

# Looking to the Future: Science, Technology, and Utopia by Dušan Barok



[Fig. 1] Small Electronic Calculating Machine (MESM), Feofaniya, Kyiv, 1951; (left to right) Lev Naumovich Dashevskiy, Zoya Sergeevna Rapota, Lidiya Mikhailovna Abalshnikova, Tamara Ivanovna Pesukh, and Yevgeniy Evgenyevich Dedeshko

When Sergei Lebedev's team built the computer at the Feofaniya Monastery in Kyiv in the early 1950s, it was kept out of public view for strategic research in such areas as rocketry and electrical transmission lines.<sup>1</sup> [Fig. 1] Within a decade, however, cybernetics in the Eastern Bloc had risen from a sensitive "bourgeois science" to an aspiring lingua franca of the sciences, discussed by its *spiritus movens* MIT professor Norbert Wiener at a congress in Moscow in 1960.<sup>2</sup> It was made compatible with dialectical materialism, the philosophical foundation of the Soviet communist project, which held that contradictions in material phenomena had to be resolved by rearranging the systems of social organization.<sup>3</sup> The cybernetic framework provided a language for describing social interaction in terms of servomechanisms and logical networks, signal and noise. Its view of the brain as an organ of adaptation rather than cognition placed humans in a direct feedback loop with machines.

#### Algorithmic Apparatus

Experimental artists in the 1960s and 1970s took on the role of generating, assessing, and altering visual configurations of planar geometries produced by machines. This meant looking at the canvas like a computer, starting from an empty space defined by a grid and resolution, and fine-tuning the parameters in their algorithms that filled it with points, curves, and shapes. Painters across the Eastern Bloc, including Zdeněk Sýkora in Louny, Czechoslovakia [Figs. 3, 14]; Ryszard Winiarski in Warsaw [Fig. 13]; Adina Caloenescu in Bucharest [Fig. 8]; Florin Maxa in Cluj-Napoca, Romania [Fig. 18]; and Horst Bartnig in East Berlin [Fig. 5], then hyperrealistically transposed selected plotter drawings into oil on canvas, murals, or mosaics. Composed of grids of abstract alternating patterns, reminiscent of Gestalt-driven Op art but also of graphic musical notation, these works maneuvered between representing the liberalization of the public sphere and the socialist modernist camouflage of the industrial landscape, as in Sýkora's glass cladding on the twenty-meter high ventilation chimneys of Prague's Letná Tunnel (1967–69) [Fig. 3], later recognized as a national cultural monument.<sup>4</sup>

As a conceptual practice, early cybernetic art did not necessarily rely on computers. Drawing on the algorithmic musical composition of her Parisian milieu, Budapest-born Vera Molnár composed her drawings and paintings using "machine imaginaire" (1958–1968), employing randomness and concepts from combinatorial mathematics, carefully feeding the system by changing one parameter after another. [Fig. 2]<sup>5</sup>

Adhering to the reproducibility of the scientific experiment, the early computer-aided work remained self-contained and autonomous, attuned to the emerging circular visual economy and creative industry, such as in Zdeňka Čechová's textile and ceramics designs of the 1980s. The subversive potentials of this art form did not lie so much in its departure from the declining Communist Party line of socialist realism, but in its creation of representations of how the machine "thinks," of the inner workings of an apparatus.

#### Nuclear Environment

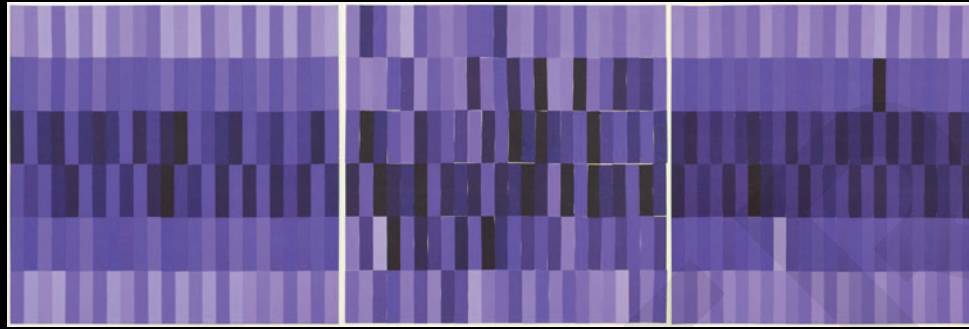
The first postwar world's fair, held in Brussels in 1958 and known as Expo 58—with its main pavilion in the shape of a giant molecule consisting of nine steel-clad spheres—sought to align the project of modernism with nuclear power. While uranium extracted in the then–Belgian Congo continued to fuel the nuclear arms race, the exhibition sought to promote the peaceful uses of the atom in nuclear-powered households, and inspired artists to break things down "molecularly" into their smallest parts to create a new reality.<sup>6</sup>

The Czechoslovak pavilion featured a stage with a film installation by Josef Svoboda and Emil Radok, which included eight canvases of different shapes and sizes titled *Polyekran* (literally "multiscreen"). [Figs. 4, 27] This work was also employed in a series of synchronized live stage performances with scenes from everyday life in Czechoslovakia titled *Laterna magika* (*Magic Lantern*).<sup>7</sup> For these works, set designer Svoboda, director Alfréd Radok, and young filmmaker Miloš Forman used new technologies to simulate the sublime image of a state-socialist utopia that had become a reality, but the polyvisuality inherent in the fragmentation of images and the multiplication of points of view was at the same time a subtle critique of the totalizing gaze of the authoritarian regime.<sup>8</sup>

Later, in Romania, the bionics-inspired Timișoara-based Sigma Group created *Multivision I* (1972–1978) [Fig. 6], an installation consisting of black-and-white film studies of the morphology of natural forms, simultaneously projected through two crisscrossed rows of successive semitransparent screens of

- 1 Slava Gerovitch, *From Newspeak to Cyberspeak: A History of Soviet Cybernetics* (Cambridge, MA: MIT Press, 2004).
- 2 Yakov Fet, "Norbert Wiener in Moscow," in *2014 Third International Conference on Computer Technology in Russia and in the Former Soviet Union* (IEEE, 2014), 194–195, DOI: 10.1109/SoRuCom.2014.50.
- 3 Gotthard Günther, "Cybernetics and the Dialectic Materialism of Marx and Lenin," *Vordenker*, (Winter 2004), [https://www.vordenker.de/ggphilosophy/gg\\_lecture-koeln.pdf](https://www.vordenker.de/ggphilosophy/gg_lecture-koeln.pdf).
- 4 "Soubor čtyř větracích komínů," *Památkový Katalog*, n.d., <https://pamatkovykatalog.cz/soubor-ctyr-vetracich-kominu-13698954>.
- 5 Zsofi Valyi-Nagy, "Vera Molnar: Weaving Variations," *Holo*, April 18, 2022, <https://www.holo.mg/dossiers/vera-molnar-weaving-variations/>.
- 6 Dennis Pohl, "Uranium Exposed at Expo 58: The Colonial Agenda Behind the Peaceful Atom," *History and Technology* 37, no. 2 (2021), DOI: 10.1080/07341512.2021.1960074.
- 7 Lucie Česálková and Kateřina Svatoňová, *The Dictator of Time: (De)contextualizing the Phenomenon of Laterna Magika* (Prague: Národní filmový archiv and Charles University, 2019).
- 8 Kateřina Svatoňová, *Odpoutané obrazy: Archeologie českého virtuálního prostoru* (Prague: Academia, 2013).

