In the Laboratory of Constructivism: Karl Ioganson's Cold Structures*

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I can look upon the sky as concrete material.

—Vladimir Tatlin, at a meeting of the Moscow INKhUK (1921)

Sculpture must give way to the spatial solution of the object.

—Aleksei Gan, *Konstruktivizm* (1922)

In her memoirs, the celebrated Russian translator Rita Rait-Kovaleva reminisces about her friendship in the 1920s with the poet Vladimir Maiakovskii. One recollection concerns the advent, in the wake of socialist revolution in Russia, of a radical new form of three-dimensional work that could not be encapsulated within the terms of the traditional category of sculpture—the so-called "spatial construction." Rait-Kovaleva attributes to Maiakovskii great insight apropos the urgency and future significance of this new Constructivist form:

> The exhibition of the constructivists: Rodchenko, Stepanova, Popova, Lavinskii—I knew them personally and so remember their names—but probably there were also others who took part, perhaps even Tatlin himself. There were only a few visitors; Maiakovskii was pacing the exhibition hall. It was evening and we were a crowd brimming over with that kind of mad excitement for which there is no reason, and which we were hardly ever without in those days. I took off my coat; next to me were some metal rods crossing one over the other, upon them—sideways—a triangle, and some semicircles or other. With someone's help my

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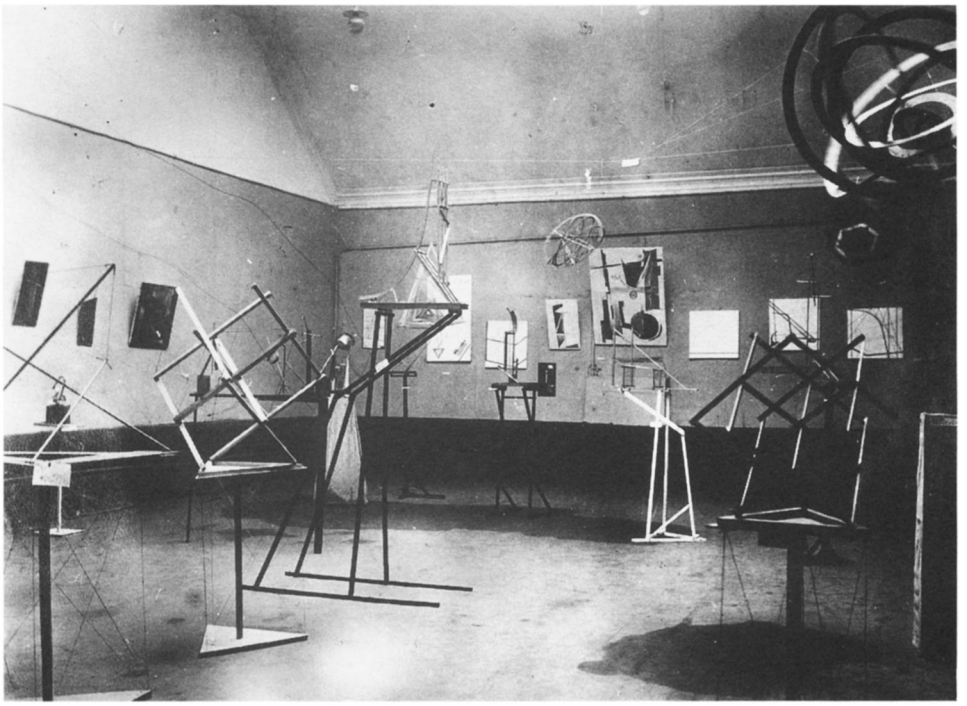
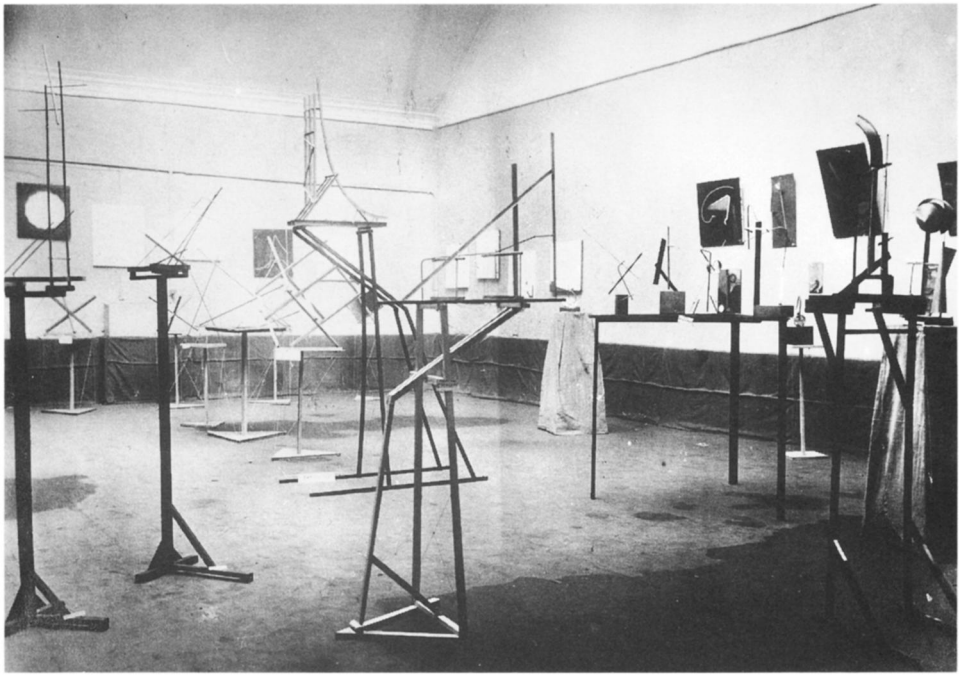




1–2. Obmokhu exhibition. Moscow. May 1921. Above: View toward south and west walls. Below: View toward east and south walls.

coat was hung upon the cantilevering arm [*vytianutoi strele*] of this sculptural structure. We were happy: art had proved itself "useful" it seemed, just as it was supposed to be. But then Maiakovskii approached us, scowling, and said, very severely but sotto voce so as not to attract the attention of the sculpture's author who was standing not far away, "Take it down immediately! What an outrage! Don't you understand anything . . . "

But when he realized that we really had understood nothing at all, he explained, his anger already assuaged by our embarrassment, how the artist wanted to demonstrate in his work new interrelationships and forms, of a kind that had never been seen before, but most importantly of all, he wanted to teach [people] to see in a new way those things which are as yet unfamiliar but which in the future might assist in the new construction of things: bridges, buildings, machines. . . . For me, the significance of stylized, nonfigurative art [*uslovnogo, bespredmetnogo iskusstva*] somehow became clear that evening, and from then on I looked at a lot of things differently. . . . In the gigantic arm of an advancing excavator I suddenly saw that metal arm of the constructivist sculpture upon which my coat had been hung: the artist's discovery transformed into life.

Many years later, after the war, in 1945, Lilly [Brik] and I translated for fun Gertrude Stein's book—the part where she talks about Picasso, about his youth, about his first works. In that book there is a similar conversation. It's the end of the first world war. Picasso is walking around Paris with someone and all of a sudden he sees camouflaged tanks crawling along—probably they were the first of those years. The form of the tank was broken up into differently colored planes—circles, squares. "Goddamn it! We invented that you know!" said Picasso to his companion. As I read this story I remembered that evening at the exhibition and the perspicacity of Maiakovskii's vision [*zorkie glaza Maiakovskogo*].[1]

Were it not for the participants that Rait-Kovaleva lists, one could situate this revelatory encounter between poet and translator within the space documented by two now well-known photographs, taken from opposite ends of a gallery of spatial constructions produced in the early 1920s by five Constructivists: Aleksandr Rodchenko, Karl Ioganson, Konstantin Medunetskii, and the brothers Iorgii and Vladimir Stenberg (figs. 1, 2). Their installation filled a single gallery—what I will call the Constructivist gallery—of a larger group exhibition held in Moscow in May 1921 by a revolutionary artists' collective, Obmokhu (Society of Young Artists). In a contemporary review, El Lisitskii credits the Constructivist gallery with having invented a radically new exhibition format: "We looked not only at

1. Rita Rait-Kovaleva, "'Vse luchshie vospominan'ia . . .': Otryvki iz knigi," in *Trudy po russkoi i slavianskoi filologii. IX. Literaturovedenie* (Uchenye zapiski Tartuskogo universiteta), no. 184 (Tartu, 1966), p. 275. Unless otherwise noted, translations are my own.

the works of art hanging on the walls," he writes, "but particularly at those that filled the space of the hall."[2]

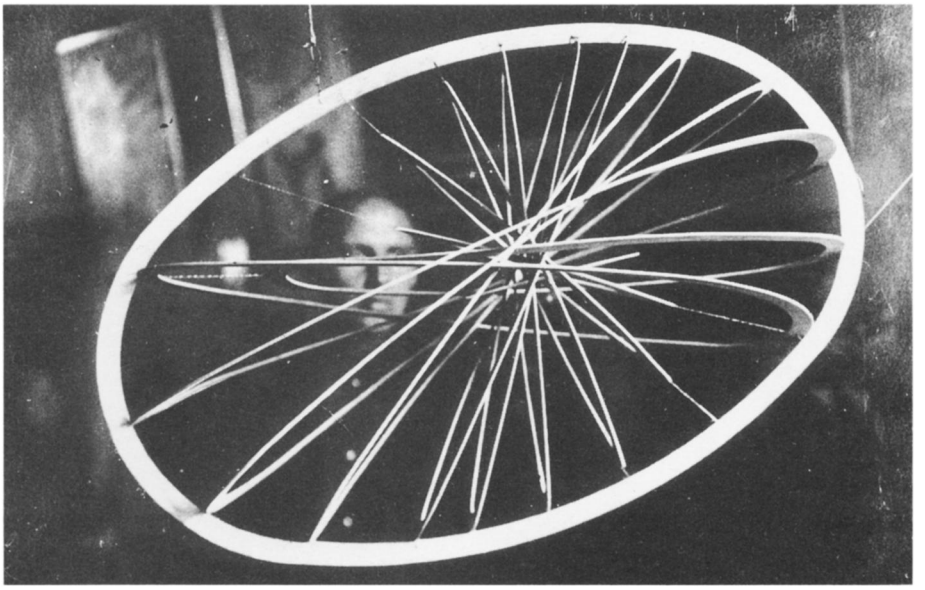
With the exception of two constructions—Medunetskii's small *Spatial Construction* of 1920, purchased by Katherine Dreier in Berlin in 1922 on the advice of Marcel Duchamp (fig. 3), and Rodchenko's ellipsoid *Hanging Spatial Construction, no. 12* (circa 1920), which for many years hung in the lounge of the great Russian collector George Costakis (fig. 4)—none of the spatial works shown in the exhibition have been preserved. Although about a third had already entered the Russian Republic's museum collections by the time of the exhibition, state acquisition was not in itself sufficient to save these constructions from the rampant destruction—"liquidation" was the official term—of avant-garde work that occurred during the reorganization of museums along conservative lines in the mid-1920s. Since the reopening of Constructivism as a field of inquiry in the Soviet Union in the 1960s, however, a good number have been reconstructed. Besides assisting in this task, the installation photographs have also done much to establish an understanding of the Constructivists as a united front—a group standing on a shared platform in opposition to a plethora of other artists' groups.

