Rethinking the Russian Avant-Garde: Russian Mystical Philosophy and Rationalist Architectural Theory

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INTRODUCTION

The merging of rational and non-rational "ways of knowing"[1] in the architectural design process is a theme that has long been an important area of speculation among architectural theorists. An investigation of Russian philosophical culture offers insights into how the highly synthetic architectural design process may be conceptualized and theorized in alternative ways that could be instructive to Western architectural culture.[2] Russian culture never fully absorbed the Cartesian devaluing, as occurred in the West, of the non-rational ways of perceiving "truth" identified by the Russian Slavophile philosophers as intuition, creativity and spiritual knowledge.[3] Russian philosophy, therefore, is able to provide a conceptual basis for a different understanding of the relationship between design and technology: having not suffered the separation experienced in the West, there exists, at least in theory, no inherent gap between "design thinking" and "technological thinking" to bridge.[4]

This paper argues that the rich, complex, and fundamentally Russian intellectual sources of the architectural theories of the Russian avant-garde deserve broader exposure in the West. The research presented here focuses on the profound influence of the nineteenth-century Russian intellectual tradition on the theoretical work of the Rationalist element of the Russian architectural avant-garde. Unfortunately, little of this rich and complex tradition is familiar to Western architectural culture. It is beyond the scope of this paper to provide a thorough treatment of how the creative products of Soviet avant-garde architectural theory came to be assimilated into Western architectural Modernism;[5] however, I strive here to offer a fresh look at Russian "Rationalist" architectural theory by locating its generating ideas within the nineteenth-century Russian intellectual tradition.

Although the Russian sources of architectural avant-garde theories have remained largely unknown in the West, the work of the Russian avant-garde artists and architects of the 1910s, 20's and early 30's has been written into the canon of Western Modernism, to the point of being mythologized. Their ideas and projects are most frequently represented in mainstream Western architectural history as having been principally inspired by ideas originating in the West. In the teaching of the history of Modernism in architecture schools in the West, the influence of pre-revolutionary Russian culture on Soviet avant-garde architecture is passed over in favor of a heroic-reductionist perspective which, perhaps predictably, attributes Russian avant-garde theories to the reworking of western European precedents, particularly those of the Italian Futurists and the French Cubists. I argue that such a representation is, in fact, a misrepresentation.[6]

NIKOLAI LOBACHEVSKII AND THE INVENTION OF NON-EUCLIDEAN GEOMETRY

In 1829, Russia was the site of a revolutionary development in mathematics: the publication of Nikolai Ivanovich Lobachevskii's disproof of Euclid's fifth, or parallel, postulate, which mathematicians had unsuccessfully struggled to prove for two thousand years. The parallel postulate states that "through a point external to a line one and only one parallel can be drawn".[7] Lobachevskii devised a geometrical system acting on a surface of negative double curvature, by means of which he was able to prove that more than one non-intersecting line may pass through an external point, and the sum of the internal angles of a triangle may be less than 180 degrees. Ushering in the era of non-Euclidean geometry with the publication of this proof in 1829, he called his system "imaginary geometry".[8] Just as the recognition of imaginary (complex) numbers shows real numbers to be but a subset, or a special case, of the set of all

numbers, so Lobachevskii's formulation of imaginary geometry demonstrated Euclidean geometry to be just a special case of the more general system he came to call "pangeometry".[9]

Lobachevskii's invention directly and profoundly influenced later thinkers in many disciplines in Russia, not just mathematics and physics, but also philosophy, literature, art and architecture. The proof of the possiblity of the existence of geometries other than Euclid's destroyed the notion that geometry offered *a priori* knowledge of the physical world, and with it was destroyed the notion of empirical mathematics. Lobachevskii's discovery represented "a revolution in the history of human thought as radical as the revolution begun by Copernicus".[10] In philosophy, the new geometries became the basis for challenges first to the concept of *a priori* space as developed in Kant's *Critique of Pure Reason*, and then to positivism. In physics, Lobachevskii's work paved the way for Einstein and his development of the Theory of Relativity.[11]

In essence, Lobachevskii proved that there is truth in the world that is impossible to be perceived by our senses. Thus, his theory is the mathematical proof of the existence of the imperceptible; even, perhaps, of the existence of mystery.