[Fig. 2] Vera Molnár, 144 Rectangles Triptych, 1969, gouache and cut paper collage on matboard

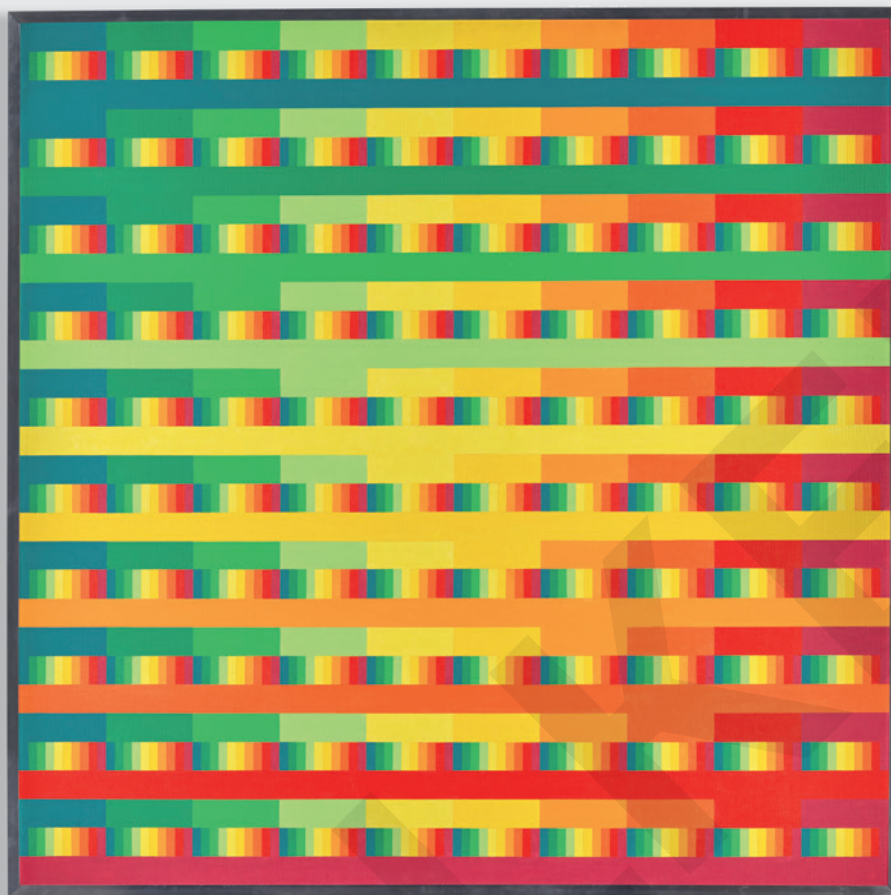


[Fig. 3] Zdeněk Sýkora, Černo-bílá Struktura (Black-White Structure) for the Letná Tunnel ventilation shafts in Prague, 1967–1969, glass mosaic



[Fig. 4] Josef Svoboda, Polyekran (1958) at the Brussels World's Fair (Expo 58)

[Fig. 5] Horst Bartrig, Komposition in zehn Farben (Composition in Ten Colors), 1979–1982, acrylic on canvas



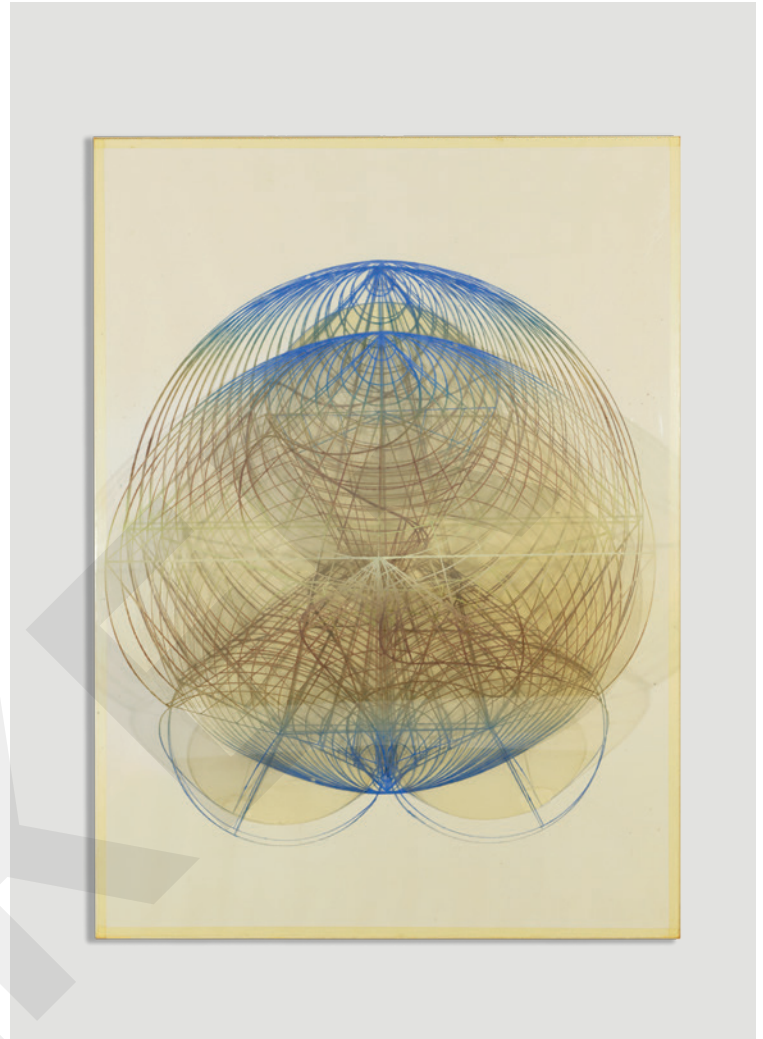
[Fig. 6] Sigma Group, Multivision I, 1978, Super 8 film (black and white, sound), 2 projections on 10 screens (stereo) screens



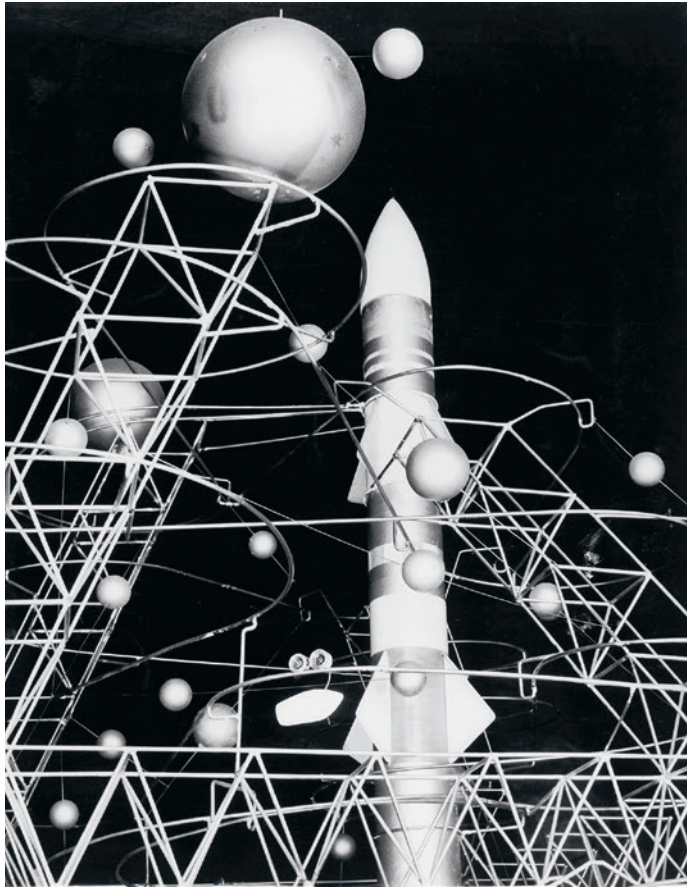
[Fig. 7] Fedir Tetyanych in front of Biotechnosphere, Knyazhichi (near Kyiv), c. 1980s



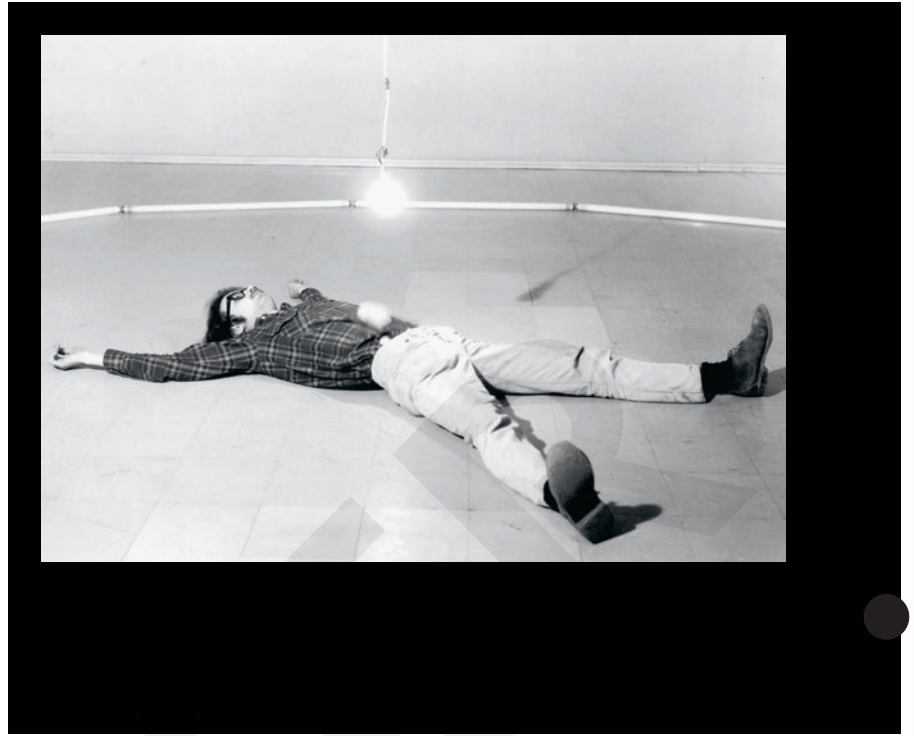
[Fig. 9] Stano Filko, Katedrála humanizmu (Cathedral of Humanism), 1968, mixed media