3. Konstantin Medunetskii. Spatial Construction. *1920.*

As our most substantial record of an extraordinary body of work produced in the revolutionary period, these photographs have therefore, like Riegl's "scrap of paper,"[3] enormous evidentiary value. But at a price: as black-and-white photographic tableaux, they afford the exhibition homogeneity where there was, I will argue, none. The present essay seeks to interrupt this effect of homogeneity, in order to shed light upon what I will argue is a controversial polemic at work *within* the gallery itself, a polemic that is fundamental to an understanding of the role of the Latvian artist Karl Ioganson—hitherto the most historically enigmatic member of the group—within Constructivism's early development. Ioganson's spatial experiment demonstrates, as we shall see, that the "laboratory" period of Constructivism had to do not only with the famously fraught question of negotiating the transition from easelism (*stankovizm*) into production, but also with the expression of some profound reservations about the very doctrine of functionalism upon which that transition was to be based.

2. Ulen [El Lisitskii], "The Exhibitions in Russia," trans. K. P. Zygas, *Oppositions* 5 (Summer 1976), p. 127 (translation modified).

3. Alois Riegl, "The Modern Cult of Monuments: Its Character and Its Origin," trans. K. W. Forster and D. Ghirardo, *Oppositions* 25 (Fall 1982), p. 22.



4. Aleksandr Rodchencko. Hanging Spatial Construction, no. 12. *Circa 1920.*

The Advent of a New Form

As the director of a new museum of contemporary Russian art—the Museum of Painterly Culture (MZhK)—Aleksandr Rodchenko wrote in June 1921 that "for the past three years the best contemporary artists, both in Moscow and the provinces, have lived exclusively from the sale of their work to the [Museum] Bureau." Such state support, he continued, "was unprecedented anywhere in the world," and as such "it is an achievement of which the commune ought to be proud."[4] By December 1920, the Museum Bureau had indeed acquired on behalf of the Russian Republic the work of over four hundred contemporary artists who would otherwise have been left stranded by the collapse of the private market for collecting. The 26 million rubles spent so far had purchased 1,336 paintings, 404 drawings, 121 graphic works, 54 sculptures, and, finally, in a category all of their own, 11 "spatial forms" (*prostranstvennye formy*).[5] By the May 1921 exhibition, half a dozen or so further works in this last category had been added to the state museum collections, Gosfond.

The pioneers of this spatial form—Ioganson, Medunetskii, the Stenberg brothers, and Rodchenko himself—were members of a state-funded think tank

4. GARF [Gosudarstvennyi arkhiv Rossiiskoi Federatsii] f. 2306, op. 23, d. 180, l. 28.

5. *Sovetskoe iskkusstvo za 15 let: materialy i dokumentatsiia,* ed. Ivan Matsa (Moscow and Leningrad: Ogiz-Izogiz, 1933), p. 102.

devoted to "objective" (read "formal") analysis, the Institute for Artistic Culture (INKhUK). With the exception of Ioganson, none had been professional sculptors, nor did they seek now to be known as such. The term "spatial form" referred instead to an altogether new kind of work that, although sharing the three-dimensional space of sculpture, was not on any account to be confused with monumental sculpture per se, with its traditional connotations of mass, gravity, immobility, and permanence—hence the inclusion of a separate category in the Bureau's inventory. In testimony to the lexical wrestling that its advent provoked, there were several other early descriptors, but when the five spatialists declared themselves "constructivists" (*konstruktivisty*) in March 1921, the Bureau and the artists themselves finally opted for the term "spatial construction" (*prostranstvennaia konstruktsiia*). Accordingly, a list drawn up that spring of artists represented in the state collections categorizes Rodchenko, Ioganson, the Stenberg brothers, and Medunetskii as "constructivists" who, along with Tatlin and Prusakov, make "constructions"; Korolev, Lavinskii, and Gabo, by contrast, make "sculptures."[6]

While all sculpture occupies space, the spatial construction advances space itself, so-called empty space, as "concrete" material. It orchestrates this material but does not fill it; it declares volume with recourse to neither mass nor weight; and it dissolves the customary distinction between the exterior and interior of form. It asserts itself as distinct not only from traditional forms of relief and monument, but also from the abstract forms produced in the INKhUK sculptor Aleksei Babichev's "space" studio at the state art school Vkhutemas in the early 1920s, as well as from the discrete objecthood of modernist sculpture that the Russian writer Ilya Ehrenburg would celebrate at the end of his 1922 tract, *A vse-taki ona vertitsiia.*[7] While the elimination of mass and the inclusion of architectural space were practices already shared by Tatlin's corner counter-reliefs, and by Picasso's constructions and studio installations, nothing presages (with the exception perhaps of the former's 1920 *Monument to the III International*) the aggressive intervention into the history of sculpture made by the Constructivists in 1921.

Of the twenty-five constructions exhibited in the gallery, about a third were borrowed from Gosfond. Mainly through the agency of Rodchenko, the Bureau had acquired five constructions by Ioganson, three by Iorgii Stenberg, two by Medunetskii, two by Vladimir Stenberg, and at least three (but probably more) by Rodchenko himself. These acquisitions were part of an overall game plan to establish within the MZhK a separate department of "Experimental Technics" (*Experimental'naia Tekhnika*) which was to be distinguished from "contemplative" fine art.[8] On account of insufficient space in the museum itself, however, it was

6. RGALI [Rossiiskii gosudarstvennyi arkhiv literatury i iskusstva] f. 665, op. 1, d. 23, ll. 152, 153.
7. Ilya Ehrenburg, *A vse-taki ona vertitsiia* (Berlin: Helikon, 1922), p. 136.
8. For the museum's acquisition records, see RGALI f. 665. Ioganson was hired in the fall of 1919 as the museum's "technical specialist." The idea for a Department of Experimental Technics seems to have been instigated by the painter Aristarkh Lentulov but others were also thinking about it; see, for example, Rodchenko's diary entry for June 15, 1920, "O Muzee Eksperimental'noi Tekhniki," in his *Opyty dlia budushchego* (Moscow: Grant", 1996), pp. 84–86.

initially felt that these acquisitions could be accommodated only if merged with the rest of the collection wherever there might be an odd space available. From the point of view of the future Constructivists this arrangement was far from satisfactory if Constructivism was to be established as a polemical front, particularly in the eyes of the museum's two largest constituencies: students from Vkhutemas and "foreign representatives of Western countries," as Rodchenko put it. It was not until March 1921, when the Constructivists declared themselves as a separate faction within the INKhUK, that a gallery within the museum was finally assigned for their purposes.

The Working Group of Constructivists—as the new faction called itself in a self-conscious appeal to the revolutionary rhetoric of the dissolution of the division of labor and to the artist's accession to the realm of the so-called practical worker (as opposed to parasitical *intelligent*)—comprised the five pioneers of the spatial construction, their fellow INKhUKist Varvara Stepanova, and, from outside the Institute, the controversial cultural agitator Aleksei Gan. In adopting its name, the Working Group officially claimed the rapidly and widely developing enthusiasm for the enterprise of "construction" as first and foremost its own. While the Museum Bureau's patronage had in a sense already earmarked the term as belonging to the group, it was not, however, uncontested territory: other artists such as El Lisitskii and Gustav Klucis were caught up in the same dialectic of art and technics, in the same attempt to build a dynamic synthesis of domains hitherto considered mutually exclusive. Aleksei Gan, an agit-man who had specialized in the staging of revolutionary festivals and mass spectacles in Moscow until expelled from the state cultural bureaucracy in late 1920 on account of the excessive radicalism of his views, was entrusted with the task of producing a provisional draft of the group's programme and an agitational communiqué with which to publicize its activities. Meeting on Monday evenings at the Museum Bureau on Volkhonka, the chief activity of the group proved to be the formulation of a theoretical position that would grant the spatial construction an inarguable raison d'être vis-à-vis the immediate exigencies of the building of socialism. The Constructivists sought, in other words, to embed their spatial experiments firmly within the discussions that were then taking place on every front concerning industrialization, a process which the Party had decreed as fundamental to the building of a socialist Russia in the aftermath of the Civil War. The building of socialism itself, the Constructivists declare in their new program, "should motivate the group to make the transition from experimental activity divorced from life, to experimentation that has a basis in reality."[9]

Having appointed Gan as their chief rhetorician, the Constructivists then spent all their sessions together trying to fathom the lexically inventive terminology of the program drafted by him. The most controversial aspects of his draft proved to be, first, the meaning of an unfamiliar new term that he sought to introduce

9. Gan et al., "Program of the Constructivist Working Group of INKhUK," trans. James West, in *Art into Life: Russian Constructivism, 1914–1932* (Seattle: Henry Art Gallery, 1990), p. 67.

into the Constructivist lexicon, *tektonika*, and second, the continuing relevance of *faktura* to the Constructivist endeavor.[10] What the group was able to agree upon immediately, however, was their understanding of *konstruktsiia* (construction), which they define straightforwardly as "organization." Rodchenko, for example, felt that the idea of "construction has already been well chewed over [*prozhevana*] and is now used without difficulty."[11] He is referring to the fact that the Constructivists, along with about twenty other members of the INKhUK, had been engaged over the winter of 1921 in a protracted debate concerning the delimitation of the principles of "composition" and "construction." A basic working definition provided by the architect Nikolai Ladovskii had served to anchor this debate: "The chief indication of construction," Ladovskii had argued, is that "there must be no superfluous [*lishnikh*] materials or elements. The chief distinguishing mark of composition—is hierarchy, coordination."[12] This drive to eliminate the excess and relationality deemed characteristic of composition was shaped, as I have argued elsewhere, by three specific topoi: the issues raised by the recent past of modernist painting; the injunction laid before a moribund architecture by engineering since the late nineteenth century; and finally, a controversial faith in "organization" and "planning" as the most efficacious means to eradicate the random and arbitrary elements spawned by the market economy of capitalism.[13] "As we see in the life of the RSFSR," Rodchenko declared during this debate, "everything leads to organization. And so in art everything has led to organization."[14] Although a commonplace under the economic policy of War Communism, Rodchenko's declaration was controversial, however, for it was during the spring of 1921, contemporaneously with the INKhUK's debate, that Lenin handed down the basic outline of a new economic policy (NEP) which was to replace that of War Communism. In advocating a partial return to a free market, the NEP flew directly in the face of efforts to ground the infant economy of post-Civil War Russia upon the principles of centralized organization and planning. The Constructivists' insistence, therefore, upon the principle of organization at precisely the moment when state economic policy was moving in the opposite direction toward the free market (i.e., away from planning toward "arbitrariness"), attests to the historical complexity of the period in which their struggle against excess—against composition—took place.

