts between two patients, so neither experienced a net blood loss. Bogdanov's work emerged against a backdrop of material devastation and mortality in Russia following revolution, famine and civil war, all of which lent a sense of immediacy and relevance to his experiments.

[16] Evgenii Ivanovich Zamiatin, *We* (Seattle, WA: Stellar Classics, 2013).

[17] Yvonne Howell and Anne O. Fisher, *Red Star Tales: A Century of Russian and Soviet Science Fiction* (Montpelier, VT: Russian Life Books, 2015), 10.

Bogdanov's desire to improve quality of life and prolong it was not unique in itself, but the philosophical bases of his ideas were quite specific to Russia at the time.

In the late nineteenth and early twentieth centuries, there was a "rejuvenation craze" throughout Russian and Western academia.[18] In terms of the preoccupation with stopping aging or at least slowing it, everything from French experiments with transplanting monkey testicles into humans to restore vitality, to the ideas that yogurt and soured milk products helped prolong life emerged in the late nineteenth and early twentieth centuries.[19] Gerontology as a field of specialty was "invented" during the course of the many scientific endeavors to rejuvenate people and reverse aging. Slowing ageing and rejuvenation remained Soviet preoccupations well into Stagnation, when the highest-ranking Politburo members formed the USSR's gerontocracy.[20]

In the West, the wider trend of addressing longevity and making people "better" largely came about through post-Darwinian theories of heredity, as well as from pseudo-scientific fields later debunked, such as the idea that sex glands contained vitally youthful serums that would regenerate an organism. Russia and the early Soviet Union still had liberal academic exchanges with Western Europe and America in first two decades of the twentieth century, but the state of Russia's "soft sciences" was perceived by outsiders, as well as by Russian scientists themselves, as backwards. This was particularly true of the field of blood research. Some Russian physicians lamented that blood transfusion research had not grown more or received an academic institute for study during WWI and the Civil War, when such methods could have saved lives.[21] To socialist revolutionaries, namely Alexander Bogdanov and his colleagues, blood came to be an important tool in the building of socialism and the creation of the New Soviet Man.

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[18] Krementsov, *A Martian Stranded on Earth,* 78.

[19] Frances L. Bernstein, Christopher Burton, and Dan Healey*, Soviet Medicine: Culture, Practice, and Science* (DeKalb, IL: Northern Illinois University Press, 2010), 63.

[20] Krementsov, *A Martian Stranded on Earth*, 75.

[21] Ibid., 22.

Apart from blood's literal role in the revolutionary dreams of extending life and improving people from their alleles up, it took on a spiritual, sacrificial significance to intellectuals who wrote of the preordained changes that Russian bloodshed had bought during the lethal first decades of the twentieth century. Gorkii took up this mantle repeatedly in *Novaya Zhizn'* articles cross 1917 and 1918, writing about the blood sacrifice made by Russia during "the suicide of Europe" (WWI), the failed revolution of 1905, and throughout the Bolshevik Revolution.[22] Gorkii's attitude and tone towards the concept of blood sacrifice for a better future reads like mystical, primordial fetishism, like something of apocryphal ancient Christianity. Some of this sacrifice Gorkii himself seemed to regard as misguided and self-negating, but a respect for the decades-long bloodletting across Russia prevails. Sinyavskii commented on the elemental power and "nobility" infused into the idea of sacrificial blood during the revolutionary years; even without any other literary sources, Gorkii's *Untimely Thoughts* would provide validation for Sinyavskii's comments. The first line of Stites' preface to *Red Star* is a quote from the novel that reads: "Blood is being shed [down there] for the sake of a better future."[23] Clearly, blood held not only scientific power for revolutionaries, but also emotional power as a tool of sacrificial expiation in the name of a theorized "better" future.

As far as blood as an element of revolutionary science is concerned, no one was as invested in it as Alexander Bogdanov. He serves as an incarnation of the union of science, politics and utopia in early Soviet Russia. Born Alexander Malinovksii in 1873 in the Grodno province of the Russian Empire (now Poland), Bogdanov, if referenced at all, is remembered primarily as a philosopher and ideologue who broke with Lenin in a debate over Ernst Mach's positivist philosophy. In Bogdanov's brief autobiography he wrote in 1924, he described his

[22] Gorkii, *Untimely Thoughts*, 9, 82,160.
[23] Alexander Bogdanov et al., *Red Star: The First Bolshevik Utopia*, 2.

education at the Tula Gymnasium that contributed to his dissident attitude: "I lived as a boarder in conditions reminiscent of a barracks or prison. Experience of the malicious and obtuse authorities there taught me to hate rulers and deny all authority."[24] Like numerous other revolutionaries in the early twentieth century, Bogdanov changed his name. He took the patronymic of his first wife, the nurse Natalya Bogdonovna Korsak. Bogdanov's studies at Moscow University's Natural Science Department put him in contact with politically active student groups opposed to tsarist rule, like the Union Council of Regional Societies (*zemliachestva*). Expelled from the University for taking part in a demonstration, Bogdanov lived in exile in Tula working as a propagandist with a fellow revolutionary, the economist Vladimir Bazarov.[25] Both men were part of a workers' study group in Tula, where another future founding member of the Bolshevik Party, Ivan Skvortsov-Stepanov, joined them. Bogdanov wrote of this period:

> It was during this activity in 1896 that I rejected Populist ideas for social democracy, and on the basis of my lectures to the circles I composed *A Short Course in Economics*, which appeared mutilated by censorship at the end of 1897 and was warmly reviewed by Lenin in *Mir Bozhy*, 1898, no. 4.[26]

After exiles in Tula, Kaluga and Vologda, Bogdanov moved to complete his medical doctorate at the University of Kharkov and became involved with the foundation of the Russian Social Democratic Labor Party (RSDLP), whom he "split with over the question of morality."[27] Between exiles, Bogdanov wrote various philosophical treatises, worked as a medical doctor at a psychiatric facility, and, notably, became the editor of *Pravda* in 1903 when he threw his weight behind the Bolshevik side of RSDLP. Lenin and Bogdanov spent exile together in Switzerland

[24] Georges Haupt and Jean-Jacques Marie, *Makers of the Russian Revolution: Biographies of Bolshevik Leaders* (London: Routledge, Taylor & Francis Group, 2017), 286.
[25] Ibid.
[26] Ibid.
[27] Ibid.

and were both elected to the Bureau of Committees of Bolsheviks (BKB) in 1904. Following Switzerland, Bogdanov and Lenin were the two primary figures in Bolshevism during the first years of the twentieth century.

Almost immediately after their formation and split with the Mensheviks, further factionalism emerged within Bolshevik ranks. According to Bogdanov, he and Leonid Krasin were both branded "left-wingers" and excluded from the Central Committee in 1909. This rift was undoubtedly connected to Bogdanov publishing *Empiriomonism*, which Lenin fundamentally disagreed with because of Bogdanov's "positivist" take on science and philosophy. In his three-volume work, Bogdanov tried to bridge Marxist ideas and Ernst Mach's idealism concerning the material vs. psychological perception of the world. This was seen as decidedly anti-materialist. Lenin wrote a response and critiqued Bogdanov's work in his 900-page *Materialism and Empirio-Criticism*, published in 1909, and in the introduction there is a critical denouncement of Bogdanov's ideas.[28] Apart from writing propaganda pieces for *Pravda* and *Proletary*, Bogdanov was politically finished in Russia by about 1911 and he left for Capri along with Maxim Gorkii, Anatolii Lunacharskii (his brother-in-law) and Leonid Krasin, among others. The disillusioned Bolsheviks in self-imposed exile on Capri founded a School for Party Workers, and many rejoined the Bolsheviks within a few years.

Upon his return to Russia after Capri, Bogdanov served in World War I as a medic, which furthered his interest in blood science as a possible life-saving measure for wounded soldiers. He spent the next several years developing his theory of Tektology, or the theory of the connectedness of everything. Bogdanov viewed aging and death as tektological failures in the body, with blood being the matrix in which rejuvenation was most capable since all systems

[28] Vladimir Lenin, "Materialism and Empirio-criticism Critical Comments on a Reactionary Philosophy," *Materialism and Empirio-criticism*, 2014, https://www.marxists.org/archive/lenin/works/1908/mec/.

relied on blood to function. Bogdanov was part of the Proletkult movement aimed at using art in order to shape a new proletarian culture, though within this there were many disagreements and divergences among Bolsheviks and former Bolsheviks. According to a Proletkult pamphlet from 1918, the organization wanted "the proletariat [to] start right now, immediately, to create its own *socialist forms of thought, feeling, and daily life,* independent of alliances or combinations of political forces."[29] Proletkult was aimed at exactly that- making a new "proletarian culture," and literary, aesthetic and social mediums were used in the development of such a culture, and indeed in the development of a new kind of person, the "New Soviet Man."[30] For example, it was from this movement that conductor-less orchestras emerged, since the conductor was seen as a vestige of bourgeois class distinction. Maxim Gorkii, the new Commissar for Education Anatolii Lunacharskii, and the Taylorist-electrification enthusiast Alexei Kapitonovich Gastev (1882-1939) were just three of the intellectuals dedicated to forging a new culture to fit with the newborn socialist state.

Besides his life as a political revolutionary and physician, Bogdanov wrote science fiction novels, essays, and encyclopedic works concerned with universal organization. The chaotic climate from 1905-1907 in Russia was one of the key motivations for Bogdanov to write *Red Star* and certainly influenced the jarring contrasts between Martian and Russian societies.[31] By depicting a successful post-revolutionary society on Mars, Bogdanov hoped to (re) inspire those who had all but given up hope of a "better future" ever existing in Russia. Lenin himself was among them.[32] While the 1905 "revolution" in Russia secured a parliament to check the Tsar's autocracy, it failed to ensure use of that parliament or to secure any civil rights for the

[29] "From the Editors," *Proletarskaia Kul'tura*, 1918, no. 3 (March 1918), pg. 36. Quoted in Mally, *Culture of the Future*, 38.
[30] Ibid., 3-4.
[31] Bogdanov, Stites, et al., 3.
[32] Ibid., 5.

majority of the population. Peasants were still starving, the workers were still without a voice, and Lenin's "Peace, Land, Bread" motto seemed a distant fantasy. By most accounts, state oppression only heightened after the superficial qualifications of the tsar's power. In addition to fallout from the attempted 1905 socialist-populist uprising, Russia had just suffered the humiliating and devastating loss of the Russo-Japanese War, and reactionary arrests and executions rose sharply as the government attempted to reign in civil unrest. The post-1905 period also saw epidemic suicide rates, understandable given the conditions and the growing sentiment that hope was lost.[33] Bogdanov's book was meant to help reignite some of this lost hope.

Bogdanov's Mars novels were fairly well received upon their respective releases in 1908 and 1913 despite his political break with Lenin and the Bolshevik party, but it was not until the 1917 Bolshevik Revolution that both *Red Star* and *Engineer Menni* gained such prominence as to actually influence state policy and the development of scientific institutions in the Soviet Union. Red Star captured the imagination of many high-ranking Communist Party members tasked with delivering the socialist utopia that Lenin and the Revolution had promised. Despite never rejoining the party, Bogdanov himself was placed in charge of the "revolutionizing" of Soviet culture under Proletkult.[34]

Notable treasures of Soviet film and literature came out of this movement, including poems by Maiakovskii and Eisenstein's *Battleship Potemkin*. In addition to the arts, material culture such as housing and clothing was also the subject of radical experiments under Proletkult directives. Lenin dissolved Proletkult in 1920, favoring other government organizations instead,

[33] Ibid., 5-10.

[34] K. M. Jensen, "Red Star: Bogdanov Builds a Utopia," *Studies in Soviet Thought* 23, no. 1 (1982): 20, doi:10.1007/bf00832683.

especially since he had never personally been as attracted to or invested in the utopian ideologies of many Proletkult leaders. It became, like many other organizations, something that needed to be under stricter control of the government because it was seen as a force that could threaten Red unity in the Civil War.

Red Star follows a Bolshevik named Leonid who is chosen to go to Mars and observe how the Martian communist society functions so that he can bring this information and a plan for the future back to Earth, where a socialist revolution is brewing. On Mars, Leonid witnesses youth-preserving blood exchanges. *Red Star* is a valuable primary source for studying Bogdanov's scientific theories about blood exchange, despite its being a science fiction novel. *Red Star* provided its intellectual and proletarian audiences with such a sharp contrast between Russia's poor, feudal misery and Mars' abundant communist utopia that the differences were nothing short of black and white. The "comradely exchange of life," blood exchanges between Martians that enabled them to stave off death and cure diseases, were central to Bogdanov's ideas of "physiological collectivism" that were at work throughout the novel and its prequel, *Engineer Menni*.[35] Roughly twenty years after Bogdanov first expressed the theoretical basis for blood exchanges increasing longevity and facilitating the "equalization of extremes" between old/young, healthy/sick, and male/female in *Red Star*, Bogdanov began real life experiments on friends and sympathetic students.

Bogdanov's blood exchange theories were distinct among other rejuvenation schemes of the early 1900s. First, they were aimed at rejuvenation of people as a species—not just individually, as had been the attempts at rejuvenation in France and America up to that point. Again, this illustrates the trend of totality in Soviet Russia, as well as the wider influence of socialism. Bogdanov's experiments were also set apart from other longevity schemes by having

[35] Bogdanov, Stites, et al., 70.

such close ties to the political philosophy of those in power. If successful, Bogdanov's utopian science fiction would become reality and in so doing, offer some validation to the Marxist stress on dynamism that fused the present with a rosy future. Before Marxism became the dominant ideology of Russia, "the comradely exchange of life" was not possible; it simply did not fit with the "trend of thinking" at the time, as Bogdanov put it.[36] After the Revolution, such an idea reinforced communist views of mankind's social, and even biological, development, and blood exchanges were perceived as possible and desirable for the advancement of mankind towards a more perfect communism. Marxism's validation of a field like blood science is easily understandable, considering Marxism was a method not just for interpreting the world, but, more critically, for perfecting it. Despite their differences in Bolshevism's early days, Lenin and Gorkii both valued the application of science for perfectibility; nowhere in the world have people become so involved with "self perfection."[37]

In 1914, Lenin claimed, "Man's consciousness not only reflects the objective world, but creates it."[38] Being and becoming were seen as almost the same thing, as perception was the same as reality. Philosophically, debate has basically always existed about the perception-reality conundrum. Lenin's idea that man's reality was his own conscious creation illustrates the active role he believed people played in forming an entirely new reality, if they so chose and applied their will and brain power to such a task. The blurring of present reality with the creation of a future reality existed before Socialist Realism, a term not coined until 1932, though Gorkii is often credited (or blamed) with "inventing" Socialist Realism with his 1907 novel, *Mother*.[39] In Marxist English scientist J. B. S. Haldane's *Marxist Philosophy and the Sciences*, the author

[36] Bogdanov, Groys, et al., 209.
[37] Gorkii, *Untimely Thoughts*, 38.
[38] Vladimir Lenin, "Conspectus of Hegel's Science of Logic - Book III (Subjective Logic or the Doctrine of the Notion)," https://www.marxists.org/archive/lenin/works/1914/cons-logic/ch03.htm#LCW38_212a, 85-241.
[39] Gorkii, *Untimely Thoughts*, 9.

synthesizes communism's guiding documents such as *Herr Eugen Duhring's Revolution in Science* by Engels, *Materialism and Empirio-Criticism* by Lenin, and *Das Kapital* by Marx in order to explain that Marxism was not a theory, but rather a method, and that theories arise only "as a result of applying the method to concrete situations."[40] It was a system "not concerned with being, but with becoming."[41] Bogdanov's experiments were indeed concerned with becoming, and blood exchanges could theoretically help people become better, healthier, and more equal. The active, transformative role that Bogdanov's research was posed to play in post-revolutionary Russian biology explains why his ideas about blood exchanges gained official attention and sanction only after the Bolsheviks took power. The shift from being to becoming was a key part of building communism in the Soviet Union, sparking Socialist Realism under Stalin where the present became the future simply by living as if the future already existed.

In Bogdanov's *Tektology of the Struggle against Old Age*, originally published as part of a three-volume work in 1922, Bogdanov explained what he saw as the chief reason for Russia's "backward" attitude towards blood exchanges and physiological research in general before the Revolution:

> The sole reason why this research, which could open an immense field of work and perspectives of unheard of victories, is not already fully underway is the individualism of contemporary scientific thinking, for which the idea of deep physiological exchange of life between two individuals must seem not only strange but directly repulsive. Of course, development will overcome this obstacle.[42]

In other words, collectivism would replace individualism, and the concept of sharing life itself would be normalized.

Bogdanov began *Tektology* before the Revolution, but once the Bolsheviks assumed power and communism had, at least theoretically, been given the opportunity to revolutionize

[40] J. B. S. Haldane, *Marxist Philosophy and the Sciences* (Random House, 1939), 8.
[41] Ibid., 14.
[42] Groys, 213.

society and the sciences, Bogdanov became more confident that his blood exchanges and other fields of "visionary biology" would gain the validation they had been denied previously.[43] The attitudes of communalism and equality were the necessary antidotes (the "development" he spoke of) to the individualism that Bogdanov believed inhibited the most dramatic and effective forms of scientific advancement in the struggle against old age. Thanks to Marx and Lenin, the struggle could continue and science would prevail. Bogdanov was not alone in his hope that one day man would slow aging, possibly indefinitely, as Lunacharskii and Gorkii also believed that communism had finally laid bare some of the secrets of nature that would free the world from formerly oppressive conditions, such as death, diseases like syphilis "poisoning" the "alcoholized" population in Russia, and recurring hunger.[44] There is debate about the extent to which these men believed in the prospect of individual immortality in the literal sense, but there is no question that they perceived communism and the Revolution as precursors to the radical transformation of mankind and his environment.

Alexander Bogdanov's work with blood transfusions during the revolutionary years represents profoundly the intersection of utopianism and Marxist-inspired science. Though he conducted relatively few actual experiments during his lifetime, Bogdanov's theory was all-encompassing and total in scale: with socialism in place, science could be directed to the task, literally, of creating a new kind of healthier, happier, "better" people thanks to the transformative, almost magical properties of blood exchange. Blood was Bogdanov's biological answer while Proletkult was his social answer to the problem of creating a New Soviet Man after the Revolution.

[43] Krementsov, *A Martian Stranded on Earth*, 9.
[44] Letter from Alexei Kaplan to *Novaya Zhizn'* editorial, quoted in Gorkii's *Untimely Thoughts*, 58.

Bogdanov's blood science and his science fiction literature are some of the earliest milestones of revolutionary utopianism melding with science. *Red Star* can be viewed as an updated scientific, Marxist version of Chernyshevskii's utopia because it provided a sort of aspirational blue print for what a post-revolutionary communist society might look like for Russia. Bogdanov's blood transfusion theories in *Red Star* served as the national crucible where utopian dreams, Marxist ideology, and biological science converged in hopes of facilitating a better socialist future following the Revolution.

Supplementing Chernyshevskii's socialist utopia, science became the means of providing all that positivism, magic, religion and even revolution had failed to bring to Russia's suffering population. Like the notions of occultists and novelists of the late nineteenth century, science became "yet another Russian doctrine threatening to save the world."[45] As the father of Russian science fiction and the first author to depict a socialist utopia built on revolutionary Marxism, technology, and science, Bogdanov's novels were more than entertainment or an attempt to educate the working class about socialism; they were his answer to the "What is to be Done?" question. The science of Bogdanov's science fiction not only blurred the separation of the two, but also was poised to address Russia's, and indeed humanity's, most enduring problems. Through science fiction, Bogdanov's *Red Star* also helped bring blood transfusions into the realm of legitimate science because of the procedure's perceived value to socialism after the Revolution.

Blood Exchanges on Mars and on Earth

Unlike Bogdanov's Russia, his Mars had neither state nor class, and it also lacked the labor, production, and financial problems so prominent in Russia at the time. All labor on Mars is voluntary, unpaid, and Martians may come and go from professions as they please.

[45] Glatzer Rosenthal, Hagemeister, et al., 190.