The Debates Between the Westernizers and the Slavophiles

In comparison to that of western Europe, nineteenth-century Russian philosophical and theoretical writing might be characterized as primarily intuitive and only secondarily as rational or systematic. The disciplinary boundaries separating philosophy, theology, mathematics and aesthetic theory were considerably less distinct in Russia than in the West, and Russian writing in these overlapping fields placed great emphasis on social questions. Nineteenth-century Russian philosophy, and the architectural theory which derived from it, addressed the most hotly-debated issues of the day: religion, revolution and the national character of the Russian people. This was part of a synthetic, holistic intellectual tradition that integrated philosophical, spiritual, artistic, mathematical, mystical, scientific and architectural ideas, which in the West would more likely only be considered within the confines of separate disciplines.[12]

In nineteenth-century philosophy, the debates centered around two basic approaches to finding solutions to social problems, those of the so-called Westernizers and Slavophiles. The Westernizers emphasized Russia's backwardness and the need to catch up with the West intellectually, socially, culturally and especially technologically. On the other hand, the Slavophiles focused on the values and virtues unique to Russian culture which they believed were not only Russia's greatest strength but could also save western Europe from the "rationalism" and "impersonalism" to which it was losing its very soul.[13]

Slavophile thought, based on Orthodoxy, did not consider "abstract logical capacity as the only organ for the comprehension of truth," to the exclusion of creative intuition and religious faith. The Slavophiles, unlike the Westernizers, embraced the non-rational modes of knowing truth – intuition, creativity and spiritual understanding – as equally valid and complimentary to rational thought.[14]

The Slavophiles formulated the philosophical concept of *sobornost'*, literally meaning conciliarism or ecumenicism, derived from *sobor*, the Russian word for council or assembly; *sobor* also means cathedral, the place of gathering together. In Russian philosophy, *sobornost'* refers to a communal or village-based approach to social organization, to an ideal of a free community united by bonds of love and common ideals, in which members retain both their social responsibility and their individuality. In short, Slavophile philosophy was "anti-rationalistic, anti-positivistic, and anti-materialistic."[15]

Vladimir Soloviev (1853-1900), "the most important Russian speculative thinker of the nineteenth century," took the Slavophile concepts of *sobornost'*, "integral knowledge" and *edinstvo* ("unity in diversity, multiplicity in one") to the next level. Soloviev called for the organic synthesis of theology, philosophy, experimental science and all branches of art as a step toward his goal of the human achievement of an "all-embracing unity of being itself." He believed that recognition of the interdependency of all forms of human cognition would lead to the non-fragmented mode of understanding that the Slavophiles called "integral knowledge".[16]

Nikolai Fedorov, Divine Consubstantiation and Cosmic Colonization

Attempts to synthesize the newest developments in mathematics and science with theology and art were characteristic of Russian philosophy at the end of the nineteenth century. Nikolai Fedorovich Fedorov (1828-1903) was one of the most significant thinkers of the period. His far-reaching circle of influence included Lev Tolstoi and Fedor Dostoevskii. He was a devoutly religious Moscow librarian with a reputation as a scholar, philosopher, mathematician and mystic. Although Fedorov may with justification be described as one of "the most formidable Russian thinker[s] of the nineteenth century",[17] his ideas, heavily suppressed in Russia during Stalinist times, have remained obscure in the West. His ideology, as published in *Filosofiia obshchago dela*[18] (The philosophy of the common task), was based on "a psychological theory of the evolution of man's humanity": that God's purpose in creating humankind was in order to bring about "the transformation of our mortal universe into an immortal cosmos".[19]

Leonid Pasternak wrote, "The name of Fyodorov (sic), hitherto unreknowned, became famous throughout Russia after his death . . . and there was not an educated man in the country who had not heard of him."[20] But with the suppression of religion in Soviet Russia in the 1920s, making written reference

to religious philosophers became more and more dangerous. Fedorov's influence may be seen in architectural projects of this time, as it may also be found in painting, theater, film and literature, but it occurs without any direct mention of his name and thus such reference is only discernable in the artistic content of the work.