In the midst of the Working Group's drafting of its inaugural program, its

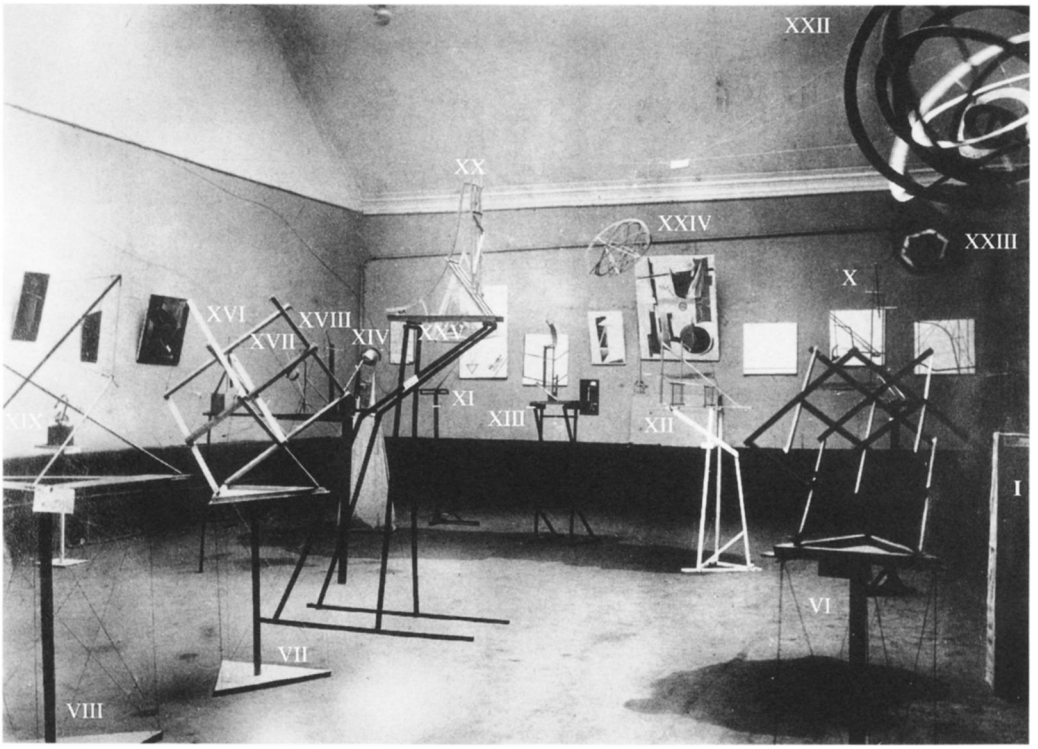
10. For a transcription of the minutes, see Selim Khan-Magomedov, *Inkhuk i rannii konstruktivizm* (Moscow: Architectura, 1994), pp. 89–112. I discuss the Constructivists' lexical controversies in chapter 2 of my "The Artist as Producer: Karl Ioganson, Nikolai Tarabukin and Russian Constructivism, 1918–1926" (Ph.D. diss., Harvard University, 1997).

11. Rodchenko (meeting of May 11, 1921), transcribed in Khan-Magomedov, *Inkhuk*, p. 110.

12. Quoted in Khan-Magomedov, "Diskussiia v INKhUKe o sootnoshenii konstruktsii i kompozitsii," *Tekhnicheskaia estetika (Trudy VNIITE)* 20 (1979), p. 47.

13. See chapter 1 of my "The Artist as Producer."

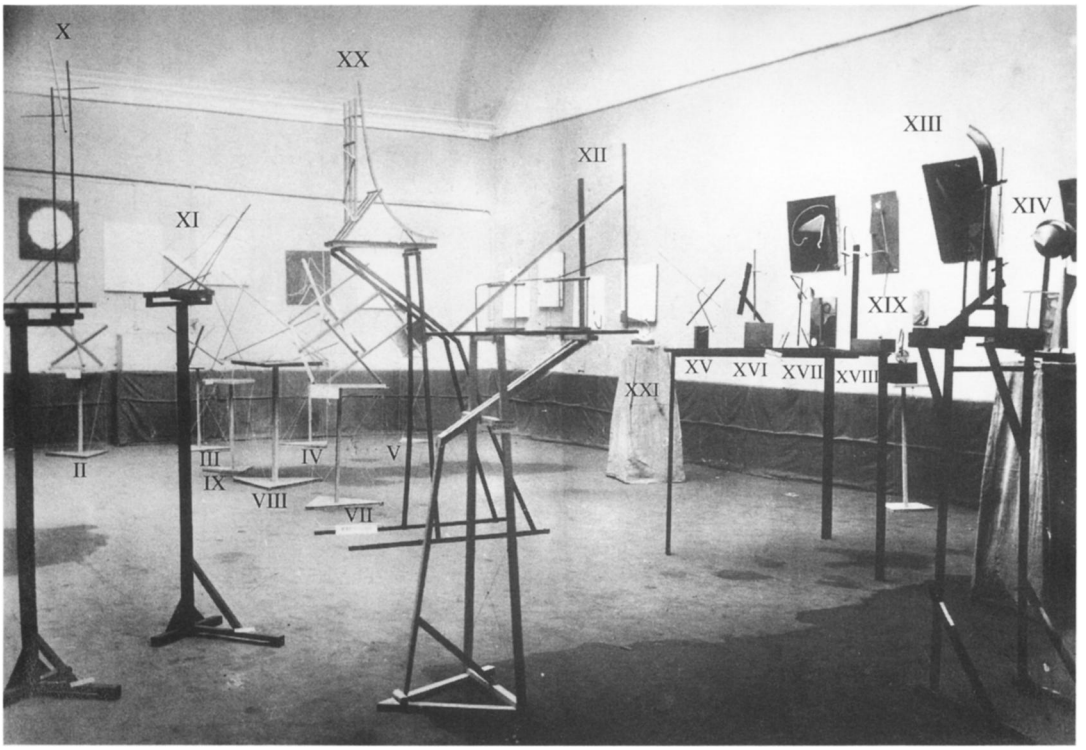
14. Quoted in Christina Lodder, *Russian Constructivism* (New Haven: Yale University Press, 1983), pp. 88–89.



three youngest members—Medunetskii and the Stenberg brothers—invited their fellow Constructivists Rodchenko and Ioganson to participate in the forthcoming exhibition of a collective to which the younger artists had belonged since 1919, Obmokhu.[15] This show was scheduled to open in May 1921 in the former galleries of the dealer Klavdia Mikhailova, a much sought after exhibition space in central Moscow both before and after the revolution. It was a perfect opportunity—and one not to be missed given that such spaces were fast disappearing with the encroachment of the NEP—in which not only to launch the activities of the Working Group and declare it as a new force on the Left, but also to publicize the advent of the spatial construction itself. In particular, it was an opportunity to do so within the context of an explicitly *agitational* kind of exhibition, since the Obmokhu collective had a track record in securing commissions from state organs seeking agitational materials. Fine print along the bottom of the poster advertising the exhibition solicits the attention of potential patrons: "Production organizations, factory committees and educational institutions are invited to conduct tours." Participation in the Obmokhu exhibition would thus have guaranteed the

15. On Obmokhu, see Aleksandra Shatskikh, "A Brief History of Obmokhu," in *The Great Utopia: The Russian and Soviet Avant-Garde, 1915–1932* (New York: Guggenheim Museum, 1992), pp. 257–65. In the scant literature on the exhibition itself, Christina Lodder offers the fullest contextualization ("The Transition to Constructivism," in ibid., pp. 266–81), while Hubertus Gassner presents a suggestive taxonomy of Constructivist positions in general ("The Constructivists: Modernism on the Way to Modernization," in ibid., pp. 312–14).

5. Figure 1 with annotations.



Constructivists a broader audience for their spatial constructions than they might otherwise have had. With luck, it might also have assisted in the finding of a permanent home for them.[16] From the point of view of the older Rodchenko and Ioganson, therefore, tagging along with a trio of much younger artists had a number of strategic functions.

In any case, the Constructivists monopolized the largest of the available spaces, sequestering themselves from the exhibition's other nine participants (the other members of the collective) whose graphic work was presumably relegated to the motley assortment of smaller galleries.[17] Within the gallery each Constructivist had his own territory, into which he placed a series of closely related works, which for ease of reference in the present essay I have numbered in a single overall sequence from *I* through *XXV*. With the exception of *I*, mounted upon the draped pedestal at the far right edge of figure 5 (the artist's name can just be discerned on a label attached to the draped pedestal), Ioganson's spatial constructions can be readily distinguished by their triangular bases: *VII* and *VIII* appear on the left of figure 5, *VI* at its right; *II, III, IV, V, VII, VIII,* and *IX* in the rearground of figure 6.

16. At least for a certain period, this seems to have been on the cards (see RGALI f. 665, op. 1, d. 13, l. 123; d. 15, l. 110).

17. In chapter 2 of "The Artist as Producer," I discuss the dimensions and orientation of the Constructivist gallery with reference to an unpublished architect's plan of the building on Bol'shaia Dmitrovka (now Pushkinskaia Street) in which Mikhailova's Salon was situated.