Consumption is unlimited because of the scientifically planned Martian economy, which ensures none go without. There is no traditional family structure and all individuals are "free" from the imagined constraints imposed by a capitalist society. Mars was largely able to achieve a socialist balance that eliminated the aforementioned problems because of the Martians' advanced science and technology. Most intriguing is how Bogdanov's Martians used science to eliminate social and sexual inequality via blood exchanges. As a practicing physician interested in the alleged "rejuvenating" properties of mutual blood exchange ("transfusion" suggests one-way blood transmission), Bogdanov used *Red Star* to vaguely outline his theories on blood science and its ability to slow aging, cure diseases, and dramatically increase longevity.[46]

Conceived of in scientific, even mechanical terms, The New Soviet Man could be shaped by communist society, and then biologically improved with blood exchanges. Advancement of the fledgling Soviet Union scientifically was an inseparable component of early Bolshevik attempts to reshape the whole of society. As a leader of *Proletkult*, a novelist, and a scientist, Bogdanov was in a unique position to influence Soviet science and society by using all three avenues.[47] Considering *Red Star* predated the revolution by ten years yet foresaw almost every obstacle the future Soviet Union would face (namely the disastrous results collectivization would have on the individual psyche, and the environmental disintegration from crash industrialization, though an oracle is not necessary to anticipate these outcomes) it is fitting that Bogdanov is often called "the prophet of the Revolution."[48]

Bogdanov's depictions of advanced socialist medicine and his theories of blood exchanges in *Red Star* were certainly grounded in and saturated with the widespread fascination with "visionary biology" during the early twentieth century. During this period, intellectuals

[46] Ibid., 85.
[47] Jensen, 14.
[48] Bogdanov, Stites, et al, 10.

were still trying to reconcile Darwin's theories of evolution, Mendel's discovery of modern genetics, and the theories of Lamarckian inheritance. This led to increased attention on the life sciences and experimental biology both in research institutions and in literature.[49] Bogdanov's musings on rejuvenation through blood exchanges was revolutionary for its time, but not alone in attempts to stave off aging and death. Though experimental rejuvenation science was popular elsewhere in the early twentieth century, it is arguable that the specific post-revolutionary disasters unique to Soviet Russia spurred a greater desire to translate Bogdanov's science fiction blood exchanges into practical biology. During the Bolshevik Revolution and WWI, Russia experienced "the decade of death," when famine, disease, and civil war claimed millions of lives.[50] This era influenced other writers and scientists, who went to war with death on the page and then in the laboratory during the 1920s.

From the Page to Laboratory

Nikolai Krementsov argues in his article *Off with Your Heads: Isolated Organs in early Soviet Science and Fiction* that Alexander Beliaev's 1925 short science fiction story about the prolonged "life" of Professor Dowell's severed head was related to pathologist Sergei Briukhonenko's real-life endeavors into "living" severed dog heads that same year. It is likely that science and literature influenced one another in a circular flow of information. Krementsov positions both this science and science fiction amidst the backdrop of the 1914-1923 "reign of death," as he calls it, and claims that both literature and science were responding hopefully to the pervasive "unprecedented demographic catastrophe" in Russia at the time.[51] Their hope was for control over their fates; over life and death. Bloch's "principle of hope" functioned not in spite of

[49] Muireann Maguire, "Post-Lamarckian Prodigies: Evolutionary Biology in Soviet Science Fiction," *New Zealand Slavonic Journal* 43 (2009): 25, Northern Illinois University.

[50] Nikolai Krementsov, "Off with Your Heads…" 93.

[51] Ibid., 87-89.

this turmoil, but because of it. Such desperate circumstances were met with equally desperate responses, responses that came as utopian societies in outer space in novels, and as medical experiments that could mechanically go to war with death as a physical certainty. Placing the power of reanimation into the hands of scientists brought man one significant stride closer to appropriating power over life and death, and eliminating any need for a divine creator. In Beliaev's short story, the scientist who brings Professor Dowell's head "back to life" exclaims: "As it is, we, scientists, intrude upon "unshakable laws of nature," challenge death itself, and take away the livelihood from miracle-makers and from God himself."[52] Such a quote distills the overarching aim of science in the new Soviet Union, and its utopian, religious characteristics.

A few months after Beliaev's story was published, Briukhonenko's isolated head experiments using an "autojector" were lauded as a means to "fight death after it had occurred," according to *Komsomol Truth* correspondent G. Grebnev.[53] The "autojector" was a rudimentary artificial circulation system, and it managed to keep a dog's disembodied head "alive" for one hour and forty minutes. This feat garnered Briukhonenko 30,000 rubles in funding from The People's Commissariat for the Protection of Public Health (*Narkomzdrav)* in 1928 for further revival experiments. Newspapers published widely on Briukhonenko's "achievement of Soviet Science," and the experiments were even known in the West.[54] In fact, Irish writer George Bernard Shaw wrote a letter in response to the Soviet experiments, claiming: "I am greatly tempted to have my head cut off so that I may continue to dictate plays and books independently of any illness, without having to dress and undress or eat or do anything ay all but to produce

[52] Alexander Beliaev, *Chelovek-amfibiia: Golova Professora Douelia; Ostrov Pogibshikh Korablei; Ariel* (Moskva: Olma-Press, 2003), 18.
[53] Krementsov, "Off with Your Heads…" 89.
[54] Ibid., 90.

masterpieces of dramatic art and literature."[55] In *Evening Moscow*, this quote accompanied a cartoon of Shaw's severed head giving a lecture while hooked to an "autojector."[56]

Briukhonenko's "autojector" experiments with severed dog heads reveal something else truly revolutionary, and somewhat unsettling, about early Soviet culture; the fact that no one was disturbed by a severed dog head being artificially "revived." There was a marked shift in perceptions of morality after 1917, which touched the way men and women viewed life and death. In his article, Krementsov includes a picture of an audience present for one of Briukhonenko's experiments, where a dog's head rests on a plate. Casually, a woman holds the plate out in front of her like she is serving dinner. The crowd clearly does not perceive the dog's head as anything disgusting, horrifying, immoral, or unnatural. In fact, they hardly seem to notice it at all. A few are smiling; some are expressionless, while Lunacharksii instead looks directly at the camera awkwardly. Krementsov insightfully comments that audiences in other nations at the time would have been appalled at such a sight, since ethics had become a concern with the advancement of experimental biology in Britain around the same time.[57] He writes: "The Soviet scientific community, as well as Soviet society at large, seemed totally unperturbed. The Soviet public became excited rather than dismayed by the severed heads of dogs supported by the intricate apparatuses."[58] The changed moral and ideological atmosphere after 1917 is largely what made such experiments possible, and even popular.

Krementsov points out that the Russian audience was different than potential European counterparts, though. One reason he posits for this is the Russian-Soviet desensitization to death

[55] Ibid., 91.
[56] Ibid.
[57] Ibid., 97.
[58] Ibid.

and carnage because of the "decade of death."[59] The Revolution brought with it a monumental shift in morality, which is also a factor in Soviet audiences gazing on at dog heads "unperturbed." Since the Revolution attacked social norms and ideologies, the very concept of what was to be considered acceptable and ethical had been transformed. Because of this, the "rules" that formerly governed human emotion, morality, and expression no longer applied. To some, the Revolution's overthrow of the past had gone too far; as early as 1918 Gorkii warned that it was "necessary to preserve some conscience and other human feelings" amidst the frantic destruction of tradition.[60] In addition, science was placed on a pedestal that was above both good and evil. It was separate, incapable of being either, since science was viewed as simply universal truth that was itself "value-free."[61]

Bogdanov's blood exchanges were unique even among experiments with severed heads and the artificial maintenance of life because, unlike the work of the Sergei Briukhonenko, the ultimate purpose of blood exchanges was in line with Marxist philosophy and could potentially help bring the New Soviet Man into reality. What's more, Bogdanov experimented with something believed to be biologically heritable, meaning his work could change future generations of Soviet men and women forever. Compared to such lofty potential, the brief reanimation of an isolated organ had more in common with a party trick than with the direction proletarian science was headed. Through the exchange of blood, the strengths of the few could be physically put into the many, abilities would be equalized, and the "comradely exchange of life" would allow for the transfer of immunity and antibodies from a younger person to an older one in order to prolong life. The exchange of an older person's immunities acquired during their lifetime would be in turn transferred to the younger individual. Clearly, Bogdanov's "comradely

[59] Ibid.
[60] Gorkii, *Untimely Thoughts*, 98.
[61] Krementsov, "Off with Your Heads…" 91.

exchange of life" was exactly that—comradely. Briukhonenko's work could only be applied at an individual level, albeit in a revolutionary way. Briukhonenko's experiments could only ever hope to tackle death mechanically by means of "reanimation," which was not the same as renewed "life." Bogdanov's blood exchanges, on the other hand, had the potential to stop death in its tracks altogether before it happened, no "autojector" necessary.

While reanimating severed dog heads captured public interest and imagination in the 1920s, heredity has gripped human interest for thousands of years. The means by which people obtain their traits, personalities and dispositions is still debated today, as is the ethics behind attempting to manipulate any of the above. In early Soviet Russia, the inheritance of acquired characteristics was still largely the scientific standard, but some biologists vocally opposed non-Mendelian genetic theory. There is no doubt that Bogdanov favored the inheritance of acquired characteristics instead of natural selection. He explicitly stated this himself in his essay on Tektology. He also claimed that because acquired traits are heritable, blood exchanges would work "tektologically" in the body by affecting all organs and all possible ailments, not just isolated pieces.[62] The aim of extending natural life, curing disease and stopping death would not be won by tackling the problem piecemeal; Bogdanov saw blood as the only transferrable tissue capable of impacting every system of the body and changing it on a total scale. This inheritance would also theoretically help make society, not just an individual, better because of the effects passed on over time. *Red Star* suggested that socialist equality, if it came to it, could be obtained through biological means of passing traits from one individual to another via their blood. This can be thought of as a "leveling" of sorts, but as always, Revolutionaries imagined this would be an upward, progressive advancement, not a downward equalization.

[62] Bogdanov, Groys, et al., 211.

Bogdanov outlined his imaginative theories regarding the rejuvenating qualities of blood exchanges between a young individual and an older one in *Red Star*, during a conversation between an androgynous Martian doctor and Leonid, the earthling chosen to go to Mars and observe their futuristic, communist society. Netti, the Martian doctor who Leonid finally realizes is female, explains to Leonid that the blood exchanges are a "comradely exchange of life" that help to slow and reverse aging, transfer antibodies and immunity between members of the population, and even neutralize sexual dimorphism between males and females. [63] The possibility of indefinitely prolonging life is also raised. Leonid asks Netti why people on earth do not use the same methods, given that it appears so simple. Netti responds, saying: "Perhaps it is merely due to your predominantly individualistic psychology, which isolates people from each other so completely that the thought of fusing them is almost incomprehensible to your scientists."[64] It was the same argument Bogdanov had put forward in 1922.

The growth of blood science in Russia can be characterized as a uniquely Soviet phenomenon in that blood transfusions were only really possible after Marxist ideology and communism transformed the country, intellectually and socially. As late as 1915, the insurmountable obstacle that Russian scientist Vladimir Shamov faced in furthering the use of blood transfusions was simple: no one would donate blood. At the time, Europe, and Russia in particular, were more or less "horrified" at the idea of putting one person's blood into another.[65] Evidence of the reasons behind Russians' apprehension to donate blood is thin, but Krementsov points to skepticism of new technology that had recently been developed in America with the Carrel and Crile blood transfusion studies.[66] To most of Europe, these experiments were unheard

[63] Bogdanov, Stites, et al, 85.
[64] Ibid., 86.
[65] Krementsov, *A Martian Stranded on Earth*, 23.
[66] Ibid., 24-25.

of and sounded more dangerous than the ailments they purported to treat. It is a notable accomplishment that within a decade of the Russian public being "horrified" at the idea of donating blood, the Bolshevik Revolution was able to upend Russia's entire moral and ethical system to the extent that artificial circulation to a severed dog head didn't even raise an eyebrow.

Leonid and Netti's conversation, more than any other scene in *Red Star*, illustrates the convergence of Bogdanov's theories of blood transfusion, Marxism, and biology into what he hoped was a practically applicable procedure that could address some of Russia's problems, and ultimately help bring about a socialist society. While Marxism is widely perceived as damaging Soviet/Russian science to the point that it is only now recovering, blood transfusions are the exception; Marxism actually furthered scientific development and permitted experimentation with blood transfusions because of the ideological reorientation socialism provided.

In 1910, Bogdanov wrote that blood exchanges "would give an experimental resolution to alchemists' dreams about the possibility of reinforcing and rejuvenating the organism by renewing its blood."[67] The language used in explaining his intentions was characteristically utopian. Where alchemy and magic had failed in the past, Bogdanov was sure that science would succeed, specifically the science of blood exchanges. This optimism, at times bordering on the irrational, was largely a product of the utopianism and Marxist ideology of pre-revolutionary Russia, which is critical to the understanding of Bogdanov's experiments and indeed the entire development of science in the Soviet Union. Bogdanov's blood experiments seemed to polarize opinion; some fellow scientists thought his methods unorthodox at best, and metaphysical at worst. On the other hand, many of Bogdanov's closest companions, educated men themselves, believed the blood exchanges helped those who had undergone them. Those in power like

[67] Ibid.

Bukharin and Stalin following Lenin's death tended to advocate what Bogdanov was doing and believed the scientific basis of his work, at least for a few years.

In *Tektology of the Struggle Against Old Age*, Bogdanov wrote about aging as nothing more than the "negative aspects of systematic divergence," and proposed a tektologial approach to solving these systematic divergences. "Tektology" refers to universal systems organization, so for Bogdanov, tektological rejuvenation meant that all systems and parts of a body should experience rejuvenation, not just isolated systems that may be in decline. "Old age is not partial damage to an organism," Bogdanov wrote, "but a tektological illness that extends to the structure of an organism."[68] Since blood is carried to all tissues, organs, and systems, it was an obvious choice for tektological rejuvenation. In another work about tektology and rejuvenation, *Struggle for Viability*, Bogdanov suggested that "blood is the bearer of individual, racial, group-specific, and species-specific characteristics of any organisms, the same way its germ-plasm is."[69] The theoretical basis for Bogdanov's perceived viability of blood exchanges spawned from an imperfect understanding of protoplasm's "immortality" in single-cell organisms, a flaw that had been pointed out in Bogdanov's own time.[70] He wrote: "The decline of an individual's vitality is overcome through the joint efforts of several organisms. Even so-called protoplasmic immortality may be achieved in this way."[71] In 1891, German biologist August Weismann discovered what became known as the "Weismann barrier," which posited that germ cells and somatic cells were completely separate, with germ cells remaining unaffected by any changes "inherited" by somatic cells.[72] This, for many, was the nail in the coffin of Lamarckism, the

[68] Bogdanov, Groys, et al, 204.
[69] Quoted in Krementsov, *A Martian Stranded on Earth*, 84.
[70] Ibid., 89.
[71] Bogdanov, Groys, et al, 207.
[72] Ralph Wichterman, "The Life Cycle, Longevity, and Aging," SpringerLink, January 01, 1986, accessed April 16, 2019, https://link.springer.com/chapter/10.1007/978-1-4757-0372-6_9.

Inheritance of Acquired Characteristics, and Darwin's strange "pangenesis" theory. While single-cell organisms retained a kind of protoplasmic immortality, Weismann claimed:

> Old age and natural death are penalties demanded of the metazoa, including man, because of their specialization and differentiation into somatic and germinal protoplasm, whereas the protozoa, without this protoplasmic specialization, are potentially immortal like the germ cells.[73]

While germ-plasm immortality did exist, it did not exist the way Bogdanov understood it. And it did not exist in humans. Regardless of the Weismann Barrier, Bogdanov believed the body could work as a whole to overcome the negative effects of aging, since blood could "transgress the limitations of individuality."[74] With rhetoric such as this, it is clear just how attractive Bogdanov's experiments would have been to the communist government.

Bogdanov saw blood as "universal" and "unifying," imagining that any exchange of "vital substance" like blood, lymph or protoplasm would inherently be revitalizing to the whole body since blood impacts all bodily systems.[75] Essentially, Bogdanov extended the protoplasm/germ-plasm principle to humans, believing that the traits of the blood from one individual would live on in the recipient, transferring "vitality" one for one. He even speculated it could reverse gray hair to its original color, or possibly change one's eye color.[76] Interestingly, in his exchange trials Bogdanov noted a reversal of gray hair color in an older recipient of a younger donor's blood, but only temporarily.[77] This theory, and many like it that flurried around the world at the time of the rejuvenation and heredity "craze," rested on an assumed inheritance of acquired characteristics. This was at the very time that modern genetics was making substantial strides, rendering Lamarck's theories outdated. Even today in Russia this debate has

[73] Ibid.
[74] Bogdanov, Groys, et al, 211.
[75] Krementsov, *A Martian Stranded on Earth*, 89.
[76] Bogdanov, Groys, et al, 211.
[77] Krementsov, *A Martian Stranded on Earth*, 68.

not been resolved and "epigenetics," the scientific blend of both acquired and inherited traits, remains the lasting legacy of the Soviet Marxist stress on environmental influence on an organism.[78]

Until recent decades, history remembered Bogdanov not as the "pioneer" of blood transfusions but as the proponent of Ernst Mach's monist philosophy that led to his rift with Lenin. Only after Gorbachev's 1989 rehabilitation of many Soviet-era figures did some acknowledgement of Bogdanov as a scientist occur. Bogdanov's scientific and medical work with blood transfusions is not even mentioned in most books on the history of Soviet science; in Vucinich's foundational *Science in Russian Culture* Bogdanov is discussed as a philosopher,[79] the same is true in Joravsky's *Soviet Marxism and Natural Science*,[80] and in Loren Graham's *Science in Russia and the Soviet Union*, Bogdanov is referenced in literally one footnote, again in regards to philosophy.[81] Bogdanov's absence from historical literature about science in the Soviet Union raises the question, then, of why he was put in charge of the country's first blood research institute if he was not a "real scientist," and why some once viewed his blood exchange theories as miraculous nonetheless. It is telling that many of Bogdanov's scientific contemporaries wondered the same thing, mainly those hostile to Bolshevism who represented the "old order" of academia later purged by Stalin.

Blood, Lambs and The Pope

Bogdanov's description of how blood exchanges would theoretically work not only came from a science fiction novel, but they contradicted much of what early twentieth century science

[78] Graham, *Lysenko's Ghost*, 112.
[79] Alexander Vucinich, *Science in Russian Culture* (London: Owen, 1965).
[80] David Joravsky, *Soviet Marxism and Natural Science, 1917-1932,* (London: Routledge, 2013).
[81] Loren R. Graham, *Science in Russia and the Soviet Union: A Short History* (Cambridge: Cambridge University Press, 2004).

had already "proved" impossible.[82] In response to one of Bogdanov's treatises in 1920, the biologist Boris Zavodovskii criticized Bogdanov's work as unscientific and Lamarckist, even calling it "deductive-metaphysical," and compared it to an early transfusion attempted on Pope Innocent VIII.[83] The history of blood transfusions in general lends some validation to these criticisms. Bogdanov's blood exchanges differed in form from the first transfusions attempted hundred of years earlier, but the underlying logic remained remarkably intact: young blood carried an inherent "youthful vitality" and would rejuvenate an older, or even dying, person.

In 1492, Pope Innocent VIII was the recipient of what is considered the world's first blood transfusion.[84] At the time, there was a general belief in medicine that if a person's lifespan was prematurely ended, his or her blood still contained vitality from the years that individual would have had left. With this reasoning, fatal amounts of blood were taken from three ten-year-old boys and poured down the Pope's throat while he was dying of fever, in order to give him their remaining vitality. All four involved died.[85]

Of course, Bogdanov did not have such a simplistic understanding of blood transfusions, but there is still striking similarity between the fifteenth-century ideas of blood's inherent and communicable vitality, and the way Bogdanov believed blood exchanges would always have mutually beneficial results. There was still a presumption that blood would retain its characteristics even after being transfused into another individual's bloodstream, which reveals the Lamarckian style that the Bolsheviks favored in the twentieth century. This thinking suggested that blood's traits had a certain amount of fixity that human traits did not, hence the ability of science to reshape mankind. For example, Bogdanov wondered if blood transfusions

[82] Krementsov, *A Martian Stranded on Earth*, 48.
[83] Ibid., 89.
[84] Jacalyn Duffin, *History of Medicine: A Scandalously Short Introduction*, 2nd ed. (Toronto: University of Toronto Press, 2010), 171.
[85] Tucker, 8-9.

would change a recipient's eye or hair color to that of the donor. Genetic science of the age had already essentially shown that this was not how inheritance worked, but Bogdanov and other Marxist scientists disagreed. To be fair, the issue of genetic and epigenetic inheritance has not been resolved even in 2019, despite all the advances made, and in fact these often only confuse inheritance concepts further. While a handful of Russian scientists attempted to point out that total rejuvenation from blood was not genetically feasible, the politics, ideology and utopianism of the time were stronger than their voices. Under Stalin, these voices disappeared altogether, though so did "star-gazing" utopianists like Bogdanov, to a large extent.

