ART AND TECHNOLOGY IN POLAND

FROM CYBERCOMMUNISM TO THE CULTURE OF MAKERS

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The difficult relations between art, science and technology in Poland

> Contemporary science and technology have common horizons… there exists a world that belongs as much to the artist as to the scientist/researcher or practitioner/technician.[1]

When writing the above words for the catalogue of the First Exhibition of Modern Art in 1948/1949, Mieczysław Porębski considered the possible relations of Polish art, science and technology which had been resurrected after the wartime atrocities and the involvement of science in military objectives. Back then it seemed that this line of development in art would be a chance for new experiments, despite the well-known limitations and censorship on the part of the regime. According to Porębski, this was also to be a proposal of continuing and revisiting the accomplishments of the first avant-garde in its many and varied currents, such as Constructivism, Futurism, innovative actions in music, literature, film, photography, etc. However, the history of the concept based on building bridges between art, science and technology in post-war Poland proved more complex, which no doubt impacted the unique approach of the artists to this type of experiments and to the overall social aura around these questions. A confluence of political, economic and social factors generated a zone of affective experience with respect to techno-culture, and this experience is still powerful in many intellectual circles. In addition, this mix of factors influenced a clear division of the humanities from the exact sciences, and of art education from science.

The paradigm of art and science still remains a rather enigmatic motto, practised responsibly by few Polish artists. This situation changed with the digital native generation's proposals for new creative practices in the early 21st century. The complicated relations between art, science and technology in Poland continue to reflect the dystopian narratives generated mainly by the experience of both world wars, the cold-war arms race, martial law as well as ecological disasters, including nuclear arms tests on both sides of the conflict. Technology is treated as a new version of social abjection, something we would like to exclude from our experience at all costs while we are aware that this zone

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[1] Mieczysław Porębski, "Wstęp do Katalogu I Wystawy Sztuki Nowoczesnej," in *I Wystawa Sztuki Nowoczesnej pięćdziesiąt lat później,* ed. by M. Świca, J. Chrobak, Kraków 1998, quoted after: *Cosmos calling. Art and Science in the Long Sixties*, ed. by J. Kordjak-Piotrowska, S. Welbel, Warszawa 2014, p. 66.

increasingly hybridises the human subject. Many people, especially from the generation of the 1960s and 1970s, associate technology first and foremost with the Chernobyl disaster – the first invisible yet global and lethal threat.

We all remember the sunny April day when the regime coyly announced radioactive pollution only to encourage people to take part in the May Day parades as if nothing had ever happened. We also remember the iodine solution, called Lugola fluid, which had to be drunk as a remedy to fight off the airborne carcinogenic elements. While each of us knew perfectly well the pictures taken in Hiroshima and Nagasaki, the direct experience of an "invisible" technology that is destructive to human life and transforms our atmosphere proved symptomatic for defining the human–technology relation in Poland. At the same time, we cannot forget the difficulties associated with access to new technological achievements and the fact that science in the Eastern Bloc was mainly controlled and managed top-down, serving particular directives and plans. This situation no doubt hampered the development of the art-science relations similar to those in the West, where after all what was crucial was not the use of new devices and designing and programming tools, but also a critical approach to them, as proposed by authors in many of their works. Under communism it was impossible to apply a subversive and hacktivist approach to technological advancements and, therefore, only after the watershed year of 1989 have we been able to speak about the creation of new artistic practices at the intersection of art, science and technology, which, however, have their single offshoots that hark back to an earlier time.

Cybercommunism

One of the major research practices and a yardstick for thinking about the relations between science, people, technology and art in the second half of the 20th century is the history of the development and definition of cybernetics, a science which significantly contributed to the change of ontological paradigms of modernity. As a new meta-science, it developed as early as in the 1940s as part of The Macy Conferences.[2] This knowledge

[2] *The Macy Conferences* was a series of interdisciplinary meetings organised between the years 1946–1953 in New York by the neuropsychologist and cyberneticist Warren McCulloch and the Josiah Macy, Jr. Foundation. The conferences aimed at establishing the fundamental principles for science dealing with the human brain. At stake was the creation of a universal discourse which would be clear to scholars of different scientific areas. The so-called core of the conference group was made up of eminent specialists from a variety of disciplines, e.g.: William Ross Ashby (psychiatrist, cyberneticist), Gregory Bateson (anthropologist, cyberneticist), Julian Bigelow (pioneer in computer engineering), Heinz von Foerster (bio-physician, philosopher, cyberneticist), Ralph W. Gerard (neuropsychologist, behaviourist), Kurt Lewin (social psychologist), Warren McCulloch (psychiatrist, neuropsychologist, cyberneticist), Margaret Mead (anthropologist), John von Neumann (mathematician), Walter Pitts (logician), Arturo Rosenblueth (physicist, cyberneticist) and Norbert Wiener (mathematician, cyberneticist).

encapsulated the practice and theory of many sciences and generated, redefined and ushered in many cognitive models of contemporary research.[3] Its development proceeded differently on either side of the cold war conflict and demonstrated differences in the approach to social relations with science and emergent technologies. Ever since inception, it was a major impetus for creating interdisciplinary teams of researchers, practitioners, technicians and artists, and was also to become a meta-language defining both technological and scientific problems and the life of the modern person within the social and cultural communications systems. The very title of a 1948 book by one of the founding fathers of the current trend: *Cybernetics, or Control and Communication in the Animal and the Machine*, clearly demonstrated that the new science opened up possibilities of experiments between disciplines and concepts which had previously been pursued separately. Norbert Wiener, the author and participant of The Macy Conferences, believed that once we define behaviour as change with respect to the environment, it is characteristic of, and can be studied in relation to, machines and animals alike. Elements such as control, self-regulation and feedback taking place in all settings, both technological and biological, proved to be of the utmost importance. Convincing reflections on the parallels between human beings and machines, as James Gleick observes, contributed to the enormous success of the book in the US and in Western Europe.

> He was interested not only in the explanation of the progress of informatics, which in fact was tangentially related to his interests, but in how informatics or data processing can enlighten humanity. As it turned out, he was seriously involved in questions of mental illnesses, mechanical prostheses and social aberrations. He feared it may devalue the human brain, much as factory machines devalued the work of human hands.[4]

The unique set of Wiener's scientific interests – he began his career from research on anti-aircraft artillery, then mainly on white noise and interference, statistical methods leading to determining events on the basis of distorted data[5] – later on laid the foundation for cybernetics as a practice of systemic management in various human and machine settings and for his profoundly humanistic and pro-social approach. He also offered an entirely new aspect of scientific work as an interdisciplinary cognitive and ethical practice. At first his theory was enthusiastically received, yet later on it was more and more often rejected and criticised in the USA. Wiener discovered specific ways of programming and projecting situations of data transfer, and saw in these possibilities for human develop-

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Regular participants included, moreover, Claude Shannon (engineer, mathematician, author of information theory), Erik Erikson (developmental psychologist, psychoanalyst) and Talcott Parsons (sociologist).