6. Figure 2 with annotations.

A Catalogue of Cold Structures (and One Mechanism)

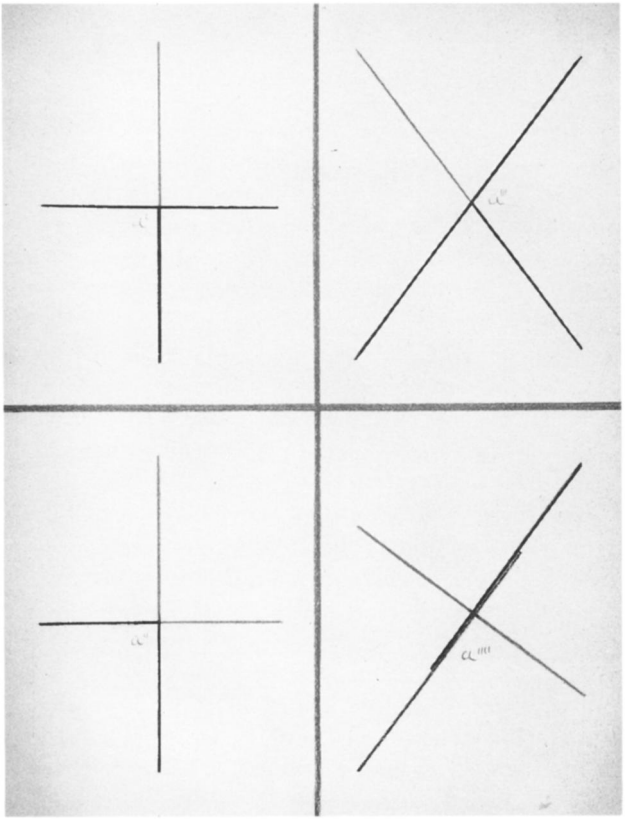
In a drawing made by Ioganson within the context of the INKhUK's composition and construction debate—*Graphic representation of a construction* (fig. 7)[18]—a large red cross divides the field into four further fields, in each of which is a cross, three of which are right-angled, and one acute- and obtuse-angled. Three of these crosses are deductive with regard to the sheet itself. Both the right-angled cross drawn in blue and red pencil in the upper-left field (annotated by the artist "'a' prime" [a']), and the one that appears below it (annotated "'a' double-prime" [a"]), index the right-angled division of the sheet made by the large red cross (which Ioganson designates on the verso as "A"). In other words, they are deduced from the primary division of the sheet. By contrast, the acute-angled cross at upper right (marked "'a' triple-prime" [a'"]) is positioned obliquely with regard to the division of the total field and is instead deduced from the corners of its own quarter-field.

The fourth small cross—the right-angled cross at lower right (marked "'a' quadruple-prime" [a""])—is the single exception to the otherwise fully deductive character of Ioganson's drawing. It is positioned in a way that is oblique not only with regard to the division of the total field, but also to the corners of its own quarter-field. In this nondeductive cross, there are three distinct orthogonals—one drawn in red, another in blue, and a third in black. Unlike the others, which configure the cross in terms of the intersection or at least conjunction of their orthogonals, the nondeductive cross at lower right configures the cross in terms of the overlapping or *contiguity* of its orthogonals. The blue and the black lines slide alongside each other and both overlap the red. This differentiation of two different modes within the drawing itself—intersection and contiguity—is significant in two respects. First, the configuration of the cross at bottom right in terms of contiguity signifies three-dimensional spatiality but without recourse to illusionistic description. Second, in contrast to the overt planarity of the other three small crosses and the large cross "A," the nondeductive cross skews or escapes the surface of the sheet. It alone possesses a dynamism that broaches the eruption into space that Ioganson considered to be essential, but not in and of itself sufficient, to the concept of construction.

On the verso, Ioganson wrote a summation of the principle that had driven his spatial production over the past several months:

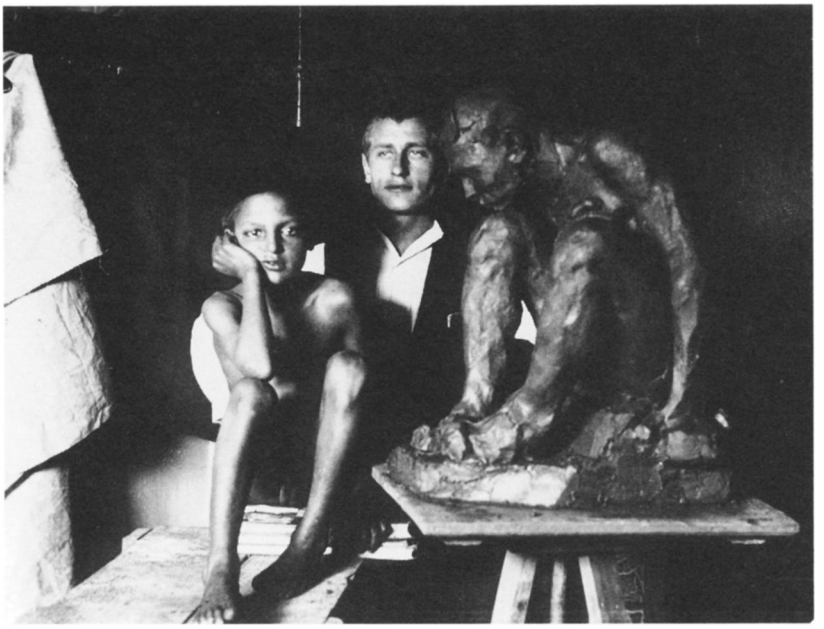
> The construction of any cold structure in space, or any cold combination
> of rigid materials, is a *Cross* (A)
> *right-angled* (a', a", a"")
> or
> *acute- and obtuse-angled* (a'").

18. Reproduced in color in *Russian Avant-Garde Art: The George Costakis Collection,* ed. Angelica Rudenstine (New York: Harry N. Abrams, 1981), p. 113, fig. 67.



Left: 7. Karl Ioganson. Graphic representation of a construction. *1921.*

Below: 8. Karl Ioganson with an untitled figure study and the model Augustins. Circa 1915.



The drawing and its inscription provide an aggressively rationalized definition of construction in terms of a primary "given" or principle—the cross—the fundamentally irreducible articulation of the minimum requirement for the existence of any structure. This principle was to become a kind of mantra for the Constructivist. He declares a variation of it at the final session of the composition and construction debate in April 1921: "All structures, old as well as new and even the most grandiose, are founded upon the *cross.*"[19] By the time of his 1922 theses on invention, the concept reads as a self-sufficient and self-explanatory principle embedded within an expanded Constructivist agenda.[20]

What the inscription further suggests is that Ioganson conceived "construction" as an activity or process (rather than as an object or end result), the goal of this activity being the production of "cold structures." The artist himself seems never to have felt any need to explicate further this central concept of his Constructivism. On the one hand, the assertion of the cross as absolutely foundational can be read simply as a statement of the minimum requirement for any sort of articulated structure: the intersection or flush contiguity of at least two elements. On the other hand, the full import of this aggressively reductive thesis cannot be understood without unraveling Ioganson's rather more hermetic expression, "cold structure." Since this term has generally puzzled historians, it is not surprising to find that in the English translation of the artist's 1922 theses, his voice is interrupted by the translator's insertion of an authoritative "*sic*" between "cold" and "structure."[21] This "*sic*" does not signal to the reader an orthographic error but rather imputes a failure of signification to Ioganson's unauthorized, as it were, conjunction of the two words.

What did Ioganson mean by "cold structure"? A few general possibilities can be mentioned quickly. First, within the climate of anti-expressionism fostered by the Russian avant-garde, this phrase broadly connotes rationalization, cerebration, calculation, numeration, and lucid, simple geometries. Second, it also relates to an expression that was common parlance among sculptors—"cold form" (*kholodnaia forma*)—which referred, unfavorably, to the suppression of *faktura* held to be typical of ancient Greek marbles in which the surface left no trace of its having been "worked." "Cold form" was therefore everything that *faktura*—defined as "the working of the material"[22]—had sought to overcome. In terms of Ioganson's early

19. Quoted in Khan-Magomedov, "Diskussiia," pp. 64–65.
20. See Ioganson, "From Construction to Technology and Invention," trans. James West, in *Art into Life*, p. 70.
21. Ibid.
22. The standard English translation of *faktura* is "texture" which, as many writers have observed, fails to capture the word's particular significance for the Russian avant-garde. The critic Nikolai Tarabukin, who served as the INKhUK's academic secretary, provides a contemporary definition of *faktura*: "By *faktura,* we mean the working of the material" (*Opyt teorii zhivopisi* [Moscow: Vserossiiskii proletkul't, 1923], p. 33). While this definition is essentially in agreement with the French *facture* from which the Russian word is derived, there is a significant twist in Tarabukin's discussion which I will come to shortly (see note 25).

sculptural practice in Riga before the revolution, *faktura* was associated with the warmth and touch of modeling in clay, which at that time was lauded as the antithesis of the subtractive process of carved cold form (fig. 8).[23] In 1921, however, Ioganson questioned the continuing relevance of *faktura* to Constructivism, asserting that "the word *faktura* has become terribly clichéd."[24] The concept of "cold structure," I want to suggest, enabled the artist to reconsider his earlier understanding of *faktura* in new terms having now to do with the structural force of the material itself. This shift signified not so much a rejection of *faktura*, as much as a realignment of his position in accordance with the Russian avant-garde's radical inflection of *faktura* as a mode of "workmanship" stripped of authorial notions of agency.[25] Third, with regard to metalworking, "cold structure" implies a structure that is produced without forging or welding. But these three meanings are only generalities. A more specific answer to this question may be found by turning to the spatial constructions themselves.