A brief glimpse at the history of blood transfusions exposes the common theme between the centuries-old aims of the procedure and those of the early twentieth century Soviet scientists. While a similar urge to change man for the better exists in both examples, though divided by space and centuries, the Soviet attempts again stand apart because of their scale, always connected to an ideology of totality. Blood transfusions from antiquity sought to cure an individual, not a people, as was the case with the Pope's fatal blood "transfusion." Yet the belief in "changing" man's nature via the blood had a historical basis as well. The first "successful" blood transfusion, meaning the patient involved survived, was performed by French physicians in 1666. This was a xenotransfusion of blood from a lamb to a fifteen-year-old boy.[86] Animal blood was used at this time due to the lack of human donors (the same problem Russia had before the 1920s), but also with the hopes of changing a human's personality and temperament. Given their status as meek and gentle in the Bible, lambs were commonly selected for blood transfusions with humans since these traits would theoretically be passed on. A few months later in England, scientist Richard Lower and a physician to Charles II named Edmund King

[86] Françoise A. Roux, Pierre Saï, and Jack-Yves Deschamps, "Xenotransfusions, Past and Present," *Xenotransplantation* 14, no. 3 (2007): doi:10.1111/j.1399-3089.2007.00404.x.

transfused the blood of a lamb into a scholar deemed criminally insane, Arthur Coga.[87] King wrote about xenotransfusions and pulmonary functions in a 1666 paper he published in *Philosophical Transactions*, the oldest continually published scientific journal in the world, asserting that the blood from one species could live on in the body of another.[88] The idea behind this was similar to Marxist utopianism that held man's fundamental characteristics could be altered by outside influence and manipulated to make him "better:" Lower thought that Coga would acquire the "Christ-like" nature of the lamb via its blood, curing his lunacy.[89] Coga did not become more like the lamb, however. Given the alchemical and philosophical air surrounding Bogdanov's blood exchanges, it is understandable that scholars who favored purely genetic approaches to biology criticized his work as unscientific.

"Soviet Exhaustion"

Criticism from Mendelian geneticists did not dissuade Bogdanov of the viability of blood exchanges, nor did it stop the government's endorsement of Bogdanov and Lamarckian biology. Ironically, after the government set up several scientific institutions around 1925 aimed at proving the inheritance of acquired characteristics, Zavodovskii himself (Bogdanov's earlier critic) ended up lecturing on the beneficial fusion of Lamarckism and genetics and he wrote in praise of the idea of blended heredity.[90] This is a clear case of politics overtaking science and those involved adjusting their beliefs, or at least the presentation of their beliefs, accordingly. Bogdanov's Marxist perspective on what he termed "physiological collectivism" through blood exchanges, which arguably hindered a more scientific evaluation of blood transfusion

[87] Tucker, 8.

[88] The University of St. Andrews, "The Economic, Social and Cultural History of the World's Oldest Scientific Journal," *Ancient and Modern Rhetoric*, accessed November 19, 2018, https://arts.st-andrews.ac.uk/philosophicaltransactions/.

[89] Tucker, 8-9.

[90] Krementsov, *A Martian Stranded on Earth,* 90.

experiments, is partially what led Bogdanov to the directorship of the Blood Research Institute in 1926. The Institute helped further blood science in Soviet Russia, so there is much ambivalence surrounding whether Bogdanov was a "good" scientist and the legacy of his work. Blood exchange science lent itself so naturally to the ideology of Marxism and communism that attacks on Bogdanov's theories were refuted in philosophical terms, not scientific or medical ones. High-ranking Bolsheviks in the government believed in Bogdanov's blood exchange theories enough to name him director in 1926, and to pin the hopes of their own "rejuvenation" on Bogdanov as well.[91] This was especially so since Lenin's death was still fresh in their minds, a successor had not been named, and a strange "epidemic" seemed to be sweeping the party's upper ranks. Rejuvenation and the overall health of the Politburo members remained of the utmost concern into the late 1970s, when the average age for members stretched to eighty and Leonid Brezhnev experienced clinical death twice while in office.[92]

Apart from the Marxist philosophy that Bogdanov peppered into his explanations of blood exchanges, coincidence and chance played a large role in the government's interest in Bogdanov's experiments. This government interest is what brought science fiction into the Academy of Sciences. The founding of the Blood Institute directly followed Lenin's death and the healing of a prominent party member, Leonid Krasin, via a blood exchange facilitated by Bogdanov. A man already mythologized in his own time, Lenin's mortality was devastating to not only the Party, but to much of Soviet Russia; over a million people assembled at his funeral, and within three days St. Petersburg had been renamed Leningrad. Gorkii and Lunacharskii were part of a serious attempt to resurrect Lenin in the future when technology would allow, which is

[91] Ibid., 79.

[92] Alexander Kopysov, "Leaders and Healers," RTD Documentary Channel, April 30, 2012, accessed November 20, 2018, https://rtd.rt.com/films/kremlin-pill-stalin-brezhnev/.

why Lenin's body was initially frozen.[93] Lenin's death also marked the point when Bogdanov finally moved from theorizing about blood exchanges to actually practicing them, though whether this timing is of particular significance is not expressly known. Bogdanov was his own initial test subject, and he exchanged 700 cubic centimeters of blood, or about 1/7 of the average body's blood volume, with a twenty-year-old student. Bogdanov claimed his health improved following the exchange and that the student's health was not adversely affected.[94] Witnesses and friends recorded similarly positive reactions and agreed with Bogdanov's rejuvenation. In 1925, Bogdanov's friend Leonid Krasin was suffering from acute anemia. Rather than see a specialist in Germany or France, as was common for elites in Russia at the time, Krasin asked Bogdanov to perform a blood exchange on him.[95] The procedure was a success and Krasin recovered fully. News of the successful blood exchange soon made its way to Moscow.

The uniquely Soviet context of these coincidences proved the most instrumental in Bogdanov's appointment to the Blood Institute. It does appear there was an unspoken connection between the loss of Lenin and Krasin's recovery, and the implication was that blood exchanges could potentially improve the Party's health and could have possibly helped Lenin. There was another curious factor that played a role in legitimizing Bogdanov's speculative blood exchange theories, and it involved the most obvious intrusion of politics and Marxist philosophy into the realm of biology before the age of Lysenko. It was called "Soviet Exhaustion." This affliction was believed to hit the upper ranks of the Party especially, who caught it while working so tirelessly building socialism.

Bogdanov had successfully completed "about ten" blood exchanges when two years after Lenin's death, the Soviet government placed Bogdanov as director of Russia's first Blood

[93] Gray, 104.
[94] Krementsov, *A Martian Stranded on Earth*, 59.
[95] Ibid., 61.

Research Institute, an institute that other scientists had tried and failed for years to implement.[96] The principles behind and potential benefits of Bogdanov's science-fiction blood exchanges appealed to real-life Communist Party officials who, with Lenin's death still fresh in their memory, hoped to apply the "comradely exchange of life" to select comrades in the upper echelon of the Party first. Though an unlikely candidate, Bogdanov gained the directorship of the Blood Research Institute through the Party's desire to cure "Soviet Exhaustion." The diagnosis usually included a vague assemblage of symptoms, ranging from anemia to blood pressure disorders. To some, it may seem fitting that a subjectively "fake" disease be treated with an equally "fake" cure. Yet what constitutes "real science" and even "real medicine" is always contextual, and of course subject to its social, cultural, and even economic environment. There is no static "science" in the sense that experiments perpetually lead to a revision of previously accepted knowledge. "Scientific truth" is always in flux. During the revolutionary period in Russia, everything seemed to be in flux; culturally, socially and politically the country had radically changed in a staggeringly short period of time. With these dramatic societal overhauls came new perspectives and possibilities in the realm of science, particularly in the life sciences, and Bogdanov's blood transfusions were one of the most concrete examples of this change in the subjective "truth" of certain sciences. That being said, "Soviet Exhaustion" certainly felt real to those experiencing it.

The fact that Bogdanov's blood transfusions were first seen in a Marxist utopian novel, or that they rested on arguably "metaphysical" perceptions, did not undermine their legitimacy or possible validity to the Bolshevik elites. This was especially true for Stalin, who asked to meet with Bogdanov personally after Krasin's recovery. Bogdanov never wrote about blood exchanges "scientifically," meaning his writings on the subject were always simply termed and

[96] Ibid., 58.

accessible to anyone with a minimal amount of education. He never even included a bibliography in his works, nor control subjects, nor stable lab conditions during his exchange experiments. This had all the characteristics of the new "proletarian science" that was emerging after Stalin assumed a leadership role in the Politburo. To the Soviet government, if it was not understandable to the masses, it was regarded as a relic of the bourgeois past that tried to use language and educational boundaries between classes to keep science "off limits" to the average person.[97] This valued simplicity in post-revolutionary science, which in Bogdanov's case seems to be an over-simplification of the practical side of blood exchanges, is another key reason his theories appealed to party leadership so much. It was far easier for government leaders to comprehend his theories in philosophical rather than scientific language. This was how Bogdanov himself understood blood science, too. Bogdanov's scientific "simplicity" may have been the cause of the Blood Institute's birth, but it was also the cause of death for his research, and for Bogdanov himself.

The transfusion process was perceived very simply, and the "everyman's science" perspective endured in the language and diagramming of Soviet medical and science textbooks. In a diagram in a 1930s medical textbook, a transfusion was as simple as a line drawn from donor to recipient.[98] This was a "direct" blood transfusion. Direct transfusion was also indicative of the state of medical procedures after 1928; the Soviet Union, once closed off from the capitalist West, could not get the anti-coagulant potassium citrate needed to perform indirect blood transfusions, meaning the blood from one individual went into a bottle to be stored, and then it was transfused into another individual later. The direct transfusion method was never

[97] Stites, *Revolutionary Dreams*, 168.

[98] Linda Kinstler, "Peter Thiel's Blood Harvesting Was Tried by the Soviets a Century Ago," *Timeline*, August 04, 2016, accessed April 15, 2019, https://timeline.com/peter-thiels-blood-harvesting-was-tried-by-the-soviets-a-century-ago-af331ee99945.

favored in the West, as it was perceived to be more dangerous and less effective.[99] Because the USSR would not allow academic, scientific, or material exchanges with the rest of the world following Stalin's Revolution from Above in the early 1930s, supplies that could have furthered technological advancement in many fields were unavailable and progress was significantly stunted until the 1990s.

Bogdanov died in 1928 after a blood exchange he performed on himself. He exchanged a substantial amount of blood with a young student who had dormant TB and possibly malaria, though sources disagree about the presence of the latter disease.[100] It was Bogdanov's twelfth blood transfusion.[101] He was buried in history until his rehabilitation in the late 1980s, largely because of the changes that resulted from Stalin's Revolution from Above. Stalin shifted the focus of science and technology to the near future, as opposed to the "star gazing" of the early 1920s. Literature also followed this trend under Stalin, as Soviet science fiction began to reflect the *how* of getting to a communist utopia, not the end result. Though his death effectively halted the experiments in blood exchange science in Soviet Russia, at least in the way Bogdanov had conceived of it, the Blood Research Institute lived on under new directors and with a new name. The Institute's doctors were more focused on the practical application and medical procedural side of transfusions, instead of the philosophical side. Nikolai Bukharin, the last "intellectual" of Lenin's old order, eulogized Bogdanov, claiming he died a martyr to the Soviet cause since he had given his life trying to further socialism through science.[102] The same year, Stalin purged Bukharin and the last of the pre-revolutionary intelligentsia.

[99] Krementsov, *A Martian Stranded on Earth*, 128.
[100] Ibid, 99.
[101] Kintsler, "Peter Thiel's Blood Harvesting…"
[102] Bogdanov, Stites, et al, 16.

Speculation exists as to whether Bogdanov's death from the blood exchange was actually a suicide, as contemporary doctors pointed out that any trained physician would have recognized the likelihood of hemolytic reaction. Krementsov sees no evidence of suicide in Bogdanov's death, but Stites views the timing of Bogdanov's death as eerily aligned with the larger trend in deaths of the former intelligentsia class.[103] By 1928, the path of Soviet "utopia" was visible; many who had taken part in the 1917 Revolution saw the decline that began even before Lenin died. It came in the form of a ruling party that cannibalized its own members, policies of self-negating growth, and an increasingly absurd and intolerant atmosphere in Russia. Many "voices" of the Revolution, like writers Sergei Esenin and Maiakovskii, succumbed to suicide in 1925 and 1930 respectively. The "brains" of the Revolution were likewise either eliminated or pushed to emigration, exile, or suicide in several cases. Whether by suicide or accident, Bogdanov's death was the most concrete expression of the failure of the "comradely exchange of life." Stalin suppressed Bogdanov's scientific works, his name was removed from the Institute, and the connection between blood transfusions and Bogdanov's science fiction was buried for sixty years.

Soviet Russia formed the first blood bank in the world after Bogdanov's death. Given Russia's aversion to blood transfusion, donation or collection up to the Revolution, Bogdanov's ideological presentation of blood exchanges as something both utopian and Marxist, able to improve the lives of Russians and help bring about equality, no doubt played a significant role in the "legitimizing" of blood transfusions for the future Soviet society. Though Bogdanov's particular implementation of transfusions did not "work" as he had planned (though his friends argued that his successful transfusions had indeed caused improvement in donor and recipient), the fact that his novels served as the bridge between a utopian fantasy and revolutionary reality is

[103] Ibid., 17.

significant. *Red Star* arguably helped change the collective mindset towards exchanging blood, and in so doing, brought about a field of experimental science that may not have otherwise existed.

Living Substance

Bogdanov's insistence on an inherent "vitality" contained in blood became a fixture of later Soviet science that stressed the presence of "vital substance" in inorganic matter. Olga Borisovna Lepeshinskaia (1871-1963) and her husband were early supporters of Marxism, Lenin and the RSDLP.[104] After the Revolution, Lepeshinskaia became a physician, and claimed to have disproved cell theory with various experiments from the 1920s-1950s showing spontaneous generation of life.[105] Spontaneous generation as the origin theory of organic matter had long been discredited, but Lepeshinskaia claimed she observed living cells emerge from non-living substance. If valid, the implications of her "discovery" were astonishing, as it effectively gave Soviet scientists the power to create life out of nothing. Though her experiments did not have of do with blood specifically, the idea of a fixed "vitality" or "living essence" was reminiscent of Bogdanov's view that blood carried with it the youth and health of the individual. While Bogdanov's blood exchanges were geared towards halting aging and death, Lepeshinskaia's work claimed the God-like ability to bring "dead" matter to life.

Lepeshinskaia's "living substance" would have been a powerful tool in the hands of the state, and it would have served to validate communism during the early Cold War. Lepeshinskaia also claimed that baking soda was a key to creating new cells from "dead" ones, making it a kind of powdered fountain of youth; her claims about baking soda actually led to a baking soda

[104] Yakov L. Rapoport, *The Doctors' Plot* (London: Fourth Estate, 1991), 254.
[105] Ibid.

shortage in the USSR for a brief time.[106] She was closely associated with Lysenko and challenged classical genetics, and her experiments were "verified" by their supporters.[107] Lepeshinskaia won the Stalin Prize in 1950 for her "discovery," and the government praised her for her groundbreaking work that overturned the cell theory developed in Germany in the 1920s.[108] Unlike Lysenko's vernalization theories, however, Lepeshinskaia's living substance theory was never openly denounced, but it just "went away," and drifted into obscurity, according to historian and author Mark Popovskii.[109] Lepeshinskaia and the case of her "living substance" mark another entry into the catalog of Soviet scientific oddities aimed at appropriating fundamental power over life and death.

"Parabiosis" and Rats that Smell Fear

Recently, Bogdanov's work has experienced a renewed, if unconscious, interest and debate among scientists in the West. Some question whether the principle behind exchanging blood to rejuvenate, heal and prolong the life of an organism is valid, but the practical attempts at it have thus far failed. In 2011, Paypal co-founder and billionaire hedge fund investor Peter Thiel announced his launch of Halcyon Molecular, a biotech company aimed at reversing aging and stopping death.[110] The principal means of researching the end of death for Thiel's company is something called "parabiosis," or the transfer of a young individual's blood into an older person, in order to reverse aging.[111] It is unknown if Thiel was or is aware that Bogdanov attempted nearly the same experiment nearly a century ago.[112] But the fact that an eccentric member of the

[106] Ibid.
[107] Ibid.
[108] Vadim J. Birstein, *The Perversion of Knowledge: The True Story of Soviet Science* (Boulder, CO: Westview, 2004), 261-262.
[109] Popovskii, 116.
[110] George Packer, "No Death, No Taxes: The Libertarian Futurism of a Silicon Valley Billionaire," *The New Yorker*, November 28, 2011, accessed May 05, 2018.
[111] Kintsler, "Peter Thiel's Blood Harvesting…"
[112] Ibid.

"nouveau intelligentsia" is attempting what the Soviets did demonstrates that the utopian dream of gaining mastery over death has not, and will not, end. It is ironic, however, that what began as an attempt to better the overall health and well being of a socialist society has now been adopted by a member of America's one percent. The use of blood exchanges to prolong life in this context will inevitably come at a premium.

As epigenetics gains acceptance in the West, albeit with substantial hesitation and controversy, the legacy of epigenetic inheritance concerning the Stalin years lives on in Russia. Vladimir Kozlov, director of Russia's Institute of Clinical Immunology, asserts that the social trauma of the Terror under Stalin has been inherited through successive generations and that this has "lamed the Russian people genetically," accounting for the lingering, "suicidal submission" of the Russian people.[113] While Kozlov is validating the Lamarckist principles that dominated the Lysenko era of "progressive biology," it is with the same, seemingly ever-present twist of sardonic Soviet irony: if his claims are to be believed, Russians did inherit something from their environment. Yet the traits were awful and socially crippling, not the advantageous effects of the communist experiment that Soviet biologists advocated.

In the United States in 2013, epigenetic research revealed that rats inherit fear.[114] When exposed to stimuli, like scent, that accompanied negative experiences for a previous generation of rats, the rats that have not directly experienced that sensation before react with fear.[115] Simply put, a parent rat that smelled something peculiar before being shocked will pass onto its progeny the same associations with that smell even if no shock is administered. In modern epigenetic parlance this is known as "ancestral odor conditioning," and it appears with ever more frequency

[113] Graham, *Lysenko's Ghost*, 134.

[114] Brian G. Dias and Kerry J. Ressler, "Parental Olfactory Experience Influences Behavior and Neural Structure in Subsequent Generations," *Nature Neuroscience* 17, no. 1 (2013): accessed February 8, 2019, doi:10.1038/nn.3594.

[115] Ibid.

in articles on nature and neuroscience. Bearing in mind the connection between these rats and Kozlov's belief about heritable fear, the Soviet Experiment's aim of making a new man through changed socio-economic conditions could be viewed as a success. Russians are different because of it, but not necessarily better.

CHAPTER IV

WATER

In truth, Darwinian fitness is a perfectly reciprocal relationship. In the world of modern science a fit organism inhabits a fit environment…Water, of its very nature, as it occurs automatically in the process of cosmic evolution, is fit, with a fitness no less marvelous and varied that fitness of the organism which has been won by the process of adaptation in the course of organic evolution.[1]

–L.J Henderson

From the period when earth's life could be measured only in geological time through the twenty-first century, water remains the most fundamental necessity for any and all life to exist. People have always recognized water's incalculable value to mankind and to nature. In the time of Aristotle and Thales, a philosophy emerged that declared, "Water is all."[2] Rain dances evolved into increasingly sophisticated technology over the past millennia as the role of water in sustaining the world increased. Water is so ubiquitous and necessary, even when invisible, that its true value is unable to be quantified; instead, water is the yardstick by which the value of all other substances can be measured.

Given its prolific role in human life and development, it is no surprise that Soviet science focused a great deal on experiments dealing with water, both in nature and in the laboratory. If the most critical element in nature could be harnessed and manipulated by Soviet scientists, it would be a literal victory over the greatest metaphor for life on the planet- an assertion of Marxist science's superiority to the capitalist West, and by extension validation of Soviet atheist ideology that put man as the central figure in human development. Just as the Bolsheviks were

[1] Klotz, 69.

[2] Oregon State University, "All Is Water: Concrete Thinking and Abstract Thinking," *Great Philosophers: Thales*, 2002, accessed May 17, 2019, https://oregonstate.edu/instruct/phl201/modules/Philosophers/Thales/thales_all_is_water.htm.

fascinated by blood's perceived ability to alter the human condition and what that meant for the forging of a more "fit" socialist man, water was the blood of the earth. The Bolsheviks had even grander designs for its use in building communism. Stalin's prison labor canal projects, the irrigation system for the culture of cotton in Central Asia, and the pseudo-scientific claims surrounding "polywater" each exemplify the prominent role of water throughout the development of Soviet science and technology. In each case, control of water had significance that reached far beyond politics. Control over water not only asserted Soviet power, but also suggested Soviet science had appropriated creative and transformative powers that once belonged to the spiritual realm. If Soviet projects such as these could transform landscapes and essentially make something out of nothing, as if by Marxist magic, the implication was that science at the behest of the state could truly forge a new world, and a new type of person fit to inhabit it.

