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Research article

Avantgarde Machines: On the Integration of Technology and Art

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Abstract

The article proposes a theoretical conceptualization of an epistemological shift within avant-garde culture, wherein machine attains the status of not merely a theme, but a fundamental principle of artistic language. The methodological framework of the study is an original three-level model that reconstructs the logic of technology's transformation from an object of representation into a subject of form-creation and, ultimately, into a cognitive matrix. The level of “Technology-as-Muse” foregrounds the process of thematization and poeticization of the machine world, where technology functions as a new iconographic resource and a source of affective energy (e.g., Alexander Labas, Dziga Vertov). The level of “Technology-as-Co-author” reveals a paradigm of hybrid authorship, in which stage and pictorial constructions act as agents that actively constitute the aesthetic experience and impose upon the work an immanent logic of material and procedure (e.g., Vsevolod Meyerhold, Lyubov Popova, Sergei Eisenstein). At the level of “Technology-as-Model-of-Thought,” art transitions into onto-technical design, interiorizing engineering rationality as the basis of the creative act; artistic production converges with social engineering (e.g., Alexei Gastev) and biocosmic utopias, and the artwork is conceptualized as an operational protocol or blueprint for a new reality (e.g., Pavel Filonov, the ballet *The Steel Step*). The article demonstrates that the proposed model describes not a chronological sequence, but a logic of increasing complexity in the ways technical rationality is integrated into artistic consciousness, the result of which was a change in the ontological status of the artwork – from representing the world to actively constructing it.

Keywords: Technology, Avant-garde, Artistic language, Theater, Constructivism, Industrialization, Biomechanics, Language

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Научная статья

Машины авангарда: Об интеграции технологий и искусства

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Аннотация

Статья предлагает теоретическое осмысление гносеологического сдвига в культуре авангарда, где техника обретает статус не просто темы, но фундаментального принципа художественного языка. Методологической основой исследования служит оригинальная трехуровневая модель, реконструирующая логику трансформации техники из объекта репрезентации в субъект формообразования и, наконец, в когнитивную матрицу. На уровне “Техника-муза” анализируется процесс тематизации и поэтизации машинного мира, где техника функционирует как новый иконографический ресурс и источник аффективной энергии (А. Лабас, Д. Вертов). Уровень “Техника-соавтор” раскрывает парадигму гибридного авторства, при которой сценические и живописные конструкции выступают как агенты, активно конституирующие эстетический опыт и навязывающие произведению имманентную логику материала и процедуры (В. Мейерхольд, Л. Попова, С. Эйзенштейн). На уровне “Техника-модель мышления” искусство совершает переход к онтотехническому проектированию, интериоризируя инженерную рациональность как основу творческого акта; художественное производство сближается с социальной инженерией (А. Гастев) и биокосмическими утопиями, а произведение осмысливается как действующий протокол или чертеж новой реальности (что можно увидеть, например, в произведениях П. Филонов, или балете “Стальной скок”). Демонстрируется, что предложенная модель описывает не хронологическую последовательность, а логику усложнения способов интеграции технической рациональности в художественное сознание, результатом чего стало изменение онтологического статуса произведения искусства – от изображения мира к его активному конструированию.

Ключевые слова: Техника, Авангард, Художественный язык, Театр, Конструктивизм, Индустриализация, Биомеханика, Язык

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INTRODUCTION

Technological development throughout human history has consistently served as a powerful engine of civilizational and cultural progress, determining the trajectory of societal evolution. Each stage of technological advancement opened new horizons, and the creation of even the most primitive tools steadily elevated humanity to a qualitatively new level of civilizational and cultural formation. This process undeniably demonstrated the connection between technical achievements and spiritual development. In the ancient Greek philosophical tradition, the polysemous concept of *techné* represented a universal category that organically encompassed science, artistic creation, various artisanal skills, and technological processes. The ancient Greeks did not draw clear boundaries between these spheres of activity, viewing them as a unified whole within the framework of human mastery and creative agency. Such a syncretic approach testified to an understanding of the intrinsic unity of the technical and spiritual principles in human activity. During the Renaissance, this unity found new embodiment: artists displayed exceptional interest in mechanical devices and technical innovations, often acting as inventors and creators of revolutionary technological advancements. Leonardo da Vinci, Filippo Brunelleschi, and other outstanding masters of the era demonstrated that the boundary between artistic creativity and technical invention could be highly conditional. Their creative work convincingly showed that technical thinking could stimulate artistic imagination and vice versa.

