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Dasein in a Space Station: The Conquest of Space and the Potentiality of Architecture

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Abstract

The paper explores some aspects of astronautics' influence on late-modernist architecture and its existential consequences. The astronautics' technologies and many 1960s designs of futuristic cities shared a false sense that in the near future man would be able to live anywhere on Earth (underwater, in the desert) as well as in outer space. When Ron Herron envisages the *Walking City* as a group of lunar rovers, with no foundations, freely roaming the surface, a GIAP member, Paul Maymont designs an air-conditioned city on the Moon. Less known are similar concepts by the architects from the Central-Eastern Europe, such as the "spacesuit-isation" of public buildings presented by Polish architect Andrzej Frydecki at the Terra-1 International Exhibition of Intentional Architecture (Wrocław Museum of Architecture, 1975). The hermetic spacesuit, which was to control and maintain fixed vital parameters of the body during space flight, has provided a solution for the modernist tendency to hermetically seal the spaces of architecture. The house of the future was to resemble the spacecraft cabin, as if the modernist "machine for living" paradigm had been replaced by the idea of a survival capsule for interplanetary flight. A similar tendency can be found in the 1960s urban utopias; the cities of the future are often disconnected from the ground, as if the new

civilization could not be rooted on Earth. The 1960s architectural question of "dwelling on the Moon" is confronted with Hannah Arendt's and Martin Heidegger's reflection that it is the earth, and not the universe, which is "the centre and the home of mortal men."

Introduction

"In 1957 an earth-born object made by man was launched into the universe, where for some weeks it circled the earth according to the same laws of gravitation that swing and keep in motion the celestial bodies — the sun, the moon, and the stars."[1] The opening phrase of *The Human Condition* by Hannah Arendt, often quoted in essays discussing the 1950s' obsessions with the space sciences, is as celebrated as it is puzzling. Why does the German-Jewish philosopher of public/political space, famous for her analysis of Nazism and Stalinism (*The Origins of Totalitarianism*, 1951), begin her reflection on the human condition with an image of the first Sputnik?

The first answer to this question requires a historical explanation. *The Human Condition* was originally published by the University of Chicago Press in 1958, the same year when the United States — terrified by the successful launch of the first Soviet artificial satellite — established the National Aeronautics and Space Administration (NASA).[2] In the view of Arendt — and of some of her contemporaries, aware of the fact that the post-war conquest of cosmic space was a part of the Cold-War arms race — this event was "second in importance to no other, not even to the splitting of the atom."[3] In the late 1950s it could not be doubted that the first satellites were launched thanks to the technology of intercontinental ballistic missiles. While criticizing the instrumentalization of human action in modern times, which ends in a "veritable art of 'making' nature," Arendt recalls an interview with a scientist, published in the *New York Times* in 1957. This scientist is Wernher von Braun, co-creator of the V-2 missile, after the war one of the leading figures in the US space program and one of the celebrities to appear in Walt Disney's TV production *Man in Space* (1955).[4]

The second answer requires a philosophical explanation. Arendt, a student of Karl Jaspers (*nota bene*, his *Die Atombombe und die Zukunft des Menschen* was also published in 1958) and Martin Heidegger, understands well the existential consequences of the post-war conquest of space. That is why she looks in perplexity at late 1950s reports claiming that the first Sputnik was the first "step toward escape from men's imprisonment to the earth."[5] Arendt's thinking on earth alienation as a phenomenon of modernity is undoubtedly influenced by Heidegger's existential/topological ontology, which is characterized by an "attachment" to the earth.[6] As Heidegger argues in his 1951 lecture "Building Dwelling Thinking," delivered to architects, engineers and philosophers at the *Man and Space* conference in Darmstadt, "Dwelling is the

manner in which mortals are on the earth."[7] Dwelling on the earth is the fundamental experience which gives rise to the realm of architecture: "we build and have built because we dwell."[8] Earlier, in *Being and Time* the philosopher explains:

> [T]he sun, whose light and warmth are in everyday use, has its own places — sunrise, midday, sunset, midnight; … The house has its sunny side and its shady side; the way it is divided up into 'rooms' … is oriented towards these, and so is the 'arrangement' … within them, according to their character as equipment. Churches and graves, for instance, are laid out according to the rising and the setting of the sun — the regions of life and death, which are determinative for Dasein itself with regard to its ownmost possibilities of Being in the world.[9]

In this light, every act of building depends on our orientation towards the earth, or, in other words, on our dwelling (as earth-bound and mortal creatures) between the ground and the horizon. Arendt's image of the Sputnik, both a symbol of the post-war conquest of space and a symptom of modern homelessness, has brought us to a point where we have to ask about the potentiality of architecture in the era of spaceflight. In this essay, I discuss some existential/topological conditions of architecture against the backdrop of modern beliefs in space colonization.