Stalin's Canals

The canal projects of High Stalinism are a major example of the role water played in the manipulation of the environment and perception, but also of the population. Containing water in nature is a monumental task, and canal projects were instrumental in Soviet industrialization and development. Before the October Revolution in 1917, as WWI continued, Maxim Gorkii mused on the critical role canals would play in shaping environment and industry for the better. In a May 1917 article *in Novaia Zhizn'*, he wrote:

> Imagine for a moment that there are sensible people in the world who are sincerely concerned with the building of a normal life and who are confident in their creative powers; imagine, for example, that in the interests of the development of our industry it is necessary for us Russians to dig a Riga-Kherson canal in order to link the Baltic Sea with the Black Sea—a project about which even Peter the Great dreamed. And so instead of sending millions to be slaughtered, we send a potion of them to this work which is vital to

> the country and to all of its people. I am confident that those killed during three years of war would have been able in this time to drain the thousands of versts of swamps in our country, to irrigate the Hungry Steppe, and other deserts, to connect the rivers of the Trans-Urals with the river Kama, to lay a road through the Caucasus mountain ridge, and to accomplish still other great feats of labor for the good of our native land.[3]

The key role water played in reshaping man's environment was recognized long before the canal projects under Stalin. Throughout his articles in *Novaia Zhizn'*, Gorkii references the "good of the country" and the necessity of such projects for not only the nation, but its people. As many revolutionaries pinned their hopes of development and change on science and technology, the means of developing the landscape and bringing advancement to "backward" Russia often featured water in a central role. Gorkii advocated canals connecting various rivers and seas, draining swamps and irrigating the "Hungry Steppe;" most of these projects were undertaken in the Soviet Union, and assigned transformative, millenarian importance. The ultimate purpose with these water control projects was to not only change the land and atmosphere, but to change the people into good socialist workers in the process.

It is interesting that in numerous *Novaiya Zhizn'* articles Gorkii criticized Bolshevik methods and even condemned Lenin's brutality and inhumanity, when Gorkii himself became one of the regime's most dedicated servants under Stalin. The features Gorkii criticized in 1917 only intensified and worsened by the 1930s, yet he still acted as advocate for some of the Soviet government's most lethal projects. Apart from the advantageous changes canals could bring to the environment and their aid in economic development for Russia, Gorkii championed Stalin's White Sea-Baltic Sea Canal project and the prison labor used to construct it. In 1934, Gorkii edited and co-authored (along with around 120 others in the OGPU's "Writer's Brigade") *Belomorsko-Baltiiskii Kanal Imenii Stalin: Istoriia Stroitelstva, 1931 - 1934*. The book was

[3] Gorkii, *Untimely Thoughts*, 14.

published in 1935 in America as *Belomor: An Account of the Construction of the Great Canal Between the White Sea and the Baltic Sea*. This "history" of the canal was government-sponsored and, naturally, a propagandistic account of the construction. It represented Belomor as a heroic socialist project, transforming prisoners into class-minded members of the proletariat via labor for the national good. Belomor changed land and individual at the same time.

In building the canal and helping achieve the aims of Stalin's first Five Year Plan, the prisoners were experiencing *perekovka*, meaning "reformation" or "rehabilitation." This was a very utopian aim of the Soviet prison system and directly connects to the religious scale of communism. The labor force included both petty criminals and political ones, though interviews for Gorkii's project were largely from those who had been convicted of "regular" crimes. Author Julie Draskoczy's book, *Belomor: Criminality and Creativity in Stalin's Gulag*, includes several excerpts from prisoners' writings, artwork, and songs penned in the camp. Andrei Kupriianov was sent to Belomor for a robbery that ended in murder. He reflected on his time at Belomor as if it were a death and rebirth: "I am united with the working class in soul, body, and blood. My father, mother and I were all killed for the cause of the working class."[4] Draskoczy explained that Kupriianov's family members had in fact died, but that his death was metaphorical; his former self perished and he became devoted to the socialist cause while in prison.[5] Kupriianov offers one example of the *perekovka* process in action. While his rebirth as a new Soviet citizen appears to have been genuine, the government imagined that this type of positive transformation affected most of the inmates and changed them on fundamental levels. Such a concept harmonized with the Soviet scientists who relentlessly favored Lamarckism based on the theory

[4] Julie Draskoczy, *Belomor: Criminality and Creativity in Stalin's Gulag* (Boston: Boston Academic Studies Press, 2014), 17.

[5] Ibid.

that people would inherit and pass on the "improvements" wrought by communism. Those who survived Belomor doubtlessly experienced irrevocable changes, but it hardly stands to reason that these were transformations that forged devoted Soviet citizens.

Belomor offers a very clear example of the Soviet means considered acceptable in forging New Man. In working to change their environment, the prisoners would change themselves and acquire positive socialist traits in the process, deeming the prison labor system inherently valuable socially and economically. The process itself was very utopian; a better environment was achieved, and people followed suit by putting the goals of the project above their own. In this way, the New Soviet Man was self-creating, almost autotrophic, once the state had set their change in motion by handing down a prison sentence. "Positive changes" from working on Belomor, for the laborers and for Soviet development, were written about in the future tense in Gorkii's account, despite the book being written after the canal's construction.[6] This confusion of tenses and the treatment of the future echoes other Socialist Realist attempts to paint the present with visions of a better future in order to will that future into being. While praised at the time of its publication, both in Russia and abroad, dissidents pointed to the slave labor that the book essentially failed to mention. Alexander Solzhenitsyn, in *The Gulag Archipelago*, called Gorkii's work "the first in Russian literature to glorify slave labor."[7] Author of *Gulag: a History* Anne Applebaum has placed the death estimate from the labor project at around 25,000, or about one-fifth of the total labor force.[8] This is a disputed figure, as some deaths were not recorded, and Solzhenitsyn puts the toll closer to 250,000.[9]

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[6] Draskoczy, 17-40.

[7] Alexander Isaevich. Solzhenitsyn, *The Gulag Archipelago: 1918-1956: An Experiment in Literary Investigation: I - II* (London: Collins and Harvill, 1974), xii.

[8] Anne Applebaum, *Gulag: A History* (New York: Anchor Books, 2004), 79.

[9] Solzhenitsyn, xiii.

The Moscow canal system and the "Port of Five Seas" projects form another story of water as a tool of state power with huge ideological significance. Soviet canal-building projects of the 1930s combined the oversized Stalinist plans to subdue the environment with the triumph of perception over reality. The Moscow Canal is a testament to the Socialist Realist manipulation of reality and the objective "present" because its construction transformed physical space into "imaginative" space. Simon Schama explains this transformation as a function of state power in *Landscape and Memory*.[10] The imaginative, psychological, and social space concepts, pioneered by French Marxist Philosopher Henri Lefebvre, have special relevance to the Soviet manipulation of nature as part of their overall manipulation of reality. The canal and its hardware put the Soviet ideology that created them into a powerful symbolic position, suggesting that the ideology itself was validated by the success of the project.

The Moscow Canal was a success, still functioning today. It does not carry with it the smell of death that still hangs around the word "Belomor." This is likely because Belomor was one of the only highly publicized prison labor projects as it kicked off the first Five Year Plan, and it featured not only an accompanying book, but also a brand of cigarettes named for it. This publicity naturally brought attention to the conditions under which the canal was made, even with Gorkii's optimistic socialist gloss on the matter. The Moscow Canal was built from 1932 to1937 using slave labor from the gulag system, but this project kept a lower profile. It runs 79 miles, linking the Volga and Moskva Rivers. Dams, locks and hydroelectric plants built in connection with the Moscow Canal stood as visible reminders that the state had the power to control such a creative and destructive force as water, the metaphorical blood of the earth. An

[10] Quoted in Costlow, Rosenholm, et al., 175.

eighty-foot-tall statue of Lenin remains at the Dubna port of the canal, though Stalin's statue was torn down during the Thaw.

The Moscow canal asserted the centrality of Moscow to the rest of the Union, not only as the seat of the government, but also because it connected Moscow to the Volga so that the most crucial waterway in European Russia ultimately headed for Moscow. Moscow became the place where the water was headed, no matter where it came from.[11] Even outside of Moscow and in places where the canal and its implementations were not visible, the canal brought constant reminders of its own significance and that of the government that forged it. Lenin's emphatic push to electrification in the 1920's was echoed in the canals' hydroelectric stations. Water and electricity merged, one having the power to create the other, while the state played master to them both. Today, Moscow Canal still keeps the lights on for the city and provides most of its drinking water. Totalitarian regimes have a long history of controlling critical supply chains and power supplies, and in the Soviet case, the canals served as both.

Water was a vital force for changing the environment throughout the Soviet Union, and also for shaping the *idea* of the environment. Technology joined with human labor in the creation of new dams, built on a scale that Russia had never previously seen. In "The Moscow Canal and the Port of Five Seas," author Cynthia Ruden portrays the canal as a "personification" of Soviet power because its presence was "proof of the validity of the ideology and wisdom of the state."[12] The canal project that claimed Moscow as "the port of five seas" was technically a lie for almost twenty years. The name existed from the earliest days of the canal's construction in 1932, when it only provided passage for waters of three seas: the White Sea, the Baltic, and the Caspian. It was not until 1952 that the canal could claim contact, even tangentially, with five seas when the

[11] Costlow, Rosenholm, et al, 177.
[12] Ibid., 176.

Volga-Don Canal linked the Moscow Canal with the waters of the Azov and Black Seas. This is a classic detail of Socialist Realism, the ability to blur and manipulate temporal and physical reality. It was false, but this type of "untruth" was so much more than a lie during the Stalin years. It was not a lie if it was going to *eventually become true*. The aspect of time was just a technicality.

Even on maps the Moscow canal came to be called "the port of five seas" because it was something that was going to happen, and the future canals were drawn on maps long before they were dug in the earth. The Bolsheviks had "dynamic facts" and "progressive biology;" it is arguable that Socialist Realism spawned a whole field of "imaginative geography" too. The image of life "as it would soon be" in the USSR was a kind of "well-intentioned" deceit propped up by Socialist Realism that grew more delusional as the Terror stretched into another World War. Future progress existed in the present, as imagining what was to come became equated with bringing it into existence. Misting the objective present with an imagined "better" future was a major triumph in the Stalinist manufacture of an alternate reality, where people were expected to live in order to facilitate that reality's very arrival. From canals to agricultural exhibits displaying a Soviet Union of bountiful abundance and overflowing harvests despite a hungry reality, Socialist Realism and its monuments traversed time and space and in so doing obscured the perception of any "objective" reality.[13] The fact that water was at the center of some of the largest Socialist Realist-era projects highlights its important role in transforming not only landscape, but perception as well. For those who were unquestionably resentful that life was not

[13] Valerie A. Kivelson and Joan Neuberger, *Picturing Russia: Explorations in Visual Culture* (New Haven, CT: Yale University Press, 2010), 122.

in fact art, as Socialist Realism would have had them believe, the Terror and purge years were effective at tempering dissent with self-preservation that caused people who otherwise knew better to allow themselves to "believe" in this other reality.

Commissar Cotton

In the years of High Stalinism, at the apex of the Terror, Stalin placed the utmost value on agricultural and production quotas, while at the same time attempting to bring non-Russians more actively into Soviet society and the national economy. During this period, Stalin's government implemented irrigation and canals in the southern Republics, achieving what Lenin had first discussed in 1921. In a proclamation to the Central Asian Republics in the newly-minted USSR, Lenin said: "Irrigation will do more than anything to revive the area, bury the past, and make the transition to socialism more certain."[14] Lenin obviously recognized water's potential to dramatically alter the environment in places like Kazakhstan and Uzbekistan, and he tied this to the ultimate goal of furthering socialism through collective labor and agriculture.

In terms of ambitious Soviet science and engineering tasks aimed at changing the environment and harnessing nature in the name of socialist progress, the irrigation systems built in Kazakhstan and Uzbekistan in the late 1930s are among those with the greatest lasting impact. In many ways, the Soviet Union's utopian goals of mastering nature and proving that the inheritance of acquired characteristics could indeed create a new type of human being were fulfilled in the areas surrounding the disappearing Aral Sea. But not in the ways the Bolsheviks had expected or hoped for. The results of diverting the Amu Darya and Syr Darya Rivers to grow cotton in the region were disastrous, but they were also, ironically, "successes" for the Soviets. At the time, the Central Asian Socialist Republics had small-scale vegetable farming and some

[14] Vladimir Lenin, quoted in Pearce, *When the Rivers Run Dry*, 202.

vineyards, while most of the land was uncultivated steppe. Though Imperial Russia thought the climate and river systems of Central Asia would make the lands ideal for cultivation, it was only under Stalin that the remaking of this environment and, to a great extent, its people, took place. Through the 1930s the Soviet government collectivized smaller Central Asian farms and implemented an irrigation system of monumental proportions, like so many other Stalinist engineering and architectural projects, in the name of "Commissar Cotton." The land was converted into immense cotton fields growing the main supply of fibers for Russian textile mills.

Soviet dams diverted water that once flowed from the Amu Darya and the Syr Darya into the Aral Sea in order to irrigate millions of acres of cotton planted in the middle of a desert, as part of a project that has been called "mismanagement of water on an almost unimaginable scale."[15] As nearly all of the arable land was collectivized for cotton, the food supply in Uzbekistan began to decline, and at the same time, the Aral Sea began to recede. During the height of the Stalinist Terror in 1938, Sultan Segizbayev, the Prime Minister of the Uzbek SSR, reminded the central government, "You cannot eat cotton."[16] Segizbayev was in government nine months before being executed for "bourgeois nationalism." Socialist Realism, which intentionally contained limited ingredients from reality, painted Central Asia as the creation of an oasis out of a desert, an astonishing feat of alchemy performed by Soviet "sorcerers" building a communist utopia. Unfortunately, the oasis was not edible.

Like Bogdanov's future communist society living on Mars in *Red Star*, the Soviets had turned desert into harvestable utility through the use of canals that controlled the single greatest material in civilization building. Water has facilitated the advancement of humanity from one stage to another throughout history, and so it did in Soviet Central Asia. In *Landscape and*

[15] Ibid.
[16] Ibid., 203.

Memory, Schama speaks of rivers as "lines of power" for a state to control, and in so doing, to win an ideological battle by "occupying" physical space with an "imaginative" one.[17]

The Soviet Union was uniquely gifted at transcending physical and temporal space with an imaginative one; it was the entire basis of Socialist Realism. Socialist Realist landmarks, architecture, art, science, entertainment, all the pieces of the culture of High Stalinism, compelled people to view their present reality as it would one day be, not as it physically was at that moment. Water was an integral part of this process. For the Soviet government, irrigation, canals and dams were all assertions and validations of the totalitarian regime's ideology that held man (Communist man more precisely) as the central force in nature. This force had the power to influence future change through Feodorovian-style "active evolution," or the ability of man to make himself evolve.

In a telescoping move that would have astonished Lenin, Soviet control of water took the Central Asian population from what was arguably the primitive communal stage of history, since many parts of the region were still tribal and nomadic, and advanced it in the span of a few decades to the final socialist stage. To the Soviets, it was even greater evidence of their engineering genius that the new socialist civilization of Central Asia would became a "hydraulic civilization," in a place with such limited natural access to water.

Schama's work asserts that landscape is an idea culturally constructed, and he discusses rivers as "lines of power," in reference to Marxist-Stalinist rhetoric on the origins of life.[18] Marx saw history as being "relentlessly push[ed] downstream," the line of water symbolizing the

[17] Simon Schama *Landscape and Memory*, (New York: Vintage, 1996), 5.
[18] Ibid.

progressive development of society.[19] The Soviet irrigation of Central Asia that drained the Aral Sea breaks with Schama's Marxian vision of linear progression, however, because instead of "pushing history downstream," the process pushed the area's development back to the beginning. Irrigating the desert only created a more severe desert. In this case, linear Marxist historical development was pushed downstream until dragging on the shallows, where it was replaced with a tragicomic circle.

Like the Stalinist canal projects, the cotton harvests in Central Asia required huge throngs of laborers. The cotton field labor was not supplied by the gulag system, but neither was it voluntary. Sparing no one, the Uzbek population was put to work picking cotton in a massive collectivized workforce. This was a success in materialist terms, however dubious, since all of the harvest was sent away for redistribution throughout the Soviet Union.[20] This labor and the products it yielded were only possible because of the state's redirection of crucial water sources. Water had played the central role in the science and engineering aimed at transforming a semi-desert landscape populated by nomads and shepherds into a socialist utopia of productivity and collectivized agricultural labor, even if this "labor" bore a striking parallel to Marx's second stage of development (slave society.) The Soviets harnessed water to change a landscape and an economy, taking small private farming plots and transforming them into million-acre state-owned fields that drafted the entire Uzbek population to work it summer through winter. All consequences aside, the transformation of Soviet Central Asia is indeed a case of man conquering nature and subduing it to his will in true messianic fashion. Changing this environment did change the people; their lifestyles and subsistence methods were turned upside

[19] Costlow, Rosenholm, et al.,178.
[20] Pearce, 203.

down.[21] If the conquest of the environment was temporary, as nature continues presently the reclamation of the cotton fields, the conquest of the people has proven more permanent.

Gorkii and the early Bolsheviks were correct in their belief that environments can alter inhabitants, but again, it is as if they only ever anticipated these changes as being solely positive Central Asia stands as contradicting evidence. This was a persistent blind spot in Soviet views of genetics and inheritance, as the previous chapter discussed. This Promethean Soviet project essentially came with a built-in self-destruct button. Such a design flaw was a common occurrence during breakneck collectivization and industrialization under Stalin. But Stalin and his regime are only partially responsible for the continuing ecological crisis of water in Central Asia and its damaging effects inherited by the surrounding population.[22]

The myopic harvesting of cotton increased into the Khrushchev era and beyond.[23] Khrushchev had promised "communism in one generation," and embarked on practical plans to improve the standard of living in the USSR while maintaining a commitment to realize communism. Textile production was an important part of offering an improved material culture in the Khrushchev era, as well as expanding agricultural diversity to produce more food. Even after Khrushchev's removal, irrigated lands in Central Asia doubled in size between 1965 and 1980. Larger and larger amounts of water were diverted to the fields.[24] While the Soviet Union may not have had science for the sake of science, it certainly had progress for the sake of progress, and environmentally indiscriminate policies like the cotton quotas in Uzbekistan pushed on into a perpetually unattainable "more." Begun in 1954, the Karakum Canal put further

[21] Ibid., 202-204.
[22] Ibid.
[23] Ibid.
[24] Ibid.

strain on the Amu Darya, and by extension the Aral Sea.[25] The world's largest irrigation canal at the time of its construction, the Karakum Canal brought water to the "driest, emptiest, and least populated" part of the Soviet Union: Turkmenistan.[26] An area of puzzling emptiness even today, Turkmenistan consumes a disproportionate amount of water considering its low population because of the water needed to irrigate cotton in desert soil.[27]

It was not only the irrigation of Turkmenistan that demanded more water from an already depleted source. Salinization across the twenty million acres of cotton fields proved to be the thirstiest culprit in the Soviet alchemy that spun water into cotton. The fields became waterlogged after insufficient drainage and over-irrigation caused the salt in the soil to leach to the top, leaving a crust of salt that continually needed to be washed away before every new harvest.[28]

Since the Soviet collapse, salinization has worsened on account of outdated equipment that is no longer being maintained. Many fields were abandoned and re-converted to desert in the 1990s, but cotton remains the cornerstone of Uzbekistan's economy and marathon quotas still exist as if the Soviet bureaucrats are still there counting cotton. Today, more water is used to wash away the result of over-watering than is used to actually water the crops. Environmental consultant and author Fred Pearce characterizes the throwing good water after bad as the "salinization treadmill;" it takes water to wash away the toxic saline result of over-watering, which in turn causes more salinization, requiring more water to clean the top of the soil, and so

[25] Nikolai Kharin, "Vegetation Degradation in Central Asia under the Impact of Human Activities," *Springer*, 2002, accessed April 15, 2019, doi:10.1007/978-94-010-0425-1_1.

[26] Pearce, 204.

[27] "Resources: Curb Vast Water Use in Central Asia," *Nature News*, accessed February 10, 2019, https://www.nature.com/news/resources-curb-vast-water-use-in-central-asia-1.16017.

[28] Pearce, 207.

on in perpetuity (or until the water finally runs out.)[29] This possibility is not as remote as may have been believed. During Stalin's lifetime the Soviet government embarked on a massive nuclear-powered desalination plant on the Caspian Sea at Shevchenko, for when Central Asia eventually ran out of fresh water[30]. The plant was decommissioned in the 1970's when fuel became too costly. In 2015, however, Kazakhstan began seeking private investors for a new plant that will restart the effort to desalinate the Caspian Sea, in the anticipation of the day when water becomes too costly.[31]

Though "mismanagement" certainly was a factor in the ecological crisis still playing out in the wake of the Soviet cotton monoculture craze, that term suggests this was all somehow accidental, that this is another "classic Soviet blunder." While that phrasing seems to equate monolithic Soviet engineering calamities with an Abbot and Costello skit, it is important to understand that Soviet engineers knew, at least as early as the 1970's, the eventual results of damming the two main Central Asian rivers. In Uzbekistan's Nukus Museum (The State Art Museum of the Republic of Karakalpakstan), there are Soviet engineering maps dating from the 1970's, anticipating the disappearance of the Aral Sea by around the year 2000.[32] The sea and its surrounding area was a pawn sacrifice for the greater goal of socialism. The Bolshevik dream of a new man and new, improved landscape permitted any means necessary in the name of its achievement.