Although technology is traditionally perceived as belonging to the sphere of means rather than the ultimate ends of human existence, for a genuine creator and researcher, it can fully transform into a primary life goal and vocation: “In this case, technology, as knowledge and invention, acquires a spiritual significance and relates to the spiritual life” (Berdyayev, 2023, p. 6). This process of sacralizing technical activity opens fundamentally new perspectives for understanding technology's role in human culture. However, traditionally, mechanical devices and industrial technologies belonged primarily to the sphere of material culture, which inevitably generated a persistent opposition between machine and spiritual cultural spheres. With the rapid development of scientific and technological progress and the intensification of industrial processes, this fundamental contradiction between the material and the spiritual has not only failed to find an adequate resolution but, on the contrary, has acquired an increasingly acute and dramatic character. Technological self-admiration and the cult of the machine, actively formed against the backdrop of the era's impressive technical achievements: Large-scale projects such as the construction of extensive tunnels, the erection of tall industrial stacks and chimneys, the building of giant oil reservoirs, the creation of branched electrical networks, the laying of transatlantic telephone lines, the revolutionary introduction of conveyor belt technologies, and the production of new stainless metal alloys – all this gradually shaped a fundamentally new conception. According to this new world view it was precisely the machine industry and industrial technologies that should determine the fundamental modes of human perception of reality and the nature of thought processes.



The early 20th century became a period of profound transformation in artistic culture, driven by the intensive development of technology and the large-scale industrialization of public life. This era witnessed the formation of a fundamentally new sociocultural situation linked to the active process of technologization in all spheres of human activity. This stage marks the emergence of a distinct aesthetic paradigm within which technology is reinterpreted as a powerful source of creative inspiration. Technological progress not only altered the material conditions of existence but also gave rise to qualitatively new forms of artistic perception of reality. Machine production, transportation, communication means, and other technological achievements became catalysts for radical transformations in the system of art. Thus, it can be argued that technology acquired the status of a "muse," defining the main directions of creative exploration. This complex and multifaceted process of interaction between technology and art constitutes one of the most significant chapters in cultural history.

The manifestations of this phenomenon were diverse: from the direct depiction of machines and industrial objects to the abstract embodiment of technical design principles. In painting, this was expressed through dynamic compositions conveying movement and speed; in sculpture, through the use of industrial materials and constructive principles; in architecture, through functionalism and the application of new construction technologies. Technology became not only a subject of depiction but also a method of creativity, determining new ways of artistic thinking and expression. In Russia, this process proved especially vivid in the work of representatives of various avant-garde movements. Futurists, Constructivists, and Suprematists created an entire aesthetic system based on a machine civilization. Vladimir Mayakovsky glorified the "beauty of speed" and mechanical rhythms, Alexander Rodchenko developed the principles of productivity for art, and Kazimir Malevich sought reflections of industrial logic in geometric forms. Constructivist architects Moisei Ginzburg and the Vesnin brothers designed buildings resembling machines, while director Vsevolod Meyerhold created theatrical performances imitating factory processes. Simultaneously, similar trends developed in Western Europe. Italian Futurists, led by Filippo Tommaso Marinetti, proclaimed the "beauty of speed" and declared war on traditional art in the name of industrial aesthetics. Umberto Boccioni and Giacomo Balla sought to convey the dynamics of automobiles and airplanes in their paintings. French Cubists Fernand Léger and Robert Delaunay found new compositional principles in machine forms. And then there is the key figure of Vladimir Tatlin whose work became one of the most convincing paradigms of embodying the idea of technology as a "muse" of art in early 20th-century Russia. Tatlin consistently reoriented art from representation to construction, turning artistic practice into an experimental laboratory of materials, loads, joints, and functional dependencies. His counter-reliefs of 1914–1915 are neither paintings nor sculptures in the classical sense, but open assemblies of wood, metal, glass, and wire, where aesthetic form emerges from the properties of the material and the method of fastening, from the logic of weight and tension, from real technical relationships. Thereby, Tatlin formulated the principle of "material, texture, construction" as the new poetics of the industrial age, in which beauty is derived from the law of a thing's function, not from its external appearance. The culmination of this was the "Monument to the Third International" (Tatlin's Tower), a



grand project synthesizing engineering, architecture, and symbolic politics. In this design, technology does not merely illustrate an idea but forms its very body: The structure dictates the image, kinematics dictate time, and infrastructure dictates the form of publicity. Tatlin thereby redefined the very genre of the monument: from static memory to the dynamic organization of modernity, from a monument-for-contemplation to a monument-for-function. No less indicative is Tatlin's "Letatlin" flying apparatus. These devices, regardless of their practical feasibility, demonstrate a shift in artistic thinking towards a mode of experimental design research, where technology acts simultaneously as method, subject, and inspiration (Punanova, 2017).