If Fedorov's ideology was brilliant, it was also bizarre, integrating space travel with Orthodox theology and particle physics with the resurrection of the dead. Fedorov is described as "simultaneously and incompatibly the most original as well as the most absurd Russian thinker".[21] What cannot be denied is that his ideas had enormous influence on Russian intellectual life in the years between his death and the silencing of his followers by Stalin in the late 1920s.[22]

Fedorov believed that through the rationalization of science and its synthesis with Orthodox Christianity, mankind would achieve control over all natural forces and the conquest of the universe as well as consubstantiality with God. He reasoned that since death was a consequence of man's corruption, advances in knowledge, social practice and science would eventually eliminate all sources of evil, from bad weather to war. Man's spiritual and psychological transformation would then bring about physical transformation as well; furthermore, by scientific advances, by controlling and thus being able to recombine the atoms, we could resurrect our ancestors. This would overpopulate the earth, which would necessitate colonization of the planets. But, it would require violent change to get this process started. Many of Fedorov's followers interpreted the Revolution in 1917 and ensuing upheaval as the cataclysmic event initiating this process of cleansing transformation.[23]

Architecture was for Fedorov the "art-of-arts", since it was the art to synthesize theory and practice fully, furthermore "subsuming all arts and sciences in the pending human and cosmic transformation that would make man and the universe into a temple."[24] Fedorov equated death with horizontality and resurrection and life with verticality, ideas which would find direct application in architecture.[25] In addition to his influence on Nikolai Ladovskii, considered below, Fedorov made a direct mark on architecture through the work of Konstantin Melnikov.[26] The influence of Fedorov's ideology is particularly apparent in the glass sarcophagus Melnikov designed and built to display Lenin's preserved corpse while awaiting future resurrection. In his autobiography, Melnikov describes the sarcophagus as "a crystal in which Lenin lies, dreaming like the Sleeping Princess".[27]

GEOMETRY, MYSTICISM AND AVANT-GARDE PAINTING

The geometry of n-dimensions began to develop in the 1830s as an extension of analytical geometry.[28] The concept of the addition of a fourth dimension may more easily be conceived and described in abstract mathematical terms than it can be visualized. The formation of a "hypersolid" in "hyperspace" may be understood by analogy to two- and three-dimensional forms and rotations: in two-dimensional space (a plane), four segments of a line may be rotated around their common endpoints to form a square: in three-dimensional space, six coplanar squares may be rotated about common edge lines to form a cube; and thus, in four dimensions, eight cubes rotated around their common surface planes may be folded into a hypercube. As early as 1816, Lobachevskii had used similar language to describe the relationship between motion and space: "In order to pass from the extension of a small number of measurements to a higher number, the line results from the motion of a point, a surface from the motion of a line, and a body from the motion of a surface."[29]

It may also be useful to evoke the concept of movement in time, not literally as the fourth dimension but as a means of visualizing it: just as a three-dimensional object passing through a plane traces a succession of two-dimensional shapes on the plane for the period of time during which it is passing through the plane, a 4-D object passing through 3-D space would be visible as a volume changing over time – what the philosopher Pavel Florenskii would come to call a "superbody". These are concepts that held great fascination for many of the Russian avant-garde artists and architects.