[3] The UK was another major centre, and the earlier studies by Allan Turing.

[4] James Gleick, *Informacja. Bit, wszechświat, rewolucja*, transl. by G. Siwek, Kraków 2012, p. 224.

[5] Wiener was a co-author of a major text titled *Extrapolation, Interpolation and Smoothing of Stationary Time Series*, in which he discussed the "statistical method of predicting future events on the basis of interrupted, uncertain and tainted ('damaged') data from the past. This was a very ambitious concept for that time and the state of development of anti-aircraft artillery." Gleick, op. cit., p. 221.

ment via a rediscovery of communications systems around around humans, and via a strengthening of the human body and mind.

> In the epoch of corporate monopolies and atomic weaponry, the theory that explained the behaviour of both humans and machines must be used to place humans in control of their machines. Abandoning his earlier enthusiasm for Turing's prophecy of artificial intelligence, Wiener now emphasised out the dangers posed by sentient computers.[6]

It was precisely for this reason that he would oppose the creation and development of artificial intelligence, which in the 1950s was a priority for US science; he was also opposed to the arms race. Aware of the risk of an unbridled growth of machines and of designing their work to replace human work, in the introduction to the Polish edition of *Cybernetics* he wrote as follows:

> The present-day industrial revolution wishes to devalue human brains, at least in the area of making simpler, more stereotypical decisions … If another revolution takes place, a run-of-the-mill person with average or less then average abilities will have nothing to sell … We have contributed to the birth of a new science which … covers technological achievements of unprecedented capacities for good and evil. We may only convey them to the world around us, but this is a world of Bergen-Belsen and Hiroshima. We do not even have a choice. They belong to our era; if we did not talk about them, we would at best relegate the development of the entire science to the least responsible and most corrupt of our engineers.[7]

His increasingly "leftist" and somewhat dystopian ideas began to arouse suspicions and alienated, for example, the followers of McCarthyism, who saw him as a threat to the stable progress of America's science policy. No wonder his vision of cybernetics, non-committed to servicing the army and opening up a debate on the moral accountability of scientists and politicians to the future of human beings in a technologically transformed reality, made a growing number of sponsors give up their financial backing for research centred around the idea of The Macy Conferences. Therefore, in the early 1950s the authorities started to see the mathematician and author of the famous game theory, John von Neumann, as a leader of the new science. He applied studies on the creation of an artificial electronic brain, carried out by Warren McCulloch and Walter Pitts,[8] and began to create a new dimension of cybernetics. In his vision this was supposed to be a science based on mathematics and logic, meant to develop automatic nervous systems and artificial intelligence, which was also to support the US army by equipping it with all kinds of

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[6] Richard Barbrook, *Imaginary Futures: from thinking machines to the global village*, London 2006, p. 48.

[7] Norbert Wiener, *Cybernetyka, czyli sterowanie i komunikacja w zwierzęciu i maszynie*, transl. by J. Mieścicki, Warszawa 1971, p. 55.

[8] Interestingly, at the onset of his research Wiener collaborated with both von Neumann and McCulloch and Pitts. On their difficult professional relations and consequences to the development of science, see: Flo Conway, Jim Siegelman, *Dark Hero of the Information Age. In Search of Norbert Wiener, the Father of Cybernetics*, New York 2005, pp. 129–235.

cybernetic service people who would be combat-worthy and able to perish in the event of a nuclear war.[9] This is how the American version of cybernetics developed without its founder, Norbert Wiener.

In the meantime, in the 1940 and 1950s in the countries of the Eastern Bloc, the Stalinist regime used the principles of central planning not only in the economy but also in science, art and everyday life. As follows from the analyses of documents from that period as carried out by, e.g. Slava Gerovitch, Russian scholars were caught in a trap between enforced development and discovery of ever new strategies, especially in the manufacture of bombs and nuclear arms and a constantly fuelled propaganda that disparaged and criticised the achievements of Western science, treated as an evil and destructive force on human beings. In 1946 Stalin personally put forth the basic priorities for Soviet science, which was to become equal to and then superior to science from behind Soviet borders,[10] and which in practice meant being inspired by, borrowing from and following American and West European accomplishments. The situation of the development of science was, then, paradoxical and extremely fragile. More innovative scholars and artists applying scientific theories were in fact walking the tightrope and were always at risk of surveillance and loss of life. Science was the property of the people in that it was supposed to serve the purposes of the military and economic growth. Under the Stalinist regime, leading Soviet scientists were especially opposed to cybernetics. Completely misinterpreting Wiener's doubts and moral concerns related to cybernetics, scientists clearly saw this science as a technocratic life-threatening pseudo-theory, a project of exterminating humanity, a form of debilitating human capacities for the sake of mechanical control of human activities.[11] The interdisciplinary nature of research held under the auspices of cybernetics, in particular the merger of biology, psychology and physics, mathematics and informatics, was unacceptable to the then regime. Stalin's clear division of disciplines, methodologies and schools was to help control scientific progress in particular areas and, therefore, the flow of ideas and concepts between them was negligible. The approach to science changed slightly with the end of Stalin's dictatorship. Nikita Khrushchev came to power, and along with him a group of scientists ready for innovation. Cybernetics began to be seen as a chance for economic development and a way of controlling industry on a mass scale. At the same time, it helped justify specific social and political changes.[12]

When in 1960 Norbert Wiener took part in a mathematics conference in Moscow, the question regarding technological progress of Eastern Bloc countries as one of Soviet Union's priorities was already obvious. Wiener himself was feted in Moscow as a science

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[9] See Barbrook, op. cit., p. 50. John von Neumann suggested that the language of self-reproducing automatons may be used in descriptions of the human brain and the computer, therefore we may create unlimited Artificial Intelligence which in many respects can surpass human capacities.

[10] Slava Gerovitch, *From Newspeak to Cyberspeak. A History of Soviet Cybernetics*, Cambridge, Mass., 2002, p. 15.

[11] Ibid., pp. 123-130.

[12] Barbrook, op. cit., pp. 139-140.

rock star.[13] In his book titled *Imaginary Future* Richard Barbrook writes that only a decade earlier the United States had enjoyed a cybernetic monopoly. Media and scientists in the USSR derogated the metatheory of their cold war opponent.[14] Now cybernetics, introduced into universities, was to be a sign of modernity which was necessary as a rejuvenating force of the ruling party. Cybernetics societies were established in nearly every country of the Eastern Bloc – the Polish one was registered in 1962.