The process of technology acquiring the status of a muse was a historically limited phenomenon. After the 1930s, technology gradually lost its romantic appeal, becoming an ordinary element of everyday life. Subsequent artistic movements no longer demonstrated such unequivocal admiration for machine aesthetics, preferring a more critical or ironic approach to technological reality.

OVERVIEW – THREE MODES OF TECHNICAL INSPIRATION

Technology in early 20th-century art can be considered in three qualitatively distinct modes of technical inspiration, each corresponding to a specific level of its conceptualization. This three-level structure is not a simple historical sequence but represents a logically determined system of increasing complexity, in which technology successively transforms from an external object into an internal template of thinking.

First level: “Technology-as-Muse.” In its most elementary form, technology acts as a muse in the classical sense of the word, i.e., a source of inspiration and a subject of artistic reproduction. Here, the traditional logic of representation is at work, where the machine, infrastructure, or industrial process becomes a new iconography, expanding the thematic repertoire of art. The artist remains in the role of observer and interpreter, and technology retains the status of an external phenomenon subject to aesthetic assimilation through conventional procedures. Philosophically, this level corresponds to understanding technology as a set of artifacts that can be included in aesthetic experience without transforming its structure. Here, technology is conceived as an extension of the natural world in its new, anthropogenic form, and thus does not require a radical revision of the artistic method.

Second level: “Technology-as-Co-author.” The mechanism becomes more complex when technology ceases to be merely an object of depiction and becomes an active participant in the creative act, moreover, on the level of an equal co-author. At this level, art is created “hand in hand” with technical means, which are not simply used by the artist but also determine the logic of form-making, “impose” their procedures and limitations, and introduce an element of automatism and objectivity into the inherently subjective creative process. This is a view of technology as a partner in creativity. It translates the concept into reality, but also leaves its own mark on it, operating by its own rules. The aesthetic effect arises from the very dialogue, from the collision of human imagination and machine logic.



Third level: “Technology-as-Model-of-Thought.” The most complex and philosophically significant manifestation of the technical muse is associated with the situation where the artist begins to think according to the pattern of a machine, that is, adopts technical rationality as a norm for organizing their own creative activity and even bodily existence. The essence of this level is that technical logic is internalized so deeply that it becomes an integral part of consciousness itself.

TECHNOLOGY-AS-MUSE

At the first and most basic level, technology acts as a “muse,” demonstrating the thematic and emotional concentration of the technical world, where machines and infrastructures become a source of inspiration, a symbolic resource, and the conceptual center of both pictorial and theatrical experience. Alexander Labas is a prime example of an artist inspired by technologization; he experienced the industrial modernization of the USSR as a personal event and as a cultural horizon in which technology figures as the hero or protagonist of the era and an object of poetic admiration, not merely a subject of observation. This is confirmed not only by his artistic and theatrical works but also by his memoirs. In his paintings of the 1920s–1930s, motifs of trains, airships, airplanes, railway stations, and escalators define the thematic focus and emotional register of the works. They form a romantic optics of the technical age where the functionality of machines is intuitively experienced as the beauty of movement, the smoothness of inertia, and the clarity of constructive forces. Compositional solutions are based on the personal experience of observing technology, they transform the line of a path, the axis of flight, and the scale relationships of masses into a register of kinetic attention. However, at this first level, this kinetics primarily aestheticizes the technical object as a source of delight and symbolic energy, without transforming into an actual technical protocol. In “The First Soviet Airship,” the technical marvel-object is presented as an animated form that reorganizes the space and time of urban life, while the painterly, “watercolor” transparency and vibration of light enhance the sensation of hovering and flight, turning an engineering hull into a lyrical sign of a new civilization. In this sense, Labas's works establish a paradigm of technology as an inspirer and object of artistic thinking. Furthermore, technological development served as an enduring muse and object of admiration for the artist Olga Rozanova (Uspenskiy, 2021). The technological world proves to have thematic and emotional dominance in her work, despite shifts in genre and stylistic strategies. In her early urban compositions, connected with motifs of streets, embankments, and industrial landscapes, technology manifests as the rhythm of traffic and light flows, creating a sense of a mechanized environment and the everyday life of machine civilization.