Designing a Space Station

Neither "Building Dwelling Thinking" nor *The Human Condition* provides us with a precise answer to the question of what astronautics has in common with architecture. The curators of the Slovenian Pavilion at the 14th International Architecture Exhibition — La Biennale di Venezia (2014), however, are among those who have recently emphasized the importance of this connection. Their presentation, entitled *The Problem of Space Travel — Supre: Architecture,* was based on a book by the Slovene engineer Herman Potočnik (alias Hermann Noordung, 1892–1929).[10]

Whereas in *Being and Time* Heidegger reveals the aspects of Dasein's spatiality with a reference to the celestial regions experienced from the earth, as early as in 1928, Potočnik offers some technological solutions for human survival in space stations. Why should we be interested in living in space stations? The engineer gives us a philosophical answer:

> Since the beginning of time, mankind has considered it as an expression of its Earthly weakness and inadequacy to be bound to the Earth, to be unable to free itself from the mysterious shackles of gravity. … And most people even today still take it as a dogma that it is indeed unthinkable for Earthly beings ever to be able to escape the Earth. Is this point of view really justified?[1]

This introductory remark leaves no doubt that the question of earth alienation – as recognized by Arendt – has accompanied the earliest ambitions of designing space stations. In his book, *The Problem of Space Travel: The Rocket Motor*, Potočnik not only discusses the system for maintaining life support functions but also describes some aspects of everyday life in a space of zero gravity, such as movements inside a space station:

> [...] human movement can now no longer occur by "walking." The legs have lost their usual function. ... To move, we must either pull ourselves along an area with our hands ... , for which purpose the walls of the space station would have to be furnished with appropriate handles (for instance, straps similar to those of street cars) ... , or push ourselves off in the direction of the destination and float towards it.[12]

Thanks to NASA TV live broadcasting, a similar system of handrails can be observed today in the interiors of the International Space Station. In order to perform experiments or everyday activities with their hands, the members of the expeditions stabilize their bodies by putting their feet under the railings attached to the walls — as if they were acrobats training on parallel bars.[13]

Two photographs of the NASA space laboratory, of the dining area and docking adaptor, serve as illustrations of Dalibor Vesely's notion of natural primary orientation, presented in his *Architecture in the Age of Divided Representation: The Question of Creativity in the Shadow of Production*.[14] Vesely refers to a description of the Sky Laboratory (launched in 1973), which consisted of two sections: a command module connected by the tunnel of docking adaptor to a cylindrical workshop. The workshop was divided into two parts, an upper and lower deck: "The lower deck was designed as if it were a room on earth, and included a dining table and seats."[15]

Even in a situation of zero gravity — when it would seem that the dining table has no sense (during the first missions food was supplied in tubes) — astronauts have insisted on having it on board; tables are now installed in space stations.[16] Let us also note that "sense" is a key notion in Maurice Merleau-Ponty's remarks on space and spatiality (the French *le sens* has a double meaning — "significance" and "direction"). Our perception of an object is linked to its orientation: "to invert an object is to deprive it of its significance."[17] A dining table has a meaning (sense) as a table when it is oriented in relation to our body in such a way that we can sit at it and have a meal. But in the situation of zero gravity, even if a meaningful relationship is established between the table and the body, other spatial references are disturbed. As Potočnik imagined regarding the positions of the body in a space station: "'up' and 'down' lose their usual meaning (related to the environment); floor, ceiling and walls of a room are no longer different from one another."[18]

When Heidegger explains the phenomenon of the spatiality of the ready-to-hand, he gives an example of an earthly and, at the same time, architectural situation:

> The "above" is what is "on the ceiling"; the "below" is what is "on the floor"; the "behind" is what is "at the door"; all "wheres" are discovered and circumspectively interpreted as we go our ways in everyday dealings; they are not ascertained and catalogued by the observational measurement of space.[19]

Following Heidegger's thinking, Vesely claims that the earth is a "primarily reference (*archē*)," which constitutes our coherent spatial experiences.[20] But to demonstrate the hidden structures of our spatial experience he leads us into the space of zero gravity, that is, into the situation in which the unity of "topology, orientation and physiognomy of space" manifests itself in the most obvious way, even when a disturbed orientation occurs. As he notes:

> The topology, orientation, and physiognomy of space constitute a unity: the visible aspects of space, its physiognomy, depend on orientation; and orientation in turn depends on the topological character of the surrounding world. This sequence of relationships and dependencies brings us closer to understanding the phenomenon of continuity in its identifiable manifestations.[21]

In this context, Vesely recalls an astronaut's remark: "You like things to be orderly like they always are on Earth."[22] In 1928 Potočnik was dreaming of escaping our planet, but he was not able to imagine his space station without a writing table (Figure 1).[23]

Imprisoned in an Architectural Capsule

The Slovenian Pavilion at the 14th International Architecture Exhibition was a presentation recalling an episode of the conquest of space in the late 1920s, but the assumption that a space station is architecture deserves more attention. In the exhibition catalogue one finds four extracts from Potočnik's publication, grouped under the titles "stairs," "walls," "doors" and "window," which evoke the situation of building a house rather than designing a space station.[24]

In the late 1920s, astronautics existed as a project important to the development of rocket technology, but not yet as a discipline which could provide architecture with ergonomic, spatial solutions. What is interesting, however, is that modern dreams of interplanetary travels coincide with the new paradigms of modern architecture. Architecture, whose original role — as the myth of Adam's first hut proclaims — was to provide man with a safe and comfortable shelter, from the 1920s on was supposed to be a functional machine for living, like "liners, airplanes and automobiles."[25] It was only in the late 1950s that architecture approached the discipline of astronautics, as if the new travelling machines, spacecraft, were to be added

to Le Corbusier's celebrated list. I define this as a moment when the "machine for living in" was challenged by the concept of a survival capsule for interplanetary flight.[26] As we read in the 1966 essay "Fantastic Architecture or Architecture of the Future," published in the Polish journal *Architektura* (Figure 2):

> Le Corbusier, Gropius, Mies van der Rohe, commonly regarded the pioneers of contemporary architecture, are men of the past. These architectural geniuses formulated their theories in the 1920s, when all those things that are part of the daily life for us — jet aircraft, artificial satellites, nuclear energy — did not exist yet.[27]