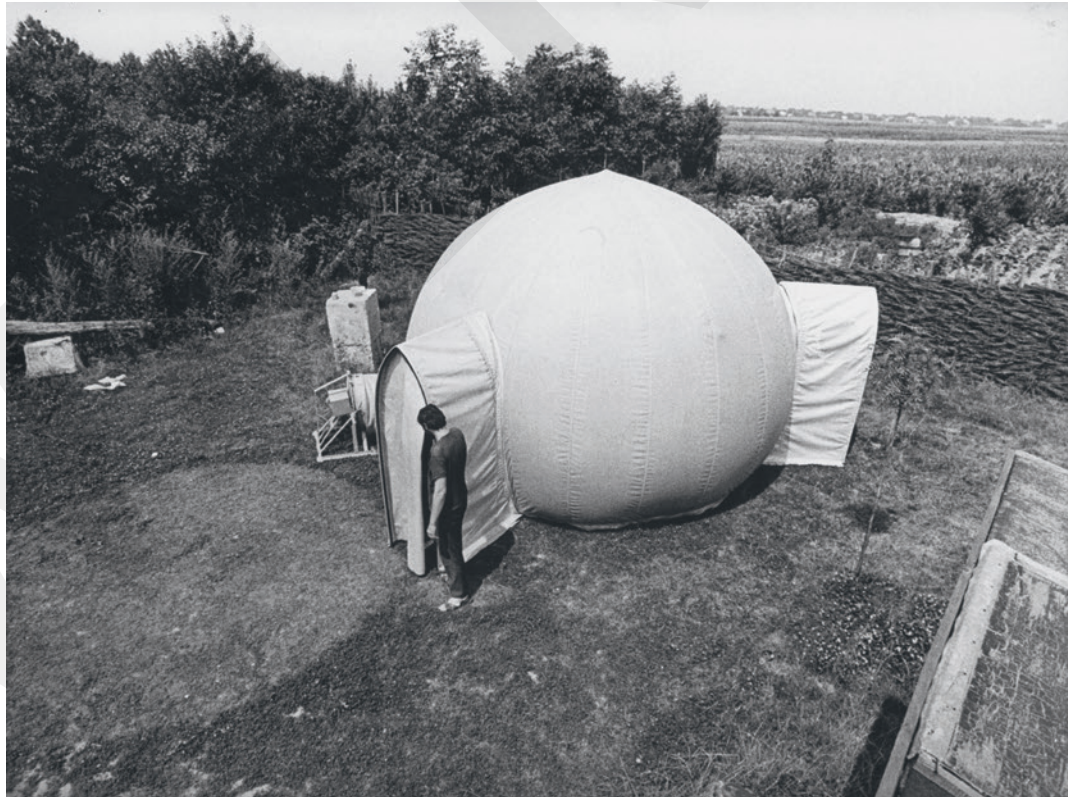
[Fig. 8] Adina Caloenescu, Topologische Transformation – Serie 4 (Topological Transformation – Series 4), 1984, lithographic print on transparent film



[Fig. 10] Jiří Novák, Kosmodrom (Cosmodrome), 1965, scale model of amusement park



[Fig. 11] OHO Group's David Nez, Kozmologija (Cosmology), 1969, installation view, Moderna Galerija Ljubljana (Museum of Modern Art, Ljubljana)



[Fig. 12] Stano Filko, Kosmos (Cosmos), 1968–1969, black-and-white photograph

different colors and textures.<sup>9</sup> Stano Filko's environments suspended the viewer in a mirror-lined, infinite space-time furnished with artifacts from the "folklore of industrial civilization" and simultaneous projections and broadcasts, imprinting themselves on visitors as "dwellings of reality" of democratic socialism (*Cathedral of Humanism*, 1968) [Fig. 9] and space exploration (*Cosmos*, 1968–1969).<sup>10</sup> [Fig. 12]

In 1980s Ukraine, Fedir Tetyanych (Frypulia) made biotechnospheres as counter-monuments as part of his art commissions for public buildings, seeking to undermine the Soviet system from within. [Fig. 7] Created from waste, the works contained items necessary for survival after a global catastrophe.<sup>11</sup> In the meantime, the Chernobyl disaster of 1986 shattered the narrative about the peaceful use of atomic energy, and decades later scientists marked the first nuclear tests as the dawn of our current epoch, the Anthropocene.

### Alternative Reality

In 1967, when the Soviet art group Dvizhenie placed a huge, shimmering kinetic crystal object symbolizing the cosmos at the celebration of the fiftieth anniversary of the 1917 October Revolution in St. Petersburg, it represented the politically correct promise of a better future.<sup>12</sup> Outside Russia, the triumphalism associated with launching the first human into space was obscured by the imperialist overtones of the Space Race (1955–1975). For example, Radovan Richta's forecast of the role of science and technology in the emerging information society as discussed in his book *Civilization at the Crossroads* (1966), commissioned by the reformist Czechoslovak government and translated into eleven languages, envisaged a cybernetic automated economy but was silent on space.<sup>13</sup> Artists thematizing cosmos resorted to perceiving it outside the political climate, treating the subject as an augmented reality, as in Jiří Novák's amusement park design *Cosmodrome* (1965) [Fig. 10] or Filko's *Cosmos*, or especially in the wake of "normalization" in many countries since the early 1970s, as an alternative reality for projecting conceptual practices and utopias.<sup>14</sup>

The experiences of Soviet, but also Czechoslovak, Polish, and East German cosmonauts who reached space by the late 1970s, evoked ideas of a state of weightlessness, lack of clear direction, the emptiness of space, extreme temperatures, cosmic sounds, and the possibility of the existence of other civilizations.<sup>15</sup> Vladislav Čáp and Stanislav Zippe created *Space with Artificial Weightlessness* (1969–1972) by inserting rotating lenses into a glass cube through which mutual reflections changed its interior into a visually dynamic environment with no distinction between what is above and what is below, simulating an artificial weightless space.<sup>16</sup> The Slovenian Group OHO looked to the cosmos seeking to achieve harmony with it by exploring energy flows and stellar constellations. [Fig. 11]

In the 1970s, Július Koller distributed postcards in public spaces that bore the acronym "U.F.O.," which stood for Universal-cultural Futurological Operations, among many variations. Alluding to the format of a gallery invitation, the

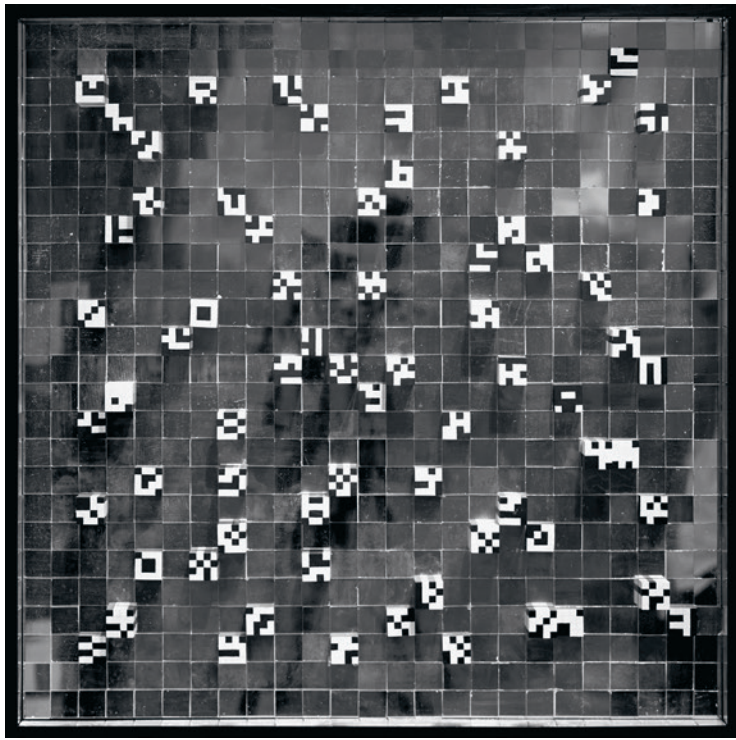
works were intended as "invitations to an idea," creating a conceptual space of possibility that the artist expanded over the next three decades, becoming himself a U.F.O., a subject of cosmo-humanist culture.<sup>17</sup>