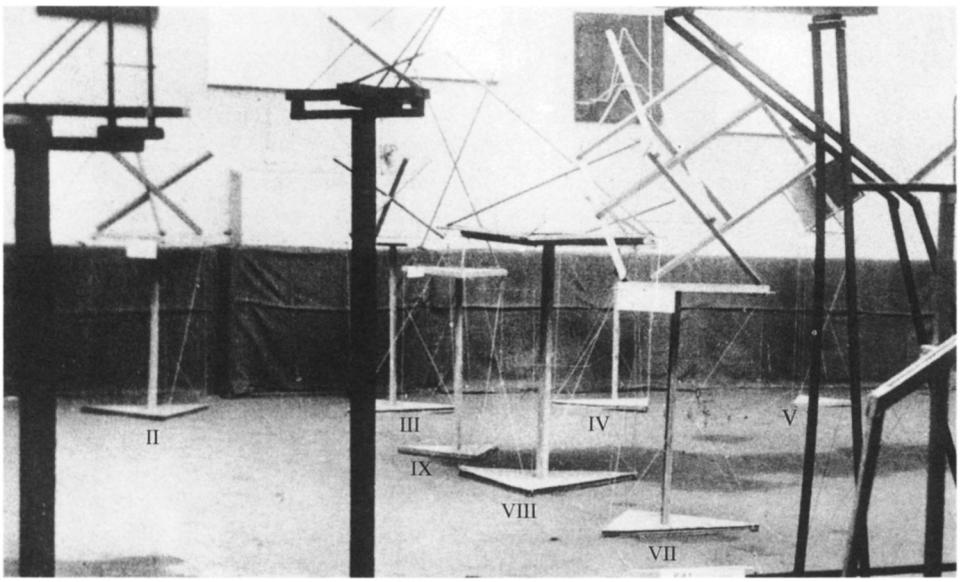
In the Constructivist gallery at Obmokhu, Ioganson showed a small but presumably representative selection of his spatial work produced between late 1919 and May 1921. Since the bruising of the photograph renders *I* all but illegible, I will proceed directly to the eight constructions mounted on triangular bases, numbered hypothetically according to what seems to me the conceptual path of Ioganson's experiment (figs. 5, 9). Of all the constructions in the exhibition, Ioganson's are the most relentlessly antipictorial: they seem to resist our attempts to read their logic off the flat surface of the photograph, and demand instead to be remade in the analyst's hands. Essential to my analysis, therefore, have been the efforts of Selim Khan-Magomedov who, in the 1970s, produced study models of six constructions (*II, III, IV, VI, VII,* and *VIII*), and the neo-Constructivist Vycheslav Koleichuk who, more recently, reconstructed *II, VII, VIII,* and *IX* for the purposes of exhibition.[26]

23. It is worth noting that the Latvian painter and critic Waldemars Matvejs, who published the first exposition of the notion of *faktura* under the pseudonym Vladimir Markov (see his *Printsipy tvorchestva v plasticheskikh iskusstvakh: Faktura* [St. Petersburg: Soiuz Molodezhi, 1914]), was a figure well known to the inaugural class of the Riga School of Art, of which Ioganson had been a part.

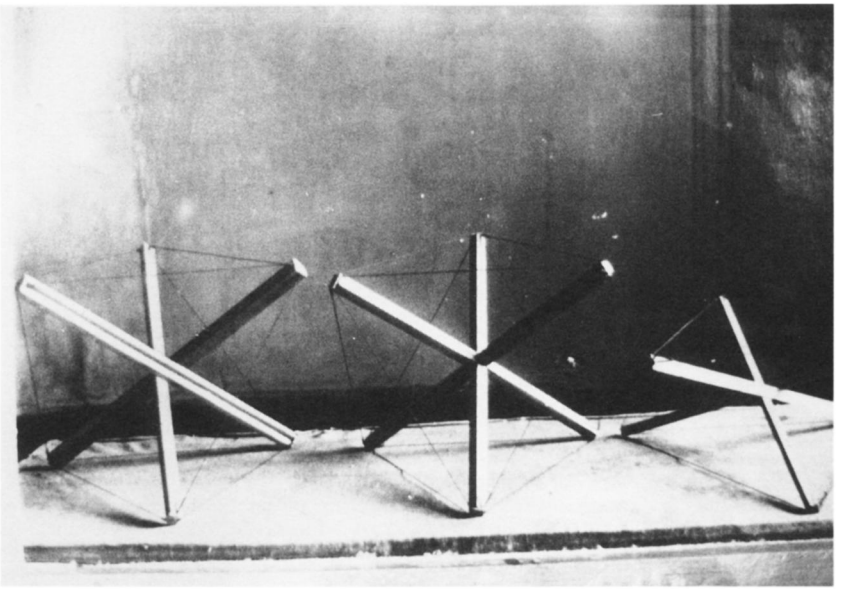
24. Ioganson (meeting of March 28, 1921), quoted in Khan-Magomedov, "Konstruktsiia, izobretenie i konstruktivizm: k probleme formirovaniia kontsepsii khudozhestvennogo konstruirovaniia," *Tekhnicheskaia estetika (Trudy VNIITE)* 23 (1980), p. 62.

25. In the paragraph from *Opyt teorii zhivopisi* that precedes the one quoted in note 22, Tarabukin asserts that "the material dictates form to the artist, and not the other way around" (p. 32). This declared shift in agency in the production of form—from the artist to the material—had radical implications for the meaning of *faktura.* Whereas in Western European languages and conventional Russian usage, "facture" is the tangible physical evidence that facilitates attribution—the handling of pigment being understood as the material trace of artistic personality—for the Russian avant-garde, by contrast, *faktura* signified not authorial presence but the very opposite: the force of the material itself was to transcend the artist's handling of it. On the problem of *faktura* see, inter alia, Yve-Alain Bois, "Malevitch, le carré, le degré zéro," *Macula* 1 (1976), pp. 37–38; Margit Rowell, "Vladimir Tatlin: Form/Faktura," *October* 7 (Winter 1978), pp. 91, 94; and Benjamin H. D. Buchloh, "From Faktura to Factography," *October* 30 (Fall 1984), pp. 86–87 n. 6 and passim.

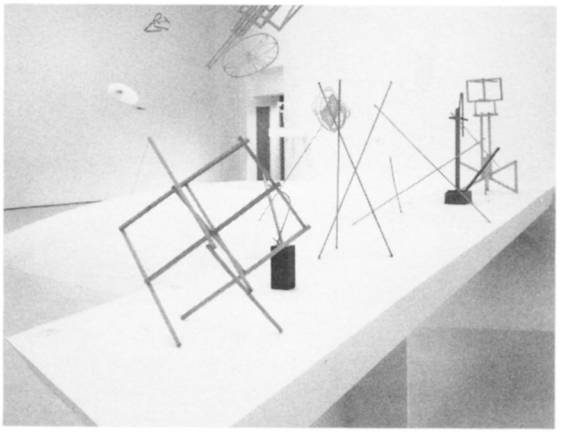
26. See Khan-Magomedov, "Konstruktsiia," pp. 63–67. In 1991, Koleichuk was commissioned to reconstruct *VII, VIII,* and *IX*; these were exhibited in the traveling *Great Utopia* exhibition of 1992–93 (see figs. 11, 12). See his "Karl Ioganson—Izobretatel,'" in *Velikaia Utopia* (Moscow: Galart, 1993), pp.

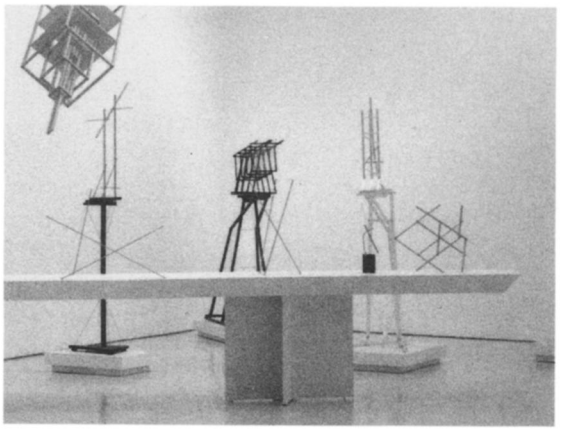


9. Detail of figure 2 with annotations.



10. Karl Ioganson. Spatial Constructions.
1920–21.



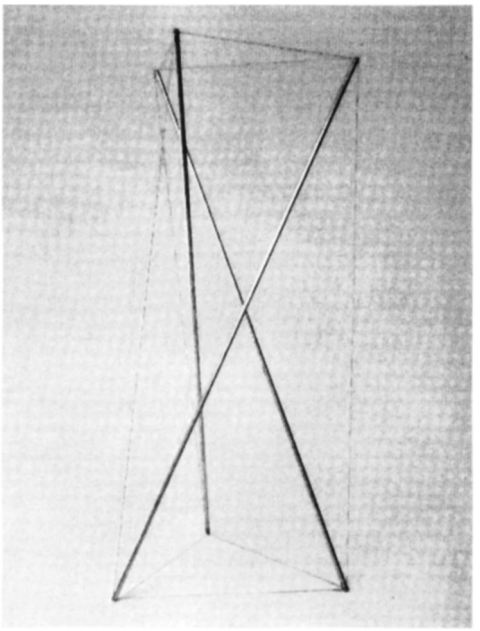


11–12. Installation of reconstructions at The Great Utopia. *Guggenheim Museum, New York. 1992.*

II, *III*, and *IV*, spaced along the rear east wall (fig. 9), form a kind of subset within his overall series. A photograph taken on a separate occasion presents the three works together in the same triadic sequence, albeit without their bases (fig. 10).[27] *II* and *III* are possible variations for the construction of a right-angled cross; *IV* for that of an acute-angled cross. In *II*, three wooden struts, right-angled in section, form a right-angled spatial cross through the alignment or flush contiguity (and not, significantly, intersection) of their flat sides. Into both ends of each

175–76. A second commission, comprising *II* and *VIII*, was completed by Koleichuk in 1993 for the Wilhelm Lehmbruck Museum in Duisburg; see *Europa, Europa: Das Jahrhundert der Avantgarde in Mittel- und Osteuropa* (Bonn: Kunst- und Ausstellungshalle der Bundesrepublik Deutschland, 1994), vol. 1, pp. 204–5.

27. Vladimir Stenberg later recounted that Ioganson's bases had been an afterthought (see Alma Law, "A Conversation with Vladimir Stenberg," *Art Journal* 41, no. 3 [Fall 1981], pp. 224–25). This helps to account for Ioganson's rather ill-designed bases (in contrast both to what they support and to those of the Stenberg brothers).



13. Karl Ioganson. Spatial Construction. *1920–21 (1991 reconstruction).*

strut is screwed a small metal plate; nine identical lengths of wire cable are then threaded through holes drilled into the plates, pulled taut and secured. The matrix of bracing wires in tension, and the centralized contiguity of the struts in compression, form a rigid structure capable of bearing loads without collapsing or undergoing permanent deformation of its members. The structure is indifferent to gravity and orientation: under suspension and rotation it will retain its rigidity. Its equilibrium is, in short, "locked in."