Let us elaborate on the concept of a survival capsule for interplanetary flight as a late-modern architectural paradigm. In "Building Dwelling Thinking" Heidegger recalls the figure of the truck driver: he is "at home on the highway, but he does not have his shelter there."[28] A shelter appears at the end of the essay, as the two-hundred-year-old wooden farm in the Black Forest.[29] The truck and the farm cannot be seen as the best examples of the 1950s technological innovations; Heidegger himself emphasizes that his reference to the farm "in no way means that we should go back to building such houses."[30] But, paradoxically, these two images — the first recalling the situation of travelling and the second envisaging a settled shelter — seem to merge into one ambition in early space-age engineering. The ambition was to design a safe and habitable module carried by a ballistic missile, that is, a mobile, hermetically sealed and automated shelter.

In her essay *The Conquest of Space and the Stature of Man*, further developing some ideas of *The Human Condition*, Hannah Arendt introduces a figure more representative for the space age than the truck driver — the astronaut who is "shot into outer space and imprisoned in his instrument-ridden capsule where each actual physical encounter with his surroundings would spell immediate death."[31] There can be no doubt that the hermetically sealed capsule is a kind of *Existenzminimum* prison.[32] In many accounts of contemporary space travel, we find not only descriptions of the sublime vastness of the universe as seen through spacecraft portholes or of the uncanny experience of zero gravity, but also of the aura of imprisonment. It is not by chance that the Polish cosmonaut Mirosław Hermaszewski entitles a chapter of his book "Imprisoned in the cabin."[33] In *Packing for Mars* Mary Roach, a journalist who has interviewed many astronauts about their everyday life in spacecraft, notes that the habitation area inside the Mir core module, in which two Soviet cosmonauts spent six months together, is the size of a "Greyhound bus" and that their sleep cabins resemble "phone booths."[34]

In trying to understand the conditions in a cosmic habitation module, we do not even have to imagine how our bodies react to the situation of zero gravity. As the cosmonaut Yuri Romanenko suggests, it is enough to imagine that you are "locked in a car" for about a week.[35] Unlike a truck driver on the earth, you can open neither the windows nor the doors of your cabin. There are no earthly smells, only the smell of metal, rubber and paint. Keeping this roughly sketched image in mind, one should be surprised with the fact that the architecture of the space age is sometimes thought of as identical with the technological goals and achievements of astronautics. A participant in a Polish discussion accompanying the Terra-1

Exhibition of Intentional Architecture (Museum of Architecture, Wrocław, 1975, Figure 3) was convinced that "the Apollo spacecraft are architecture, even though they haven't been designed by architects."[36]

Indeed, spacecraft, automated capsules and lunar rovers were an important source of inspiration to architects, artists and designers in the late 1950s and 1960s, as the exhibitions *Cold War Modern: Design 1945–1970* (Victoria & Albert Museum, 2008) or *Star City: The Future Under Communism* (Nottingham Contemporary, 2011) have recently demonstrated. We may share this fascination with space-age technologies, but we should not forget the political context of the conquest of space. As Svetlana Boym aptly notes, Soviet and American understandings of space exploration were not the same. In the Soviet Union, as well as in its satellite countries (I would add), "we were taught that we would travel into the cosmos before we travelled abroad. We were encouraged to aim upwards instead of Westwards."[37]

While the Soviets were preoccupied with launching the first Sputniks and sending the first man into orbit, the Americans were obsessed with fully automated kitchens which resembled the interiors of spacecraft cabins with their multiple control panels; the famous RCA Whirlpool "Micracle Kitchen" at the 1959 American Exhibition in Moscow clearly illustrates the connection between satellites and household appliances. We can understand why astronauts as earth-bound creatures have a dining table in a spacecraft. But why — on the earth — do we want to have a fully automated home resembling the interiors of hermetical space cabins? Every activity seems easier and faster in the automated kitchen than in a traditional household, but the more appliances, the more operation skills are required.

In 1961–1969 — during the time between Gagarin's orbiting the earth, and Armstrong's and Aldrin's walking on the Moon — Paul Maymont (GIAP — Groupe International d'Architecture Prospective) designed an air-conditioned city on the Moon, while the Japanese Metabolist group worked on the idea of living capsules, resulting in 1972 in the completion of Kisho Kurokawa's Nagakin Capsule Highrise. Intoxicated by this cosmic atmosphere, we could multiply the examples of architectural designs (Figure 4), which look as if they were made by space scientists (disparagingly called "plumbers" by "pure" physicists – as Hannah Arendt notes[38]). But what is more important is the question of to what extent the technological solutions developed for travelling in the universe are necessary for dwelling on the earth. This problem has already been addressed by Kenneth Frampton, in his critique of Archigram:

> [I]n their obsession with suspended space-age capsules, Dennis Crompton, Michael Webb, Warren Chalk and David Greene felt under no obligation to explain why one might choose to live in such expensive and sophisticated hardware and yet at the same time in brutally cramped conditions. … they all proposed space standards that were well below the *Existenzminimum* established by those pre-war functionalists they supposedly despised.[39]

Perhaps, the only sensible explanation is that post-war architects and urban planners expected enormous growth in global population; due to overpopulation men will have to live in cramped places. In the space

age, this argument was combined with futurologists' expectations; new places have to be found, such as underwater cities, cities in the desert, cities on the Moon, etc. But what interests me the most in revealing the meaning of architecture of the space age is not the sensible explanation but the paradox of the situation. While space scientists were making first steps "toward escape from men's imprisonment to the earth," architects were preoccupied with imprisoning us in spacecraft-like, excessively automated homes.