> Taylorist discipline had lost its allure of organisational modernity. According to the reformers, the ruling party required a new vision of the socialist future if it wanted to rule over this new economic paradigm. Having fulfilled Stalin's goal of industrialising the Russian economy, the vanguard had to move on to tackling the tasks of the next stage of its world-historical mission. Under its leadership, the country's best engineers and technicians should focus their energies upon prototyping the cybernetic future. Russia's factory economy was already in the process of being upgraded into the Unified Information Network. By replacing Stalin with Wiener, bureaucratic Communism would be able to preserve its ideological hegemony over the imaginary future of proletarian communism. … After decades of purges, wars, corruption and austerity, the promised land was within sight. By the 1980s at the latest, the inhabitants of Russia and Eastern Europe would be enjoying all the wonders of proletarian communism.[15]

By far the highest accomplishment of early science during the post-Stalinist political "thaw" was the Soviets' launching the first satellite into space in 1957. Theoretically, they were heading the exploration of the cosmos at that time. The Americans responded in 1960 by creating ARPA and, using the cybernetic gap, began work on a new global communication network. The Russians also tried to develop this version of communication.

> In this Russian vision of the Net, two-way feedback between producers and consumers would calculate the correct distribution of labour and resources which most efficiently satisfied all of the different needs of society.[16]

The idea of developing a "computer language" as objective and rational, a basis for arriving at a new objective truth in science and society, was one of the major contributors to the development of cybernetics. Oskar Lange, one of the leading Polish cyberneticists and economists of the time, wrote as follows:

> Mathematical programming enhanced by the use of computers is becoming the fundamental tool of long-term economic planning and of solving minor dynamic economic issues. In this application the computer does not replace the market; it plays the role the market would never be able to play.[17]

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[13] Ibid., p. 140.
[14] Ibid., p. 139.
[15] Ibid., pp. 144–145.
[16] Ibid., p. 144.
[17] Oskar Lange, "Maszyna licząca i rynek," in idem, *Dzieła*, vol. 2: *Socjalizm*, Warszawa 1973, p. 336.

It seemed then that for a short period of time cybernetic ideas dismantled the censorship of scholars, who were able to more openly practise in an interdisciplinary and innovative way. The artists thought likewise. When Lem published his *Obłok Magellana* (*The Magellanic Cloud*) in 1954, he was unable to use the word cybernetics for political reasons and replaced it with the term mechaneuristics; in the 1960s he was able to use it freely.[18] However, did this turn towards cybernetics fundamentally change the relations of art and science in Poland, or was it a temporary revival of some possibilities which once more, for geo-political reasons, was not strong enough and lacked the conceptual foundations to be continued and developed?

Art and science during the post-Stalinist thaw

After a long period of Stalinist terror, mechanisation and streamlining the toil of the workforce, a moment came to return to the "human being" and his or her needs.

> The challenge for communism was the rehabilitation of the human being (one which was nourished by "discovery" and publication of the early writings of Karl Marx which articulated his "dream of the whole man." Exuberant scientism and doubting existentialism represented two poles of thought in the Thaw years (and after).[19]

In his text entitled *Nervous Systems: New Machines and Bodies in Polish Art and Film After the Thaw*, David Crowley highlights the fact that one of the major questions posed by the regime "elites" concerned the re-establishment and monitoring of man–technology relations as principal social challenges of the second half of the 20th century. At a time of a rebirth of cybernetics with a human face in Eastern Bloc countries, of scientific and technological progress foreshadowing an era of thinking machines, a global system of communications and biological transformations, these issues were the focus point of revised Marxist ideals. New methods of their social implementation were sought, and a time of experimentation and creating science and art laboratories followed.

> In an air of a "scientific and technological revolution" the state permitted experiments in culture and science to be carried out not only by cyberneticists, psychologists or ergonomists, but also artists, film makers, architects, and musicians. Galleries, theatres, film and recording studios were described in the 1960s – by their creators – "laboratories" and artworks as "instruments." Belonging to the newly-licensed zone of "experimentation" and sharing the official rhetoric of progress, these labs enjoyed resources and relative freedom from censorship.[20]

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[18] See Joanna Kordjak-Piotrowska, "Art and Cybernetics in the Long Sixties," in *Cosmos calling. Art and Science...*, p. 57.

[19] David Crowley, "Nervous Systems: New Machines and Bodies in Polish Art and Film After the Thaw," in *Cosmos calling. Art and Science...*, p. 31.

[20] Ibid., p. 38.

It seemed then that Porębski's idea expressed in the late 1940s, which in reality had not been pursued and developed, would finally be implemented in new scientific and artistic practice. In fact, for over a decade this practice was successfully followed. It was during this period that Krzysztof Penderecki's and Eugeniusz Rudnik's unique musical compositions were created,[21] created among others in the Experimental Studio of Polish Radio. It was then that work by such artists as Włodzimierz Borowski was created: in his series of *Pokazów synkretycznych* (*Syncretic Shows*) he stimulated and watched the reactions of viewers and subjected them to visual and sensory experiments. This was also a time of experiments conducted by Wojciech Bruszewski and Grzegorz Kowalski, at the end of the decade by Krzysztof Wodiczko, Ryszard Winiarski, Ryszard Waśko, and later of the *Elektroniczne antynomie* (*Electronic Antinomies*) by Janusz Połom, made in collaboration with engineers and programmers, or the avant-garde work of Zbigniew Rybczyński. This artistic practice of the 1960s and 1970s was underpinned by scientific concepts, the language of mathematics and computer science as well as early activities in the fields of biotechnology, neurology, cognitive psychology, new solutions in ergonomics,[22] or physics. Many of the works have their conceptual dimension and deliberately experimented with the audiovisual form and new ways of recording and registering reality, but they also tried to extend the perception spectrum of their recipients.

The information turn that took place in the West in the 1940s, mainly thanks to the research and publications of Claude Shannon, was reflected in Polish art practice. Fascinations with mathematical models, cybernetics and feedback were not only to engage new engineers but also to be an important field of reflection for artists and humanists. At the same time, the fast-developing information theory (the zero-one system), which increasingly more often became a language of many disciplines, such as biology, chemistry and neurology, changed the way studies of life on and outside planet Earth were carried out. Not only machines and equipment but, first of all, a new programming language was developed. Information theory was to be the foundation for developing new tools in the humanities and social sciences, in methods of defining cultural phenomena, their course, flow, feedback or interferences. It was therefore extremely important to combine competencies, to transcend the boundaries of scientific disciplines and, finally, to seek new forms of education. In his treatise, first published in 1962 and delivered as a paper at a scholarly meeting of the Committee of Art Sciences at the Institute of Arts of the Polish Academy of Sciences in Warsaw, Mieczysław Porębski, when introducing the language of maths into research on art history, indicated the need to rework and reflect on new cognitive models that were indispensable to the emerging art combined with science and technology.

[21] Eugeniusz Rudnik was one of the first makers of electro-acoustic music in Poland, an experimenter, author of *Skalary* and the first quadraphonic piece *Vox Humana*; he was interested in the relation between sound and qualities of space.

[22] Ergonomics (including anthropometric studies) was one of the most robustly developing areas of studies on the human being in the 1950s and 1960s in Poland. The frequently resulting simplified cognitive models were criticised by, e.g. Krzysztof Wodiczko in the project called *Instrument Osobisty* (*Personal Instrument*) (1969).