PETR USPENSKII

Linda Henderson has coined the term "hyperspace philosophy"[30] to designate a type of popular philosophy which developed in the late nineteenth century and quickly spread throughout western Europe, North America and Russia, spurred by such fantasy stories as *Flatland* by E. A. Abbott (1884)[31] and *The Time Machine* by H. G. Wells (1895).[32] Hyperspace philosophers included the English mathematician Charles Howard Hinton, the American architect Claude Bragdon, and the Russian philosopher, mathematician and mystic Petr Demianovich Uspenskii. Petr Uspenskii blended a belief in the reality of four-dimensional space with spiritualism, mysticism and Theosophy, and, like the Slavophiles, opposed positivism and materialism in favor of the powers of intuition. Uspenskii preached that humankind's capacity for "higher inner knowledge" and thus for spiritual self-transformation could lead from the "three dimensions of space" through the "three dimensions in time" into the "seventh dimension of the pure imagination." Like Soloviev, Uspenskii preached that the new consciousness would first reveal itself in works of art.[33] This mode of thought, linking through art the "scientific" rationalism of the new geometries and the "intuitive" powers of spiritualism, is an important key to understanding the evolution, out of the Russian intellectual tradition of "integral knowledge", of the theories and creative activities of the Russian avant-garde.[34]

Uspenskii believed, as did Fedorov, that by cultivating inner consciousness through knowledge, a person could attain a higher psychological life, or achieve a higher level of intuition. For Uspenskii, this state of unifying "cosmic consciousness" existed in a higher dimensional space. Furthermore, before such higher consciousness could be achieved, Uspenskii, much like Fedorov, believed that it was first necessary to clear away the chaos of the old world, to prepare for the new way by cleaning the slate.

PAVEL FLORENSKII AND IMAGINARY SPACE

Pavel Florenskii was a major thinker in scientific and artistic circles in Russia in the early 20th century, although it is only recently that his name has become known in the West, outside of Russian-émigré theological circles. He was born in 1882 in Azerbaijan; he died in 1937, executed in one of Stalin's prison camps. He was a mathematician and philosopher, a physicist and mystic, an art historian and an Orthodox priest. Most importantly for our purposes, he also taught at the VKhUTEMAS, where he held the positions Professor of Perspective and Professor of the Analysis of Space. In these capacities, he was in contact with and had considerable influence on a number of the most important writers, artists and architects of his time.[35]

Florenskii's philosophy was rooted in the tradition of Vladimir Soloviev and the Slavophile concept of *sobornost'*. His dream was to create a system of metalogic having a similar relation to ordinary logic as non-Euclidean has to Euclidean geometry. Such a metalogic would be based on the negation of certain axioms of Aristotelian logic, according to the method of "pangeometry" derived by Nikolai Lobachevskii to disprove Euclid's parallel postulate. This metalogic, Florenskii believed, would lead to a new, non-positivist science, in the spirit of Soloviev's integral knowledge.[36]

Florenskii believed in the synthesis of science and revelation, the multi-dimensionality of time in the space-time continuum, and mathematics as the basis for a new cosmological worldview. He was facinated by thermodynamics and the many invisible manifestations of energy. In his book *Ikonostas*,[37] Florenskii demonstrated how art was the means by which the invisible spiritual world all around us could be made visible, through the agency of artists as messengers of God. The iconostasis served as a window through which humanity could experience the spiritual world: the icons allowed us to "see" God. Florenskii had a utopian faith in the capacity of the creative spirit, of pure artistic energy, to create a new way of life for humankind.

Beginning in 1921, Florenskii taught courses on perspective and the analysis of space at the VKhUTEMAS, where his close friend and collaborator, the painter and graphic artist Vladimir Favorskii, was Rector from 1923-26.[38] Despite the government policy of aetheism, Florenskii defied the official ban on religion and continued to wear his priest's cassock, even while teaching his classes. As the poet Vladimir Maiakovskii wrote, "Vo VKhUTEMASe – / Florenskii v riase" (In the halls of the VKhUTEMAS – / Florenskii is wearing a cassock). As a result of his refusal to stop this practice, after 1924 Florenskii's courses were cancelled.[39]

Analiz prostranstvennosti i vremeni v khudozhestvenno-izobrazitel'nykh proizvedeniiakh (Analysis of space and time in the fine arts) was Florenskii's transcription of the lectures he delivered at the VKhUTEMAS in 1921-23.[40] In his lectures and in this book, he outlines the importance of the concept of the fourth dimension in the synthesis of art, mathematics and religion in imaginary (spiritual) space. The following quotations are translated from this source:

> Time is the fourth coordinate, or fourth measure of reality. It is clear that this fourth dimension should not completely disappear in works of fine art. (...)[41]

> We speak about the bodiliness, or three-dimensionality, of everything in the world, and we negate the physical reality of things of only one or two dimensions. Objects with only one or two dimensions we consider abstractions. This is exactly the same for the fourth dimension, time. Any real object has a duration, large or small, in time; it must have this fourth dimension in order to exist. Any object that has zero duration, zero dimension in time, is an abstraction and cannot be considered a part of reality. Besides the impossibility of perceiving such an object in reality, it cannot be perceived in theory because the processes of thinking – real thinking – also flow in time. The processes of thinking themselves have duration in time and a sequence of elements. All understanding happens only in the space of time. (...)[42]

> In this way, any part of reality, even in a pure physical sense, has its *thickness in time*, and it cannot be discussed as having only three dimensions. (...) This is even more powerful if we consider the physiological, psycho-physiological and psychological sides of reality perceived in genuine experience. (...) Thus reality should be understood in all its parts and separate components as four dimensional.[43]

Trying to understand the wholeness of reality from the perception of fragments is "like trying to understand the human body from a section of a frozen corpse".[44] This applies to a section in time as well:

> So, any reality lies in the dimension of time no less than it lies in each of the three dimensions of space. Any example of reality, if it is perceived in reality, has its line of time. (...) In other words, every real form (*obraz*) has four dimensions and is, if we are speaking of it as a whole, some

form of a four-dimensional geometry, in other words, it is not a body but a super-body.[45]

When the artist takes this into account, "the activity of art is working for the condensation or thickening of space and time."[46]

Florenskii argues that there is not just a single time-dimension. Just as Lobachevskii had shown that curving the plane in space gives us the possibility of many planar geometries, of which Euclidean geometry was but one example and Lobachevskii's imaginary geometry another, of many possible others, so Florenskii believed that there are many possible time coordinate systems into which space may be found to curve. Energy fields are what provide the tension to bring this curvature into effect. Florenskii likened the divine, spiritual, imaginary world of art to the space of the square root of negative one and four-dimensional space. He was, prophetically, conceptualizing twenty-first century virtual space in the 1920s.[47]

CONCLUSION

If we recognize that it was in the context of these many rich ideas that the Russian avant-garde artists and architects were creating their work, then we can begin to see that work in a new light. The dynamism for which the compositions of the Russian avant-garde is reknowned is in many cases a manifestation of serious investigations into the means of representing n-dimensional space in art and architecture and a search for visual/spatial means of representing the synthesis of the mathematical and the spiritual in pursuit of a higher cause. Art would serve to bring about a social (*not* a socialist) revolution. This is a point of great confusion in Western architectural interpretations of the work of the Russian "Rationalist" avant-garde.

NOTES

[1] Mary Field Belenky, *Women's ways of knowing : the development of self, voice, and mind* (New York: Basic Books, 1986).

[2] In this dissertation, the term "Western" is applied broadly to refer to Western European/Anglo-American culture, in order to form a contrast with comparable aspects of Russian/Eastern European culture.

[3] See "The Slavophiles" (Ivan Kireevsky and Aleksei Khomiakov) in James M. Edie, James P. Scanlan, and Mary-Barbara Zeldin, eds., *Russian philosophy* (Knoxville: University of Tennessee Press, 1976), 157-269.

[4] Building Arts Forum/New York, *Bridging the gap : rethinking the relationship of architect and engineer : the proceedings of the Building Arts Forum/New York Symposium, held in April of 1989 at the Guggenheim Museum* (New York: Van Nostrand Reinhold, 1991); Eugene S. Ferguson, *Engineering and the mind's eye* (Cambridge, Mass.: MIT Press, 1992).

[5] See, for example, Elena Sidorina, *Skvoz' ves' dvadtsatyi vek : khudozhestvenno-proektnye kontseptsii russkogo avangarda* (Moscow: Informatsionno-izdatel'skoe agentstvo Russkii mir, 1994).