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[29] Ibid.

[30] E. V. Novikov, S. I. Golub, and V. B. Chernozubov, "Distillation Desalination Plant in the City of Shevchenko. Layout, Equipment and Operating Experience," ScienceDirect, August 02, 2001, accessed April 16, 2019, https://www.sciencedirect.com/science/article/pii/S0011916400840163.

[31] Tom Freyberg, "Seawater Desalination Plant Set for Kazakhstan," WaterWorld, November 10, 2015, accessed April 16, 2019, https://www.waterworld.com/articles/wwi/2015/11/seawater-desalination-plant-set-for-kazakhstan.html.

[32] Pearce, 205.

The loss of a sea in itself is upsetting evidence of reckless modern over-use, even if it left behind a scenic locale for *Vogue* photo shoots and extreme tourists looking to climb on the rusted ships revealed as the sea retreated. The real ecological consequence of the vanishing sea is something early Bolsheviks inspired by Feodorov and Cosmism hoped to one day achieve: it changed the weather. The Aral Sea has shrunk by 90%, leaving dramatically less water evaporating into the atmosphere to stabilize the climate and provide rain.[33] This caused a drinking water crisis from 2000-2002 because of drought throughout the region.[34] Summers are now hotter and winters harsher, altering the length and conditions of the growing season. The exposed seabed contributed to the salt problem in Central Asia. Salt and dust from the once-underwater basin scatters across the area in violent dust storms that are fairly common, another result of the altered weather and climate.[35] The Soviets changed the environment here far beyond the scope of any intentional socialist planning.

Salt Poisoning

The Aral Sea disaster and the "re-deserting" of Central Asia are just two legacies left by the Soviet attempt at building communism using canals, but it is the human legacy left by this project that is most closely linked to the early Bolshevik dream of changing man through his environment. Again, this did not happen as they had hoped. The salt deposits, chemicals and pesticides leftover from "Commissar Cotton" have left heritable marks on the population of Karakalpakstan in ways that actually lend validity to the field of epigenetics. The people here make up the "nation of anemics" that lives with the often-overlooked consequences of the Aral

[33] Ibid., 210.
[34] Kai Wegerich, "Natural Drought or Manmade Water Scarcity in Uzbekistan?" *Central Asia and the Caucasus*, 14th ser., no. 2 (2002): October 2001, accessed April 19, 2019. https://www.preventionweb.net/files/1776_VL102309.pdf, 1.
[35] Pearce, 210.

Sea's evaporation.[36] The salt in the air, water, soil, and food has caused widespread anemia, which mothers pass on to their offspring in 87% of births.[37] This has formed a hereditary anemia with a long list of lifelong ailments that contributed to a unique "health situation," one which Karakalpak gynecologist and community activist Oral Ataniyazova can find no counterpart anywhere in the world.[38] Salt, ultimately, is what ties the Soviet science of blood with their conquest over water. Interviews with mothers in the regions most affected reveal a general feeling that there is a "lack of good blood" due to salt poisoning from relentless cotton harvesting on exhausted lands.[39] Hereditary anemia based on traits these mothers have acquired during their lifetimes is exactly the kind of epigenetics that haunts Russia to this day. This is an alteration of gene expression dressed up like changes to the DNA itself. Traits like these are heritable, usually for a few generations, and it is this concept that has allowed Moscow papers to retroactively claim that "Lysenko was right," even if for all the wrong reasons. The former Soviet territories have illustrated identifiable cases of epigenetic inheritance in the last two decades, none of which include the inheritance of some "good" communist character acquired from a socialist environment. The cases in question are salt poisoning-anemia, and the famine genetics identified in survivors of the Siege of Leningrad. Again, "progress" and "change" never carried the implicit positivity that idealistic Bolsheviks of the Revolution believed.

Whether epigenetic or genetic, the results are the same in the Aral Sea region. Infant mortality and maternal mortality have risen, but life expectancy has fallen sharply.[40] For former Soviet Central Asia, and in particular Karakalpakstan, salt epitomizes the "tragedy of totality;" it is a utopia morphed into a dystopian catch-22. The salt is a problem whose solution actually

[36] Ibid., 211-212.
[37] Ibid.
[38] Ibid.
[39] Ibid.
[40] Ibid.

prolongs the problem it is attempting to alleviate, as more water leaves more salt. There is no reclaiming the Aral Sea or undoing the changes to the climate that its disappearance has caused. The surrounding environment has come full circle, from desert to agricultural epicenter and back to desert again. That is the end of the line, back at the beginning, nullifying the whole process. Antaniyazova and others recognize that the only solution is to "retire irrigated land and revive the old ways of herding livestock and tending orchards and growing vegetables."[41] This is exactly what Uzbek and Kazakh shepherds were doing almost one hundred years ago when Soviet irrigation canals were first implemented. Lenin's dream in the early 1920s to modernize and industrialize the steppe and its people led to a necessary and inevitable return to "the old ways," which the Soviet government sought to eliminate in its Central Asian republics. Soviet efforts to create a socialist utopia by scientifically manipulating nature to in turn alter man pushed most of Central Asia past utopia's gate, straight into the end of the world.

Vozrozhdenie

Apart from the white dusting of salt over less and less productive fields, the area surrounding the Aral Sea had to contend with another remnant of massive, transformative Soviet engineering projects, this one in the shape of an island that ceased to be an island. The Uzbek Ambassador to the U.S from 2001-2003 Shavkat Khamrakulov said that, "Vozrozhdenie Island is what we inherited from the former Soviet Union."[42] An island named in the spirit of "rebirth" and "renaissance" ended up the strongest evidence for the lasting impact that the Aral Sea left in its passing. Following the creation of the Soviet Union, Lenin claimed that irrigation in the

[41] Ibid., 213.

[42] Jonathan Tucker, Raymond Zilinskas, and Sonia Ben Ouagrham, "Russia Announces Plans to Participate in Research on Vozrozhdeniye Island," James Martin Center for Nonproliferation Studies, March 11, 2002, accessed April 20, 2019, https://www.nonproliferation.org/russia-announces-plans-to-participate-in-research-on-vozrozhdeniye-island/.

Central Asian Republics would "bury the past." Instead, in another complete inversion, the irrigation that drained the Aral Sea laid bare some of the other scientific skeletons in the Soviet closet. *Vozrozhdeniye* Island was formerly the largest island in the Aral Sea, a natural fortress ringed with water that made it easy to patrol and separated it from the rest of society. A place of many monikers, the island was originally named for Tsar Nicholas I, but after the October Revolution the Bolsheviks renamed it *Vozrozhdenie*, meaning "rebirth" in Russian.[43] This was where the Soviet Union created and tested biological weapons from 1936 to 1990 (except for an undocumented period from 1937 to 1954 during which time testing stopped and the island went quiet).[44] Today, this island is more commonly referred to as Anthrax Island or "biological Chernobyl."

Originally operations on the island were conducted under the *sanitarno-tekhnicheskii* division (STI) within the Worker's and Peasant's Red Army, but the Ministry of Defense took over in 1954 under the *Biopreparat* (biological research program) umbrella.[45] At Vozrozhdenie's Field Scientific Research Laboratory (PNIL), the medical-scientific Military Unit 25484 tested and researched smallpox, bubonic plague, anthrax, botulinum toxin, equine fever, and other diseases that had been weaponized.[46] During the 1970's the Soviet Union was part of the Biological Weapons Convention along with The U.S and Britain. The world knew about the Soviets' nearby germ testing facility at Aralsk on the Aral coast in Kazakhstan, but Vozrozhdenie was never declared on any of the Convention lists requiring such information.[47]

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[43] Anthony Rimmington, *Stalin's Secret Weapon: The Origins of Soviet Biological Warfare* (New York, NY: Oxford University Press, 2018), 96-98.

[44] Ibid.

[45] Ibid.

[46] Ibid.

[47] PBS Frontline, "Plague War: Interview with Dr. Kanatjan Alibekov," PBS, October 1998, accessed April 20, 2019, https://www.pbs.org/wgbh/pages/frontline/shows/plague/interviews/alibekov.html.

In 1988, Moscow warned personnel at Sverdlovks-19 about a "surprise" visit they were getting from the Biological Weapons (BW) Convention committee.[48] The leadership basically told those working at the facility to bury the hundreds of tons of anthrax that had been developed there. Packed into stainless steel drums, the anthrax was shipped to the still-secret Vozrozhdenie Island, doused in bleach, and hastily buried. Two years later the end came. With the collapse of the Soviet Union, the staff and troops abandoned the island. In 1992 Boris Yeltsin's Edict No. 390, "On Ensuring the Implementation of International Obligations Regarding Biological Weapons," called for the end of the biological weapons program at Vozhrozhdenie and elsewhere.[49] The island was only acknowledged as a testing site after the Soviet Union had officially dissolved. Thorough decontamination of the island fell by the wayside, as money for such a project was not a top priority for the former Soviet Union, dealing with its newly inherited economic collapse.

Had it not been for the 1992 defection of Dr. Kanatzhan (Ken) Alibekov, *Biopreparat* director at Vozrozhdenie who oversaw the anthrax tests, the site may have just sat there, disturbed only by those coming to strip the copper wiring from light fixtures, unaware of the pathogens buried beneath the soil. Alibekov disclosed the details of the biological weapons program on the island to the U.S government, and warned of the buried "chemical time bombs."[50] Alibekov, a medical doctor and microbiologist, wrote an exposé about his directorship at the island titled *Biohazard* that provided most of what the world now knows about the BW

[48] Ibid.

[49] NTI, "Vozrozhdeniye Open-Air Test Site," Nuclear Threat Initiative - Ten Years of Building a Safer World, 2019, accessed April 20, 2019, https://www.nti.org/learn/facilities/815/.

[50] PBS Frontline, "Plague War: Interview with Dr. Kanatjan Alibekov," PBS, October 1998, accessed April 20, 2019, https://www.pbs.org/wgbh/pages/frontline/shows/plague/interviews/alibekov.html.

program in the Aral Sea.[51] The book has captivated and spooked doomsday-dwellers and conspiracy theorists in America, many of whom are stuck in romantic nostalgia for the days when the country's largest security threat was a *Red Dawn* type scenario; the title of one enthusiastic review of Alibekov's book reads: "Run up those credit cards, there's no chance for survival!"[52] Alibekov would likely encourage continued payments towards debts, as he believes the dangers once posed by Vozrozhdenie have passed.[53]

Around the same time as Alibekov's emigration in 1992, the Aral Sea's waterline fell to the point of creating a large sand bar that divided the sea in two. Further recession of the Aral Sea and the emergence of more land bridges pushed the U.S to investigate the increasingly accessible soil at Vozrozhdenie. In 1998, inspectors found finding anthrax spores there that were still virulent in over half the samples taken.[54] Over the next several years, the largest land bridge formed during the shrinkage, this one connecting Vozrozhdenie to Uzbekistan, effectively ending Vozrozhdenie's existence as an "island" in 2001. Scientists warned that as the island joined the shoreline, animals, insects and people could more easily bring contaminants into populated areas of Central Asia. In 2002, the U.S spent around six million dollars to decontaminate and properly dispose of the buried anthrax on an island once surrounded by the sea.[55] Now, it is a desert in the middle of more desert.

The island was chosen as a site for biological weapons tests before the more dramatic years of the sea's disappearance. Irrigation in Central Asia not only failed to "bury the past and

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[51] Ken Alibek and Stephen Handelman, *Biohazard: The Chilling True Story of the Largest Covert Biological Weapons Program in the World, Told from the Inside by the Man Who Ran It* (New York, NY: Dell Pub., 2000), 2.

[52] "Customer Review," Amazon, August 30, 2016, accessed April 20, 2019, https://www.amazon.com/gp/customer-reviews/R1QSA1UUNNDWFU/ref=cm_cr_dp_d_rvw_ttl?ie=UTF8&ASIN=0385334966.

[53] PBS Frontline, "Plague War…"

[54] NTI, "Vozrozhdeniye Open-Air Test Site."

[55] Tucker, Zilinskas, and Sonia Ben Ouagrham, "Russia Announces Plans…"

bring about socialism more efficiently" as Lenin had claimed in 1921, but the irrigation process and the manipulation of the steppe landscape is what ultimately made Vozrozhdenie's buried past of such concern. Soviet control of freshwater supply lines that fed the Aral Sea are what allowed for research settlements on the island in the first place, since fresh water had to be shipped over to the island. It is estimated that in 1960, Vozrozhdenie was about 77 square miles. At the time of its desertion in 1992, it had grown to 770 square miles.[56] That is perhaps the greatest manipulation of the environment in this story. Central Asian cotton was an exercise in Soviet power's ability to divert water, an exercise so effective it became permanent when the water was diverted to non-existence. Soviet engineering created more land without even actively trying to do so, a feat of alchemy that brought the potential of pandemic. Had the sea remained and the land bridges not surfaced, the possibility of animals and people spreading contaminated soil from the island would have been far smaller. Before, only boats could access the island, but shipping lanes became desiccated and unusable in the 1990's. The use of vehicles to bring supplies to the compound at Vozrozhdenie over the land bridge also posed a threat, since soil from the island was brought back to the mainland and then taken wherever else the vehicle went. Restricted sea-access had previously mitigated this possibility.

The climate change that the Aral Sea's disappearance caused also made Vozrozhdenie's link to the mainland more dangerous. Windstorms that sweep across the land grew more severe as the temperature rose. There is no longer water blocking the wind's path to or from the former island. Winds across Vozrozhdenie used to blow most of its dust into the sea, but when the sea vanished around the island, the dust storms moved across the land unimpeded. Before the U.S decontamination in 2002, the windstorms stirred up dust with active anthrax spores and blew

[56] NTI, "Vozrozhdeniye Open-Air Test Site."

them across land bridges to the shore and beyond. For doctors from the Monterey Institute who examined the island in 1995 and 1997, the possibility of bubonic plague spreading through rodents crossing to the island was of more concern than anthrax contagion.[57]

At its base, the story of Anthrax Island is a fitting vignette to illustrate the overall relationship between water and the Soviet Union. The story is also about utopian dreams on a biblical scale. The Soviet ambition of radically changing the landscape of Central Asia and instituting the reign of "Commissar Cotton" was made possible through the science and technology of extensive irrigation that diverted water otherwise headed for the Aral Sea. The salinization of the fields from over-irrigation and quota-driven constant use further increased the need for more water. The island's narrative and that of the Aral Sea also fit the repeated Soviet model of Marxist utopian aspirations that aimed at progress and advancement, but overshot and instead resulted in regression of a total nature. Cotton changed Central Asia and the Aral Sea so much that it actually went backwards. This is especially true given the capitalist consequences of socialist failure in the area. When the ecological crisis in Uschai, Karakalpakstan finally killed the area's main factory in 1995, freshwater stopped being pumped there.[58] This scarcity sparked a capitalist market in the sale of water to the place where the Amu River's waters had once been headed.[59] Another quintessentially capitalist endeavor was born in the Aral Sea's disappearing act when Uzbek Gas discovered oil under the dried seabed. Essentially, for those who lived through the Soviet years spent transforming Central Asia, "materialism in practice meant the de-materialism of the physical world," and the overall journey to socialism ended in capitalism.[60]

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[57] Tucker, Zilinskas, and Sonia Ben Ouagrham, "Russia Announces Plans…"
[58] Pearce, 215.
[59] Ibid., 268.
[60] Gray, 14.

Vozrozhdenie Island was not only used for lethal experimentation, but it also died of thirst in the same way Karakalpakstan has. This process that can be credited to the aspirations and ideology of those responsible for the "rebirth," in general, that accompanied the Revolution. To the progress-fixated Bolsheviks, eagerly shoving the new Soviet population towards Marx's last stage of development, nature was the previously insurmountable obstacle that science was set to conquer. Yet the legacy of this "last stage" only accentuated the void between progress and adaptation.

Ultimate subjection of nature and its processes, from rain to climate to landscape, was perceived in not only scientific terms in Soviet Russia, but semi-spiritual ones as well. Assuming full control of an environment once so far beyond the scope of human interference lent great credence to the atheist "religion of science" that swept Revolutionary Russia under the Bolsheviks. Soviet efforts at changing nature unconsciously mirrored Feodorov's Cosmist ideas. This ideology never fully left the Soviet Union, and many would argue it still has not gone from Russia today. In 1992, at the same time that Vozrozhdenie's staff and military units deserted en masse, another project aimed at manipulating nature on an even grander scale was taking place at Baikonur, Russia's space launch site about 300 kilometers from the Aral Sea. Already the Russian Federation at that point, the Russian government embarked on a project that sounds like something from Bolshevik science fiction in the *Red Star* days.[61] They were going to end night. Using a twenty-meter orbital mirror called Znamaya 2 to reflect sunlight to earth, the Russians attempted to change darkness into daylight in certain parts of the country.[62] There was a Znamaya 2.5 and a Znamaya 3 before the project was abandoned in 1999, though a five-mile

[61] Tucker, 268.

[62] "Space Mirror," *The Triz Journal*, August 22, 2014, accessed February 10, 2019, https://triz-journal.com/space-mirror/.

wide bright spot was achieved before the last satellite burned up in the atmosphere over Canada.[63] Burning up in the atmosphere can be viewed as the metaphorical (and sometimes literal) fate of most Soviet scientific mega-projects with a millenarian agenda. When such dreams hit the reality of earth, they were destroyed. A breath of Earth's air extinguishes them, a process which could take decades like "Commissar Cotton's" end, or minutes, like the Znamaya satellites.

Polywater

As Soviet utopian dreams morphed into an obsession with military technology as a means of asserting communism's validity against the American foil of capitalism, Soviet science followed suit. The Space Race, nuclear proliferation, and Cold War competition between the West and the USSR prompted grandiose scientific projects, many of which had utopian roots. The Cold War atmosphere led some of these experiments down the path of "pathological science," in which results were fabricated, knowingly or otherwise, in order to fulfill state directives and the overall goal of elevating the communist system as a whole. The Soviet interest in water as a means to appropriate control over nature was not limited to engineering projects that hanged entire landscapes. Experiments in the laboratory during this time focused on water not only as a means of granting Soviet man an elemental power over creation, but the ability to use this as a weapon against enemies. During the 1960s, the United States and Britain became aware of Soviet experiments with "creating" a new type of water that could have devastating consequences if it came into contact with natural water sources. The substance in question has since acquired many names: anomalous water, orthogonal water, and water II. At the time it was best known as "polywater."

[63] Ibid.

Polywater emerged after the Space Race, with the USSR successfully launching Sputnik in 1957. Famous Soviet propaganda posters featured an astronaut in space looking out curiously, searching for something, and declaring "*Bogu, net*." No God. As communist man laid claim to space in Sputnik's victory for socialist science, the concept of God took another blow. On the heels of the Soviets, President Eisenhower created NASA and then came the launch of America's Explorer I satellite in 1958. America set its sights on going to the moon as the Berlin Wall went up in 1961, The Cuban Missile Crisis threatened total annihilation in 1962, and the communist-capitalist "hot" wars of the Cold War played out in Korea and Vietnam. This panorama of competition, war and paranoia, on land and in space, juxtaposed Communism and Capitalism as irreconcilable adversaries locked in a physical and psychological battle best exemplified by a hackneyed chess game metaphor. Military advances and scientific-technical prowess were among the weapons used in this decades-long war of ideological attrition, prompting ever more ambitious and outlandish experiments to push the limits of the achievable. With these experiments, each side hoped to tip the scale in favor of its respective social and economic system.

Soviet physical chemist Boris Vladimirovich Deriagin (1902-1994, also Romanized as Derjaguin) presented a paper at England's Faraday Society conference in 1966 titled "Effects of Lyophile Surfaces on the Properties of Boundary Liquid Films." Deriagin was a member of the Soviet Academy of Sciences, which by this period had grown to include a veritable "army" of scientists. He also served as the director of the Laboratory of Surface Phenomena at the Institute of Physical Chemistry in Moscow.[64] Academic and scientific exchange restrictions were lessened during Khrushchev's Thaw and the Destalinization period, enabling Deriagin's travel to

[64] Klotz, 79.