In *The Problem of Space Travel: The Rocket Motor*, Potočnik describes in detail the rooms of the space station (such as the Habitat Wheel), within which "the same atmospheric condition will be maintained artificially as on the Earth's surface," and predicts the situation when it would be necessary to remain outside of the enclosed capsules: "airtight suits would have to be used, whose interior is also supplied automatically with air by attached devices. Such suits would be quite similar to the familiar underwater diving suits."[40] Not only the spacecraft-like home, but also the spacesuits technology is an example of the affinities between astronautics and architecture. As we have already discussed, Heidegger's and Arendt's existential philosophy is based on a fundamental presumption that "the earth, and not the universe, is the center and the home of mortal men."[41] The technologies of astronautics and some 1960s' designs of futuristic cities seem to question this "geocentrism." They rather share a belief that in the near future man would be able to live anywhere, whether be it on Earth or in outer space. This message was clearly conveyed by the 1964 New York World's Fair featuring Futurama 2. Before the viewers' eyes passed images of desert cities and jungles or Antarctic landscapes studied with mobile laboratories, but also of a (fake) Moon surface examined with lunar rovers or a (fake) Hotel Atlantis for undersea vacationing.[42] These staged images of lunar and underwater explorations deserve our attention; they both feature men (or, to be more precise, miniaturized dolls) dressed in special suits, which maintain vital parameters in a harsh environment.

In 1975, a Polish architect Andrzej Frydecki (1903–1989) argued that the spacesuit has become one of the paradigms of contemporary architecture: "shielding the user from direct and harmful, or actually lethal … environmental conditions, it allows for expanded capabilities in the evergrowing domain of human exploration."[43] In order to illustrate his argument the architect presented a small drawing – a sequence of representative clothing for different historical epochs, such as a Greek chlamys, a Roman toga, a monk's frock, a knight's armor, a gentleman's dress coat and, finally, an astronaut's spacesuit (Figure 5). Frydecki is not the first and certainly not the last architect to see a cultural affinity between clothing and architecture; it is enough to recall Adolf Loos' essay *Architektur* (1910), in which he compares the elevations of a house to a men's dress coat [*Frack*][44], Vito Acconci's remark that "clothing is the first architecture of the body,"[45] or Hans Hollein's jet helmet, spacesuit and scape capsule as a "minimum dwelling."[46] Nevertheless, let us follow the space-age concept that the body's first architecture is a spacesuit. According to Frydecki, the spacesuit is an "indicator of contemporary technological solutions for new fragments of the environment, organized on the basis of … spacesuit-isation, that is, equipped with devices providing for collective inhabitation, without any direct contact with the external environment."[47] Frydecki does not provide a specific architectural design which could illustrate his concept of "spacesuit-isation," but describes it as a universal

principle of architecture: "not only such specific creations of contemporary technology as submarines, airplanes and spacecraft but also large over- and underground objects — cars, metro trains, some types of public buildings — are designed as collective spacesuits".[48] At this point we have to return to the paradox of astronautics' merging with architecture. Whereas space scientists were preoccupied with designing spacesuits for maintaining vital parameters outside a space station, architects were challenged to technologically optimize the environmental conditions occurring on Earth.

"Mortals Dwell on the Earth"

Let us summarize the arguments of Heidegger, Arendt and Vesely: "the earth is the home of mortal men," "the earth is a primary reference." In the light of this existential condition, it is a paradox that the architecture of the space age sometimes tries to free itself from the earth. The cities of the future are often disconnected from the ground (in a more extreme way than Le Corbusier's structures on *pilotis*) as if the new civilization could not be rooted on Earth. Yona Friedman's *Spatial City* (1958) comprised of a load bearing structure suspended some twenty meters above the ground and living modules, or cells that can be arranged anywhere, in any configuration. Ron Herron's *Walking City* (1964), as a group of lunar rovers, with no foundations, freely roamed the desert. These cities (or superstructures) of the future sever themselves from the past of Earthly civilizations, that is, from the layers of the ground in which the foundations of the remnants of the past — such as Heideggerian churches and graves[49] — are hidden.

Man can neither "conquer space" nor "dwell on the Moon" (despite the fact that Armstrong and Aldrin made their first lunar walk as early as in 1969, humankind has not colonized the Moon). He can at best – as Arendt argues in "The Conquest of Space and the Stature of Man" – make "a few discoveries in our solar system."[50] Arendt's objection to the very notion of the conquest of space results from its 1950s Cold-War arms race rhetoric. But we may also argue that the idea of this conquest does not begin with the launch of the first Sputnik, but with the 19th-century philosophical prophecies of Russian cosmism. In *The Philosophy of the Common Task* written between the 1870s and the 1890s (published posthumously in two volumes, the first in 1906 and the second in 1913), Nikolai Fedorovich Fedorov (1828–1903), considered today the father of Russian cosmism and the mentor of the young scientist-visionary Konstantin Tsiolkovskii, claimed that it is not enough to visit all the planets of the universe — the human race has to colonize them.[51] Unlike the engineer Potočnik, the librarian Fedorov does not provide posterity with precise, technical drawings of a rocket motor, or a space station. But his claim, that the ultimate goal of space exploration is to prepare habitable settlements for our "resurrected fathers,"[52] should become a point of interest for the philosophers and historians of architecture.