[6] Much of the material in this paper is adapted from portions of the author's PhD dissertation: Elizabeth Cooper English, "*Arkhitektura I mnimosti*: The Origins of Soviet Avant-Garde Rationalist Architecture in the Russian Mystical-Philosophical and Mathematical Intellectual Tradition." PhD Dissertation, University of Pennsylvania, 2000. The dissertation is extensively illustrated.

[7] Loren R. Graham, *Science in Russia and the Soviet Union : a short history* (Cambridge: Cambridge University Press, 1993), 42, see also pp. 10-45; Rudolf v. B. Rucker, *Geometry, relativity, and the fourth dimension* (New York: Dover Publications, 1977), 20.

[8] C. Duffy, "Nicholas Ivanovich Lobachevsky," in *In memoriam N. I. Lobatchevskii = Pamiati Lobachevskogo posviashchaetsia*, ed. A. P. Shirokov (Kazan: Izd-vo Kazanskogo universiteta, 1995), 3:2:151. This is the third of three volumes of collected essays commemorating the work of Nikolai Lobachevskii to be published by the University of Kazan. All three volumes bear the same title. The first appeared in 1897 and volume 2 was published in 1927.

[9] Linda Dalrymple Henderson, *The fourth dimension and non-Euclidean geometry in modern art* (Princeton, N.J.: Princeton University Press, 1983); V. F. Kagan, *N. Lobachersky and his contribution to science* (Moscow: Foreign Languages Pub. House, 1957); N. A. Litsis, *Filosofskoe i nauchnoe znachenie idei N.I. Lobachevskogo* (Riga: Zinatne, 1976); P. A. Shirokov and I. N. Bronshtein, *A sketch of the fundamentals of Lobachevskian geometry*, trans. Leo F. Boron (Groningen: P. Noordhoff, 1964); A. S. Smogorzhevskii, *Lobachevskian geometry*, trans. V. Kisin (Moscow: Mir, 1982); A. V. Vasil'ev, *Nikolai Ivanovich Lobachevskii. 1792-1856* (Moscow: Nauka, 1992).

[10] David Abbott, ed. *The biographical dictionary of scientists : Mathematicians* (London: Blond Educational, 1985), 89.

[11] Kagan, 83-85; Henderson, 4-5, 11-17, 25; Rucker, 21.

[12] Christopher Read, *Religion, revolution, and the Russian intelligentsia, 1900-1912 : the Vekhi debate and its intellectual background* (London: MacMillan Press, 1979), 8; Bernice Glatzer Rosenthal, "Lofty Ideals and Worldly Consequences: Visions of *Sobornost'* in Early Twentieth-Century Russia," *Russian History* 20, no. 1-4 (1993): 179-95; Robert Slesinski, "Russian Philosophical Thought as a Search for Integral Knowledge," *Transactions of the Association of Russian-American Scholars in the U.S.A.* 25 (1992-93): 21-35.

[13] James M. Edie, James P. Scanlan, and Mary-Barbara Zeldin, eds., *Russian philosophy* (Knoxville: University of Tennessee Press, 1976), 1:160-61.

[14] Edie, 1:185-86, 198-99; Judith Deutsch Kornblatt and Richard F. Gustafson, "Introduction," in *Russian religious thought*, ed. Judith Deutsch Kornblatt and Richard F. Gustafson (Madison, Wis.: University of Wisconsin Press, 1996), 7-8.

[15] Edie, 1:161-62; Slesinski, 27-28.

[16] George L. Kline, "Russian Religious Thought," in *Nineteenth century religious thought in the West*, ed. Ninian Smart (Cambridge: Cambridge University Press, 1985), 2:208-10.

[17] Stephen Lukashevich, *N. F. Fedorov (1828-1903) : a study in Russian eupsychian and utopian thought* (Newark: University of Delaware Press, 1977), 13.

[18] Nikolai Fedorov, *Filosofiia obshchago dela*, vol.I (Verny, 1906), vol II (Moscow, 1913).

[19] Lukashevich, 13.