According to him, in many respects it became a meta-art which revised former mythological narratives on reality and on itself, developing new reflections on their new forms. In conclusion, he stressed as follows:

> After all we are dealing here with a separate, fledgling creative discipline which, not subverting anything, takes a position similar to that of meta-mythology with respect to mythology addressing old and contemporary works as well as what it does itself and what it finds as "ready-made" around itself. Defining their and its own essence, it constructs, as if separately for each new work (or rather for each of their new series), a separate non-transferrable technology, typology and morphology … It provides information not on things, relations, impressions or images, but on the boundaries of information itself.[23]

Porębski knew full well that the social transformations taking place on both sides of the Iron Curtain in the 20th century necessitated a redefinition of the tools of both artists and humanists. The meta-art he wrote about took care of the new forms of human perception, both audio and visual, and of the technological extension of human reception qualities. It was also to address permutation systems serving mechanisms and even forms of Artificial Intelligence. At the same time, in this paper Porębski points to one more important issue, namely that the new creative practice informs about "the limits of information itself." This succinct phrase contains the very essence of what will be studied later on: the language of the new media, or a code, record which is "hidden" underneath the surface of things, where phenomena (irrespective of their nature and origin) may be expressed, recorded and, more importantly, processed and manipulated. In the *Iconosphere*, his best-known theoretical work, Porębski wrote as follows:

> The "information boom" of recent years, who knows if not more threatening than the "demographic book" and "energy book," is characterised not only by the inclusion of mass communications media but also their intensification, shock impact, assaulting ever more ruthlessly the recipient's reception system. The ubiquitous image stereotypes, conventions and symbols encroach upon us, inform and deceive, encourage and warn. Has this boom not exceeded one or another escape velocity, when all ties with any tradition, both classical and conservative and subversive and innovative, cease to operate and new, previously unknown laws come into play?[24]

However, back then these ideas were too complex and had to wait nearly thirty years to be revisited in the arts and humanities. In the 1960s and 1970s, technology was less advanced than that in the West or even in East Germany;[25] besides, the alleged political "thaw" proved short-lived and illusionary. After a moment of "a deeper breath," censorship

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[23] Mieczysław Porębski, "Sztuka a informacja," in idem, *Sztuka a informacja*, Kraków 1986, p. 77.

[24] Mieczysław Porębski, *Ikonosfera*, Warszawa 1972, pp. 228–229.

[25] On the development of technology in East Germany, which was faster and different than that in Poland or in the Soviet Union, see: Dolores L. Augustine, *Red Prometheus. Engineering and Dictatorship in East Germany 1945–1990*, Cambridge, Mass., 2007.

returned, persecution of many artists continued, and technology was again perceived as related to the regime and oppression.

In the 1960s Polish industrial design was a major area for the development of the idea of combining art, science and technology. More often than not, the designs were of supreme quality and oftentimes went beyond the utilitarian function, thus paving the way for new artistic practices at the intersection of prototype engineering and artistic expression. Art and Research Studios (Zakłady Artystyczno-Badawcze ZAB, 1954-1977), affiliated with the Interior Architecture Faculty of the Academy of Fine Arts in Warsaw, were instrumental in the development of Polish industrial design at the crossroads of art and science. This was a place focusing on experiments at the intersection of arts and engineering sciences led by, e.g. Jerzy Sołtan and Oskar Hansen. This is how Wojciech Fangor describes his cooperation with ZAB when working on a project for Expo'58 in Brussels:

> I was supposed to paint a frieze on this wall. On the outside: ruffled optical geometry, inside: blown-up children's drawings ... doing nothing. Władysław Gomułka said that Poland cannot afford such extravagance. The design was rejected.[26]

One of the people who initiated and developed possible interaction between art and technology was Andrzej Pawłowski. Running the first Faculty of Industrial Form at the Academy of Fine Arts in Krakow in Poland in the early 1960s, he emphasised setting up interdisciplinary teams in educating new designers. According to him, a designer needs to collaborate with engineers in charge of particular production issues, must increase his or her knowledge regarding sociology, economics, material technology, processing techniques, automation and security, and also assume social responsibility for a given work.[27] Pawłowski had a very unique approach to technology. He was fully cognizant of the threats of scientific acceleration of the 20th century. He wrote as follows:

> The dynamic development of our civilisation is increasingly a reason for a dangerous imbalance. Human "development" and "existence" are at risk of an "unbridled" progress of the technological and industrial civilisation.[28]

Janusz Krupiński believes that:

> Pawłowski's optimism is inspired by the hope that it is precisely industrial design which will be able to curb, harness, tame and direct the technological and industrial civilisation and convert it into a genuine culture.[29]

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[26] Marcin Wicha, "Fangor: od 'Lenina w Poroninie' do designu," *Dziennik.pl* [online], 2008, 6th December, available from: http://kultura.dziennik.pl/artykuly/83958,fangor-od-lenina-w-poroninie-do-designu.html [accessed: 30 July 2014].

[27] Andrzej Szczerski, "Designing Designers – Industrial Design at the Academies of Fine Arts," in *Cosmos calling. Art and Science...*, pp. 173–174.

[28] Andrzej Pawłowski, *Inicjacje. O sztuce, projektowaniu i kształceniu projektantów*, ed. and selection J. Krupiński, Warszawa 1987, pp. 46–45.

Design, according to Pawłowski, involved the introduction of specific principles into the chaotic techno-cultural reality and attempts made by humans to harness scientific discoveries. When defining design models, Pawłowski was inspired by a method that was extremely popular in the 1960s and 1970s known under the acronym TRIZ (Theory of Inventive Problem Solving, or Theory of Inventive Question Solving), developed by the Soviet scholar Henryk Altszuller.[30] In his famous book under the much-telling title of *Algorytm wynalazku* (*The Algorithm of Invention*), which was widely commented in the Eastern Bloc, the theoretician called for heuristic programming, or establishing activities necessary in the practice of invention.[31] By combining Marxist dialectics with a systemic and scientific approach to education and problem solving, Altszuller wrote:

> The entire sense of the inventiveness theory consists in fact in its allowing us to find a solution to a task deemed as creative today, at a level of organisation of mental work to be reached tomorrow.[32]

The method was in fact a Soviet response to all kinds of versions of so-called design thinking which also dealt with efficient and systemic problem solving.[33] The rational approach to problem solving was to facilitate "moving step by step to a successful solution" and was known as the Algorithm of Inventive Question Solving (AIQS).[34] The algorithm as defined by Altszuller was a protocol made up of a description of directed actions. It was also to stimulate the discovery of the inventor's identity features necessary for the actions and was composed of three principal stages: analysis, elimination of technological contradiction (operational stage) and correction (synthetic stage).[35] Naturally, thinking about the algorithm as a form supporting the practice of inventiveness was to work out a common strategy for emergent technological reflection. Despite the theoretician's assurance that he "does not ignore the human being," this was a rather mechanical programme fostering not so much creativity but efficient solutions to technical and scientific problems. No doubt this was a major basis for educating future designers as it systematised the creative process and linked it inseparably with realistic tasks. The invention algorithm was not

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[29] Janusz Krupiński, "Andrzeja Pawłowskiego koncepcje wzornictwa," [online], available from: http://www.krupinski.asp.krakow.pl/content.php?page=docs/pawlowskiego_koncepcje_wzornictwa.htm&type=teksty [accessed: 2 March 2014].