In Rozanova’s *Metronome* (see figure 1) the figure of the measuring device transforms into a visual equivalent of modernity's standardized tempo, establishing rhythmic sensibility as a cultural norm. In *Composition with a Train*, the railway motif functions as a source of directed energy: the lines of the track, plumes of smoke, and the mass of the carriage coalesce into a configuration that renders the industrial subject a visual machine of acceleration and long-distance transfer. In *Work Box and Writing Desk*,



utilitarian objects of modern life emerge as elements of a daily ontology of technology where the clarity of volume and distinct planar relationships convey an ethic of rational organization of labor, attention, and space. In *Factory and Bridge*, the engineering landscape acts as a model of collective force: trusses, spans, and diagonals of smoke structure the image like a schematic of loads and the distribution of forces. *Flight of an Aeroplane* (figure 1) focuses on the philosophical theme of technology as an inspiring principle: the idea of flight is translated into an arrangement of planes and saturated color relationships that create a sensation of acceleration and smooth inertia without direct figuration. In this context, color acts as a meaning-generating engine, transforming the technical subject into autonomous painterly energy while preserving the affective charge of admiration for engineering beauty and its spatio-temporal effects. Throughout Rozanova's *oeuvre*, technology becomes a source of poetic energy, transitioning from her early engagement with collage and Cubo-Futurist experiments to Suprematist compositions, all the while maintaining an emotional charge of admiration for the speed and constructive clarity of engineering forms.



Figure 1. *Flight of an Aeroplane* (1916) and *Metronome* (1915) by Olga Rozanova.

Dziga Vertov's film *Enthusiasm: Symphony of the Donbas* represents the first level of the structure, where technology appears as a muse, an inspirer, and an object of poetic admiration, becoming the central theme, symbolic resource, and source of the work's emotional energy. The film is organized as a hymn to industrialization, in which machines, aggregates, mines, factory conveyors, and radio transmitters become the protagonists of the narrative and emblems of the new age. It consolidates a collective feeling of historical ascent and faith in the transformative power of technology. The



technical world here is primarily thematized and aestheticized: it provides the content of the shots, the imagery, and the key metaphors, forming a rhetoric of a celebration of labor. The compositional idea of a triptych and the sequence of blocks dedicated to replacing the “old” with the “new,” the circulation of machine energy, and the expansion of the industrial rhythm into the countryside support an interpretation of technology as a positive force and a cultural mission of renewal. Visual slogans and a poster-like tone enhance the pathos of choosing modernity. The sound work, based on industrial noises, sirens, and whistles, emphasizes the theme of the “music of machines,” but functions primarily as a thematic extension of the image of technology and a source of emotional intonation, rather than as an autonomous logic of a technical protocol constituting the very method of form generation. Technology inspires, structures the thematic material, and forms the emotional register of the work, remaining an object of artistic admiration and a cultural ideal of progress without full integration into the media-technical ontology of form itself.

The opera *Victory over the Sun* represents a borderline case between the first and second levels: technology acts as a hero and symbol of the new order, inspiring the work, while simultaneously becoming a principle for organizing stage space and actor corporeality through geometricized décor and mechanomorphic costumes. The opera constructs a myth about the “victory of the advanced technology of the future over the old nature,” where the capture and “wrenching out” of the sun metaphorizes the replacement of natural light with artificial, electric light, and consequently, affirms the shift from a cosmic to a technogenic order, elevating machines and engineering power to the status of a positive hero of the era and a cultural ideal of renewal. This thematic layer constructs technology as an object of admiration and a source of emotional energy, supported by the scandalous, poster-utopian rhetoric of the production and the public's reaction to the provocation of the “new” against the “old.” At the same time, Kazimir Malevich's scenography, with large planes of triangles and circles incorporating machine elements and the relief contours of technical forms, translates technology into a logic of form-making, where geometry becomes an “operator” of composition, not just a theme. The borderline status of *Victory over the Sun* consists in this duality of glorifying technology as a protagonist and introducing technical logic into the very fabric of the performance (Punanova, 2017).

TECHNOLOGY-AS-CO-AUTHOR

The synthetic nature of the interaction between technology and artistic creativity is particularly evident within the performative arts where technical and aesthetic discourses form a unified semantic field, transmitting fundamentally new semantic configurations to the audience. The language of art and the language of technology create a unified whole, making it possible to convey meanings inherent to technologies, creating hand in hand.

Characteristic for the turn of the 19th–20th centuries were audience expectations of technical wonders from theatrical performances. For instance, as noted by I. F. Petrovskaya, the public at performances in St. Petersburg gardens expected primarily unusual machine effects and spectacular solutions (Petrovskaya, 1979, p. 139). Meeting these expectations, technology could truly play a leading role only in a theatrical space



where mechanics and light began to determine the rhythm and form of the action, creating a special dramaturgy of space.