### Digital Movement

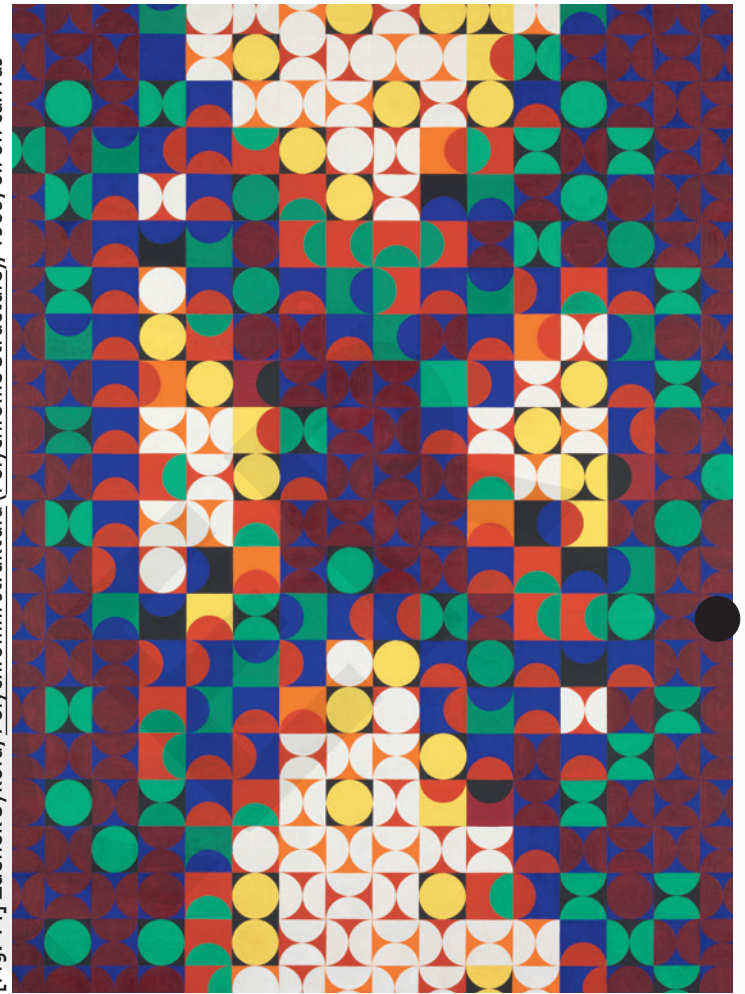
For many artists who experimented with algorithms, the computer screen was a mediating tool rather than an artistic medium in itself. Those who began to explore digital image synthesis did so by building, recording, and simulating electronic screens.

Josef Svoboda employed digital film collage and montage in his projection system *Diapolyekran*, which premiered at Expo '67 in Montréal. It involved a projection screen consisting of a wall of cubes, each of which was equipped with slide projectors and could move back and forth, providing a surface in kinetic relief.<sup>18</sup>

- 9 Lucian Ionică, "Grupul timișorean Sigma și experiența filmului," *Meridianul Timișoara*, January 27, 2020, <https://www.meridianultimis.ro/2020/01/27/grupul-timisoorean-sigma-si-experienta-filmului/>.
- 10 Lucia G. Stach and Aurel Hrabušický, *Stano Filko: Universal Environment* (Bratislava: Slovak National Gallery, and London: Scala Arts & Heritage Publishers, 2023); and Mira Keratová, "Genealogy of Modernist Essentialism," in *Stano Filko: A Retrospective*, ed. Sandro Droschl (Berlin: Hatje Cantz, 2023).
- 11 Nikita Kadan and Yuri Leiderman, "Pryshchur muzeia" [Прищур музея], *Prostory*, December 16, 2016, <https://prostory.net.ua/ua/praktyka/42-pryshchur-muzeia>.
- 12 Margareta Tillberg, "You are now leaving the American Sector: The Russian Group Dvizhenie, 1962–1978," in *Place Studies in Art, Media, Science and Technology*, ed. Andreas Broeckmann and Gunalan Nadarajan (Weimar: Verlag und Datenbank für Geisteswissenschaften, 2008), 153–154.
- 13 Radovan Richta, *Civilization at the Crossroads* (1966) (New York: International Arts and Sciences Press, 1968).
- 14 Maria Veits and Stanisław Welbel, "Counternarrating the Cosmos," *Blok*, September 24, 2020, <http://blok.magazine.com/counternarrating-the-cosmos-maria-veits-and-stanislaw-welbel-in-conversation/>.
- 15 Tomáš Pospiszyl and Ivan Adamovič, eds., *Planeta Eden. Svět zítřka v socialistickém Československu 1948–1978* (Prague: Arbor vitae, 2010); and Joanna Kordjak-Piotrowska, ed., *Cosmos Calling! Art and Science in the Long Sixties* (Warsaw: Zachęta – Narodowa Galeria Sztuki, 2014).
- 16 Jan Wollner, *Kosmické inspirace v umění, architektuře a designu 60. let* [Art, Architecture and Design in the Space Age] (Prague: Univerzita Karlova v Praze, 2011), 32.
- 17 Daniel Grůň, Kathrin Rhomberg, and Georg Schöllhammer, eds., *Július Koller One Man Anti Show Dokumentation Dokumentation Dokumentácia* (Vienna: mumok – Museum Moderner Kunst Stiftung Ludwig Wien, 2017), <https://juliuskollersociety.org/archive/>.
- 18 Jarka M. Burian, *The Scenography of Josef Svoboda* (Middletown, CT: Wesleyan University Press, 1974), <https://muse.jhu.edu/chapter/2706249>.



[Fig. 13] Ryszard Winiarski, *Area 53. Obszar statystyczny z uwzględnieniem trzeciego wymiaru* (Area 53. Statistical surface in third dimension), 1971, fiberboard, wood, mirror, acrylic