[30] Before World War II he was a promising engineer and theoretician, during Stalinist times he was banned from practising his profession, and after the "thaw" his concepts regained popularity and were the basis for teaching designers in many countries of the Eastern Bloc.

[31] Henryk Altszuller, *Algorytm wynalazku*, transl. by T. Nowosad, Warszawa 1975, pp. 39–40.

[32] Ibid., p. 52.

[33] Suffice it to mention the ideas of the World Game by Buckminster Fuller from the 1960s, see Agnieszka Jelewska, *Ekotopie. Ekspansja technokultury*, Poznań 2014, pp. 168–171, or the ideas and practices of *design engineering* described, e.g. in Robert McKim's *Experiences in Visual Thinking* (1973), one of the sources of inspiration for the development of *design thinking* as an educational model at Stanford University.

[34] Altszuller, op. cit., p. 86.

[35] Ibid., pp. 87–91.

supposed to unleash new design thought but to streamline the efficiency of action. We must remember that it was a form of programming work and action subject to a system, although many of these, thanks to the designer's special talents and capabilities, went beyond the superimposed pattern. A case in point is the history of Polish rocket research that was conducted, for example, by Jacek Walczewski at the University of Science and Technology in Krakow in the Unit of Rocket Technology he set up in 1957. After initial success this work was discontinued due to pressure from the "Eastern neighbour."[36]

And so, following a short period of development of art and science projects, once again it turned out that experiments could be performed in strictly defined frameworks and under designated principles. Joanna Kordjak-Piotrowska observes as follows:

> The decline of the Gomułka era saw the end the myth – dating back to the post-Stalin Thaw of the mid-1950s – of the artist designing a new, high-tech reality in close collaboration with engineers, constructors, mathematicians. Instead, artists and critics started voicing a sense of doubt or irony concerning the ideology of technological progress; the notion – fundamental for the 1960s – of science as a "universal remedy for all of humanity's ills" was found to be flawed.[37]

When at the turn of the 1970s the USA was a country where conscious art and science practice consisted in reclaiming military and systemic technologies for their social and communication use, or for a critical reflection on the relation of nature, humans and technology, interest in these issues in Poland had actually started to wane. The events of 1968 were a serious foreshadowing of a new propaganda and of more stringent censorship. Again, tanks appeared on the streets and once again the social and everyday experience of technology became largely negative. The disappointment with the expectations that artists and scientists had with respect to relations between art and technology is linked with the loss of society's faith in a possible redefinition and in changes of the system's elements, which the regime promised following Stalin's death, including new experiments in education or actions for the sake of culture. Characteristic for this situation is also the creative biography of Grzegorz Kowalski, one of the major Polish artists of the second half of the century. He is a graduate of the Sculpture Faculty of the Warsaw Academy of Fine Arts and a disciple of, e.g. Oskar Hansen, whose concept of the "Foma Otwarta" ("Open Form") was for him one of his major inspirations. In the 1960s he also collaborated with Mieczysław Porębski and took part in his seminars on science and art at the Warsaw Academy of Fine Arts (within an inner circle of the initiated, next to, e.g. Feliks Falk and Ryszard Winiarski).[38] Importantly, Kowalski's piece of work for graduation in 1965 was a design, a model of a *Pomnik energii jądrowej* (*Nuclear Energy Monument*), a work that is deeply critical of instrumentally treated science, of the madness of nuclear arms development and a powerful statement against the threat of annihilation of the world. This work also

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[36] A description of the entire project: http://rakietypolskie.pl/opis [accessed: 14 July 2014].

[37] Kordjak-Piotrowska, op. cit., p. 67.

[38] Ibid., p. 52.

consisted of two famous elements which differently treated the question of cognitive psychology, neurobiology and engagement of viewers' senses, i.e. the *Studium przestrzeni percypowanej przez zmysły: równowagi i dotyku* (*Study of Space Perceived by the Senses: of Balance and Touch*). These were actually attempts at a very subtle implementation of the idea of introducing the viewer into new perception environments. In the last two works the artist himself used terms inspired by Porębski's texts, e.g. a "set of stimuli" or a "set of receptors."[39] As Maryla Sitkowska claims:

> Grzegorz Kowalski's early work coincided with a rebirth in the movement of symposia and avant-garde workshops with a science and social programme (integration with different groups of recipients, developing new kinds of art patronage by, e.g. large factories). Kowalski took part in some major events of this movement, such as the 1st Symposium of Visual Artists and Scientists called "Art in the Changing World" in Puławy (1966), the 2nd Biennale of Spatial Forms in Elbląg (1967), the 5th Koszalin Workshop in Osieki (1967), and the Visual Arts Symposium "Wrocław'70." The common denominator of works made and shown at the above symposia was their capacity to be transformed by the viewers' interference. This was, e.g. the *Kompozycja okolicznościowa* (*Commemorative Composition*) from Puławy (1966) and the *Kompozycja aktualna* (*Current Composition*) at the São Paulo Biennale in 1969.[40]

By the late 1960s Kowalski already senses a profound hiatus between the ideas of combining art and science to explore human perception and the political and economic situation. He participates in a scholarship programme in the US and on coming back begins a period which he himself defines as "practising freedom against censorship and political oppression"[41]. His teaching will in the 1990s contribute to the establishment of a studio with the informal name of Kowalnia (Smithy), which laid the foundations for Polish critical art and which in a large measure was anti-scientific and anti-technological.

In the late 1970s the idea of bringing together art and science, not necessarily via cybernetics or informatics, but conceptually and formally, was implemented by the artists gathered around the Film Form Workshop in Łódź (1970-1977), e.g.: Józef Robakowski, Paweł Kwiek, Wojciech Bruszewski and Zbigniew Rybczyński. Alicja Cichowicz writes:

> Members of the FFW showed an intellectual approach to art, combining a constructivist worship of technology with artistic methods based on science. They wished to discover significant and unique features of the film message and the material and technological conditions. They analysed the interrelations between elements of construction of a film work: space and time, image and sound, as well as the questions of the relation between film and reality and perception physiology. Studies on the medium's structure were enhanced by theory and criticism; they published their own periodical ("Zeszyty WFF") with lectures, projects documentation and methodological analyses of their work.[42]

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[39] Ibid., p. 51.