A telling example in this regard is the play *Mr. Mogridge Jr.* staged in 1924 by the young Nikolai Akimov. The artist built a large-scale three-dimensional construction on stage, the central element of which was a high platform raised three meters above the stage, with staircases, an inclined slide, and a massive ship's funnel. A revolving turntable incorporated into the set, with sharply outlined contrasting openings, originally organized the dynamics of the performance and gave it a cinematic speed of scene change. As the critic Nikolai Petrov noted, the spatial solution of the stage and the system for changing scenes predetermined the form of the action, turning it into a sequence “developing with cinematic rapidity” (Petrov, 1927, pp. 30–31). Here, the set no longer served as a background but became a mechanism dictating the dynamics of the performance's world.

An even more radical technological rethinking of the stage occurs in theaters under the direction of Vsevolod Meyerhold. The set design for Bernard Shaw's *Heartbreak House* for the “Theater of the Actor” under Meyerhold's direction was Sergei Eisenstein's final project upon completing his first year at the State Higher Director's Workshops. Only the young artist's third project was approved, and it became a “turning point” in his creative path (Kleiman, 1998, p. 47). The resulting “machine for acting” included circus trapezes and ropes, moving elevators, sidewalks, a revolving wheel, springboards, trapdoors, and other mechanisms (10 different types in total, see figure 2). In his “Explanatory Note to the Project of Material Design for the Performance 'Heartbreak House'” (1923), Eisenstein positioned himself as an “artist-constructor,” creating a mechanism that moves and shifts the actor independently in a specific, comically calculated coordination with his verbal material (Eisenstein, 1923). This means that the technological infrastructure became the main director, programming the stage action. On the reverse side of sheet 7 of the “Explanatory Note,” there is a schematic drawing titled “Hearthrug Brings the Tea,” which shows that the actress in this scene was supposed to perform a somersault over her head from a springboard – all the while holding a tray (Kuznetsova, 2022). Technology was integrated into the theatrical action, becoming the machinery of the theater, which included “active movement instead of dreary sitting at a table or on aristocratic garden benches” (Kleiman, 1998, p. 51).



Figure 2 Sketch of the stage construction for Bernard Shaw's play *Heartbreak House* (Sergei Eisenstein, “Machine for Acting,” 1922).

In *The Magnanimous Cuckold*, produced by Vsevolod Meyerhold at the Théâtre Zon (1922), a new type of stage construction was created: a wooden apparatus resembling a mill, a complex labyrinth of platforms, staircases, revolving planes, wings, and wheels (Fig. 3). This construction had no independent semantic content but functioned as the internal machine of the performance, an “instrument for the actors' play,” in the words of researchers (Meyerhold, 1998). Three wheels – a large black one, a small red one, and a white one with spokes – were integrated into the precise score of the performance: their movement corresponded to the tempo, energy, and tension of the stage action (Popova, 1922). Here, technology ceases to be a stage accessory: the revolving mechanisms, accelerating or slowing down, objectified the dynamics of the action, visualized the emotional states of the characters, and introduced rhythms into the fabric of the performance that were not reducible to the human body. Thus, the scene of Bruno's jealousy was built on the sequential involvement of mechanical elements: first the white wheel began to spin, then the red one, then the black one, and finally the windmill. Their joint operation was created according to the principle of increasing emotional tension, which reached its climax at the moment of the character's drama. Bruno, trying to stop the mechanism, essentially entered into a struggle with the very machinery of the performance, where the mechanical rhythmicized human passions, making them inseparable from the dynamics of the device.



Figure 3. Sketch of the stage construction for the performance *The Magnanimous Cuckold* directed by Vsevolod Meyerhold (Lyubov Popova, "Installation," 1922).

This embodied the key principle of Meyerhold's biomechanics: the actor became simultaneously the material and the machinist, a body-machine and the organizer of its work. In his programmatic texts, the director emphasized that all art is the organization of material. Biomechanics thus demonstrated the indistinguishability of art and technology: the essence of art, like the essence of a machine, was expressed in the transformation of matter through rhythm, resistance, and struggle with the material.

The mechanical principle in early 20th-century theatrical scenography was organically complemented by electricity. In the experimental theater culture of the 1910s–1920s, electricity became a symbol of new energy and a form-giving principle. Within the "FEKS" (Factory of the Eccentric Actor), an electric impulse was understood as a force capable of animating and transforming bodies. In "The Electrification of Gogol" (1922), the "galvanization" of Charlie Chaplin's corpse was shown. And in the utopian scenario "Edison's Woman," electricity became the principle for the birth of a new artificial human. Here, electricity not only constructed images but also acted as a metaphor for animation, as the very energy of art.