According to Fedorov's religious utopianism reinterpreting the Christian dogma of the resurrection of the dead, the "common task" of mankind is the physical resurrection of our ancestors through scientific means: "Resurrection is an act not only of God's grace but also of human activity."[53] As Boris Groys rightly notes, "for Fedorov, immortality is not a paradise for human souls, but a museum for living human bodies."[54] That is why Fedorov's "common task" includes the project of colonizing the entire cosmos. When this task is fulfilled and men overcome death, Earth will not be able to harbor the masses of the resurrected bodies.

At first glance, Fedorov's connections with architecture are not evident. Contemporary scholars, however, tend to search for indirect affinities between Fedorov's writings and Vladimir Tatlin's *Model for a Monument to the Third International*, or Kazimir Malevich's Suprematist paintings and architectural projects.[55] The purpose of my concluding remark is neither to confirm nor to question the aforementioned interpretations, but to emphasize the difference between Fedorov's utopian concept of immortality and Heidegger's existential philosophy of death (Dasein's possibility of "Being-towards-death"[56]). While the former encourages colonization of the cosmos, the latter says: "mortals dwell on the earth". These two, mutually exclusive, philosophical traditions have an impact on our contemporary thinking on the potentiality of architecture in the age of space explorations. But it seems that most of space-age architectural projects have been founded upon an existential utopia – similar to Fedorov's vision of immortality and space colonization – that sooner or later we will be able to dwell on distant planets.

Images

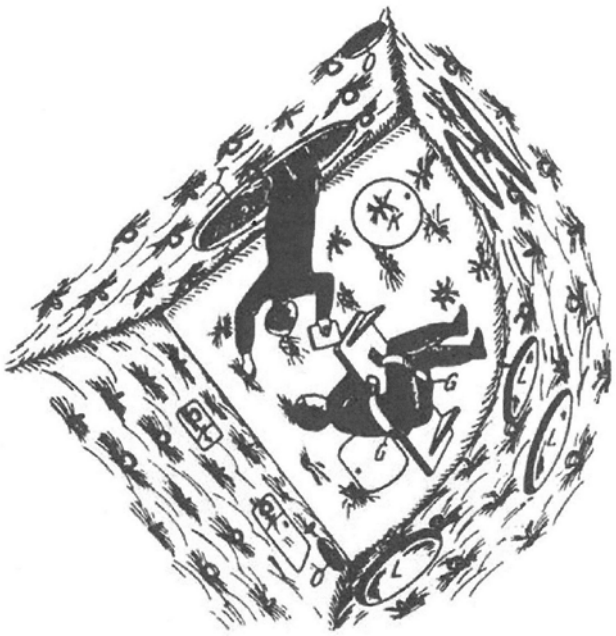

Figure 61. Writing in the weightless state: for this purpose, we have to be secured to the tabletop, for example, by means of leather straps (G) in order to remain at the table at all (without having to hold on). A man floats in from the next room through the (in this case, round) door opening, bringing something with him.

Figure 1. Hermann Noordung (Herman Potočnik), The Problem of Space Travel: The Rocket Motor, ed. Ernst Stuhlinger and J. D. Hunley with Jennifer Garland (Washington, D. C.: National Aeronautics and Space Administration, NASA History Office, 1995), 81. (Photo: courtesy of NASA History Office)

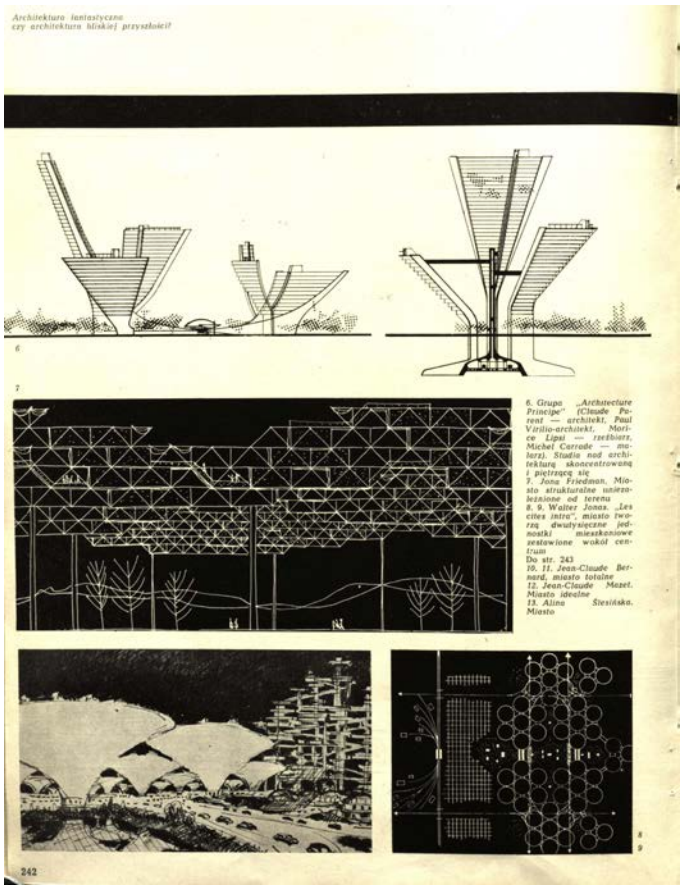

Figure 2. Krystyna Styrna, "Architektura fantastyczna czy architektura przyszłości" [Fantastic Architecture of Architecture of the Future], Architektura 6 (1966), 242.