[40] http://culture.pl/pl/tworca/grzegorz-kowalski [accessed: 15 August 2014].

[41] http://culture.pl/pl/tworca/grzegorz-kowalski [accessed: 15 August 2014].

[42] http://www.robakowski.net/tx45.html [accessed: 7 July 2014].

They deemed as important the Constructivist tradition, works by the Themersons as well as ideas espoused by Strzemiński and Kobro in their understanding of abstraction, approach to scientific research and art and to form as a carrier of imagery. Rejection of a classical film plot, protagonist construction and a linear sequence of events pushed these artists, each in his or her own way, to the meta-film level. Their artistic statements try to define their new ways of perception, systems of recording and technological recorders of reality.

> The Film Form Workshop – writes Ryszard W. Kluszczyński – emerging at a time of special intensification of conceptualist tendencies in art and of the development of structural cinema, naturally joined the community of artists who rejected the traditional aesthetic stand for the sake of the cognitive one and – patterned on the philosophical school of positivists – regarded their communication capacities as the only to be noteworthy. Members of the "Workshop" found their own way within a broadly construed conceptualist movement in art, tapping into the traditions of the Polish (and Russian) artistic avant-garde of the 1920s and the 1930s. The ideology and practice of Constructivism was in this way an important source of inspiration for the arts and theory.[43]

What was important was then the search for a language arising from the recording technology rather than from literary narratives, as Paweł Kwiek observed in *1,2,3… ćwiczenie operatorskie* (*1,2,3 … Operator's Exercise*), in which he discussed the new approach to the process of film making:

> I begin to wonder what will appear on the screen. What will the film be about? I think that deep down it will be about nothing. I approve of the absence of meaning or rather the absence of the significance of the film. Actually, the 3 minutes of my life in which I did what I did under the influence of the camera did not matter either.[44]

Some of the WFF members, e.g. Kwiek and Robakowski, treated art as a trans-disciplinary form, combined performative activities and film, tested interactions between bodies and recording devices, pursued "non-human," non-classical forms of recording reality, and followed and showed emergent models of interaction between the human somatic and its technologically generated images. Others, such as Wojciech Bruszewski, experimented with generativeness, recursiveness and randomness, thus laying the foundation for Polish interactive art.

> In 1972, in the early stage of his career, next to the permutational *Bezdech* (*Apnea*) film (a linear combination of different sets of the same elements), Bruszewski created, moreover, a generative and permutational object, *Nowe Słowa* (*New Words*), which could generate 256 different combinations of letters-components. Most of them did not have the status of words in the Polish language but were a potentiality.[45]

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[43] Ryszard W. Kluszczyński, "Przestrzenie generatywności. Wprowadzenie do twórczości Wojciecha Bruszewskiego," *Dialog*, no. 7–8, 2012, p. 152.

[44] http://culture.pl/pl/tworca/warsztat-formy-filmowej [accessed: 12 March 2014].

[45] Kluszczyński, op. cit., p. 157.

In the late 1960s the Soviet regime was increasingly brutal in its praise of a utopian techno-human future, although access to technology in Poland or the USSR remained negligible, incomparable to that in the West or even East Germany, where the situation of the flow of ideas and scientific and technological progress assumed a different course. This change of political course also affected the disillusion with ideas of merging art and technology and extended anew the gap between the humanities and the exact sciences, thus distancing the countries of the Eastern Bloc from the art of the new media and the emergent *art&science* practices which began to flourish in the West.

Aksel Berg, chairman of the Council on Cybernetics, one of the most vociferous advocates of technological progress, stated in 1967:

> When computers appear in our homes … we will no longer need to call a doctor; a machine will tell us what to do. Students will not have to visit some places and listen to absurd lectures by retirees who know nothing any longer; programs will be optimised and you will be connected to a machine; this connection will flow like water and light in your homes … If someone does not believe, let them commit suicide. This is our future, after all; we shall fight for it and eliminate all standing in the way.[46]

This military and revolutionary stylistics was to express the assumptions of the ideology of progress which no longer made believe that it was a new form of freedom. This was perfectly well addressed by Stanisław Lem:

> We ascend to ever higher levels of military technology, as a result of which not only conventional armoured trains and bombers, not only strategies and staffs, but the very essence of global antagonism becomes obsolete. I do not know which direction it will evolve into.[47]

This famous quote comes from the introduction to Lem's philosophical essays, published under the title *Summa Technologiae* in 1964. Although writing behind the Iron Curtain, Lem was aware of many of the processes which transformed societies on either side of the cold war conflict. The development of technology in the second half of the 20th century was linked with major problems the human race was facing at that time, e.g. anti-humanist tendencies identified in the West with the names of, e.g. Michel Foucault and Jacques Derrida, the technocratic visions of the new society of Jacques Ellul and Lewis Mumford, the extension and cyborgisation of body and mind (Marshal McLuhan), the network as a new model of global communication, the conquest of outer space as part of the cold war arms race, and the emerging movements of political revolutions and transformations.

In his *Summa Technologiae*, Lem was mainly concerned with the human being who designs and is fitted with new survival technologies. The human being as described by Lem has long ceased to believe in the infallibility of his or her agency and has begun to

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[46] Gerovitch, op. cit., p. 255.

[47] Stanisław Lem, *Summa Technologiae*, 2012, [electronic edition], p. 36.

discover him or herself as an element of the ecosystem. It is from this perspective that we should interpret the writer's aversion to the demands of humanism, unthinkingly repeated in the humanities and philosophy.

> I trust no pledges; I believe no assurances underpinned by so-called humanism. The only way to deal with technology is another technology. Human beings know today more about their dangerous inclinations than a hundred years ago, and in another hundred years this knowledge will be even better.[48]

The human being was defined by Lem as an evolutionary element of new technogeology, a science which, when technologically enhanced, indicates human forms of coexistence with Earth as a planet. However, Lem in many respects harboured no illusions that this coexistence is not homeostatic, as some theoreticians of cybernetics believed. "Because, unlike most animals, the human being can not only adjust him- or herself to the environment, but actually adjusts this environment to his or her needs."[49] Each technology is double-edged. It may be both a form of administration and destruction as well as of support and development. However, the 20th century clearly demonstrated that not infrequently the two issues began to cling to each other and were spheres of human activity which were difficult to be teleologically and ethically differentiated. Lem's essays provide an image of a cybernetically educated science-fiction thinker and philosopher who recognises and tries to pursue the traces, fragments, signs and omens of the techno-cultural paradigm at the foundation of modernity, where technology is not merely a context, commentary and instrument but where it co-creates possible models of human existence.