It is this quality—rigidity—that Ioganson has in mind, I would argue, when he uses the expression "cold structure." For Ioganson, "cold structure" is a structure in which all the forces acting upon it, both internally and externally, are in a state of equilibrium. This definition is confirmed by Vladimir Stenberg's late reminiscence that Ioganson used the term "cold structure" to refer specifically to a "non-kinetic, non-mechanical structure [*nepodvizhnuiu, nemekhanicheskuiu strukturu*]."[28] This holds good for all of the latter's spatial constructions at the Obmokhu exhibition with the exception of *VIII*, which is a special case to be discussed in turn. Besides this single exception, Ioganson's abiding interest is not the construction of apparatuses with movable parts but the pursuit of rigid structure. *II* is a rigid structure constructed entirely without recourse, however, to rigid joints. Tatlin's censure of welding, on account of the violence it wreaks upon the material, is thus taken further, for Ioganson avoids even the traditional carpentry used in

28. Quoted in Khan-Magomedov, "Konstruktsiia," p. 58.

the *Monument to the Third International.* The simple contiguity of three wooden bars, in the form of a right-angled cross common to any timber roof construction, is afforded stability by the strategic deployment of wires in tension. The wire cables are therefore doing *structural* work, which implies that cables in tension can, to a significant degree, take the place of rigid members in compression.

Using the same materials, *III* presents a variation on the construction of a right-angled cross. Six struts (half-lengths with respect to those in *II*) and twelve pieces of bracing wire are used (compared to nine in *II*). Two crucial changes can be observed. The half-lengths are joined, in a manner unfortunately not visible in the photograph, to form the central "intersection" of the cross. However the joint is made, it is presumably not in and of itself capable of conferring stability upon the whole, since four rather than three wires are threaded through each metal plate. The overall count of twelve bracing wires affords the construction rigidity, resulting in a virtual octahedron consisting of eight triangular planes or faces. *III* is a cold structure, but it lacks the structural economy of *II.* In *II,* the number of wires is precisely calculated, Khan-Magomedov reports, so that this number is no more and no less than is necessary for structural stability: *II* is braced by three wires, one for each strut.[29] In *III,* by contrast, two wires run from the end of each strut (making a total of six wires in all), necessitated by the instability of the mock "intersection" of the half-length struts. Contiguity is thus shown to be the more rationalized mode of cross construction, not only because it avoids both the difficulty and expense of joints (the weakness of traditional timber construction was always in the joints), but also because it reduces material expenditure overall. In other words, *II* and *III* have the same structural virtues but *II* gets them for less. Cold structure itself is therefore only the first of Ioganson's several objectives, the second of which is to impose upon construction the greatest possible economy of material and energy: what is *the minimum number of elements* required in order to produce a cold spatial structure?

Even when the wire cables are unequal in length, resulting in a sprawled acute-angled spatial cross, as in *IV,* the constructive principles of contiguity and reduction are still capable of producing a rigid structure. Ioganson's economy of construction is thus shown to have a certain flexibility: it applies in all possible cross formations, these being in turn, as repeatedly stated by the Constructivist, the basis of all cold structures. In terms of an economy of construction, then, *II* and *IV* are clear advances upon *III.* Within the logic of the experiment, *III* becomes the fall guy, serving to throw into sharper relief the more rationalized solutions presented by those that flank it. The triad demonstrates not only Ioganson's pursuit of cold, read "rigid," structure, but also his search for a universally applicable constructive system involving the least possible material expenditure: minimum outlay for maximum return. With such an economy of expenditure, the artist demonstrates that rigidity is not dependent on the presence of rigid joints,

29. Ibid., p. 63.

but can be produced through tensile stress. In the name of structural economy, Ioganson foregrounds the deployment of wire cable as an integral *structural* member of the construction, rather than as more simply the means of its assembly.

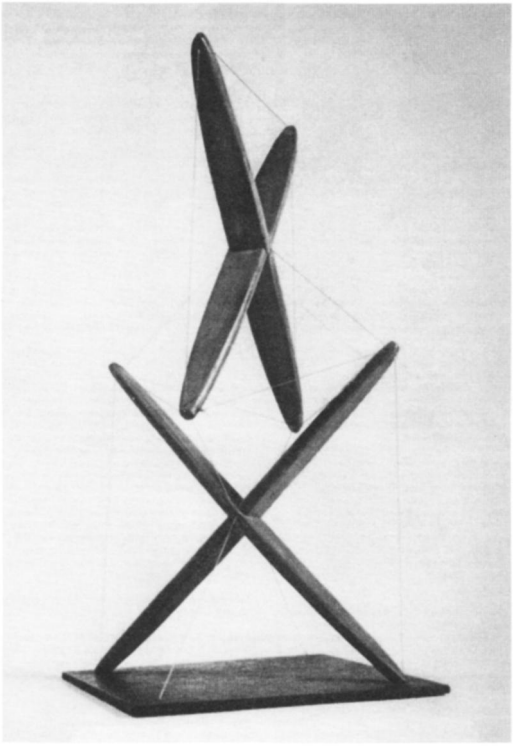
Upon the basis of his findings in the triad, Ioganson begins to generate larger, more complex constructions.[30] With *VI* and *VII*, he factors in a new requirement: the *modular extension* of the primary cold structure. All the units of wood deployed are cut to a standard length. This is at first a little difficult to see, however, because when mounted, both *VI* and *VII* are tipped onto three points. Displacement onto a diagonal axis lends dynamism to the right-angled articulation but without compromising its rigidity, further underscoring the cold structure's antigravitational capacity for rotation and reorientation. At the same time, the displacement deflects any attempt to read the structures "in sum" since each admits of radically different views (cf. figs. 5, 9, 11, 12).

Both *VI* and *VII* begin with the contiguous arrangement of three wooden struts in the form of a right-angled cross. But in *VI*, instead of attaching bracing wires to each end of the three original struts, Ioganson attaches two wooden bars at precisely their midway point. Each is of the same length as the original struts; one is attached vertically, the other horizontally. The end of each of these additional bars is then connected with another, to create, as it were, three frames in all. Each frame lies in the horizontal plane of one of the three original struts, while two of the three original struts form the internal cross-beam of each frame. A total of fifteen struts is used in *VI*, and there are no bracing wires.

Replacing six of the fifteen rigid members with bracing wire in *VII* produces a more complex but nevertheless still rigid version of the modular extension of the basic cross, comprising nine struts of identical length and fifteen bracing wires also of equal length. At each end of the three original struts Ioganson attaches one additional strut, either in a vertical or in a horizontal position with respect to the basic cross configuration, making a total of nine struts. Nine of the total of fifteen bracing wires are in the same position as in *II*; the remaining six are stretched between the free ends of each of the additional struts. This once again demonstrates that strength and rigidity depend neither on mass nor weight: metal cables are thinner and stronger than timber struts. With *VI* and *VII*, Ioganson's economy of construction thus arrives, via the standardized modular unit, at the possibility of potentially infinite expansion within a nonrelational progression. Ioganson was the only one to work with the principle of modularity in the Constructivist gallery, a principle which Gan applauds, in another context, as comprising "Nothing accidental, nothing not accounted for, nothing as a result of blind taste or aesthetic arbitrariness."[31]

From this point on, both the stakes and the ambition of Ioganson's experiment escalate, along initially related but ultimately radically divergent paths. In the last

30. I am skipping over *V* because it is insufficiently visible.
31. Gan, *Konstruktivizm* (Tver': Tverskoe izd-vo, 1922), p. 65.



14. Kenneth Snelson. Early X Piece. *1948–49.*

two constructions of the series, Ioganson replaces the wooden struts with metal rods, which opens up new possibilities. While the centralized contiguity of the three struts is fundamental to the "economy" of the cold structure of *II* and *IV* through *VII*, such contiguity is largely dispensed with in *VIII* (cf. figs. 9, 11). Composed of three metal struts and seven bracing wires, the formerly contiguous cross is displaced in *VIII* into a kind of sprawling motion, so that only two of the rods, which slide along each other, remain in any kind of contiguous relationship; the third simply "floats" in the net of bracing wires. *VIII* is not a "cold structure" but a mechanism, of the kind that Stenberg stated Ioganson was *not* making, the single exception therefore to Ioganson's series of cold structures. *VIII* cannot support loads, nor tolerate rotation or suspension without alteration to its structure. What *VIII* demonstrates is not rigidity but the process by which rigidity is established: the finding of the delicate equilibrium of compressive and tensile forces essential for stability. "With any stimulus to the freely floating strut," Koleichuk writes, "the precarious balance of the composition's forces is destroyed," but this movement will gradually subside and the structure's members will come to rest once again in a stable formation.[32] In accordance with the pedagogical deliberateness of Ioganson's series, *VIII* is a meditation upon the intrinsic and perpetual motion of all, *including rigid*, structures: since all structural materials

32. Koleichuk, "Karl Ioganson," p. 176. (The captions for the reconstructions of *VIII* and *IX* have been inadvertently transposed in his essay; see *Velikaia Utopiia*, p. 175.)

respond to the forces that act upon them, there can be no perfectly rigid structural materials, which means in turn that all structures sustain some degree of movement, however imperceptible. First published by the Hungarian Communist Bela Uitz in 1922, and again in 1929 by the Constructivist Lazlo Moholy-Nagy, *VIII* quickly became the most well-known of Ioganson's constructions in the West, but it was not, in fact, the last word in his series.[33]

The final work of the series, *IX*, is partially dissolved in the installation photograph by the flood of light coming from above that renders one of its three metal struts all but invisible in the web of interlaced cables, struts, and pedestals which amasses at the east end of the gallery (cf. figs. 9, 13). *IX* consists of three metal struts, each about a meter in length, and nine bracing wires. The almost illegible third strut rises, inclined to the right, from the corner of the triangular base that projects directly toward us. Centralized contiguity is here not only displaced, as in *VIII*, but made wholly redundant. There is no cross as such, or rather, there is only the ghost of a former contiguity. It is as if *IX*, which has the same ratio of compressive to tensile members as *II*, drags the spatial cross of *II* skyward, resulting in the elongation of its members to such an extent that they no longer touch one another. "It is as if," Koleichuk writes, "they are floating in a net of . . . wires."[34] The elimination of centralized contiguity in *IX* exacerbates the perceptual ambiguity already noted with regard to *VI* and *VII*: the production of a fundamental asymmetry, a kind of unpredictability of structure that presents radically divergent versions of itself according to the vantage point of the viewer. There is no demarcation of interior from exterior in this disorienting structure; nor would it be possible to "clad" *IX*, to provide it with a virtual skin (as is possible with the octahedron of *III*).