Figure 3. Terra-1 Exhibition of Intentional Architecture, Museum of Architecture, Wrocław, 1975. (Photo: Museum of Architecture, Wrocław)

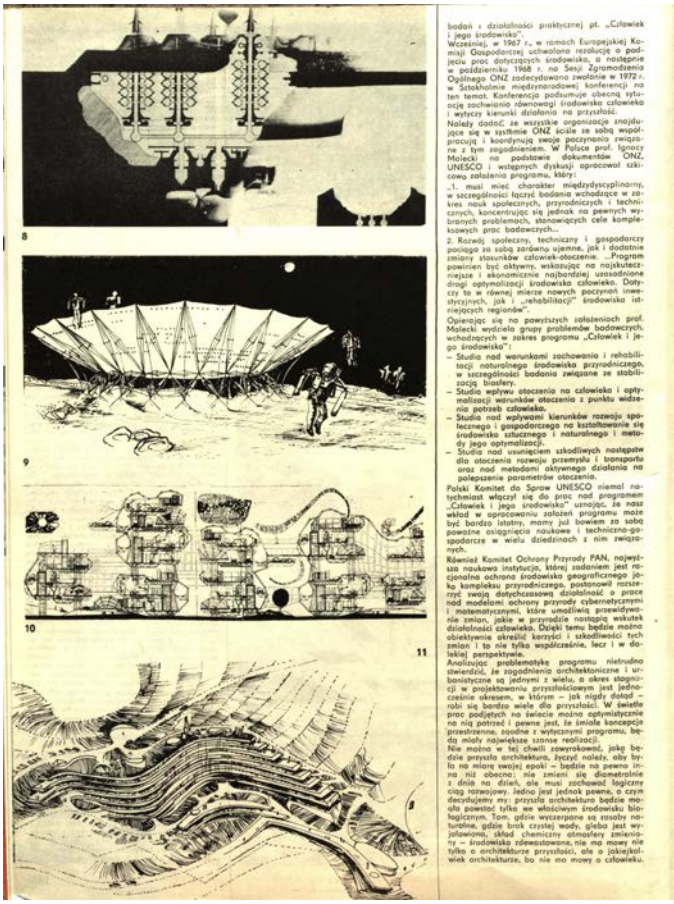

Figure 4. Krystyna Styrna, "Nowy etap w projektowaniu przyszłości" [A New Stage in Projecting the Future], Architektura 4/5 (1970), 146.

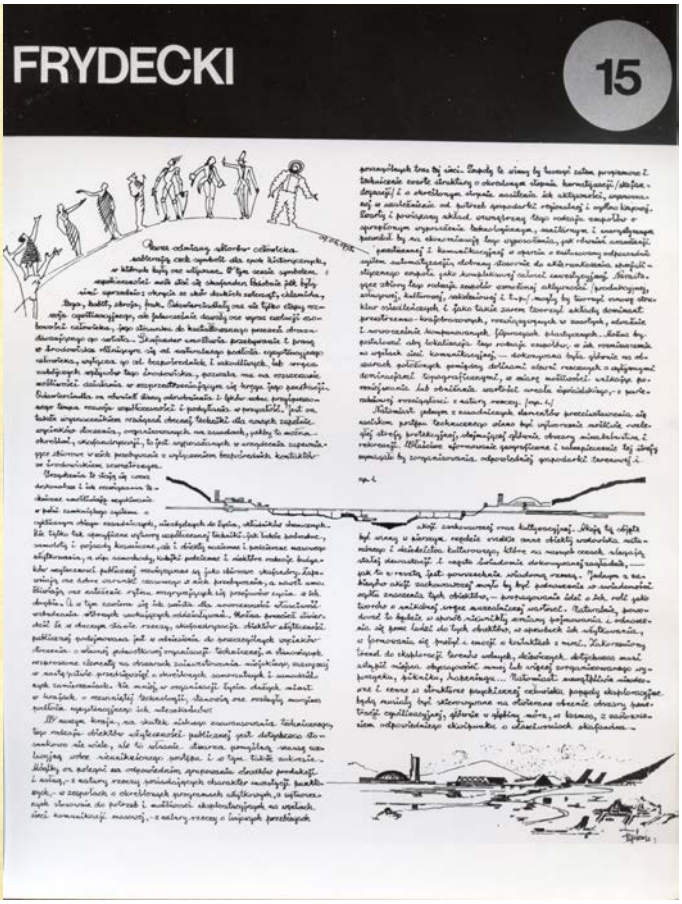

Figure 5. Andrzej Frydecki's concept of "spacesuitisation" presented at the Terra-1 Exhibition of Intentional Architecture, Museum of Architecture, Wrocław, 1975. (Photo: Museum of Architecture, Wrocław)

Notes

1 Hannah Arendt, *The Human Condition: A Study of the Central Dilemmas Facing Modern Man* (New York: Doubleday Anchor Books, 1959), 1.

2 On the history of the launch of Sputnik 1, its political propaganda significance during the Cold War, and the birth of NASA, see, for example, Walter A. McDougall, *... The Heavens and the Earth: A Political History of the Space Age* (New York: Basic Books, 1985); Matthew Brzezinski, *Red Moon: Sputnik and the Hidden Rivalries that Ignited the Space Age* (New York: Holt Paperbacks, 2008).

3 Arendt, *The Human Condition*, 1.

4 Ibid., 206. See also Arendt, *The Human Condition*, 360 (endnote no. 72): "Quoted from an interview with Wernher von Braun, as reported in the *New York Times*, December 16, 1957". On von Braun's biography see Michael J. Neufeld, *Von Braun: Dreamer of Space, Engineer of War* (New York: Vintage, 2008).