[20] Leonid Osipovich Pasternak, *The memoirs of Leonid Pasternak* (London: Quartet, 1982), 106.

[21] Lukashevich, 33.

[22] Charlotte Douglas, "Beyond Reason: Malevich, Matiushin and Their Circles," in *The spiritual in art : abstract painting 1890-1985*, ed. Maurice Tuchman and Judi Freeman (New York: Abbeville Press, 1986); Michael Hagemeister, *Nikolaj Fedorov : Studien zu Leben, Werk und Wirkung* (Munich: Sagner, 1989); Michael Hagemeister, "Russian Cosmism in the 1920s and Today," in Rosenthal, ed., 190; Michael Holquist, "Tsiolkovsky as a Moment in the Prehistory of the Avant-Garde," in *Laboratory of dreams : the Russian avant-garde and cultural experiment*, ed. John E. Bowlt and Olga Matich (Stanford, Calif.: Stanford University Press, 1996); Lukashevich, 28; Irene Masing-Delic, "The Transfiguration of Cannibals: Fedorov and the Avant-Garde," in Bowlt and Matich, eds.; Bernice Glatzer Rosenthal, "Introduction," in *The occult in Russian and Soviet culture*, ed. Bernice Glatzer Rosenthal (Ithaca, N.Y.:

Cornell University Press, 1997); James P. Scanlan, "The Nineteenth Century Revisited," in *Russian thought after communism : the recovery of a philosophical heritage*, ed. James P. Scanlan (Armonk, N.Y.: M.E. Sharpe, 1994), 26; Richard Stites, *Revolutionary dreams : utopian vision and experimental life in the Russian revolution* (New York: Oxford University Press, 1989), 169-70; George M. Young, Jr., *Nikolai F. Fedorov, an introduction* (Belmont, Mass.: Nordland Pub. Co., 1979); George M. Young, Jr., "Fedorov's Transformations of the Occult," in Rosenthal, ed.

[23] Elisabeth Koutaissoff, "Introduction," in N. F. Fedorov, *What was man created for? : the philosophy of the common task : selected works*, trans. Elisabeth Koutaissoff and Marilyn Minto (London: Honeyglen, 1990), 11-13, 25; George M. Young, Jr., "Toward the New Millennium: Ideas of Resurrection in Fedorov and Solov'ev," in Scanlan, ed., 62-71.

[24] Masing-Delic, 25.

[25] Fedorov, *Filosofiia*, 2:260.

[26] Starr, 245-56; S. Frederick Starr, "Meetings with Melnikov, 1967" (unpublished manuscript, courtesy of the author, 1999), 8.

[27] Konstantin Stepanovich Mel'nikov, *Konstantin Stepanovich Mel'nikov : Mir khudozhnika : arkhitektura moei zhizni, tvorcheskaia kontseptsiia, tvorcheskaia praktika*, ed. A. A. Strigalev and I. V. Kokkinaki (Moscow: Iskusstvo, 1985), 157-58; Hagemeister, "Russian Cosmism," 108-9; Stites, 120, 170; Nina Tumarkin, *Lenin lives! : the Lenin cult in Soviet Russia* (Cambridge, Mass.: Harvard University Press, 1983), 179-82. See Figure 6.1. The Sleeping Princess of Russian folktale is similar to the English/German folktale heroine Snow White; not the Sleeping Beauty, as has sometimes been assumed in error.

[28] Linda Dalrymple Henderson, *The fourth dimension and non-Euclidean geometry in modern art* (Princeton, N.J.: Princeton University Press, 1983), 6-7.

[29] As quoted in C. Duffy, "Nicholas Ivanovich Lobachevsky," in *In memoriam N. I. Lobatchevskii = Pamiati Lobachevskogo posviashchaetsia*, ed. A. P. Shirokov (Kazan: Izd-vo Kazanskogo universiteta, 1995), 152. See Chapter 1, note 3. This quotation comes from a student notebook of transcriptions of Lobachevskii's course lectures, discovered posthumously among his papers and first published in 1909.