Furthermore, it was lighting technologies that defined a new quality of theatrical space. For instance, in Tairov's experiments in *Famira Kifared* (1916) and *Salome* (1917), projectors created abstract architectural forms from colored beams which transformed along with the action, forming a conditional visual space. The theatrical artist Alexander Golovin saw in electric light the possibility of perfecting painterly searches. He created lighting scores where each beam complemented the stage like a painterly stroke, creating the desired mood for the viewer.

In 1908, the Electroteatre "Scena" (later the Théâtre Zon) opened in Moscow, where experiments with "light symphonies" turned light into the main protagonist of the action:



colored rays, changing to the rhythm of the music, created abstract dynamic pictures. These experiments finally cemented electricity's status not as a servicing element but as a full-fledged constructive factor of theater, which did not merely illuminate the stage space but itself became an expression of the performance's energy and meaning.

Thus, in the early 20th-century theater, technologies established themselves not as secondary elements of the spectacle but as equal co-authors of the artistic language. Meyerhold's revolving wheels, Akimov's constructions, and the electrical experiments of Golovin and Tairov demonstrate the overcoming of the boundary between art and technology, showing their co-authorship, collaboration, and participation in the production.

TECHNOLOGY-AS-MODEL-OF-THOUGHT

At the third level, the “artist” begins not merely to use technologies but to think like them. This trend was not accidental; it became one of the key vectors of the cultural and social modernity of the 1920s–1930s. The spirit of technicism, born from the rapid development of industry, transport, and communications, permeated the era, manifesting itself at various levels of human activity. However, the most radical and consistent theoretical and practical expression of this mindset was found outside of art, in the sphere of the scientific organization of labor and the design of the new human. Here, the figure of Alexei Kapitonovich Gastev is iconic. Leading the Central Institute of Labor, he developed a total concept of “social engineering,” aimed at the rational reassembly of human behavior according to the patterns of engineering design. For Gastev, a worker, artist, or engineer was to become a universal operator, whose movements, reactions, and thoughts obeyed the same logic as the work of a well-adjusted mechanism: “In the social sphere, an era of precise measurements, formulas, blueprints, control gauges, and social norms must begin” (Gastev, 1972). Thus, Gastev's project became the extreme point in the spectrum of techno-utopian visions of that era, where the fusion of human and machine was conceived not as enslavement but as the next evolutionary step towards creating a new, “engineered” subject.

Parallel to this, the poetic avant-garde of the Biocosmists – Aleksandr Svyatogor and Alexey B. Yaroslavsky – radicalized techno-rationality into a cosmogonic program, demanding that art and science intervene in the ontology of life through technical means of immortality, resurrection, and cosmic expansion. This turns creativity into a project of technical restructuring of time, death, and space. In their manifestos, the poetic word is conceived as a “material force” and a program of action; that is, language must work like a machine, managing reality according to an engineering logic, expressing an ultimate shift from the aesthetic to the onto-technical design of the world. As Svyatogor (2018) formulated, biocosmism relies on the latest conquests of science and technology and at the same time strives for their restructuring.”

A book by Vasily Kamensky demonstrates the complete integration of technical logic into the structure of the work, where printing technology becomes an equal co-author of the poetic statement. The material embodiment of industrial aesthetics through the very procedure of book production is fundamental: the text is printed on colored



wallpaper, has the shape of an irregular pentagon, and is typeset with variously sized fonts arranged chaotically on the sheet (Guryanova, 2018). Here, technology functions as an element of meaning generation. The poetic text becomes a technological protocol, requiring the reader to possess special decoding skills conditioned by the very procedure of the printing experiment. The key point is that the work exists as a hybrid of a design solution and an aesthetic object. Kamensky's work transforms the poetic book into a means of cultural-technical organization of experience, where reading practice becomes an experiment in mastering new modes of perception and interpretation.

In painting, similar tendencies manifested in the works of artists who sought maximum objectification of the creative process. Kazimir Severinovich Malevich, in his late period, developed the theory of the “additional element” in art, according to which artistic form was to function like a technical construction, where each element has a precisely calculated function (Turchin, 2003). Pavel Nikolaevich Filonov created a method of “analytical art,” based on the principle of “made-ness” (*sdelannost*), where a painting was built according to an algorithm that excluded chance and subjective arbitrariness (Filonov, 1984). At the third level, the final “hardwiring” of technical logic into the artist's consciousness occurs. Technology becomes not an external tool but an internal “operating system” of the creator; traditional artistic values yield to an engineering approach.