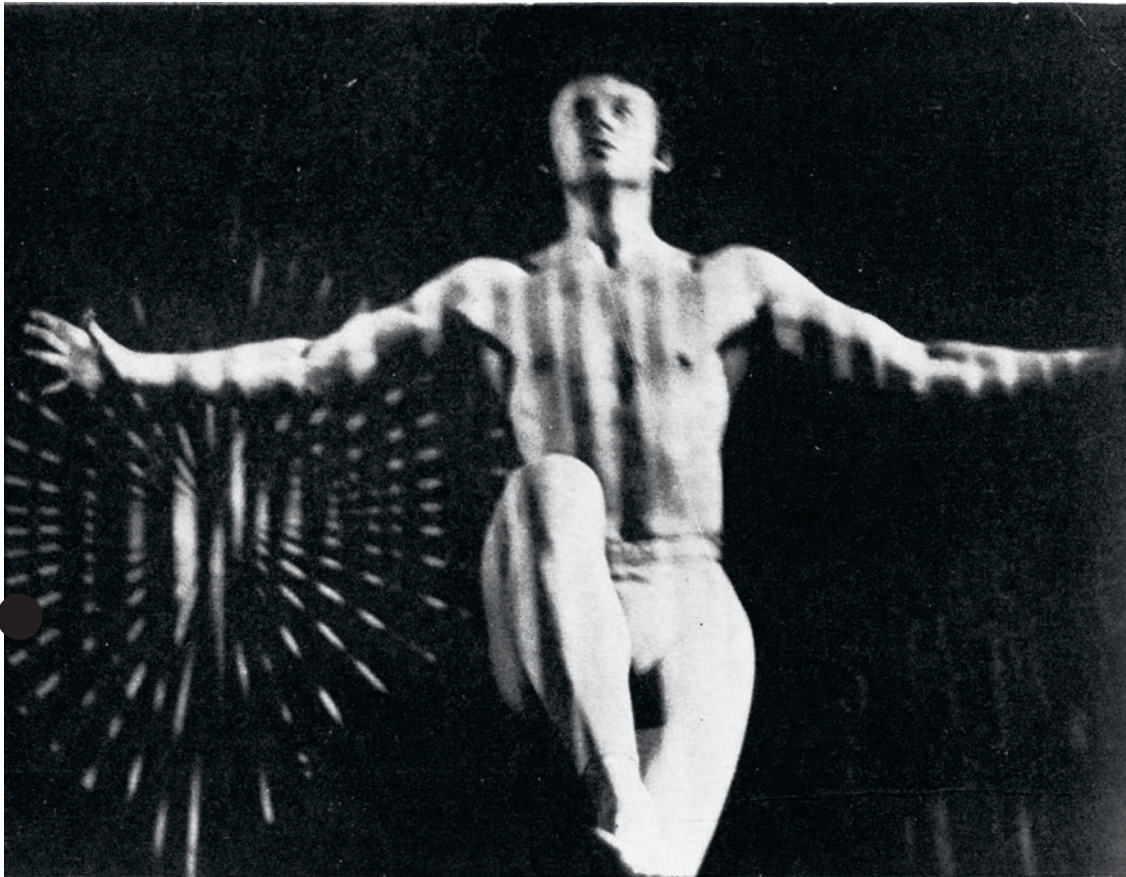


[Fig. 14] Zdeněk Sýkora, *Polychromní struktura* (Polychrome Structure), 1969, oil on canvas



[Fig. 15] Daniel Mróz, Cover illustration for Stanisław Lem's *Summa Technologiae*, 1964, illustration

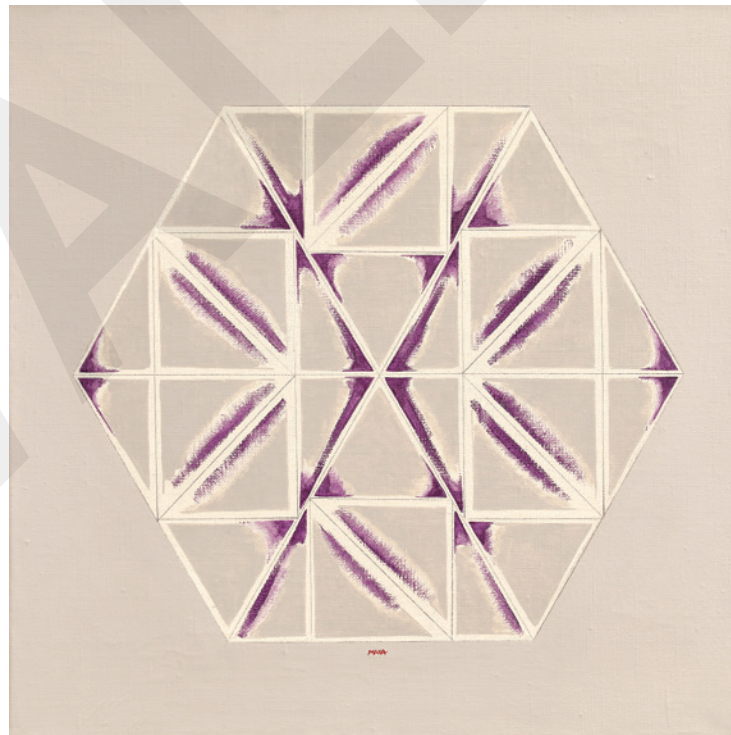




[Fig. 16] Syntéza, Spirála (Spiral), 1968, performance view, Divadlo hudby (Theater of Music), Prague



[Fig. 17] Syntéza, Spirála (Spiral), 1968, performance view, Divadlo hudby (Theater of Music), Prague



[Fig. 18] Florin Maxa, Hexagon, 1977, acrylic and oil on canvas

In the Zagreb milieu of the influential New Tendencies series of international exhibitions (1961–1973), Vladimir Bonačić engaged in visual research on digital materialism, designing stand-alone audiovisual digital objects in which aesthetic evaluations and choices were not only relegated to the computer but also stripped of randomness, programmed in accordance with the pure mathematics of Galois fields. His Dynamic Object GF.E (16,4) NS C M (1969–1971) [Fig. 20] can be interacted with by adjusting the speed of the visual output and filtering certain tones in the surround sound but not changing the composition.<sup>19</sup>

Zbigniew Rybczyński's first film, Square (1972) [Fig. 19], follows the human figure in various movements, subjecting it to a process of pixelization and resolution change. Unaware of computer-imaging techniques at the time, he achieved the effect of pixelization by arranging squares of paper on non-black segments of the image.<sup>20</sup>

In Budapest, Gábor Bódy made the computer-animated film Psychocosmoses (1976), drawing from the theory of cellular automata. He worked from the premise that instead of constructing a plot, a story can develop spontaneously based on the initial setting, the nature of the characters, and a set of plot rules. The film depicts three scenarios—the Dog's Night Song, the Garden of the Fugitives, and High Noon—according to whether offensive, defensive, or neutral characters prevail.<sup>21</sup>

#### Social Intermedia

By the 1960s, modernist art, which had been considered oppositional under Stalin, became a staple of museums in Yugoslavia, Central Europe, and Romania, where aesthetic modernization was associated with the revival of Cubism and Constructivism.<sup>22</sup> By the end of the decade, however, the "soft" avant-garde and autonomous modernism of official art and institutions had become linked with the rigidity and hierarchization of bureaucratic communism. Similarly, the "scientific" approach of conceptualism, which focused on questions of technology and the formal problems of art, felt innocuous to the state apparatus and alienated from social life. A more socially oriented, intermedia experimentalism began to emerge in the independent spaces of private flats and attics, but also in enclaves of critical practice operating within the state system.

The Student Cultural Center, founded in Belgrade following demonstrations for the continuation of the socialist revolution and the deepening of socialist self-management, attempted to "de-skill" art-making and to undermine the individualism inherent in contemporary art.<sup>23</sup> Its series of festival-like April Meetings (1972–1977) had become an important gathering place for artists and cultural workers in film, performance, and video, where they worked "together instead of learning by copying the masters."<sup>24</sup> In Budapest, the Balázs Béla Studio opened its doors to poets, writers, visual artists, and composers to coproduce their films. Gábor Bódy facilitated an experimental film group that

included the artists Dóra Maurer and Miklós Erdély, who worked under the banner of "Complex Research in Public Education," or K/3 (1973–1976), and dealt with semiotics and socially engaged documentary.<sup>25</sup>

In Poland, the Akumulatory 2 gallery in Poznań created an environment conducive to conversation by securing the availability of the artists in the span of their exhibitions, usually lasting only several days, thus establishing a reputation as a place where one comes to learn.<sup>26</sup> The Workshop of the Film Form emerged from a student movement to reform educational practices at the National Film School in Łódź.<sup>27</sup> Many of the collective's works were didactic explorations of media specificity, such as Paweł Kwiek's live broadcast performance Video A (Studio Situation) (1974) [Fig. 21], in which the artist controlled the way he was portrayed by giving instructions to the camera crew in real time, highlighting how the technological mediation of an event determines how it reaches the audience.<sup>28</sup>

19 Darko Fritz, "Vladimir Bonačić: Computer-Generated Works Made within Zagreb's New Tendencies Network (1961–1973)," *Leonardo* 41, no. 2 (2008): 179, DOI: 10.1162/leon.2008.41.2.175.

20 Siegfried Zielinski and Peter Weibel, eds., *State of Images: The Media Pioneers Zbigniew Rybczyński and Gábor Bódy* (Nürnberg: Verlag für Moderne Kunst, 2011).

21 Miklós Peternák, *Képháromszög* (Budapest: Ráció Kiadó, 2007), 99–100.

22 Jérôme Bazin, Sándor Hornyik, Tihomir Milovac, and Xawery Stańczyk, "Narratives and Places of Cultural Opposition in the Visual Arts," in *The Handbook of Courage: Cultural Opposition and Its Heritage in Eastern Europe*, ed. Balázs Apor, Péter Apor, and Sándor Horváth (Budapest: Hungarian Academy of Sciences, 2018).