[30] Henderson, 25.

[31] Edwin A. Abbott, *Flatland : a romance of many dimensions* (London: Seeley, 1884).

[32] H. G. Wells, *The time machine, an invention* (New York: H. Holt and Company, 1895).

[33] Charlotte Douglas, *Swans of other worlds : Kazimir Malevich and the origins of abstraction in Russia* (Ann Arbor, Mich.: UMI Research Press, 1980), 30.

[34] See discussions of Russian cosmism in Michael Hagemeister, "Russian Cosmism in the 1920s and Today," in *The occult in Russian and Soviet culture*, ed. Bernice Glatzer Rosenthal (Ithaca, N.Y.: Cornell University Press, 1997); and James P. Scanlan, ed. *Russian thought after communism : the recovery of a philosophical heritage* (Armonk, N.Y.: M.E. Sharpe, 1994).

[35] P. A. Florenskii, *Analiz prostranstvennosti i vremeni v khudozhestvenno-izobrazitel'nykh proizvedeniiakh*, ed. M. S. Trubacheva and O. I. Genisaretskii (Moscow: Izdatel'skaia gruppa Progress, 1993); V. V. Bychkov, *The aesthetic face of being : theology of Pavel Florensky* (Crestwood, N.Y.: St. Vladimir's Seminary Press, 1993); N. O. Losskii, *History of Russian philosophy* (New York: International Universities Press, 1951), 176-91.

[36] Leonid Sabaneeff, "Pavel Florensky – Priest, Scientist, and Mystic," *Russian Review* 20 (1961): 320; Robert Slesinski, *Pavel Florensky : a metaphysics of love* (Crestwood, N.Y.: St. Vladimir's Seminary Press, 1984), 51; Bernice Glatzer Rosenthal, "Lofty Ideals and Worldly Consequences: Visions of *Sobornost'* in Early Twentieth-Century Russia," *Russian History* 20, no. 1-4 (1993): 179-95; Bernice Glatzer Rosenthal, "The 'New Religious Consciousness': Pavel Florenskii's path to a revitalized Orthodoxy," in *Russian culture in modern times*, ed. Robert P. Hughes and Irina Paperno (Berkeley: University of California Press, 1994), 134-57; Judith Deutsch Kornblatt and Richard F. Gustafson, eds., *Russian religious thought* (Madison, Wis.: University of Wisconsin Press, 1996).

[37] P. A. Florenskii, *Ikonostas* (Moscow: Iskusstvo, 1994); publ. in English as: Pavel A. Florensky, *Iconostasis*, trans. Donald Sheehan and Olga Andrejev (Crestwood, NY: St. Vladimir's Seminary Press, 1996).

[38] Catherine Cooke, *Russian avant-garde : theories of art, architecture, and the city* (London: Academy Editions, 1995), 173.

[39] V. V. Gorbunov and Iurii Markovich Nagibin, *Ideia sobornosti v russkoi religioznoi filosofii : piat' izbrannykh portretov* (Moscow: Feniks, 1994), 59.

[40] Michael Hagemeister, "P. A. Florenskij und seine Schrift *Mnimosti v geometrii* (1922)," in Florenskii, *Mnimosti*, 41-42.

[41] Florenskii, *Analiz*, 184. All translations from this source are by the author, with the assistance of Tamara Orzhekhovsky.

[42] Ibid., 189-90.

[43] Ibid., 192-93.

[44] Ibid., 194.

[45] Ibid., 195.

[46] Ibid., 224.

[47] Aleksandr Solzhenitsyn said of Florenskii that he anticipated the development of cybernetics, in Aleksandr Isaevich Solzhenit'syn, *Arkhipelag GULAG, 1918-1956 : opyt khudozhestvennogo issledovaniia* (Moscow: Sov. pisatel', Novyi mir, 1989); see also Aleksandr Isaevich Solzhenitsyn, *The Gulag Archipelago, 1918-1956 : an experiment in literary investigation*, trans. Thomas P. Whitney, 7 vols. (New York: Harper & Row, 1974), 671, 682.