The advancement of scientific and technological progress has become so clear that one does not need to be a specialist to notice it. I believe that the changeability of living conditions caused by this advancement is one of the factors which affect the establishment of the homeostatic systems of morals and norms of the present-day world. When the entire human life of the following generation is no longer a repetition of parents' lives, what kind of guidelines and knowledge can be offered by the experienced elderly to the young? The truth is that the interference in the patterns of activity and its ideals by the very element of incessant change is masked by another process, far more conspicuous and definitely more serious in its direct consequences, i.e. accelerated oscillations of the self-begetting system with a positive feedback with a very weak negative component, i.e. the East–West system which over the past years has oscillated between series of global crises and denouement.[50]

Lem indicates, first of all, a new set of ethical and cultural problems arising from developments in genetics, biotechnology, neurology and psychology that redefine the notion of natural heredity of the human race. This, according to the writer, will result in rudimen-

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[48] Ibid., pp. 19–20.
[49] Ibid., p. 18.
[50] Ibid., p. 22.

tary changes in norms, behaviours and morals. The issues foreshadowed by Lem are today one of the most important ones for the scientific discourse and practice of both the exact sciences and the humanities and arts on a global, ecological and existential level. However, the most important and direct dimension of techno-culture for Lem in the 1960s was the cold war system of feedback between the United States and the Soviet Union. The system, based on a military technological race, determined the principles of information flow and of the use of this information and its social implementation. It moreover impacted the entire biosphere, as Lem wrote, with radioactive waste, nuclear tests, threat of deployment of chemical weapons, and the possible annihilation of the entire planet.

The Long 1980s

Due to the political, economic and cultural situation in the long decade of the 1980s in Poland (reaching into the 1970s, with ramifications still in the 1990s), it is difficult to mention any circumstances conducive to the development of experimental artistic phenomena at the intersection of art, science and technology. Actually, from today's point of view it is difficult to imagine responsible art which would not become directly and critically involved in the support of movements fighting for freedom and civil liberties. Because of that (and because access to new technologies in Poland was not easy), in fact media art (technological) did not develop. The new strategies of pursuing art in an interdisciplinary dialogue with science and technology originating in the 1960s and 1970s were pushed aside and gave way to what were at that time significant forms of social commitment, less focused on designing and more on critical activism. In the long 1980s, technology is practically entirely associated with the military regime; not only with tanks and armoured vehicles on the streets but also with a broadly construed computer culture whose development is controlled, blocked and superimposed. While personal computers addressing a wide market appeared in Western Europe, in Poland, although we had our own Odra computers in the Wrocław-based Elwro factory, they were mainly used in the industry and strictly in science. In such a reality computers could not be seen as a factor allowing artists to "reclaim in a partisan fashion" the technological media for the sake of independent communities, which was an especially characteristic feature of the processes of mediation of reality in Western Europe and in the USA.[51]

Another phenomenon sprang up in Poland at that time – in the first half of the 1980s it helped establish proto-networks based on strategies of media exchange. Characteristic for that period was the intense explosion of the music community, especially of independent rock, punk and new wave artists. Their concerts gathered crowds of young people. A music festival was held in Jarocin and was treated by the regime as a kind of safety valve, and probably because of that it was tolerated. Still, the growing music fashion and

[51] See Jelewska, op. cit., pp. 79–111; 157–187.

access to cassette recorders facilitated the birth of new forms of independent media communication. Concert audiences not only listened to the music but also often recorded it on portable cassette recorders, then copied the recordings and made them accessible to others. This gave birth to the underground publication market, free from the impact of censorship and based exclusively on the exchange of recordings between users. Bands did not need to officially release their records as everyone knew their repertory thanks to bootlegs, or pirated recordings made during concerts. This extremely interesting phenomenon was to a large extent instrumental in a critical reflection on the culture of the then generation, for whom art and artistic practice were a form of community experience, by definition belonging to the public domain. This media and community paradigm, unconsciously resorting to the ideas of media piracy, was one of the most important factors in the development of an independent culture in Poland. Despite the ever stricter political repressions of many artists, grassroots counter-culture phenomena began to expand their impact zones. Symbolic manifestations of this phenomenon included a banner that conceptually and critically referenced the technological experience of the modern person. The poster in question is "Cosmic Solidarity," hung on the bus of the Brygada Kryzys band in 1981 shortly before the imposition of martial law. The power of contesting the military culture of the Eastern Bloc was expressed in many ways by the young generation. One punk band established in 1981 called itself SS-20, after the Soviet rocket for launching nuclear warheads.[52] Another band, Moskwa, set up in 1983, composed a song titled *Światło atomowe* (*Atomic Light*):

Światło atomowe zabija dziecka wzrok
Ciała nieruchome i pokrwawione są
Światło atomowe wyciska z mózgu sok
Ciała nieruchome do śmierci tylko krok

Bomby, miny, karabiny, czołgi
To już historia!
Wybuch jądrowy, grzyb atomowy
Nie do obrony!

(The atomic light destroys a child's eyes
Bodies in blood keep silent
The atomic light squeezes out our brains
Bodies are still, a step from the grave

Bombs, mines, guns and tanks
Are a song of the past!
An A-bomb explosion
Doesn't leave us that fast)[53]

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[52] Later they changed their name to *Dezerter*.

[53] Moskwa, *Światło atomowe*, http://www.moskwa.band.pl/teksty/ [accessed: 10 August 2014].

In turn, the first song of the black album of Brygada Kryzys, entitled *Centrala* (*Headquarters*), addressed the heightened state of turmoil and the awaiting of a signal from the Headquarters which, as Robert Brylewski maintained at that time, were the Gdańsk offices of the Solidarity movement.

Czekamy na sygnał
Z centrali!
Czekamy, czekamy ...
Wszyscy na jednej fali!
Centrala nas ocali

(We wait for a signal
Sent from our HQ!
Awaiting a signal,
All on the same wave!
The Headquarters will save us!)[54]

The counterculture and opposition activities of many artists sentenced them to life in an economic and political underground. Access to technological advancements or the practice of meta-art, once promoted by Mieczysław Porębski, was out of the question. When the world was truly entering the era of conscious and socially-involved forms of cyber-culture, hacking, the art of the new media and other artistic activities, in Poland, naturally, there was no impetus for the development of a computer culture and technological art in a democratic dimension, liberated from the impact of the monitoring agendas of the state. Nevertheless, the history of Polish informatics is marked by outstanding accomplishments, such as the AKAT-1 computer designed by Jacek Karpiński in 1959. This design won the world competition for technical talents held by the UNESCO. Thanks to this Karpiński was able to go abroad and study, e.g. at MIT. As it later turned out, he was an informer of Polish economic intelligence under communism. Finally, AKAT-1 was never mass produced since no parts for its manufacture could be legally purchased in Western Europe. In the 1970s Karpiński designed another spectacular computer, the K-202 which had ample computational capacities, but only 30 copies were made and sold to various Polish and foreign institutions. This was how most Polish designs finished. Because of the Iron Curtain it was impossible to establish contacts with Western industry and, therefore, domestic designs were doomed to live a short life. Informatics and the attendant computer culture thus became a theoretical discipline resembling reality from an anecdote quoted by Lev Manovich in *The Language of the New Media*:

Moscow, 1975. Although my ambition is to become a painter, I enroll in the mathematical ("matematicheskaya") high school, which in addition to a regular curriculum has courses in

[54] Brygada Kryzys, Centrala, http://www.brygada-kryzys.art.pl [accessed: 10 August 2014].