Let us turn to ballet. The design scheme of the stage determines the very mode of the performance's existence in *The Steel Step*, composed by Sergei Prokofiev in 1925 (Figs. 4 and 5). The scenography is conceived as a system of shafts, wheels, light trusses, and multi-level platforms that calibrate the kinetics of the body and the rhythm of the ensemble. The music is composed alongside the scenario episode by episode, and the costumes function as transformable nodes of action. A unified techno-rational framework emerges, where movement, light, and props form a procedural model in which the spectator reads not a plot but the work of a mechanism unfolded in time and across the vertical dimension of the stage (Porshnev, 2020).

Also, the “Mechanical Dances” of Nikolai Foregger articulate a method of movement algorithmization. Corporeality is prescribed as a machine with impulse, pause, and repetition programming sequences according to the laws of seriality and modularity. The choreography is built as a controlled protocol of energy transfer, where discretization and syncopation create a new ontology of stage time. The theme of the machine recedes before the machine logic of gesture organization; thus, technology acts as a cognitive framework regulating the production of attention (Gordon, 1975).

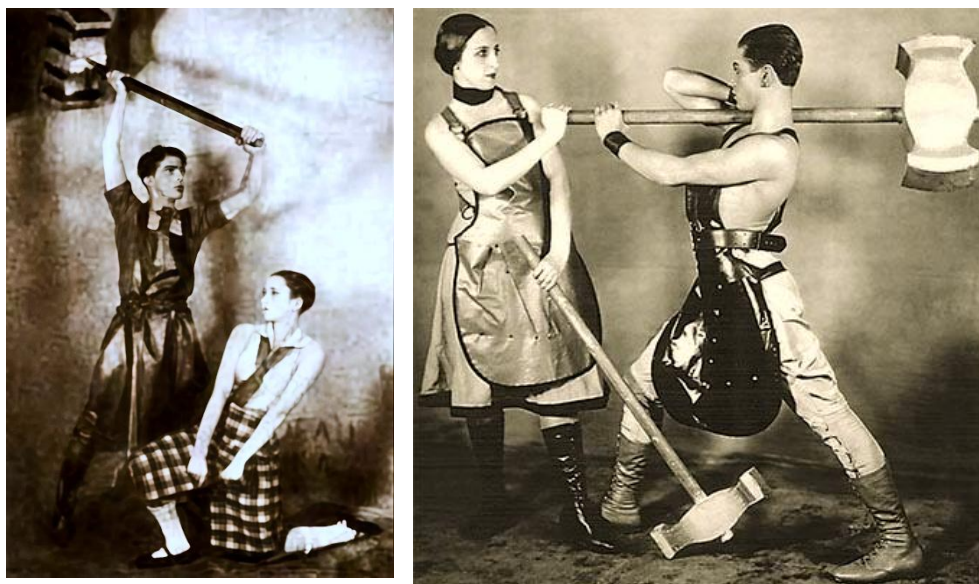


Figure 4. Scenes from the ballet *The Steel Step* by Léonide Massine (1927), music by Sergei Prokofiev