23 Marko Ilić, *A Slow Burning Fire: The Rise of the New Art Practice in Yugoslavia* (Cambridge, MA: MIT Press, 2021), 115–126.

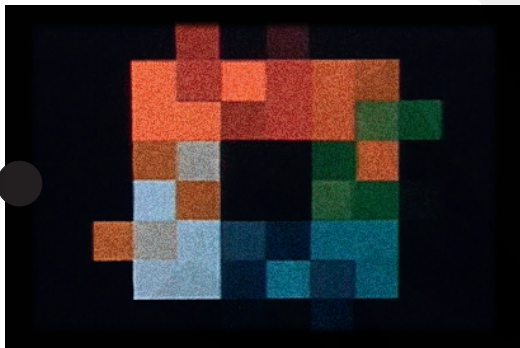
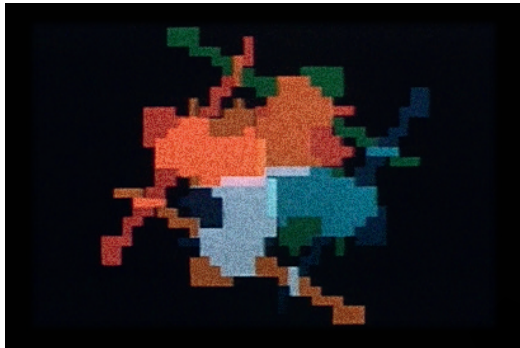
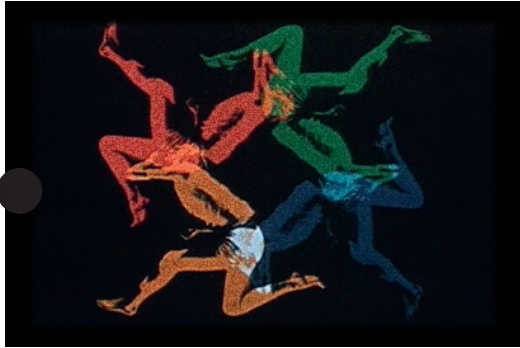
24 Bojana Piškur et al., eds., *This Is All Film! Experimental Film in Yugoslavia 1951–1991* (Ljubljana: Museum of Modern Art, 2010).

25 Peternák, *Képháromszög*, 98–99.

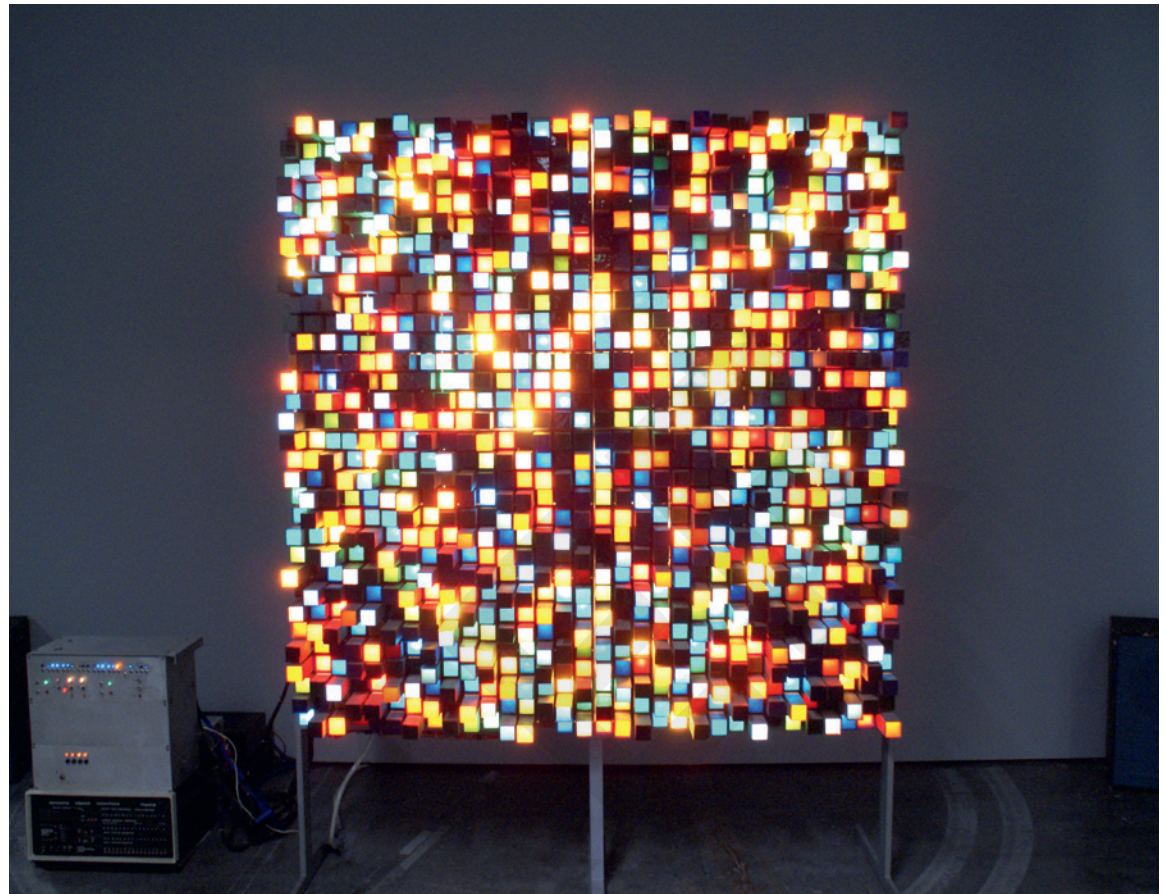
26 Bożena Czubak et al., *Beyond Corrupted Eye: Akumulatory 2 Gallery, 1972–1990* (Warsaw: Zachęta – Narodowa Galeria Sztuki, 2012), [3], [5].

27 Łukasz Mojsak, "From the Workshop of the Film Form to Martial Law: On the Intersecting and Bifurcating Paths of Paweł Kwiek's and Józef Robakowski's Cinematographic Work in the 1970s and the 1980s," in *Experimental Cinemas in State-Socialist Eastern Europe*, ed. Ksenya Gurshtein and Sonja Simonyi (Amsterdam: Amsterdam University Press, 2022), 79–80.

28 Mojsak, "From the Workshop of the Film Form to Martial Law," 91–92. The video can be found at <https://artmuseum.pl/pl/filmoteka/praca/kwiek-pawel-video-a-sytuacja-studia>.



[Fig. 19] Zbigniew Rybczyński, Kwadrat (Square), 1972, 35mm film (color, sound) transferred to digital



[Fig. 20] Vladimir Bonačić, Dynamic Object GF.E (16,4) NS C M, 1969–1971, mixed media



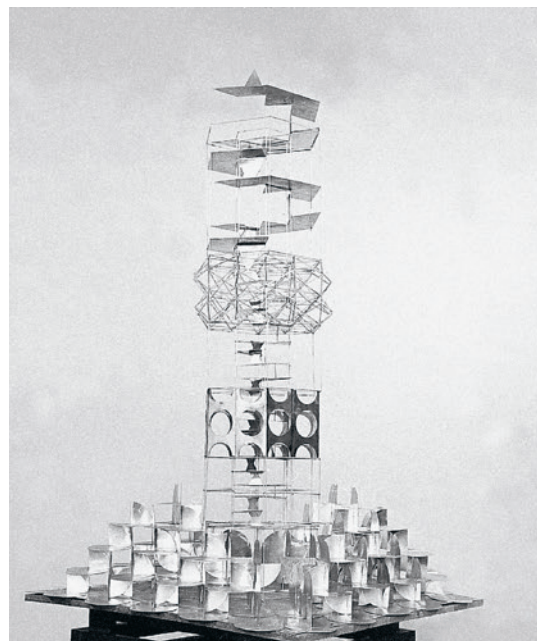
[Fig. 21] Paweł Kwiek, Excerpt from Video A (Sytuacja studio) (Video A [Studio Situation]), 1974, live television transmission, video transferred to digital