Nottingham. Though Khrushchev was ousted two years prior to this conference, Brezhnev had not yet been in power long enough to institute the repressive measures of his later, less coherent years. Studying the surface properties of "thin liquids" known as colloids, Deriagin claimed that he and a (possibly non-existent) colleague named N.N Fediakin had observed the condensation of water into a capillary tube while "in the gas phase, at a pressure below the saturation vapor pressure of the liquid."[65] This meant an ultra-stable form of water had been created.

Without a background in physical chemistry and the DLVO surface colloids theory, this is, at best, an over-complicated description of some dew collecting in a test tube above steam. To physicists, chemists, and the works of Einstein, this observation contradicted all three thermodynamic laws thought to be unbreakable, and, if accurate, meant that Deriagin's discovery could finally put a perpetual motion machine within man's grasp. Polywater was posed as the possible "Philosopher's Stone" of chemistry that could potentially mark Soviet victory over not only capitalist nations, but over the unbreakable laws of nature. Polywater illustrates the crucial role water played in the Soviet dream of gaining the power to manipulate matter and the environment, a power that had once been out of man's grasp. In addition, polywater gave creative power to Soviet scientists, since Deriagin and his team had "made" this new type of water in an alchemical experiment that turned regular water into something else entirely.

Since at least the twelfth century, philosophers and mathematicians across the globe pondered whether a perpetual motion machine capable of producing its own energy source indefinitely could be achieved.[66] An example would be a windmill capable of producing the wind it needs to function while using no outside energy. Life would be radically changed if such

[65] Ibid., 70.

[66] Helaine Selin, *Encyclopaedia of the History of Science, Technology, and Medicine in Non-Western Cultures* (Berlin: Springer Verlag, 2008), 269-273.

a machine could be produced. Constant and efficient production would change labor relations, indeed the idea of labor altogether, and the invention would shatter the ceiling constraining distant science fiction space fantasies to the realm of the imagination. All experiments for creating a machine capable of sustaining itself have failed, as energy can be neither created, nor destroyed.

Water was long a part of the perpetual motion machine dream. Anglo-Irish chemist Robert Boyle, in seventeenth-century England, devised an idea for a self-watering pot based on some of the surface-liquid relationship theories familiar to Deriagin centuries later. Boyle suggested that a thin capillary tube would pull water up from a bowl naturally because of the physical surface properties and interactions between water and the capillary, and then the water could recirculate through the bowl, back up the tube, in perpetuity.[67] This would mean that the capillary-water relationship would have to be physically stronger than the force of gravity, which in effect would prevent the tube from ever refilling the pot because the water, having conquered gravity, would not fall from the tube. This fact would negate the perpetual motion of a self-watering pot at the outset.[68] Boyle never achieved a perpetual motion machine, but did not put the invention beyond the reaches of alchemy. Some special substance would be needed to overcome the self-negating problems posed by the perpetual motion machine idea.

The discovery in Deriagin's lab that put thermodynamic impossibility into the realm of the possible was a "new" form of water created from the experiment. According to former MIT professor Irving Klotz, more is known about water than any other chemical substance on the

[67] TED-Ed, accessed February 10, 2019, https://ed.ted.com/lessons/why-don-t-perpetual-motion-machines-ever-work-netta-schramm.

[68] Ibid.

planet, given its supreme role as catalyst and reference standard in nearly all fields of science.[69] Simply put, it would be a surprise if water had any surprises left in it. Despite this, Deriagin's "polywater" had never before been observed or created. It did not exist in nature. Deriagin described this new water as being fifteen times more viscous than water—the viscosity of motor oil. Polywater was said to boil at 150 degrees Celsius (302 degrees Fahrenheit) and freeze at -15 to -30 degrees Celsius. It was around 1.5 times as dense as normal water, and had a vitreous shine since its refractive index was 1.46, while regular water's was 1.33.[70] All of polywater's extraordinary features immediately gave rise to some skeptics, but also attracted a curious, anxious public. Some were eager for the discovery to be validated, especially members of the Communist Party of Great Britain who wanted the USSR to have an achievement over America, but others were quick to dismiss it all as Soviet propaganda.

Whether skeptical or hopeful, communist or capitalist, the responses to polywater were emotional. Long-standing notions of water's most stable state were being shaken, and the relationship between water and the quartz silicate capillaries in the experiment drew responses ranging from doubt to hysteria: if all it took to "polymerize" water was contact with silicates in humid conditions, how was there any "regular" water left in nature, given the presence of silicates in most rocks? Others rushed to replicate Deriagin's experiments, with Americans pointing to the lack of reproduced experiments from Deriagin's past as one reason to suspect his claims, apart from the political motivations to distrust Deriagin. Some American scientists claimed to have replicated the experiments and produced small amounts of polywater. Infrared and Rama spectra tests on polywater conducted by E. R. Lippincott at the University of Maryland concluded that the spectra tests on polywater revealed, "not a spectrum of any known

[69] Klotz, 68.
[70] Ibid., 80.

substance."[71] John Desmond Bernal, an Irish-born scientist, respected pioneer of x-ray crystallography and member of Great Britain's Communist Party, had written several books about Marxism and the sciences before Deriagin's polywater paper of 1966. Bernal, intrigued by the Soviet discovery and an open sympathizer with both Stalin and Lysenko, claimed that polywater was "the most important physical-chemical discovery of the century."[72]

The prospect that a Soviet scientist had taken water, the most common chemical substance on the planet, and "made" a new kind of pure, stable, spectacular water in his lab bore a striking resemblance to the alchemy of old. The difference between a scientist and a sorcerer, besides hat preferences, is essentially repeatability: scientists, given the same lab conditions and equipment as one another, could theoretically replicate each other's results. One can learn to be a scientist, but a sorcerer appears to possess otherworldly abilities unique to him alone, inherited through some metaphysical miracle. The creative power over a substance like polywater seemed more in line with sorcery than science, a nod to the occult-mystic inspired "scientific" dreams of intellectuals like Feodorov. Polywater also had a latent religious significance, in terms of creation and the power to bring about Armageddon. There was no room for God in a world where a Soviet scientist could make a new form of water, the ingredient most essential for any life form to exist, in a laboratory. This would have been a crowning achievement for communist over capitalist science, and it would mean the USSR stood to gain control over creation and extinction by harnessing Deriagin's polywater. Or so the Soviets would have had people believe.

Soviet polywater sparked a "water race" in the U.K and U.S, as each funded tests aimed at replicating Deriagin's results and collecting even a microscopic quantity of polywater in order

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[71] Ellison Taylor, "The Great Polywater Doodle," *Oak Ridge National Laboratory Review*, Winter, 1971, 14.

[72] Klotz, 82.

to catch up with the Soviets. Most problematic to American scientists were Deriagin's claims that this new water was pure water. American experiments tested micrograms of polywater that had been collected and found assorted mineral traces including sodium and potassium. Denis Rousseau of the Department of Physiology and Biophysics at the Albert Einstein College of Medicine found in 1971 that polywater's mineral composition was oddly like human sweat when he performed tests on polywater and his own sweat.[73] The Soviets and Deriagin insisted that the Americans had done the experiment wrong or had contaminated their results in an intentional attempt to undermine his discovery. Rousseau went on to write about the phenomenon of "pathological science," when results are misinterpreted due to wishful thinking or delusion.[74]

Meanwhile, F.J. Donahue of Wilkes College in Pennsylvania wrote an article stating that he "regard[ed] polywater as the most dangerous substance on earth" because of the "polywater gap."[75] During the Space Race and the "bomb gap" America and the USSR were locked in a battle of inventive and technological one-upsmanship, leading some Americans to fear that the USSR was leading the way in polywater research and was therefore all the more dangerous. There was also the fear that polywater "grew at the expense of normal water," and that "polymerization of Earth's water would turn her into a reasonable facsimile of Venus."[76] Falling somewhere between the apocalyptic alarmists and the unconvinced skeptics, *The Wall Street Journal* ran an article selling the possible future industry to be built around polywater. The paper claimed that in a few years, a "five billion dollar a year industry" could arise from polywater

[73] Denis L. Rousseau, ""Polywater" and Sweat: Similarities between the Infrared Spectra," *Science*, January 15, 1971, accessed February 11, 2019, http://science.sciencemag.org/content/171/3967/170.abstract?sid=68de19c4-686a-45e9-84bd-ed9cd65f9196.

[74] Denis L. Rousseau, "Case Studies in Pathological Science," SAO/NASA ADS: ADS Home Page, January 01, 1992, accessed February 11, 2019, http://adsabs.harvard.edu/abs/1992AmSci..80...54R.

[75] Klotz, 91.

[76] Ibid.

because it had the potential to be material for clothing and furniture.[77] *The Wall Street Journal* also proclaimed: "Good news: The U.S has apparently closed the polywater gap, and the Pentagon is bankrolling efforts to push the country's polywater technology ahead of the Soviet Union's."[78] *Time* magazine also published a panicky, yet hesitant, article called "Unnatural Water" on December 19, 1969, and again in 1970.[79] Amid all of this, the general public in America, the U.K, and the USSR, did not seem overly concerned with the fact that polywater as a doomsday device was eerily similar to ice-nine, the invented substance of Kurt Vonnegut's 1963 novel *Cat's Cradle*, an ironic commentary on the arms race.[80] Ice-nine's danger lay in its ability to transform any liquid it touched into ice, posing the threat of freezing the world's water and ending life on Earth. Polywater was believed to have the ability to polymerize any water it touched, bringing the same result as in *Cat's Cradle*.

After more thorough chemical makeup and atomic vibration tests in the United States, scientist R.E Davis came to the conclusion that, "all polywater is polycrap and American scientists have been wasting their time studying the subject unless it can be defined as a topic of water pollution and waste disposal."[81] Polywater's death knell came when tests on an empty capillary tube in New Mexico revealed the same results as those done on alleged polywater samples; the water was not "new" in form and was not even pure water, merely water contaminated by the everyday minerals naturally occurring in the quartz tube. Years later in 1973, Deriagin made a rare show of bravery and humility when he published in a scientific journal that his tests had failed to produce a new type of water, and that he had mistaken

[77] Ibid.
[78] Quoted in Ellison Taylor, "The Great Polywater Doodle," 15.
[79] "Science: Unnatural Water," *Time Magazine* Archives, December 19, 1969, accessed February 11, 2019, http://content.time.com/time/magazine/article/0,9171,941747,00.html#ixzz193cs9DeB.
[80] Kurt Vonnegut, *Cat's Cradle* (New York, NY: Dial Press Trade Paperbacks, 2010).
[81] Klotz, 89.

contaminants in the quartz tube for properties of polywater.[82] Deriagin's scientific career continued after he rejected polywater, and he published in journals into the early 1990s.

In light of polywater's non-existence, most American publications went silent on the subject and it faded into obscurity. After Deriagin's paper retracted his claim to have made "new" water, an issue of *Popular Science* magazine in June 1973 turned polywater into a DIY project for kids, evoking a visual of ribbons at science fairs, when just two years earlier polywater technology was one of highest forms of competition with the USSR.[83] Some scientists felt compelled to offer an explanation for the polywater "delusion:" science that stems from the "pathological" is what accounts for scientists who otherwise "knew better" getting tangled up in experiments that were either complete nonsense, or developed for the potential posterity of the human race on Earth. Human logic and decision forms the barrier between science and "hysterical hearsay," a boundary with frequent border collapses. How the line between these two distinctions could be so thin perplexed the scientific community involved with the tests. Ellison Taylor, who attended the conferences where Deriagin presented, authored an article on the polywater debacle for the *Oak Ridge National Laboratory Review*:

> By its very nature, the phenomenon being observed provided samples that were almost too small to study at all. So, the obvious experiments couldn't be easily done, and the imagination of the proponents could reign almost unconfined. Besides, discovery is such fun. The hope of finding something new is what keeps us all going…But it's fatal to fall in love with your discovery: there is a wellknown [sic] tendency to overlook the faults of the beloved.[84]

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[82] B. Derjaguin et al., "Results of Analytical Investigation of the Composition of "anomalous" Water," *Journal of Colloid and Interface Science* 46, no. 3 (1974): , doi:10.1016/0021-9797(74)90053-8.

[83] P.A. Christian and L. H. Bherka, "How You Can Grow Your Own Polywater," *Popular Science*, June 1973.

[84] Taylor, 17.

If the debunking of polywater was humbling and humiliating for Deriagin and Soviet science, it was equally so for Western countries that championed the objective, "superior" science of the free world. One wonders which role is preferable; creating the sci-tech ruckus that stoked ideological battles of superiority and eschatological paranoia, or falling for it. Within the context of Soviet ideology, it is no wonder that Deriagin tried to "overlook the faults of the beloved" in his discovery, given polywater's potentially life-altering implications. During the Cold War and when the Soviet Union began experiencing the period known as Stagnation under Brezhnev, a discovery of such magnitude, one that could fulfill the age-old dream of a perpetual motion machine as easy as it could destroy the Earth, would have been a much-needed validation of the communist system. When Deriagin first published about polywater in 1966, Brezhnev had undone some of Khrushchev's Thaw-era reforms, and partially rehabilitated Stalinist policies in economics, but international scientific exchange was still tolerated if not encouraged. The USSR was arguably in a state of disillusioned malaise at this time, when any revolutionary fervor attached to Marxism or fear of the firing squads had long since waned into redundant apathy, only interrupted by discontent over the lines for toilet paper, and the perpetually-missing cup from Soviet soda vending machines.

Economically and socially, the socialist system had failed to incentivize or motivate its own workforce, while massive spending on the military led to a further decline in consumer goods and standards of living.[85] The "dream," it appeared, belying the communist revolution and the refashioning of man and Earth, was dead. Yet this is exactly why Deriagin and others like him were so driven to prove otherwise, claiming that a discovery capable of breathing new life back into the Soviet Experiment had been achieved, even if that was not reality.

[85] Robert Service, *A History of Modern Russia: From Tsarism to the Twenty-first Century* (Cambridge, MA: Harvard University Press, 2009), 200.

The history of post-Revolutionary Russia is a case study in the absence of an objective reality on a massive, state-sanctioned scale; science was not immune from this. Mistakes, delusions, frauds, and misguided aspirations exist in science all over the world, whether capitalist or communist. But given the uncomfortably close proximity of the scientific establishment with the government in general in the USSR, science was especially susceptible to discoveries and experiments in the "pathological" vein. When the genuine progress never arrived, when the miraculous was just beyond the current Five Year Plan's grasp, there was political and psychological incentive for scientists to go ahead and claim success anyway. Polywater did not survive the litmus test of reality in Western countries, but had such scientific exchanges never taken place, polywater could have well remained an imagined super-weapon for Soviet propaganda. While the threat of purges and Stalin's Terror no longer silenced scientific dissenters in the Soviet Union during the Stagnation era, the union of government and science left little room for those who would seek to challenge what amounted to "reality" itself; for much of its life, the USSR was in many ways the proverbial Emperor, parading naked through the streets as the masses, compelled by various forces to "believe," applauded his "new clothes.

Bioactive Water

The Soviet fascination with water continued after the polywater scandal. "Discoveries" related to water still seemed to hold the greatest hope for transforming landscape and people. For example, in 1978 brothers Igor and Vadim Zelepukhin of the Institute of Fruit and Vine Growing in Kazakhstan claimed that melted snow produced a more "biologically active" form of water that increased productivity in cotton seeds and that could potentially do the same in animal

species. [86] The Zelepukhins' "bioactive water" was very reminiscent of Lysenko's vernalization claims from the previous decades, when he claimed exposing seeds to various temperatures of water before planting would increase harvest yields. His work never conclusively proved this.

The pseudoscience behind a more biologically stimulating form of water from melted snow rested on the theory of "water memory." This holds that water keeps trace "memories" from substances it was previously in contact with, even after dilution and purification, making homeopathic remedies from this water possible. Traditional chemistry rejects the notion of "water memory" entirely. The Soviet claims to "bioactive water" came from the Zelepukhins' "discovery" that the crystalline structure of snow created a hexagonal molecular order more favorable to living cells than normal water, which the brothers believed increased enzymatic and physiological processes in the cells.[87] The shape of the molecular clusters in snow allegedly enabled living cells it was in contact with to better absorb nutrients and overall cell function. The "bioactive water" pseudoscience was also called hexagonal water because of the stress placed on the shape of the molecules from melted snow that were thought to be so biologically beneficial. The brothers extended their bioactive cottonseed results to hypothesizing that their snow-water discovery could make crops more productive and enhance positive characteristics in plants and animals, a truly utopian aim.[88] Again, water was conceived of as a means to change man and his environment for the better.

Three French scientists working around the same time as the Zelepukhin brothers tried to patent melted snow that they had infused with nitrogen and aged in a barrel for months, claiming that this water could speed up the healing time from burns, but that it also was valuable for the

[86] Klotz, 92.
[87] Ibid., 93.
[88] Zelepukhin, V. D.; Zelepukhin, I. D. *Kluch k Zhyvoivode*; Kainar: Alma Ata, 1987.

cosmetics and perfume industry.[89] Melted snow was believed to have special properties outside of the Soviet Union, but the ideological significance linked with this water's application is what sets the Soviet example apart. "Bioactive water" was another in the long line of attempts to radically change the environment and give communists an unprecedented control over it. The French wanted to use bioactive water to make face cream; the Soviets wanted to use it to change the nature of plants and animals. In the end, neither used it for anything.

Water is more deeply linked with the life process than any other substance. As a geological force and building block of life and civilization, water shapes the physical world and the life forms that it sustains. The utopian, maximalist ideology that informed Soviet science emphasized transformation on a total scale, which was measured by an optimistic, semi-delusional "soviet impatience." Water naturally emerged as the element most able to reshape man and his environment in a relatively short amount of time. Controlling such a powerful and essential tool in the creation and maintenance of life became a preoccupation of Soviet science and engineering throughout the twentieth century.

Lenin and Stalin both ambitiously embraced expansive canal and irrigation projects not only in the interest of industrializing and advancing the Soviet Union, but also with the hopes of forging good communist citizens out of the labor force used for such projects. Gulag laborers constructed the Belomor Canal during Stalin's First Five Year Plan. Celebrated author Maxim Gorkii praised this in *A Canal Named Stalin*, claiming that the physical work involved in changing Russia's landscape was in turn changing the prisoners into "reformed" socialists concerned with the overall benefit of the working class. Gorkii, and arguably much of Soviet society, held that man changed himself through changing his environment. This hinged on

[89] Klotz, 93.

Lamarckism and epigenetic inheritance popular among the Soviet scientific establishment from the Revolution and into the Stagnation period. Often times, only "positive" changes were ever acknowledged in these concepts of heredity.

Belomor has the strange distinction of being the most publicized Five-year Plan prison labor project, and at the same time, the most lethal. The Belomor Canal was a titanic undertaking, and though its 140-mile-long route was (and remains) too shallow for most commercial shipping crafts to navigate, it was eulogized as a triumph of socialist labor and *perekovka*, or "rehabilitation." American political philosopher Marshal Berman wrote that, "The canal was a triumph of publicity; but if half the care that went into the public relations campaign had been devoted to the work itself, there would have been far fewer victims and far more development."[90] Still, in the Socialist Realist reality of the 1930s, the Stalinist canals gave communism a symbolic power over the elements and over human development.

This power over man and his environment was also asserted during the irrigation of the "Hungry Steppe" from the 1920s through the Stagnation. The massive irrigation system that diverted two major rivers in Soviet Central Asia attempted to change the "backwards" steppe and its inhabitants into models of socialist productivity. Harvesting cotton in Uzbekistan and Kazakhstan did indeed change the landscape and people of the region, but not in the utopian, positivist way that Marxist ideology had anticipated. Instead of transforming the southern, dry areas populated with herders and nomads into a living cornucopia filled with the wonders of communist advancement, over-irrigation in Central Asia created conditions more in line with an apocalypse than an Eden. The repercussions of quota-driven cotton monoculture endure to the present day, including the "re-deserting" of the steppe, the disappearance of the Aral Sea, salt

[90] Marshal Berman, *All That Is Solid Melts into Air: The Experience of Modernity* (London: Verso, 2010), 76.

poisoning in Karakalpakstan, and a renewed anxiety over freshwater availability in the former Soviet south. One of the ultimate utopian ideas in the early Soviet context was to control of the weather, as was described in works by Cosmist philosopher Nikolai Feodorov and the "father" of rocketry, Konstantin Tsiolkovskii. Illustrating again the streak of black humor and irony that stretched most of the Soviet Union's seventy-four years, Soviet irrigation did change the weather in Central Asia. However, the changes were not positive. Neither were the changes in the surrounding population as a result of the salt left in the wake of over-watering. Many of these changes came in the form of diseases and birth defects, epigenetically inherited. Communist thinkers sought for decades to prove the inheritance of acquired characteristics; this was not the proof they had hoped for.