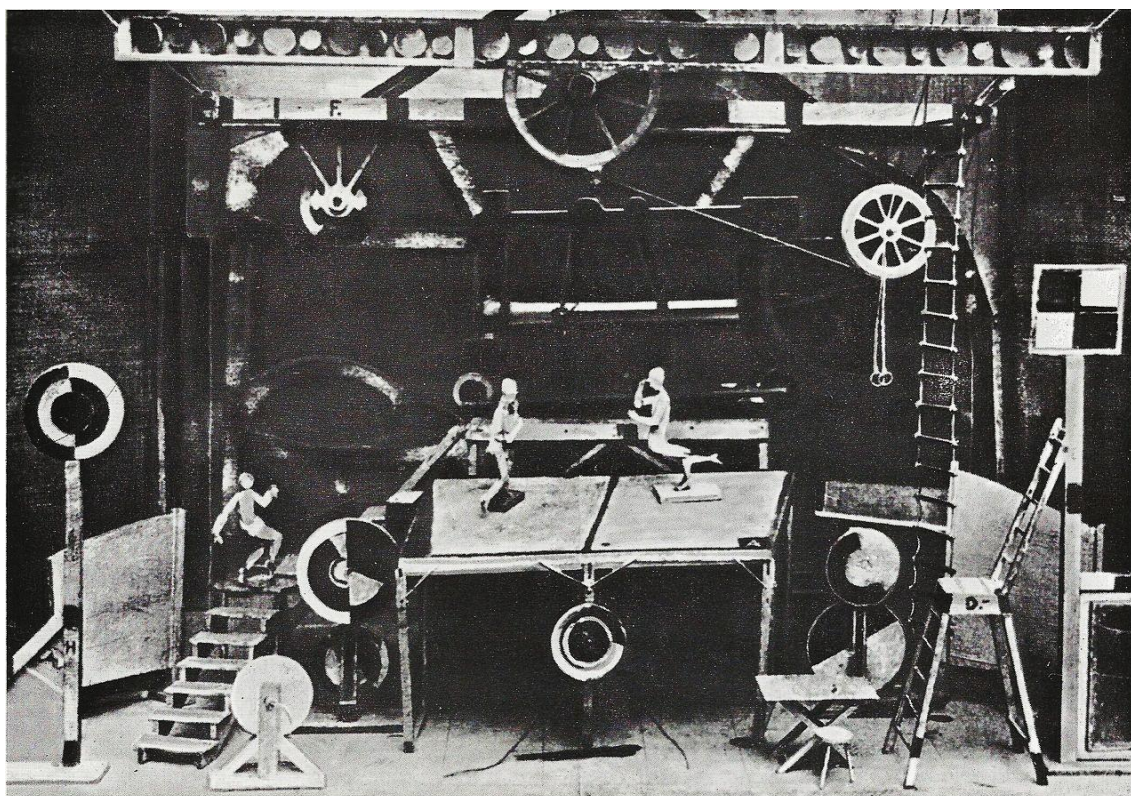


Figure 5. Stage model for the ballet *The Steel Step* (Georgy Yakulov, 1927)



The ballet *The Bolt* by Dmitri Shostakovich reinforces the regime of operational thinking through its industrial-satirical plot and the workshop-like organization of choreography and scenography. The machine in the workshop acts not only as a subject of depiction but as the center of movement coordination. The action sequences of technicians, adjusters, and workers form a montage of labor operations as a stage algorithm. Modern reconstructions emphasize the scale of the machine environment and robotic units, which set the frame for human movement and reveal the asymmetry between the power of the technical apparatus and the fragility of the body (Rosenbaum, 2015).

In Alexander Tairov's production of *The Hairy Ape*, stage mechanics and the lighting score act as conditions of visibility and meaning assembly. The Constructivist stage works as a mediation laboratory, where optics, the screen, and the rhythm of transitions manage the connections between the actor and space. The technical configuration becomes an operator of semiotic tension and a distributor of the spectator's gaze (Posner, 2018).

The Man Who Was Thursday, with sets by Alexander Vesnin, demonstrates the complete integration of technical logic (Berezkin, 2008). The setup with elevators, moving sidewalks, and revolving and descending floors turns the stage into an urban machine, where short situations changed with the speed of film editing. Blinds snapped, elevators slid, light advertisements flashed, and the structure acted as an autonomous stage platform that could be taken out of the theater and shown in the open air. In this case, the theater conceives of itself as a technical apparatus, and the performance as a technological process.

CONCLUSION

Technology in avant-garde art constitutes not a marginal episode in art history, but a large-scale project of recoding artistic creativity in accordance with the paradigms of technical rationality. The proposed three-level model (“Technology-as-Muse” – “Technology-as-Co-author” – “Technology-as-Model-of-Thought”) reveals the immanent logic of this process, which consists of the sequential interiorization of technology: from its external assimilation as an object of aesthetic experience to its entrenchment as a deep structure of artistic thinking. This trajectory was marked by a transition from a representative to a constructive and, finally, to a projective paradigm in art.

The analysis of the material has demonstrated that each level corresponds to a specific configuration of relations between the artist and technical reality. If at the first level technology remains an external source of inspiration and the artist its interpreter, the second level gives rise to a situation of hybrid agency, where stage machinery and constructive principles become co-authors, determining the very processuality of the work. The culmination of this movement is the third level, where a metaphysical fusion of art and technology occurs: the artistic consciousness begins to operate with the categories of engineering calculation, standard, and protocol, and the creative act is conceptualized as a form of socio-technical projection.



Thus, the early 20th-century avant-garde undertook a radical attempt to overcome the traditional opposition between *techné* and *poiesis*, striving for their synthesis in a new, technogenic form of creativity. Within this logic, the artwork loses its autonomy as an aesthetic object and acquires the status of co-producer or a transformed reality – be it the reality of the stage, the human body, or the social order. The historical limitations of this utopia do not negate its theoretical significance: the proposed model serves as a productive analytical tool for comprehending contemporary processes related to digitalization, artificial intelligence, and bioengineering, where the question of the boundaries between human and machine creativity once again acquires paramount urgency. The avant-garde's investigation into technology as a cognitive matrix remains a vital reference point for understanding the ongoing reformatting of artistic and cultural production in the technogenic epoch.

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