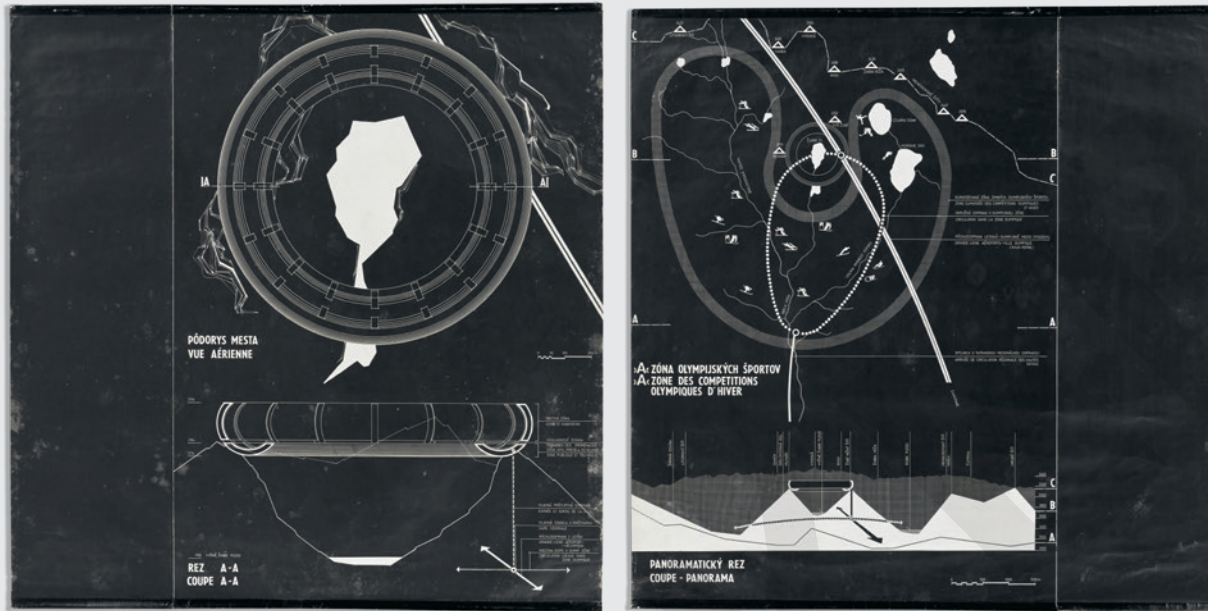
[Fig. 22] Nicolas Schöffer, CYSP 1, Festival d'art d'avant-garde, Cité radieuse, Marseille, 1956



[Fig. 23] Paweł Kwiek, Video i oddech. Kanał informacji (Video and breath. Information Channel), 1978, black-and-white photograph



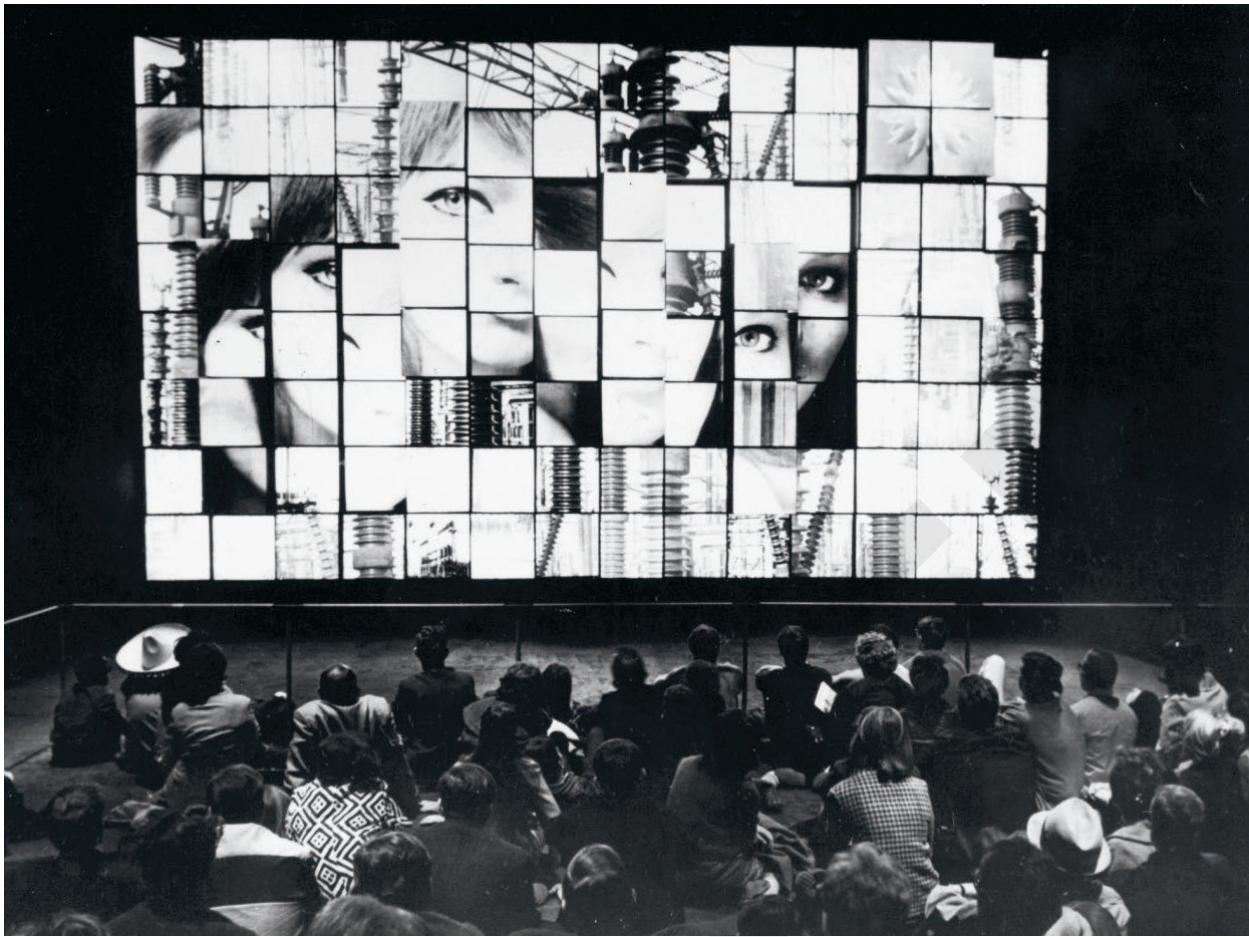
[Fig. 24] Sigma Group, Turnul Informational (Information Tower), 1971, scale model, galvanized wire, aluminum plates



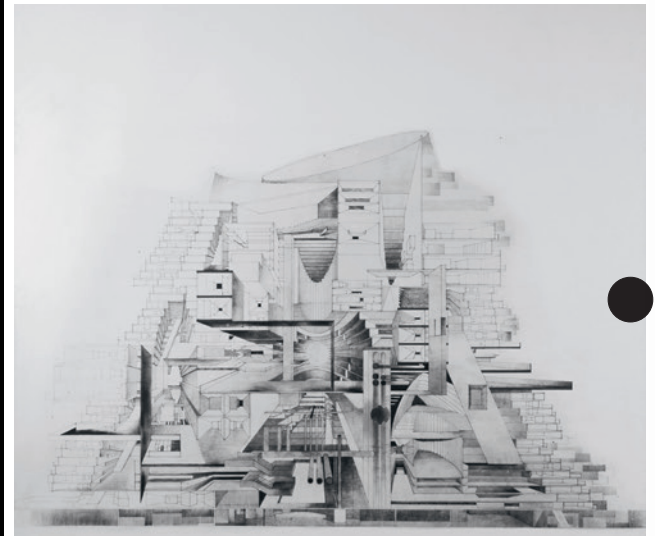
[Fig. 25] VAL (Viera Mecková, Alex Mlynářčík, Ludovít Kupkovič), Design plan for Olympic City Heliopolis for the High Tatras, 1968–1974



[Fig. 26] Gorazd Čelechovský, Scale model of the planned city of Eteara, 1967



[Fig. 27] Josef Svoboda, Polyekran, 1958, installation view, Expo 58, Brussels

[Fig. 29] Oskar Hansen, Linearny System Ciągły (Linear Continuous System), 1966, illustration

[Fig. 28] Vjenceslav Richter, Architectural drawing for Project Synthurbanism: Ziggurat, 1963–1964

### Cyborg Body

The search for extraterrestrial life sparked the imagination of divergently sentient beings. Many artists, however, resisted anthropomorphic inclinations and instead of projecting human traits onto alien species, they recognized it as an opportunity to see ourselves from an alien perspective. Stanisław Lem's novel *Solaris* (1961) revolved around an unknowable reflexive being in the form of an ocean of gel encompassing the entire planet, which in his theoretical treatise *Summa Technologiae* (1964) [Fig. 15] becomes its own virtual space, a product of "phantomatic" creative engineering, an immersive sensory and neural simulation for navigating geographies past and future.<sup>29</sup> For Lem, phantomatics was the "art of feedback," an area in which the recipient becomes an active participant, finding themselves at the center of preprogrammed events.<sup>30</sup>

The collective Dvizhenie called such a domain the *Cybertheatre*. From 1966 to 1967, the group envisioned an environment suggestive of a postapocalyptic Earth. It was to be inhabited by 25- to 50-meter-tall "kiberi" (metal automata)—automated cyberbeings programmed to move, emit flashing lights and sounds of semilogical speech, and generate puffs of colored gases, in response to spectators passing by.<sup>31</sup> The impact of these fantastic spaces on the human body echoed not only the cybernetic view of the adaptive brain but also Lenin's theory of reflection, which conceived of human consciousness as a dynamic reflection of the objective material world that fully shapes its content and structure, and constituted his major contribution to the philosophy of dialectical materialism.