Water's paramount role in Soviet science is also evidenced in the polywater experiments of the 1960s, when Boris Deriagin claimed to have created a new form of water that could be harnessed as a lethal weapon if it came into contact with the Earth's natural water sources. While Cold War paranoia and rivalry played a substantial role in the "polywater race," it was an extension of a much older Soviet desire to assume control over the elements, and over creation itself. This utopian, Promethean idea led to the "pathological science" behind Deriagin's "discovery" of polywater. Though eventually debunked, polywater was a brief, terrifying, fascinating experiment all at once. It was not only the manifestation of the Soviet urge to assume messianic powers over the Earth, but of an immutable human desire to transcend the realm of scientific possibility. This desire has sometimes been so strong that it has caused oddly specific scientific "colorblindness" in the case of some experiments, and also caused downright delusional falsehoods in others. The USSR had its share of both.

CHAPTER V

MARS

Soviet science was given the task of transforming landscape and people after the Bolshevik Revolution, as the assorted scientific-technical projects concerning blood and water have illustrated. On a more total scale than this, however, the new breed of maximalist, utopian science born with Russia's communist revolution was set to master space flight in order to conquer the "Near-Sun" solar system.[1] This was the endgame for Cosmist philosopher Feodorov and his followers, for the "father of rocketry" Konstantin Tsiolkovskii, and for the intellectuals scribbling equations to overcome zero gravity against a backdrop of poverty, war and starvation.

All of these were "Earth" problems, and of course needed to be dealt with. Yet that task appeared so daunting and impossible, that intellectuals often skipped the "fixing Earth" part altogether, in favor of designs for societies on other planets or on the moon. Again, this was a prevalent urge in late nineteenth-century Russia, one that endured into the Thaw. It was Russia's state of being "behind," of being arguably "backwards" in the eyes of so many of the discontented, which led to the ubiquity and importance of leaving Earth for the possibilities, real or imagined, that space could offer. Yvonne Howell, editor of *Red Star Tales: A Century of Russian and Soviet Science Fiction*, positions Revolutionary Russia in an "inherently science fiction situation," because it was a country "untouched by modernity," experiencing "a process that Leon Trotsky famously diagnosed as "combined and uneven" development," while a small, radical minority set their sights on advancements that appeared centuries away.[2] Referring to the science fiction from turn-of-the-century Russia through the Revolutionary years, Howell writes that:

[1] Igor Yudin, "Lenin and Tsiolkovsky," *Soviet Life*, April 1981, 16.
[2] Howell, Fisher, et al, 9.

> Renowned artists and intellectuals of the time produced works of fiction that consciously probed a revolutionary new premise: what if the unprecedented pace of scientific and technological discovery is consciously harnessed to utopian ideas of social and even spiritual advancement, so that age-old dreams of peace, plenty, and even immortality are no longer the stuff of fairy tales?[3]

Writers like Tsiolkovskii, Feodorov and Bogdanov each explored such utopian themes, including scientific foundations for bringing such ideas to real life. In this way, science fiction and science itself were attached in Revolutionary Russia, both providing inspiration and grounding for the other.

The works of astronomers and authors abroad likely influenced Cosmist belief and Bogdanov's science fiction. For instance, the late 1800s saw much conjecture about life on Mars, both in science and in literature. In 1870s Italy, astronomer Giovanni Schiaparelli telescopically observed Mars, mapping out what he called "canali" across the surface. "Canali" referred to naturally occurring channels on Mars' surface.[4] When this was translated into English, "canali" became "canals," inspiring the perception that these rifts were manmade by intelligent life.[5] Schiaparelli's work led American astronomer Percival Lowell to map the canals he observed on Mars as well. Lowell believed that the Martian canals, which numbered over four hundred, were evidence of a "struggle against a dying environment," undertaken by throngs of workers and engineers on Mars.[6] Though his observations were inaccurate and may have been "the result of fatigue, optical illusions or, perhaps, the pattern of blood vessels in his eye," Lowell's ideas about an advanced society on Mars inspired others and were not fully "disproved" until the

[3] Ibid., 10.
[4] Stites, *Passion and Perception*, 118.
[5] Ibid.
[6] Ibid.

1962-1973 NASA Mariner missions.[7] Mariner IV provided the first close-up photographs of Mars' surface, revealing neither water nor canals.[8]

London author Percy Greggs translated Schiaparelli and Lowell's interpretations of the Martian landscape into a science fiction novel, *Across the Zodiac*, in 1880. The book included descriptions of the Martian engineers' canals, advanced Martian science and technology, and even orange vegetation growing there.[9] H.G Wells may have also drawn on Gregg's novel, as *War of the Worlds* also featured orange plant life.[10] Such works cemented Mars' place in human imagination as the planet most likely to support life, either in the present or future. Bogdanov expanded on this when he situated *Red Star* and *Engineer Menni* on an advanced, communist Mars, complete with red vegetation. From at least the nineteenth century, Mars was viewed as the most "practical" planetary destination for human space travel. In Revolutionary Russia, from 1890-1917, Stites counts the appearance of nearly twenty stories focused on "utopian societies, fantastic voyages, and interstellar travel."[11] These stories offered a reality dramatically different than the conditions of Russia at the time, which explains their mass appeal. Such stories eventually began to seep into the realm of scientific possibility.

To spectators that could not mentally reconcile the state of Russia at the beginning of the twentieth century with the intelligentsia's visions for the future, such aspirations may have appeared a fantasy that would never intertwine with "legitimate" science. One story that epitomizes the perception of Russia's "irreconcilable differences" is that of H.G. Wells' trip to

[7] Erik Washam, "Lunar Bat-men, the Planet Vulcan and Martian Canals | Science & Nature...," Smithsonian Institution Archives, September 12, 2012, accessed May 02, 2019, https://archive.is/nMXKO.

[8] David R. Williams, "Mariner Four," NASA Space Science Data Coordinated Archive, March 20, 2019, accessed May 2, 2019, https://nssdc.gsfc.nasa.gov/nmc/spacecraft/display.action?id=1964-077A.

[9] Stites, *Passion and Perception*, 118.

[10] Ibid, 119.

[11] Ibid.

meet Lenin shortly after the Revolution, in the autumn of 1920. Wells was fascinated with the idea that a new form of government had emerged in Russia and felt that the there was "something monumental, unprecedented in history" taking place there.[12] Having written *War of the Worlds* in 1897, Wells was widely read in Russia and he was close with Gorkii, allegedly sharing a mistress, Moura Budberg, with him.[13] Wells had imagined that Lenin's Soviet Russia was to be the vanguard of "the future global, planned society."[14] Upon his return to England, Wells wrote *Russia in the Shadows*, in which he revised his perspective on the Soviet Union as the first modern utopia: "I cannot see anything of the sort happening in this dark crystal of Russia. But this little man in the Kremlin can."[15] The author arrived in Petrograd only to find poverty, hunger and cold. Wells had arrived during the Civil War, on the eve of one of Russia's deadliest famines.[16] Though he could not imagine any kind of advanced future for Russia, he wrote with a tone of impressed confusion that Lenin could:

> He sees the decaying railways replaced by a new electric transport, sees new roadways spreading throughout the land, sees a new and happier communist industrialization arising again. While I talked to him, he almost persuaded me to share his vision.[17]

Bewildered as he was, "almost" is the key takeaway from Wells' assessment. Though a science fiction author himself, Wells could not picture the country he witnessed in 1920 ever turning into a modern, industrial, "advanced" land, let alone a would-be utopian savior of Europe, and beyond.

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[12] Yudin, 16.
[13] Gray, 101.
[14] Yudin, 16.
[15] H. G. Wells, *Russia in the Shadows*, June 2006, accessed April 29, 2019, http://gutenberg.net.au/ebooks06/0602371h.html.
[16] Ibid.
[17] Ibid.

To say that Wells and the Bolsheviks perceived the October Revolution in a way that cast Russia as the world's "savior" is not inaccurate. Before becoming a full-fledged soapbox for Stalin's government, Gorkii wrote disparagingly of this theme: "And this unfortunate Russia is being dragged and shoved to Golgotha to be crucified for the salvation of the world. Isn't this "Messianism" with a hundred horsepower?"[18] Gorkii frequently invoked the Christ and Prometheus archetypes when discussing the Russian Revolution, with his criticisms of a Soviet blood sacrifice morphing into praise after Lenin's health declined. Both Gorkii and Wells changed their opinions about Russia's role as the world's messiah; Gorkii became a believer, while Wells lost any and all faith in humanity. In 1981, a time when nostalgia for the success of Soviet space projects was incredibly strong, an issue of *Soviet Life* critiqued Wells for essentially lacking the imagination that men like Lenin and Tsiolkovskii had possessed.[19] Where Wells only saw science fiction and fantasy, revolutionaries saw a roadmap for future reality.

For Russia and the Soviet Union, there has always been a very short distance between science and science fiction. The purpose that science fiction served for Russian and the Soviet society was markedly different than in Western counterparts. Revolutionary and Soviet aspirations for interplanetary travel appeared throughout science fiction and popular culture, but also in academies and laboratories where the term "science fiction" was taken as a challenge. It was not fiction if it would one day be true. After all, these were the people who had toppled centuries of autocratic oppression with the telegraph office and "moral superiority."[20] Given what happened when the Bolsheviks seized power, the very binary of possible-impossible seemed flipped on its head. This "world turned upside down," something both apocalyptic and

[18] Gorkii, *Untimely Thoughts*, 141.
[19] Yudin, 17.
[20] Vladimir Lenin, "Advice of an Onlooker, Oct. 8 (21) 1917," Marxists.org, November 2000, accessed May 2, 2019, https://www.marxists.org/archive/lenin/works/1917/oct/08.htm.

utopian, inspired every kind of transgression against the formerly "fixed" laws of nature and science, as well as general rejection of past tradition. Nothing spat in the face of the past, God, and the realm of the possible like the idea of conquering space.

Utopia in the Russian and Soviet context centered on control, complete and unqualified. Control over the environment and its inhabitants was believed to create a template for a scientifically planned, socialist-style state in which everything was self-regulating, foreseeable, and manageable. In a society like this, none need grow poor or go hungry. None would use their powers to oppress the weak. A society like this obviously stood in blunt contrast to Russia during and after the revolutionary years, only adding to its appeal. Long before the Space Race and Cold War, even in pre-revolutionary Russia, writers and scientists had already turned their gaze towards space as the ultimate form of escapism. The moon and Mars in particular served as favorites among hypothesized future homes and destinations for armchair travelers imagining an atmosphere that turn-of-the-century Russia failed to provide. This trend only continued and intensified as the better communist society that had been promised continually "refused to arrive."[21]

There is something universally appealing and mystifying about space and the prospect of visiting other planets. It has been the preoccupation of astronomers and dreamers since ancient times, and it remains a focus for space programs, both government-funded and private, around the world. Revolutionary Russia and the Soviet Union that followed had a unique relationship with space as the ultimate utopian achievement, particularly after the Revolution. Science and science fiction shared a close reciprocal relationship in the Soviet Union, and it was often difficult to distinguish the two. In the foreword to the first English publication of the Strugatskii

[21] Arkady Strugatsky, Boris Strugatsky, and Dmitry Glukhovsky, *The Doomed City*, trans. Andrew Bromfield (Chicago Review Press, 2016), x.

brothers' 1972 science fiction novel *The Doomed City*, author of *Metro 2033*, Dmitrii Glukhovskii, explains the exalted status science fiction as a genre had for Soviet society.[22] He argues that in the USSR science fiction "became the absolute genuine mainstream," as opposed to its niche status in the West, because:

> the Communist Party and the government were implementing a grandiose project to remodel society, the state, the individual, the entire world all at once—a project so fantastic that in comparison the most audacious of writers' fantasies seemed to be no more than a forecast of what was coming tomorrow. Standard Soviet science fiction—and the Strugatskys' early prose—transported us into the future promised by the ideologists: a future that was just and bright; a future in which communism had triumphed and peace had reigned on Earth for a long time already, Russian had become the language of international dialog, and all the dramatic events unfolded far out on the remote boundaries of the galaxy, to which earthlings carried progress and prosperity.[23]

Because the government, significantly aided by science, was undertaking such an expansive transformation, what would otherwise constitute "science fiction and fantasy" looked surprisingly normal. Furthermore, in a society continually trained to "look ahead" at the progress of the future, over the "radiant shop counter of destiny, in[to] communist paradise," space travel and visiting other planets was simply what came next.[24]

A Place to Put the Bodies

The Russian-Soviet obsession with space began with Feodorov (1829-1903) and Tsiolkovskii (1857-1935) at the close of the nineteenth century. Though Feodorov died before the Revolution and Tsiolkovskii was sixty at the time of the Bolshevik coup, their ideas became the backbone of the future Soviet space program.[25] Interestingly, Cosmism featured many elements of communism, when taken to an absolute extreme. For instance, Cosmists believed

[22] Ibid., viii.
[23] Ibid.
[24] Ibid.
[25] Yudin, 17.

death should be abolished because living one natural lifetime was equated with "owning" a certain period of time.[26] Immortality and freedom to move about the universe were seen as the only forms of total freedom.[27] Cosmists wanted the state to assume nothing shy of total "biopower" in assuring resurrection for all.[28] For Feodorov and Tsiolkovskii, who melded philosophy, mathematics, and science, immortality and spaceships were a practical possibility and they were directly connected. Feodorov pioneered many Cosmist, futurist ideas about life beyond the bounds of space and time, while Tsiolkovskii devised plans for inventions that would help make those ideas reality.[29] Just two of those designs were the dirigible and the closest equivalent to the modern airplane.

Though he was of noble birth (coincidentally of the Gagarin line), Feodorov spent much of his life indigent.[30] After becoming a teacher and librarian, he assumed the role of philosopher to the intelligentsia, including Tolstoy.[31] He did not believe in money or property, intellectual or physical, so he did not seek to publish or profit from his works. Michael Deacon of *The Telegraph* wrote an article about Feodorov's formative role in the Soviet space program, which coincided with a 2011 BBC a documentary on the subject, *Knocking on Heaven's Door*.[32] In the article, Deacon detailed Feodorov's asceticism:

> Nikolai Fedorov was so poor that he rented not a flat but the corner of a room, and lived solely on bread, tea and water. It's said that he died because one of his pupils gave him a fur coat – the coat made him sweat, the sweat led to a cold, and the cold turned into

[26] Groys, Svyatagor, et al, 60.
[27] Ibid.
[28] Groys, et al., 7.
[29]Ibid., 230.
[30] Ibid., 229.
[31] Ibid.
[32] George Carey, Nick Fraser, and Teresa Cherfas, "Storyville: Knocking on Heaven's Door - Space Race," BBC Four, November 15, 2012, accessed April 30, 2019, https://www.bbc.co.uk/programmes/b0109ccb.

> pneumonia. If anyone has ever died a death more Russian, I'd be fascinated to hear about it.[33]

Before dying an exemplary Russian death by fur coat, Feodorov was a religious man. However, his Cosmist philosophy embarked on a "secularization of Christianity" since the ultimate aim was literal immortality and resurrection: "replacing the immortality of the soul guaranteed by god with an immortality of the body guaranteed by the state."[34] Feodorov's posthumously published "Philosophy of the Common Task" declared death the universal enemy of mankind, and it was therefore humanity's common purpose to create "the technological, social and political conditions under which it would be possible to resurrect by technological and artificial means all people who have ever lived."[35] Feodorov anticipated that Earth would become overcrowded and therefore require the use of other planets to house the scores of resurrected dead.

Since Tsiolkovskii was mostly deaf from childhood fever and therefore unable to attend school, he educated himself.[36] He studied at the Rumyantsev Library in Moscow, where Feodorov worked as a librarian, and by most accounts Tsiolkovskii became his pupil.[37] They shared similar beliefs about immortality for all and the use of airships not only to visit, but also to harness and populate, other planets. Tsiolkovskii wanted "to fulfill in practice what Feodorov called the 'petrification of the heavens' (the transformation of the planets into habitable places for resurrected ancestors.)"[38] James Andrews, one of Tsiolkovskii's biographers, claimed that

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[33] Michael Deacon, "How a Penniless Mystic Won Russia the Space Race," *The Telegraph*, April 10, 2011, accessed April 30, 2019, https://www.telegraph.co.uk/culture/tvandradio/8438988/How-a-penniless-mystic-won-Russia-the-space-race.html.

[34] Groys, et al, 11.

[35] Ibid., 7-8.

[36] Deacon, "How a Penniless Mystic Won Russia the Space Race."

[37] Ibid.

[38] Groys, et al, 12.

Tsiolkovskii's rocketry designs were a manifestation of "his trying to overcome death through conquering outer space."[39] Feodorov and Tsiolkovskii surmised that a vehicle would have to be created in order to transport humans to areas in the solar system close to the sun, since it was the Milky Way's primary energy source.[40]

Tsiolkovskii did not fear overcrowding on Earth; he welcomed a huge population boom as a sign of man's advancement as a species, even welcoming an increase in carbon dioxide in the air since it posed "great benefit to plants and no harm whatsoever to man."[41] In *The Future of Earth and Mankind*, he wrote: "Only when Earth's population has increased a thousand times will man become master of the soil, ocean, air, weather, plants, and himself…Man shall slowly overcome everything, but for this to happen he needs to multiply, make technological advances, and better the species."[42] Tsiolkovskii, like Feodorov, thought the day would come when every deceased individual would be back to Earth's population and, once Earth was full, these beings would find new homes out in space.[43] For Cosmists anticipating a mass resurrection, space was initially a place to put the bodies. Exactly how the resurrection would take place was not fully developed, but Feodorov knew these individuals would end up in space and that a means of getting there needed to be found. Feodorov dreamed of the Earth as a "great electric boat" able to maneuver throughout the universe after the sun's energy had been directed to that purpose.[44] This was before air travel was possible, let alone space travel, and well before solar power as a realm of advanced technology.

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[39] Quoted in Tucker, 271.
[40] Sovietskaiia Kultura, "A Poet Stars in a Movie about Tsiolkovsky," *Soviet Life*, April 1981, 54-55.
[41] Groys, Tsiolkovskii, et al., 122.
[42] Ibid., 115-119.
[43] Yudin, 16.
[44] Groys, Feodorov, et al, 58.

Apart from musing on how to physically get into outer space, both Feodorov and Tsiolkovskii hypothesized scientific processes for making other planets habitable. These were similar to their plans to transform Earth. Weather control, directing more of the Sun's energy into the Earth, and encasing areas in mobile greenhouse of thick quartz glass and rust-proof wire netting were just a few of the ideas Tsiolkovskii explored. He calculated that the Sun's energy could sustain "no fewer than ten thousand trillion" people, and therefore he thought it entirely possible that "after the Sun's warmth has been conquered, the population and its power would be so enormous that it would have ample capacity to adjust the makeup of the air."[45] This would allow people to adapt to life on other planets, and their creation of habitats with vegetation, he believed, would help create hospitable atmospheres in space.

Tsiolkovskii put some of Feodorov's theories to paper and, essentially, invented the dirigible and the first monoplane in the 1880s, though these designs would only come to fruition decades later. In 1896 he came up with the Formula of Aviation, widely known as the Tsiolkovskii Equation, which is still used today to determine the amount of fuel a rocket needs relative to its mass in order to achieve conservation of momentum.[46] The equation provided proof of how a manned spacecraft could overcome gravity, which was lost on the scientific community at the time. The Academy of Sciences was surprisingly uninterested in the rocket equation, which seemed a speculative, far-flung fantasy. Tsiolkovskii did not receive support from the government or academia until after the Revolution, when Lenin signed off on a monthly stipend of 500.00 rubles (around 227.00 USD) so Tsiolkovskii could continue his work.[47] The government's Protocol No. 776 from September 1921 gave Tsiolkovskii this salary, illustrating

[45] Groys, Tsiolkovskii, et al., 126.

[46] Brian Dunbar, "The Tyranny of the Rocket Equation," NASA, May 01, 2012, accessed April 30, 2019, https://www.nasa.gov/mission_pages/station/expeditions/expedition30/tryanny.html.

[47] Yudin, 16.

the importance and value he had to the new Soviet regime.[48] Owing to the Civil War, territory losses in WWI, and excess disease and famine deaths, incomes in Russia from 1919 until the beginnings of economic recovery in 1922 were at levels so low that they "had not been seen in Eastern Europe since the seventeenth century."[49] As a scientist, to have been granted a salary at all during this time was remarkable.

Ironically, Tsiolkovskii's status as a "reject" from the imperial academies did him a favor. "Bourgeois" scientists spent most of the post-Revolutionary years starving and freezing at their desks after having their funding cut off.[50] The first victims of Lenin's passive scientific purge were Mendelian geneticists and microbiologists, including the creator of the world's first seed bank, Nikolai Vavilov.[51] Any field of study without an immediately apparent application to the furthering of Marxism was suspect, and in that Tsiolkovskii was fortunate. Airships and a radical assault on death actually fit with the revolutionary fervor and ideological urge to change everything. Once relegated to "non-recognition and total oblivion" in Imperial Russia, Tsiolkovskii's designs for conquering the air were given serious consideration under Lenin.[52] Naturally, Tsiolkovskii supported the Revolution, writing:

> Before the Revolution, my dream could not have come true. It is only the October Revolution that has brought recognition to the works of a self-taught person; it is only Soviet Power and the party of Lenin that has given me effective help. I was able to feel the love of the masses, and this gave me the strength to continue my work… I hope that my work, maybe soon and maybe in the distant future, will yield society mountains of bread and an immense source of power.[53]

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[48] Ibid.