Despite the fact that its rigid members do not touch, *IX* is nevertheless capable of sustaining rotation, suspension, and loading forces without permanent deformation or collapse. *IX* presents, therefore, an entirely new order of cold structure which does not depend whatsoever on rigid joints, nor even on the contiguity of the cross. Instead, *IX* owes its stability to a precisely configured interplay between, or mutual annihilation of, the forces of discontinuous compression (in the metal rods) and those of continuous tension (in the taut wire cables). The rigidity of *IX* is secured by carefully factoring in the *length* of its struts and tendons. (Previously in the series, length had no bearing on the structure's stability, as *IV* demonstrates.) The factoring in of length affords a radical nonhierarchy of material within the structure: no material is subordinate to, nor more important than, the

33. See *Egység* 2 (1922); reproduced in *The First Russian Show: A Commemoration of the Van Diemen Exhibition. Berlin. 1922* (London: Annely Juda Fine Art, 1983), p. 41. See also Moholy-Nagy's Bauhaus book *Von Material zur Architektur* (Munich: Langen, 1929 [1928]), p. 133, fig. 116. It seems plausible to suggest that Ioganson's *VIII* served, for Moholy-Nagy, as a critique of what he had derided as the otherwise "static" Constructivism of the Russian Constructivists, and therefore as a pedigree and exemplar for his own explicitly kinetic interpretation of Constructivism; on the latter, see Moholy-Nagy and Alfred Kemeny, "Dynamic-Constructive System of Forces" (1922), in Krisztina Passuth, *Moholy-Nagy* (London: Thames and Hudson, 1985), p. 290.

34. Koleichuk, "Karl Ioganson," p. 176.

other. Under tension, the thin wire cables are of equal value, structurally, to the rigid members. The wires are structural members, not merely assembly elements: if one of the nine were cut, *IX* would collapse.

Gutted of any kind of centralized core or nucleus, *IX* turns out to be the most acute dramatization of the principle of tensility. It demonstrates that Ioganson's cold structure need not, in fact, be dependent upon any kind of internal supporting armature. With *IX*, the Constructivist therefore transcends his own rhetoric apropos the cross as the fundamental principle of all cold structures, discovering a new way in which to construct a cold structure. The rigidity of *IX* depends not on the existence of rigid joints, or even on a contiguous cross stabilized by bracing wires, but on an altogether new principle.

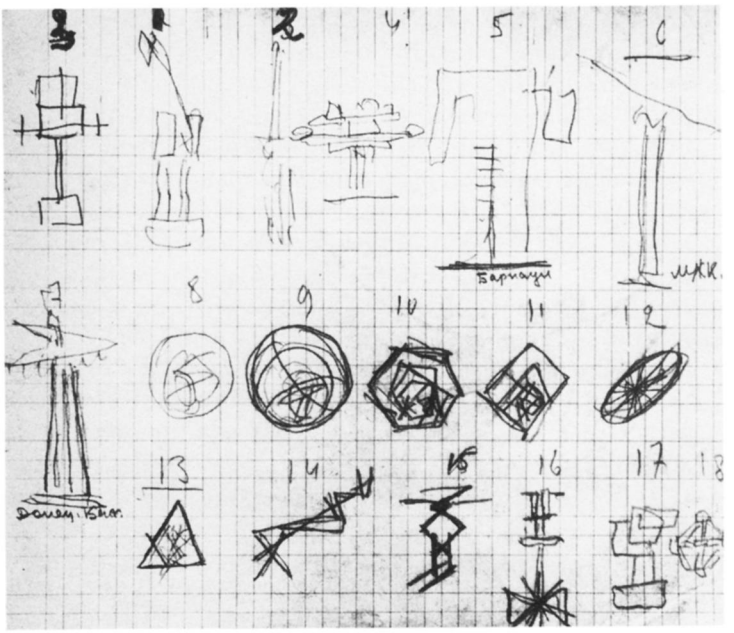
Koleichuk argues that *IX* is an example of what would now be called in the West a "tensegrity system." In his view, Ioganson is therefore to be credited with having been "the first to demonstrate this very simple spatial modulus (which belongs to the new class of constructions that were discovered again . . . by B[uckminster] Fuller in the late 1950s and named by him tensegrity)."[35] Koleichuk's argument raises complex issues, but to clarify one point first: although Fuller did invent the name "tensegrity"—a contraction of "tension" and "integrity"—he was not the one to have "discovered [it] again." This slip is completely understandable since Fuller always claimed, at least in the public realm, to have invented the principle himself. In fact, the (re-)discovery of this novel structural principle was made in 1948–49 by a young American artist whom Koleichuk also mentions, Kenneth Snelson. In the summer of 1948, Snelson had gone to study with Joseph Albers who was then teaching at Black Mountain College. Fuller was also at Black Mountain that summer as a visiting professor, designing the geodesic domes for which he was to become renowned. Snelson was captivated by both Albers's Bauhausian principle of "less is more" and Fuller's radical spatial experiments. One of the first works he made upon his return home was *Early X Piece* which he dates to December 1948 (fig. 14): two rigid members—wooden "X" forms—are suspended, without touching one another for support, in a matrix of nylon tension lines. *Early X Piece* maintains its form irrespective of external factors such as gravity. When Snelson showed it to Fuller the next year, the latter was impressed by its "discontinuous structure," and in a letter credited Snelson with the "original demonstration" of discontinuous compression and continuous tension.[36]

If *Early X Piece* is what credits Snelson with the "discovery" of an as yet unnamed structural principle, then Ioganson's *IX*, with its discontinuous compression

35. Ibid. "A tensegrity system is established when a set of discontinuous compressive components [e.g., the rods] interacts with a set of continuous tensile components [e.g., the wires] to define a stable volume in space" (Anthony Pugh, *An Introduction to Tensegrity* [Berkeley: University of California Press, 1976], p. 3).

36. Quoted in Howard Fox, "Kenneth Snelson: Portrait of an Artist," in *Kenneth Snelson* (Buffalo, NY: Albright-Knox Art Gallery, 1981), p. 23 n. 1.

15. Aleksandr Rodchenko. Untitled.
Circa 1921.



and continuous tension, must credit the Constructivist in the same way. That is to say, both Snelson and Ioganson discovered or invented, independently, the same structural principle. In any positivist account, Ioganson's temporal priority would grant him the greater originality, but the matter of invention is significantly more complex. What must be factored in is an assessment of what was made of the new principle by the inventor and his contemporaries. As is well known, the tensegrity principle was greatly developed in the postwar period by Snelson, for whom it became the basis of his life's work, as well as by many others. What, however, did the Constructivist make of it? We know that from early 1922 onward, Ioganson began to represent himself as an "inventor," and that Lisitskii refers to him thus in his 1922 Berlin lecture.[37] We have no record, however, that Ioganson referred to *IX* in any specific way, nor did he, unlike Snelson and Fuller, patent the principle.

If the significance of *IX* was not grasped at the time of its exhibition, an important reason for this has to do with the fact that while tensile structures date to antiquity, it was only with the advent of high-strength steels after the Second World War that cables of extraordinarily high tensile strength could be made, and thus a full exploration of tensile stress as a structural principle take place. Snelson

37. A letter of March 1, 1922 from Ioganson to the INKhUK's chair Aleksei Babichev is signed "from the inventor, Ioganson" (Khan-Magomedov collection, Moscow). See also Ioganson, "From Construction to Technology and Invention"; and Sophie Lissitzky-Küppers, *El Lissitzky: Life, Letters, Texts* (New York: Thames and Hudson, 1980), p. 340.

and Fuller were able to take up the promise of the tensegrity principle in a way that was, I am suggesting, *materially* impossible for Ioganson. Indeed, the very recognizability of Ioganson's *IX* as a significant invention is hinged upon the achievements of those who came after him: the great body of space-frame work produced in the 1950s and 1960s constitutes one of the preconditions, that is, for grasping the significance of Ioganson's discovery. Unfortunately for the Constructivist, *IX* was one of those inventions that, as Vladimir Shklovskii was to put it in another context, "came too early."[38]

Systemic Invention

Having discussed the substance and path of Ioganson's experiment, I want to consider, finally, the polemical investment of his spatial constructions vis-à-vis those of his Constructivist colleagues. To summarize first Ioganson's series: *II*, *III*, and *IV* declare the cross as the fundamental principle of cold structure; *VI* and *VII* demonstrate its modular extension; and *VIII* and *IX* transcend it—*VIII*, as a meditation upon the intrinsic and perpetual motion of all, including rigid, structures, and *IX*, by ridding cold structure of any internal armature whatsoever. Considered overall, Ioganson's sequence constitutes an unrelenting investigation of tensility in the name of formulating a constructive practice with the greatest possible economy of both materials and energy. (In this regard, Russia's material shortage in the post–Civil War period has productive poignancy insofar as it could be said to have stimulated, rather than circumscribed, this investigation.) His spatial experiment seeks to formulate, in short, a mode of production that could eradicate, as Ladovskii had defined it, the excess and relationality of composition.

Of his Constructivist colleagues, it was with Rodchenko that Ioganson had the most engaged and sustained dialogue. Rodchenko's pictorial inventory describes three distinct series of spatial constructions (fig. 15). The first series, dating to 1918–19, consists of cantilevering planes, cut in plywood in a limited range of shapes, slotted into one another and painted white (sketches 1 through 7). In his second and third series, Rodchenko rejects this compositional mode of assembly of heterogenous forms in favor of uniform elements, homogenous materials, and nonrelational structures (sketches 8 through 18). In the *Hanging Spatial Constructions*, four of which—*XXII*, *XXIII*, *XXIV*, and *XXV*—are suspended at various intervals from three wires that cross the ceiling diagonally (fig. 5), Rodchenko elaborates a nascent principle of deductive or indexical structure: the very structure of the work reveals the process of its production.[39] Each is

38. "O rodivshikhsia slishkom rano: Sud'ba mekhanikusa Polzunova," *Izobretatel'* 1 (January 1929), p. 37.