5 Arendt, *The Human Condition*, 1.

6 For a detailed analysis of Arendt's account of earth alienation in *The Human Condition*, see David Macauley, "Hannah Arendt and the Politics of Place: From Earth Alienation to Oikos," in *Minding Nature: The Philosophers of Ecology*, ed. David Macauley (New York: Guilford Publications, 1996), 102–133. On Heidegger's complex and interrelated terms of "earth" and "world", see Jeff Malpas, *Heidegger and the Thinking of Place: Explorations in the Topology of Being* (Cambridge MA; London, England: The MIT Press, 2012), 29–31, 243–245.

7 Martin Heidegger, "Building Dwelling Thinking", in *Poetry, Language, Thought*, trans. Albert Hofstadter (New York: Harper & Row, 1971), 148. On an architectural audience of Heidegger's lecture see, for example, Adam Sharr, *Heidegger for Architects* (Abingdon: Routledge, 2007), 36.

8 Heidegger, "Building Dwelling Thinking", 148.

9 Martin Heidegger, *Being and Time*, trans. John Macquarrie and Edward Robinson (Oxford UK, Cambridge MA: Blackwell, 1993), 137 [104].

10 *First Space Architect: Herman Potočnik Noordung. The Problem of Space Travel – Supre: Architecture* (exhibition catalogue), ed. Miha Turšič et al., 7.06–23.11.2014, Pavilion of Slovenia at the 14th International Architecture Exhibition – La Biennale di Venezia 2014.

11 Hermann Noordung (Herman Potočnik), *The Problem of Space Travel: The Rocket Motor*, ed. Ernst Stuhlinger and J. D. Hunley with Jennifer Garland (Washington, D.C.: National Aeronautics and Space Administration, NASA History Office, 1995), 1.

12 Ibid., 81.

13 "NASA Public Affairs interviews Expedition 48 Crew About Upcoming Activities", accessed September 24, 2016, http://www.nasa.gov/mission_pages/station/videos/index.html

14 Dalibor Vesely, *Architecture in the Age of Divided Representation: The Question of Creativity in the Shadow of Production* (Cambridge MA; London: The MIT Press, 2004), 53.

15 Ibid., 395 (endnote no. 14).

16 Mary Roach, *Packing for Mars: The Curious Science of Life in the Void* (London: Oneworld Publications, 2010), 257–258.

17 Maurice Merleau-Ponty, *Phenomenology of Perception*, trans. Colin Smith (London: Routledge, 1994), 253.

18 Noordung (Potočnik), *The Problem of Space Travel*, 79.

19 Heidegger, *Being and Time*, 136–137 [103].

20 Vesely, *Architecture in the Age of Divided Representation*, 51–52.

21 Ibid., 52.

22 Ibid.

23 Noordung (Potočnik), *The Problem of Space Travel*, 81–82.

24 *First Space Architect: Herman Potočnik Noordung. The Problem of Space Travel – Supre: Architecture*, unnumbered pages [2–5].

25 See Le Corbusier, "Eyes Which Do Not See", in *Towards a New Architecture*, trans. F. Etchells, (New York: Dover Publications, 1986), 85–148.

26 See Gabriela Świtek, *Gry sztuki z architekturą. Nowoczesne powinowactwa i współczesne integracje* (Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika, 2013), 442.

27 Krystyna Styrna, "Architektura fantastyczna czy architektura przyszłości", *Architektura* 6 (1966): 243. This argument is a development of my essay published under the title "Spacesuits, Space Kitchens, Space Cities …", trans. M. Wawrzyńczak, in *Kosmos wzywa! Sztuka i nauka w długich latach sześćdziesiątych / Cosmos Calling! Art and Science in the Long Sixties*, eds. Joanna Kordjak-Piotrowska, Stanisław Welbel (Warszawa: Zachęta – Narodowa Galeria Sztuki, 2014), 145–153.

28 Heidegger, "Building Dwelling Thinking", 145.

29 Ibid., 160.

30 Ibid.

31 Hannah Arendt, "The Conquest of Space and the Stature of Man", in *Between Past and Future: Eight Exercises in Political Thought* (New York: Penguin Books, 1968), 277.

32 On a blending of a modernist *Existenzminimum*, a paradigm of a prison cell, and the cosmic design of Superstudio (1971), see Gabriela Świtek, "A Simple Idea in Architecture: On the Principle of Projecting Prisons", in *Architecture and Justice: Judical Meanings in the Public Realm*, eds. Jonathan Simon, Nicolas Temple, Renée Tobe (Farnham: Ashgate, 2013), 46–47.

33 See Mirosław Hermaszewski, *Ciężar nieważkości. Opowieści pilota-kosmonauty* (Kraków: Universitas, 2009), 147–155.

34 Roach, *Packing for Mars*, 42.

35 Ibid., 50.

36 See Aleksander Paszyński, comment in a discussion about the Terra-1 International Exhibition of Intentional Architecture, "Dyskusja", *Architektura* 12 (1975): 389. The Terra-1 exhibition (Wrocław's Museum of Architecture, 1975) was initiated and curated by the Wrocław-based architect Stefan Müller. It presented some fifty projects of architects and artists, including Yona Friedmann, Oskar Hansen, Arata Isozaki, Rem Koolhaas, Elia Zenghelis, Madelon Vriesendorp and Zoe Zenghelis (*Exodus*, a project for London), Renzo Piano and Richard Rogers (Centre Pompidou), Aldo Rossi and Donatella Mazzoleni (*A Vertical Ground: Habitable Material for a City Structure*, 1967–1970), Superstudio (*Life, Education, Ceremony, Love, Death*).