[49] Mark Harrison and Andrei Markevich, "Russia's National Income in War and Revolution, 1913 to 1928," VOX, CEPR Policy Portal, May 11, 2012, accessed April 30, 2019, https://voxeu.org/article/russia-s-national-income-war-and-revolution-1913-1928.

[50] Popovskii, 6.

[51] Ibid., 7-11.

[52] Yudin, 16-17.

[53] Quoted in Yudin, 16-17.

While one can almost see the cue cards held up by a Soviet committee for this particularly glowing outpouring, Tsiolkovskii genuinely believed that science and technology could bring about a utopian future, where the problems plaguing early twentieth-century Russia would be extinct. This quote is also indicative of what exactly "utopia" meant in Russia at the time—a society with enough to eat and power over its own fate. It was a very simple dream that had endured from ancient times. Since the Bolsheviks threw their weight behind science as a means to get to this utopia, albeit selectively and politically, Tsiolkovskii's admiration is understandable.

Tsiolkovskii prided himself on being a realist, and insisted his work was not "utopian," but rooted in demonstrable science and math.[54] He diverged from Feodorov on the topic of religion, believing that there was some kind of creator acing as a "puppet master," but that religion itself offered very little to adherents.[55] "My conclusions are more comforting than the promises made by the most life-affirming religions," he wrote in the foreword to *Panpsychism*.[56] He distanced himself from religion and anything otherworldly, claiming:

> Not a single positivist could be soberer than I am […] if my wine gets you drunk, at least it is natural. To understand me you must utterly abandon all things obscure, such as the occult, spiritualism, dark philosophies, and all authorities except that of hard science, that is, mathematics, geometry, mechanics, physics, biology, and their practical applications.[57]

Tsiolkovskii's dismissal of everything occult is of course relative—the "occult" which he disavowed was relatively the same in content as it had been in the Silver Age. Merely the label had changed when a regime set on eliminating the "opiate of the masses" took control. As

[54] Groys, Tsiolkovskii, et al., 133.
[55] Konstantin Tsiolkovskii, "*Kosmicheskii filosofiia: ect ly bog*?" accessed May 01, 2019, https://tsiolkovsky.org/ru/kosmicheskaya-filosofiya/est-li-bog-2/.
[56] Groys, Tsiolkovskii, et al., 133.
[57] Ibid.

religion ceased to be the lens through which all phenomena was judged, it was replaced by science. That which was once metaphysical, when viewed in relation to the "standards" set by religion, became theoretical scientific possibility as religion's social and cultural prominence plummeted in Russia. This shift happened dramatically fast for Russia, at least in the major cities, where the most revolutionary, anti-religious activity took place.

Alexander Feodorovich Svyatogor (born Alexander Feodorovich Agienko, 1889-1937) took great inspiration from Feodorov and Tsiolkovskii's writings. His pseudonym derives from the Russian words for "sacred mountain," and was the name of a legendary *bogatyr* from Russian folklore. Svyatogor was linked with a few anarchist groups in Russia and Ukraine before the Revolution, and was a Black Guard commander for the Bolsheviks during the coup.[58] He later disavowed anarchism and founded Biocosmism, built on the Cosmist tenets of immortality and interplanetary travel. Its disciples, the Biocosmists-Immortalists, flatly condemned any "religious or mystical tendencies" that lingered in Feodorov's philosophy.[59] Like Tsiolkovskii writing about being a "sober positivist," Svyatogor's writings sought to distance Biocosmism from anything unable to be classified as a hard science. In *Our Affirmations*, a Biocosmist list of "commandments," Svyatogor explained how the quest for immortality was distinctly practical and atheist:

> Death is so logically senseless, ethically inadmissible, and aesthetically ugly that the question of immortality inevitably emerges in a person's consciousness. In his inability to face death, man has looked for salvation in religion and mysticism in the hope of immortality, if only for the soul. At a time when religion has finally become obsolete, when a religious and mystical solution to the question can no longer be offered as real bread, and death's stronghold has been shaken biologically, mankind has, at last, come close to solving the realization of individual immortality.[60]

[58] Groys, et al., 234.
[59] Groys, Svyatogor, et al., 61.
[60] Ibid., 60.

While "the occult" and mysticism may have nominally disappeared from Revolutionary movements like Cosmism and Biocosmism, metaphysical themes nonetheless persisted among them; they were reclassified under the umbrella of future scientific possibility. As a professed positivist and a materialist scientist concerned with practical application of ideas so advanced they were once categorized as "dark philosophy," Tsiolkovskii saw no contradiction in rejecting "the occult" while in the same essay supporting alchemy. He wrote about "celestial chemistry" that allowed "simple bodies with a small atomic weight to turn into gold, silver, iron, aluminum and so on."[61] While nuclear science made some incredibly small "alchemical" transformations of lead into gold possible in the 1980s with the use of a Bevalac (particle accelerator), it was laughably uneconomical and time consuming: a Nobel Prize winner in chemistry estimated that because a Bevalac cost $5,000 per hour to use, "it would cost more than one quadrillion dollars per ounce to produce gold by this experiment."[62] This alchemical recipe only calls for three things: "a particle accelerator, a vast supply of energy and extremely low expectation[s]."[63] Tsiolkovskii had none of these, but he anticipated ways to come by the first two.

A few decades after Feodorov's death, and while Tsiolkovskii was still working, his fantastical ideas captivated men like Gorkii, Platonov and Boris Pasternak.[64] It is not insignificant that many Cosmist ideas carried themes that had been seminal to communism; with immortality and space travel, there would be no nationalities or borders, and all would have the equal right to live forever.[65] In his essay *Panpsychism*, *or Everything Feels* Tsiolkovskii called

[61] Groys, Tsiolkovskii, et al., 141.
[62] John Matson, "Fact or Fiction?: Lead Can Be Turned into Gold," *Scientific American*, January 31, 2014, accessed April 30, 2019, https://www.scientificamerican.com/article/fact-or-fiction-lead-can-be-turned-into-gold/.
[63] Ibid.
[64] Groys, et al, 229.
[65] Groys, Feodorov, et al., 56.

the "frontier" between living ("responsive") matter and less responsive (or even dead) matter "artificial, like all frontiers."[66] In addition, the government was allowed a prominent role in Cosmism, at least during the interim before utopia was achieved, at which point the government and state would dissolve naturally. This is the same formula that communism in the USSR was, in theory, to follow. Cosmism theoretically relied on science to achieve its aims, another similarity it shared with Marxism-Leninism. Its goals could only be considered "utopian" until the day when technologies arose able to render utopia a reality. Cosmism's future "truths" were anticipatory, much like the future conditions presented in Socialist Realism.

Freedom to Move about the Universe

Immortality and interplanetary travel went hand in hand for Cosmists and Biocosmists. Colonization of space was required to house the resurrected generations, but space was ultimately where all life on earth was headed. If Tsiolkovskii had believed in frontiers, he would have called it the final one. Feodorov's initial dream of immortality and interplanetary travel as the ultimate forms of freedom for all required that the entire universe become "biological."[67] Feodorov and Tsiolkovskii desired that all planets and universes be eventually "ruled by reason," which would happen when humans left earth and "installed life on all worlds."[68] Feodorov further theorized that for the universe to become fully "biological," the power of the sun had to be harnessed and redirected in higher concentrations into the grounds of each planet. This would happened " by the instrument of the lightning rod-aerostat," causing "all of the energy of the Sun

[66] Groys, Tsiolkovskii, et al., 134.
[67] Groys, Feodorov, et al., 58.
[68] Ibid.

[to] be directed onto each planet, thereby freed of gravity's bonds and turned into a great, electric boat."[69] Svyatogor elaborated on this concept in his *Biocosmist Poetics* (1921):

> Our Earth must become a spaceship steered by the wise will of the Biocosmist. It is a horrifying fact that from time immemorial the Earth has orbited the Sun, like a goat tethered to its shepherd. It's time for us to instruct the Earth to take another course. In fact, it's time to intervene in the course taken by other planets too. We should not remain mere spectators, but must play an active role in the life of the cosmos!"[70]

Cosmists wanted Earth to "break free" from the despotism of the cosmos and chart courses of its own. Taking control of Earth's path and "destiny" not only suggested a new world of scientific possibility, but invoked the ethos of defying religious predestination. Svyatogor posed Earth's "horrifying" fate of orbiting the sun as something preordained from the birth of the galaxy, by a force that humans were about to conquer with science.

Though Feodorov and Tsiolkovskii died in 1903 and 1935 respectively, their philosophies concerning man's ability to colonize outer space influenced the next generation of Soviet scientists. Svyatogor was just one dedicated protégé who wrote extensively on Cosmist-Biocosmist ideas. The influence of the Cosmist movement endured long after its prophets had died; it still persists today. The Cosmist belief in abolishing death and moving freely among other planets led Tsiolkovskii to create a viable equation and designs for rockets that allowed the Soviet Union to put Yuri Alekseevich Gagarin into space in April of 1961. His equation is still used in its exact form today, and rocket scientists do not anticipate it ever being overturned unless the radius of Earth changes. This is known as the "tyranny of the Tsiolkovskii equation," because Earth's gravity remains a constant force that dictates the fuel load a rocket will need to even make it out of the atmosphere, and only a change in Earth's size would impacts its

[69] Ibid.
[70] Groys, Svyatogor, et al., 83.

gravitational force.[71] Tsiolkovskii formulated this equation only ten years after the first gasoline-powered automobile was invented in Germany; before anyone in Russia had even the prospect of automotive travel, Tsiolkovskii figured out how to successfully get a rocket into space.

Given the technological and social conditions of Russia at the time of Feodorov and Tsiolkovskii's major works, Soviet achievements in space flight are nothing short of miraculous. Cosmism's influence on the Soviet space program and rocket science is not a historical stretch, an urge to connect two things that appear related but which share no common ancestor. It is well documented that Tsiolkovskii's equation was devised while he was imagining how man would leave earth to achieve Cosmist aims of total interplanetary control and the literal abolition of death. Furthermore, Cosmism's ideological overlap with communism led some Bolsheviks to tolerate, if not abide by, the philosophy. Lenin was known to have detested most of the esoteric and otherworldly elements swirling around Revolution-era Russia, yet he personally allotted Tsiolkovskii a monthly paycheck. Tsiolkovskii was not, at that time, a highly respected "expert" in the field. On the contrary, Tsiolkovskii's status as a self-taught visionary with oversized scientific plans for the future are the very traits that endeared him to the Revolution and Lenin.

During the Space Race (1955-1969), Sergei Pavlovich Korolev and Valentin Pavlovich Glushko, two of the USSR's lead rocket engineers, relied on Tsiolkovskii's designs to create rockets capable of putting a man in space.[72] To protect their assets from possible assassination during the Cold War and Space Race, the Soviet Government kept Korolev's name classified.[73]

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[71] Jatan Mehta, "Rocket Science 101: The Tyranny of the Rocket Equation," *Medium*, May 24, 2018, accessed May 02, 2019, https://medium.com/teamindus/rocket-science-101-the-tyranny-of-the-rocket-equation-491e0cf4dc6a.

[72] Asif A. Siddiqi, *Challenge to Apollo: The Soviet Union and the Space Race, 1945-1974* (Washington, D.C.: National Aeronautics and Space Administration, NASA History Div., Office of Policy and Plans, 2000), 6-7.

[73] James Harford, *Korolev: How One Man Masterminded the Soviet Drive to Beat America to the Moon* (New York, NY: Wiley, 1999), 135.

He was known only as "Chief Designer" and his identity as the lead designer on the Sputnik and Vostok space missions was not revealed until after his death.[74] It is fascinating that though Tsiolkovskii never constructed or launched a rocket himself, he created the equation needed to do so. Cosmism may have included numerous impractical theories, but space travel was something that moved from philosophy to science fiction to Soviet reality in a shockingly short span of time.

Mars enticed Soviet writers and rocket scientists, as the "Red Planet" was very popular in science fiction and became a focus of the Soviet space program. Though Schiaparelli's Martian canals were debunked by the time Space Race was underway, Mars remained the best, if not only, planet that astronauts could potentially visit. This is still true today. Given its proximity to Earth and the Sun, it has the best chance of supporting organic life. Before turning his attention to the lunar project to compete with America's prospective moon landing date, Korolev had his sights set on Mars.[75] Mars had captured the Soviet imagination long before practical space travel, though. Bogdanov wrote about Mars, "gleaming red and hateful," in *Red Star*, exalting Mars as hosting the ideal communist society of the future.[76] In the Soviet scientific and literary imagination, Mars had striking similarities to the lost civilization of Atlantis, arguably the most famous utopia in the world. As a psychological device, Atlantis continually resurfaced throughout history, expressing mankind's fear of impermanence and lack of control. More and Bacon based their utopias loosely off of Atlantis myths. Mars came to be the Atlantis for the advanced, scientific age of socialism that Soviet science attempted to usher in—it was where a "perfect" society would flourish, and man would have total control over his environment and

[74] Ibid.
[75] Ibid., 300.
[76] Stites, *Passion and Perception*, 118.

fate. Though Plato's Atlantis and More and Bacon's utopias all looked back to a more perfect past, the Soviet Atlantis did not yet exist; it was a place that existed only in the future tense, and it was located nowhere on Earth, but in space.

Giant Radishes on the Moon

The moon was also a popular location for a future Soviet utopia. In 1958, Professor N.A Varvarov, then chairman of the Astronautics Section of the Soviet Union's civil defense apparatus (DOSAAF), expressed the Soviet government's plans to build inhabited communities on the moon.[77] An article by Albert Perry of *Scientific Digest* from February 1958 elaborated on some of Varvarov's quotes about building lunar cities:

> The Red city will be constructed in one of the lunar craters, under a tremendous dome of glass and furnished with aluminum doors which Prof. Varvarov calls "air-locks." Inside at every half-mile or so, the city will be partitioned by glass walls with double doors. These will minimize the damage that may result from falling meteorites or other accidents…"We will find it expensive to transport food from earth to the moon," declares Varvarov. "A loaf of bread on being carried to the moon will be worth its weight in gold. Therefore our future lunar settlements will have to be self-sufficient… Because of the difference in gravity, all plants will grow fantastically big when transplanted to the moon: "A radish will be as tall as a date palm grows on earth. Onions will send forth sprouts thirty-three feet long."[78]

Varvarov's plans for Soviet cities on the moon include ringing echoes of Tsiolkovskii's Revolution-era plans to use glass and metal "greenhouses" to transform the landscape and atmosphere of Earth and other planets. It is striking also that one of the first features Varvarov mentions about living on the moon is the enormity of the food; utopias long included bounty as a prerequisite, especially the Russian and Soviet utopias. In dreaming of thirty-three-foot-long

[77] Albert Perry, "Soviet Cities on the Moon? - *Science Digest* (Feb, 1958)," *Modern Mechanix*, accessed May 01, 2019, http://blog.modernmechanix.com/soviet-cities-on-the-moon/

[78] Ibid.

onion sprouts and tree-sized radishes, there is something undeniably Russian that harkens back to peasant commune idylls.

In advanced technocratic societies like Bogdanov depicted in *Red Star*, the fact that everyone always had as much food as they wanted was specifically mentioned. Food, being such a basic and primitive need, informed and shaped ultra-advanced scientific utopias that were set on other planets, where there were always systems in place to ensure its availability. While the Soviets were embarking on space travel, preparing to colonize the moon, the enduring trauma of famine and bread lines continued to prompt fantasies about living in a place where one never needed to worry about having enough to survive. Though conditions in the USSR had improved since the Revolutionary years and since Stalin's Great Terror, for those involved with the space program in the 1950s and 1960s, the last Soviet famine was still a recent memory. This was especially so since it had occurred just ten years before Professor Varvarov talked about making a habitable environment on the moon. After World War II and in the wake of drought, the USSR experienced a famine from 1946-1948—the last Soviet famine, and the only famine to occur anywhere in post-war Europe.[79] Over one million people died as a result.

In what is seen as an answer to the famine, Stalin's "Great Plan for the Transformation of Nature" was born, which planned to institute crop rotations and the practice of *lesopolosa* (forest strips).[80] The forest strips, also known as "shelterbelts," were to be planted around crops to protect them from the elements. Afforestation in an effort to protect harvests was also devised to change the weather, helping to ensure better harvests and avoid drought.[81] Stalin's project illustrates the gravity of the famine threat in the USSR, even in the late 1940s. As strange as it is

[79] Bernstein, Burton, et al., 174-194.

[80] Mikhail Bogdanovich Wojciechowski, "Gosudarstvennaya lesopolosa," *Nezavisimaya*, November 26, 2008, accessed May 02, 2019, http://www.ng.ru/science/2008-11-26/14_forests.html.

[81] Ibid.

to consider that only one decade separated the 1946-1948 famine from the launch of Sputnik, this exceptionally short period also influenced scientists' visions for space in the future. It seemed that no matter how advanced man became, even the New Soviet Man, the desire to control forces of nature and landscape in order to ensure survival endured, and were expressed in the form of huge radishes, glass "palaces" on the moon, control over the unruly forces of nature, and triumph over death.

CHAPTER VI

CONCLUSION

Soviet science featured many grandiose projects and its aims were nothing less than total in scale. Even before the Revolution, Russia was perceived both at home and abroad as a land of superlatives; there are numerous true statements and centuries of anecdotal evidence that attest to this. Considering everything from Russia's geography to its historical body count, comparative phrases with "the largest," "the most," "the least," "the worst," "the oldest," often crop up in research. Bearing such a history and tendency towards extremes in mind, it makes sense that violent revolution, seeking to radically change the Russian state and way of life, succeeded in October 1917. These radical changes that Lenin and other Bolsheviks imagined were to be made real by scientific Marxism and the creation of a better communist environment. Thus, the state's goal of creating a communist utopia played a defining part in Soviet scientific experimentation, from the early revolutionary period, through the Stagnation. Blood, water and Mars were three key pieces for the science tasked with building the better society of the future. Across various fields of Soviet scientific research, these three themes reveal the utopian, transformative, and messianic nature of the Soviet Experiment as a whole. They expose the strong utopian and even religious foundations of Soviet society, which invariably centered around forging a new environment and, in so doing, a new variety of human to inhabit it.

Alexander Bogdanov's revolutionary blood exchange experiments were rooted in his 1905 science fiction-utopian novel, *Red Star*. He founded Russia's first blood research institute in hopes of facilitating the "comradely exchange of life" through blood transfusions in hopes of curing disease, and even reversing the aging process. This was part of the wider Soviet urge to transform people and improve lives. Bogdanov's blood exchanges also highlighted the heredity

debate going on during the early twentieth century, and the shortcomings in his work illustrate how Marxism helped ensure the survival of the inheritance of acquired characteristics well into the 1970s. In the minds and experiments of some of the radical men behind Russia's Revolution, blood could be exchanged to improve health and possibly stave off death.

Water was the most important element in the Soviet quest to change the environment. The Stalin canal projects of the first Five-Year Plan, the irrigation of Central Asian steppe, and the "discovery" of polywater each testify to the powerful role water played in the grand Soviet plan to transform both landscape and people. This goal was utopian, as conquering nature sought to give the New Soviet Man utter control over his habitat, production, and his own life—things that were markedly absent from pre-revolutionary Russian life. Still, this control remained out of the grasp of the New Soviet Man, despite massive engineering projects and substantial advances in technology and science.

The Cosmist works of Nikolai Feodorov and Konstantin Tsiolkovskii inspired the Soviet Space program and effected genuine results in scientific achievement, even if the grander designs of the Cosmists were never realized. Mars and space were came to symbolize all that Earth could hope to achieve through communism, and served as imaginative locations for the Soviet Atlantis of the future. Authors, philosophers, politicians, and scientists all took part in explaining utopian visions of Soviet man conquering the Earth and the cosmos in their writings and experiments. The Soviet view of space also indicates a Soviet urge to not only transform Earth, but other planets as well. Mars was often cast as the location of the socialist humanity of the future in science fiction throughout the Soviet years, and served as evidence of the wider transcendental aims of a communist utopia.

Blood, water and Mars as genera of Soviet science attempted to create the New Soviet Man, and then give him an unprecedented level of control over areas once reserved for God alone: possible immortality, apocalyptic transformation, and creation itself. Once science had displaced religion following the Revolution, science itself took on features of a religion. It served as the only form of salvation from the most quintessential of Russian problems, like starvation, inhospitable environments, and an overall lack of control.

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