39. The terms deductive and indexical are not drawn from the Constructivist lexicon, but are nevertheless extremely useful in delineating the systemic character of Rodchenko and Ioganson's spatial constructions. The concept of "deductive structure" was developed by Michael Fried in his

produced in the same way: on a sheet of plywood, Rodchenko drew with compass and ruler, repeating the given geometrical figure to form a regularly diminishing pattern. The lines were then cut and the ribs rotated into space, affording the once flat plane its spatial volume. Some of the ribbed elements would then be fixed to one another with wire. As in the case of Ioganson's spatial constructions, these wires were removable so that the constructions could be collapsed and archived.[40]

Insofar as the structure of each of the *Hanging Spatial Constructions* is deduced entirely from the initial geometric figure selected, only the first cut is "arbitrary" (and even this arbitrariness is mitigated by Rodchenko's recourse to a universal planar geometry). Their deductive or indexical structure constitutes an important example of what I discussed earlier as the avant-garde's radical inflection of the notion of *faktura* in terms of a shift in agency from the artist to the material itself.[41] There remains, however, a crucial difference between Rodchenko and Ioganson's respective systemic structures in the Constructivist gallery. In Hubertus Gassner's otherwise very suggestive taxonomy of spatial constructions, "systemic structure" is equated with "cold structure."[42] This is problematic since Rodchenko's *Hanging Spatial Constructions* are not cold structures. As discussed earlier, "cold structure" has a specific meaning within the Constructivist orbit of 1921—namely, rigidity. Of Ioganson's series, only his mechanism, *VIII*, broaches the question of movement: for movement to occur the force must be more substantial than the weight of the floating metal rod itself. His mechanism is both kinetic and stable but alternatively so, whereas the slightest variation in the current of air sets Rodchenko's delicate ellipse into motion, a kineticism further accentuated by the aluminum paint that the artist applied to some of its ribs. The kinetic quality of Rodchenko's second series of systemic constructions indicates therefore that "cold structure" is not a concern that is shared by Ioganson and Rodchenko, but rather one that divides them.

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discussion of Frank Stella's black and shaped canvasses of the late 1950s and early 1960s (see *Three American Painters* [Cambridge: Fogg Art Museum, Harvard University, 1965], especially pp. 40, 46). The efficacy for the study of twentieth-century art of C. S. Peirce's definition of the indexical sign—in which the relationship between the sign and its referent is understood to be causal—is forcefully demonstrated by Rosalind Krauss in "Notes on the Index: Part 1" and "Part 2," in her *The Originality of the Avant-Garde and Other Modernist Myths* (Cambridge: MIT Press, 1985), pp. 195–219; see also Buchloh, "From Faktura to Factography," pp. 89–90.

40. See Mikhail Kaufman's well-known photograph of Rodchenko posing, in the Constructivist overalls of his own design, before his collapsed second series of spatial constructions (reproduced in Lodder, *Russian Constructivism*, p. 28, fig. 1.33). In terms of their collapsibility, both Ioganson's and Rodchenko's spatial constructions are fully consistent with Stepanova's argument that "the Museum as a storehouse of the unique object has turned into an archive"; see *5 x 5 = 25: Vystavka zhivopisi* (Moscow: Klub VSP, 1921), n. p.; trans. C. von Manen in *5 x 5 = 25: A Catalogue in Facsimile* (Budapest: Helikon, 1992).

41. See notes 22 and 25.

42. See "The Constructivists," p. 314. Rodchenko's third series, based upon the principle of modularity, is his most explicit contribution to the "systemic" mode of construction developed with Ioganson. None of this series was exhibited in May 1921, however, whereas the modular principle governs the entire run of Ioganson's spatial experiment at Obmokhu and is specifically demonstrated by *VI* and *VII*.

Medunetskii's small spatial constructions—four of which are arranged upon an elevated triangular table (*XV, XVI, XVII, XVIII*) while a fifth rests on a lower pedestal against the south wall (*XIX*) (figs. 3, 6)—are assemblages of industrially processed materials and found objects, the detritus of Russia's infant industrialism. Medunetskii believed that working in three dimensions in and of itself eradicated any residual fetishism of material surfaces: "It's good that we have moved away from drooling over surfaces and from textural [*fakturnoi*] beauty in painting. Material demands construction and in spatial objects there is none of the old drooling over the material."[43] Notwithstanding this conviction, Medunetskii's spatial constructions are well characterized by Gassner as "warm" constructions "based on materials and not on a structural system."[44] Each construction, in other words, is a small laboratory of contrasting *faktura* (understood now in the reductive sense in which Medunetskii himself uses it, i.e., as merely "texture"), ostensibly not unlike Tatlin's "selections of materials" but with several important differences: Medunetskii's constructions proclaim their complete independence from the wall; their articulation of space is explicitly linear; and their points of contact are, as Christina Lodder notes, reduced to an absolute minimum.[45] Consider, for example, the configuration of cantilevering metal rods, *XV*, at the far left of the table, wherein each rod intersects the other and one even punches through that which "supports" the structure, its cubic "base." Further, Medunetskii's interest in explicating the force-resistance of materials does not transcend the more general principle of compositional accretion: in the Yale construction, *XIX* (fig. 3), the frank malleability of the S-shaped tin strip is juxtaposed with the utterly resistant curvature of the iron rod. This contrast of tin and iron elements is then anchored to the base, compositionally, by a second formal and material juxtaposition: the brass triangular plane and the zinc coupling ring. These contrasts are further accentuated by the distinct colorations of the materials, both inherent (the yellow sheen of the brass) and applied (the painted red iron rod and the faux marbling of the metal base).[46] Despite his statement to the contrary, Medunetskii's evident pleasure in exploring contrasts of material texture for the sake of demonstrating those contrasts leads him to a concern with composing internal formal relationships.

The towering construction *XX* in the center of the gallery is by Vladimir Stenberg, while adjacent to the midpoint of the long south wall is his small construction, *XXI*; the work of his brother Iorgii occupies the foreground of figure 6: *X, XI, XII, XIII, XIV*. While the Stenberg brothers (who often worked collaboratively) and Ioganson seem to be closely aligned in terms of their ostensible interests, when we compare their respective contributions to the gallery it becomes clear that the brothers and Ioganson were, in fact, the furthest apart of all the

43. Quoted in Khan-Magomedov, "Diskussiia," p. 59.
44. Gassner, "The Constructivists," p. 314.
45. Lodder, "The Transition," p. 276.
46. Ibid.

group's members. Each had taken on board at least some of the engineer's new materials (steel, iron, glass) and had, as well, taken his enthusiasm for the engineer's structural art to the classroom in order to familiarize himself with the new forms invented in the late nineteenth and early twentieth centuries—suspension bridges, radio towers, aeroplanes, and dirigibles—all of which were powerful demonstrations of the structural virtues and possibilities of tensile stress. The Stenbergs had attended the Moscow Institute for Civil Engineering, while Ioganson became involved with the training workshops of the Moscow District Military Engineering Directorate. The main focus of both civil and military engineering at this time was bridge construction, and from a pedagogical point of view this meant, above all, instruction in the art of the truss: a lightweight, non-massed form of horizontal beam. Although ancient in principle, the form of the truss had undergone a process of extremely rapid transformation with the advent of iron and steel.

The Stenberg brothers evidently made more exacting use, in a conventional sense, of their time in the classroom than did Ioganson. Their drawings indicate a keen interest in calculating engineering-type specifications for their spatial constructions, including for their stunning bases.[47] But it is not this technical "sophistication" that chiefly distinguishes the Stenbergs from Ioganson, but rather the particular purpose to which each put his newly acquired knowledge. While the spatial constructions of the Stenbergs are stable, nonkinetic structures, rigidity itself is not at all the *subject* of their work as it is for Ioganson. Instead, the Stenbergs instrumentalize tensile stress for the purposes of a more or less traditional task of *representation*, which operates on two levels. The first level is symbolic: the dynamic sweep of the parabolic curve of steel in *XX* signifies, within a highly rationalized structure, a desire for flight, for the conquest of space, for the transcendence of material limitations and the refusal of the constraints of gravity. The second level has to do with resemblance: *XX* frankly resembles the bridge-towers that stand at either end of a bridge-span.[48] (Other constructions exhibited elsewhere by Vladimir resemble the cantilevers of cranes.)[49] In the Constructivist gallery, Iorgii's constructions similarly suggest existing technological apparatuses, while in other related works his fascination with the engineer's truss is made explicit.[50] Ioganson was among the harshest critics of such constructions: in a session of the composition and construction debate, he asserts that each of the Stenbergs' spatial works is "merely the representation [*izobrazhenie*] of a technical construction."[51] Enthusiastic imitation of existing technical armatures was not, as far as Ioganson was concerned, a solution to the problem of the relationality and excess of composition with which the INKhUK was deeply engaged.

47. See *Von der Fläche zum Raum* (Cologne: Galerie Gmurzynska, 1974), catalogue no. 69.
48. Bela Uitz published Vladimir's towering construction in *Egység* with the title "Bridge Construction" (*The First Russian Show*, p. 42).
49. See *Von der Fläche zum Raum*, catalogue no. 67.
50. See ibid., catalogue no. 64.
51. Quoted in Khan-Magomedov, "Konstruktsiia," p. 57.

When the critic Nikolai Tarabukin ridicules such aestheticizing "imitations of technical and engineering structures" for having no utilitarian function, he is giving voice to one of the fundamental dichotomies underpinning the Constructivists' famous call to production in November 1921: the rejection of aestheticism (or "easelism" [*stankovizm*]) in the name of functionalism.[52] While the aestheticism of the Stenbergs' technical armatures is unmistakable, Ioganson's cold structures cannot be slotted neatly, however, into the other half of this pervasive dichotomy. Rather, what I want to suggest is that Ioganson's spatial experiment escapes the oppositional terms of Tarabukin's critique: for these cold structures, no referent can be found, nor any function defined. The polemic between Ioganson and the Stenberg brothers in the Constructivist gallery has therefore a deeply ironic cast. As would-be technological fundamentalists, the Stenberg brothers subscribed to the notion that technology offered a full-proof means by which to get rid of aesthetic judgment. Yet for all their championing of functionalism, and for all their familiarity with engineering specifications, the ultimate results of their labors are aestheticizations, that is, imitations of that which has *already* been invented. Whereas Ioganson, by insisting on remaining within the terms established by the composition and construction debate—the struggle against excess—circumvents resemblance and easy familiarity with what is already known, and in so doing, invents a new principle—a prototensegrity principle—that would come to have, in the course of the twentieth century, enormous functional significance. In the Constructivist gallery at the Obmokhu exhibition of May 1921, therefore, we witness not merely a transitional laboratory phase between "pure experiment" and "experiment which has a basis in reality," but rather a precise instantiation of the failure of the doctrine of functionalism and the triumph, instead, of a noninstrumentalized mode of invention. At a meeting of the Working Group of Constructivists—two weeks before the Obmokhu exhibition opened—Ioganson summed up this triumph in the following way: "When they invented the radio they did not exactly know, at the time, how they would use it."[53]

52. *Ot mol'berta k mashine* (Moscow: Rabotnik prosveshcheniia, 1923), pp. 10, 17–18.
53. Ioganson (meeting of May 11, 1921), transcribed in Khan-Magomedov, *Inkhuk*, p. 110.