Driven by cybernetics, early posthumanism explored the synthesis of the human body with space, light, and time, adapted to electronic circuitry. The pioneering autonomous kinetic sculpture *CYSP 1* (1956) [Fig. 22], by the Hungarian-born Nicolas Schöffer, was performed in a ballet with dancers on the roof of Le Corbusier's *Cité Radieuse* in Marseille, France. In another kinetic ballet, *Spiral* (1968) [Figs. 16, 17], the Prague-based *Syntéza* group created a luminodynamic environment in which a dancer was accompanied by a sculptural object subjected to a projected-light composition.<sup>32</sup> The central motif of Sherban Epuré's lifelong project *S-Bands* (from 1968) was a figure shaped by forces of the mathematical space of planar folds.<sup>33</sup> In the performance *Video and Breath* (1978) [Fig. 23], Paweł Kwiek, sitting in a meditative position, connected his chest to a television receiver with a cable and used his breath to control the brightness of the monitor, which through a closed circuit displayed the image of both the artist and the television.<sup>34</sup>

### Networked City

In 1968 the cultural anthropologist Margaret Mead challenged fellow American cyberneticists to account for the social implications of the language of cybernetics. She expressed the fear, widely shared in the West, "that the Soviet system may become totally cyberneticized, in the technical sense, as a way

of controlling everything within its border and possibly outside, with thousands of giant computers linked together in a system of prodigious and unheard-of efficiency."<sup>35</sup> Indeed, Soviet cyberneticists were building an alternative to the centrally planned economy in the form of a feedback-controlled nationwide mechanism.

The ideas of feedback, automation, and communication networks also fell on fertile ground in architecture and urban planning. Accelerating population growth and increasing demands for housing and transport gave way to visions of networked cities. Architects Oskar Hansen and Zofia Hansen brought their theory of open form, which argued that design should be derived from and flexible to human activity, to the scale of urban planning in *Linear Continuous System* (1966) [Fig. 29]. The work attempted to rethink the entire concept of the city and replace the traditional concentric development that created peripheries with large parallel strips that would stretch across the whole of Poland.<sup>36</sup> The inhabitants were to participate in the design of the city, similar to *Etarea* (1967) [Fig. 26], the study of a satellite town outside Prague by Gorazd Čelechovský and a broad interdisciplinary team. The aim of the *Etarea* plan was to reduce traffic by unifying residential and recreational functions and creating a cybernetic communication network using pneumatic tubes.<sup>37</sup> The ecological aspect of

29 Stanisław Lem, *Solaris*, trans. Bill Johnson (2011); and Stanisław Lem, *Summa Technologiae*, trans. Joanna Zylińska (Minneapolis: University of Minnesota Press, 2013), 191–234.

30 Lem, *Summa*, 196.

31 Lev Nusberg, "Cybertheater," *Leonardo* 2, no. 1. (1969): 61–62. Tillberg, "You are now leaving the American Sector," 154–155.

32 Andrea Sloupová, "Syntéza po syntéze: české kinetické umění 60. let a pozdější tvůrčí postupy jeho protagonistů," MA thesis (Prague: Karlova univerzita, 2008), 37.

33 Sherban Epuré, "About the S-Bands," [http://sherban-epure.com/S-Bands-A/About\\_the\\_S-Bands.html](http://sherban-epure.com/S-Bands-A/About_the_S-Bands.html).

34 Daniel Muzyczuk, "Paweł Kwiek. Video i oddech. Kanał informacji," *Muzeum Sztuki Zasoby*, <https://zasoby.msl.org.pl/arts/view/9657>.

35 Margaret Mead, "The Cybernetics of Cybernetics," in *Purposive Systems: Proceedings of the First Annual Symposium of the American Society for Cybernetics*, ed. Heinz von Foerster, John D. White, Larry J. Peterson, and John K. Russell (New York: Spartan Books, 1968), 3.

36 Emilia Kiecko, "Polish Futurological Projects and the International Context," *Institute of the Present*, February 28, 2020, <https://institutulprezentului.ro/en/2020/02/28/polish-futurological-projects-and-the-international-context/>.

37 Gorazd Čelechovský, et al., *Etarea. Étude du milieu humain dans la ville* (Prague: Státní komise pro techniku & Pražský projektový ústav, 1967); and Maroš Krivý, "Automation or Meaning? Socialism, Humanism and Cybernetics in Etarea," *Architectural Histories* 7, no. 1 (2019), DOI: 10.5334/ah.314.

electronic communication was also highlighted in Sigma Group's Information Tower (1970) [Fig. 24] in Timișoara. Powered by a computer system installed inside, the tower was intended to react to changes in the immediate surroundings while offering a supply of basic everyday information.<sup>38</sup>

Insisting on the need to preserve human contact in communication and to solve the traffic problem by other means, other artists and architects proposed vertical approaches. Vjenceslav Richter's Ziggurats (1963–1964) [Fig. 28], Karel Honzík's Domurbia (1964), and VAL's Heliopolis (1968–1974) [Fig. 25] concentrated the life functions of the collective into gigantic megastructures for thousands of dwellers.<sup>39</sup> Richter, who represented Yugoslavia and its self-management model in international expositions, saw the ziggurat as both an embodiment and spatial representation of socialism.<sup>40</sup>

Several of these projects aroused interest and support in the echelons of power, but none of them came to fruition. Neither did the Soviet internet. Instead, its architect Victor Glushkov put into practice thinking about the network topology in the Druzhba (Friendship) pipeline, which, instead of data, transported oil to Soviet satellite countries.<sup>41</sup> The internet eventually came to Europe in the early 1970s, but with a different purpose: to link seismic observatories to the ARPANET network that eavesdropped on nuclear testing carried out behind the Iron Curtain.<sup>42</sup>

- 38 Andreea Palade-Flondor, "Sigma—Space Utopias. The Relationship with Architecture," Institute of the Present, February 28, 2020, <https://institutulprezentului.ro/en/2020/02/28/sigma-space-utopias-the-relationship-with-architecture/>.
- 39 Vjenceslav Richter, Sinturbanizam (Zagreb: Mladost, 1964); Vladimir Kulić, "Vjenceslav Richter's Sinturbanizam," Institute of the Present, February 28, 2020, <https://institutulprezentului.ro/en/2020/02/28/vjenceslav-richters-sinturbanizam/>; Karel Honzík, "Vertikální obec," Československý architekt 9, no. 11 (1964): 2; and Peter Szalay, "Architektonická skupina VAL – Voies et Aspectes du Lendemain (Cesty a aspekty zajtrajška)," Magda, October 20, 2017, <https://magdamag.sk/2017/10/20/slovincina-esej-daydream-skupina-val-voies-et-aspectes-du-lendemain-cesty-a-aspekty-zajtrajska/>.
- 40 Kulić, "Richter."
- 41 Oleksiy Radynski, "The Great Accelerator," e-flux Journal, no. 82 (2017), <https://www.e-flux.com/journal/82/134024/>.
- 42 Nils Holme et al., "Datateknologi," in Fra Forsvarets forskningsinstituts historie (2003), 22–24, <https://publications.ffi.no/nb/item/asset/dspace:5903/FFIs-historie-nr3.pdf>.