37 Svetlana Boym, "Kosmos: Remembrances of the Future", in *Star City: The Future Under Communism*, eds. Łukasz Ronduda, Alex Farquharson, Barbara Piwowarska (Nottingham: MAMMAL Foundation, Nottingham Contemporary, transit.at, 2011), 187.

38 "Even today, when billions of dollars are spent year in and year out for highly 'useful' projects … , the physicist is still likely to look down upon all these space scientists as mere 'plumbers'. The sad truth of the matter, however, is that the lost contact between the world of the senses and appearances and the physical world view has been re-established not by the pure scientist but by the 'plumber'". See Arendt, "The Conquest of Space and the Stature of Man", 273.

39 Kenneth Frampton, *Modern Architecture: A Critical History* (London: Thames & Hudson, 2004), 282.

40 Noordung (Potočnik), *The Problem of Space Travel*, 89.

41 Arendt, "The Conquest of Space and the Stature of Man", 279.

42 "'64-65 NY World's Fair FUTURAMA Ride Video", accessed September 28, 2016, http://www.youtube.com/watch?V=2-5aK0H5jk. See also Beatriz Colomina, *Domesticity at War* (Barcelona: Actar, 2006), 286–287, 292.

43 Andrzej Frydecki's unpublished letter to Stefan Müller (20 May 1975, Wrocław), with commentary on the project, Wrocław Museum of Architecture (library catalogue no. 11613). Frydecki's concept of "spacesuit-isation" was presented at the Terra-1 Exhibition of Intentional Architecture in 1975. See Świtek, "Spacesuits, Space Kitchens, Space Cities …", 148–149.

44 Adolf Loos, "Architektur" (1910), in *Warum Architektur keine Kunst ist*, Hrgs. P. Stuiber (Wien: Metroverlag, 2009), 72.

45 *Art Becomes Architecture Becomes Art: A Conversation Between Vito Acconci and Kenny Schachter, Moderated by Lilian Pfaff* (a series: *Kunst und Architektur im Gesprach / Art and Architecture in Discussion*), ed. Cristina Bechtler (Wien, New York: Springer, 2006), 91.

46 Hans Hollein, "Alles ist Architektur" (1968), quoted in Jane Pavitt and David Crowley, "The Hi-Tech Cold War", in *Cold War Modern: Design 1945–1970*, eds. David Crowley, Jane Pavitt (London: V&A Publishing, 2008), 172–173.

47 Andrzej Frydecki's letter to Stefan Müller.

48 Andrzej Frydecki's letter to Stefan Müller.

49 Heidegger, *Being and Time*, 137 [104].

50 Arendt, "The Conquest of Space and the Stature of Man", 278.

51 For a renewed interest in the work of Fedorov see, for example: Ludmila Koehler, *N. F. Fedorov: The Philosophy of Action* (Pittsburgh PA: Institute for the Human Sciences, 1979); George M. Young, *Nikolai F. Fedorov: An Introduction* (Belmont, Mass.: Nordland Publishing Co., 1979); Michael Hagemeister, *Nikolaj Fedorov: Studien zu Leben, Werk, und Wirkung* (Munich: Verlag Otto Sagner, 1989); George M. Young, *The Russian Cosmists: The Esoteric Futurism of Nikolai Fedorov and His Followers* (Oxford: Oxford University Press, 2012).

52 Nikołaj Fiodorow, *Filozofia wspólnego czynu*, trans. Cezary Wodziński and Michał Milczarek (Kęty: Wydawnictwo Marek Derewiecki, 2012), 407. See also an abridged English translation: Nikolai Fedorovich Fedorov, *What Was Man Created For? The Philosophy of the Common Task, Selected Works*, translated from the Russian and abridged by Elisabeth Koutaissoff and Marylin Minto (Laussane: Honeyglen Publishing/L'Age d'Homme, 1990).

53 Nicholas Berdyaev, "N. F. Fedorov", *The Russian Review* 9 (1950): 126.

54 Boris Groys, "Immortal Bodies" in *Going Public* (Berlin: Sternberg Press, 2010), 158. A version of this essay also appeared as "The Immortal Bodies," *RES: Anthropology and Aesthetics* 53/54 (2008): 345–349.

55 For Fedorov's cosmism and its influence on architecture, art and popular culture see, for example: Norbert Lynton, *Tatlin's Tower: Monument to Revolution*, ed. John Milton (London and New Haven: Yale University Press, 2009); Igor A. Kazus, "The Idea of Cosmic Architecture and the Russian Avant-garde of the Early Twentieth-Century", in *Cosmos. From Goya to de Chirico, from Friedrich to Kiefer: Art in Pursuit of the Infinite*, ed. Jean Clair (Milan: Bompiani, 2000), 111; Boym, "Kosmos: Remembrances of the Future", 186–213; Asif A. Siddiqi "Imagining the Cosmos: Utopians, Mystics, and the Popular Culture of Spaceflight Revolutionary Russia", *Osiris* 23 (2008): 265–268; Asif A. Siddiqi, "Competing Technologies, National(ist) Narratives, and Universal Claims: Toward a Global History of Space Exploration", *Technology and Culture* 51 (2010): 432.

56 Heidegger, *Being and Time*, 279–311 [236–267].

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