> calculus and computer programming. The programming course lasts two years, during which we never see a computer. Our teaches uses a blackboard to explain the concepts of computer programming. First we learn a computer language invented in the Soviet Union in the late 1950s. The language has a wonderful Cold War name: "Peace-1" ("MiR-1"). Later we learn a more standard high-level language: ALGOL-60. For two years, we write computer programs in our notebooks. Our teacher grades them and returns them with corrections: missed end of the loop statement, undeclared variable, forgotten semicolon. At the end of the two-year course, we are taken – just once – to a data-processing center, which normally requires clearance to enter. I enter my program into a computer, but it does not run: Because I had never seen a computer keyboard before, I used the letter *O* whenever I need to input zero.[55]

In the long decade of the 1980s we can still discover flickers of new computer-related thinking. Domestic factories, with the largest one being Elwro and MERA-ELZAB, MERA-KFAP and UNIMOR began the manufacture of various versions of computers for office work, accounting and design. A microcomputers company set up in the mid-1980s composed of a dozen or so Polish brands manufacturing electronic devices prepared the production of a clone of the IBM PC/XT computer (on the Western market since 1983) known as Mazovia 1016, but eventually production of this machine never took off and the entire project fell through. Despite the setbacks, in Poland we could also encounter single copies of computers brought from abroad by private individuals. And thus the computerisation tendency became an expanding idea that transformed the Polish landscape of culture and creative practice.

The level of interest in computer culture is also evident through the emergence of popular magazines on the topic on the market. *Bajtek*, set up in 1985 and published continuously for eleven years, helped us stay posted on relevant issues. It was edited by Władysław Majewski until 1989 and was an insert in the *Sztandar Młodych* daily newspaper for young people; only after the democratic transformations did it become an independent magazine. The role of promotion and education that *Bajtek* played was significant indeed. First of all, it introduced to the general public discourse connected with computer culture. More importantly, however, it helped set up a non-institutionalised (non-academic, non-official) milieu interested in new technologies. However, all of this was too little to produce phenomena such as the makers in Western Europe or in the US, although the first symptoms did emerge.

The first issue of *Bajtek* contained an interview with Władysław M. Turski, professor at both Warsaw University and London University, the then president of the Polish Informatics Society. Asked about the threats of the absence of IT literacy, Turski bitterly summed up the status quo of Polish computer culture of the 1980s:

> Despite a wave of public yet superficial interest in IT issues (actually in its visual side), the threat (of civilisation and intellectual colonisation) not only exists … but has deepened over the

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[55] Lev Manovich, *The Language of New Media*, Cambridge 2001, p. 3.

> last six years,[56] when nothing was done to lay the uses for IT in Poland on solid foundations than before. … This process, regrettably, continues; it is accompanied (and in large measure caused) by the phenomenon of continued obsoleteness of computer equipment at universities. … While five years ago in the few informatics institutes the matter was treated seriously and we educated students on more or less the same level as average universities abroad, now we are completely unable to do so. Not only do we not have equivalent or only slightly less advanced machines, but we actually have no machines to help us educate students in the area of, say, computer graphics or high-tech ergonomic systems of access to computers.[57]

Despite the lack of direct access to computer hardware, slowly in some Polish homes we could come across such computers as Commodore 64, ZX Spectrum, and all models of Atari and Amiga at the turn of the decades. Available at the same time were also Russian copies of game consoles, such as Exi-Video 01 or later Videosport-3. Owning a Commodore, Spectrum or Atari was a sign of entering a new circle of social relations. First of all, the low accessibility of computers caused fast development of networks of people with computers and exchanging cartridges, pirating cassettes or later discs. Interestingly, bringing computers from abroad had its impact on democratisation processes in Poland. In line with the ideas of contemporary design, by entering the zone of Western computer culture we annexed certain ideas of culture in which the computational machines themselves were designed.

Designed in the 1980s for fast communication, sharing experience and pursuing opportunities for development based on the free flow of data, computers in Poland slowly became symbolic of a new reality, which was later to change such culture zones as artistic creativity itself, steadily changing the array of choices of creative practice.

The 1990s is a decade of a new paradigm of the global digital culture. The media culture begins to spread between many transmission media, starting from satellite TV (a sign of the times in the 1980s[58]) through cellular phones, to the revolutionary changes following global accessibility to the Internet. The essence of this new cultural paradigm is significantly emphasised by Lev Manovich. In the introduction to the *The Language of the New Media* he wrote as follows:

> In 1995 the Internet appears – the most material and visible sign of globalization. And by the end of the decade it will also become clear that the gradual computerization of culture will eventually transform all of it. So, invoking the old Marxist model of base and superstructure, we can say that if the economic base of modern society from the 1950s onward starts to shift toward a service and information economy, becoming by the 1970s a so-called "post-industrial

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[56] The time which elapsed since the publication of Władysław M. Turski's book entitled: *Nie samą informatyką* (Warszawa 1980).

[57] Władysław Turski, "Matchbox dla szofera," *Bajtek*, no. 1, September 1985, pp. 3–4.

[58] It is worthwhile at this point to recall the artistic manifesto of Nam June Paik entitled *Art and Satellite* of 1984. See Nam June Paik, "Art and Satellite," in *Multimedia from Wagner to Virtual Reality*, ed. by R. Packer, K. Jordan, New York 2001, p. 39.

> society" (Daniel Bell), and then later a "network society" (Manuel Castells), by the 1990s the superstructure starts to feel the full impact of this change. If the postmodernism of the 1980s is the first sign of this shift still to come – still weak, still possible to ignore – the 1990s' rapid transformation of culture into e-culture, of computers into universal culture carriers, of media into new media, demands that we rethink our categories and models.[59]

Poland is fast-tracked to the new reality; the globalisation processes ushered in by the digital media coincided here with the transformation of the political system and with democratic access to culture and technology. Yet the introduction of capitalism bore fruit with intense transformations felt there and then. Virtually overnight Poland became part of the galaxy of the new world of supply and demand. The unmistakeable climate of trade fairs, which operate until today, was dominant in Poland long before the new shopping centres offered brand-name products. We constructed capitalism in the media to a large extent through piracy: vending stalls were full of illegally copied cassettes and videos, CDs burned at home and floppy disks with computer games. For many private entrepreneurs the bazaars were a springboard for a new dimension of doing "business." Computers were more and more commonplace, and watches and bicycles were replaced as the most popular presents offered on the occasion of one's First Communion by Pegasus game consoles and satellite dishes. New television and radio stations emerged, often local, with no legal authority to broadcast. This first stage of Polish democracy was no doubt a form of compensation after years of not being able to own and access media and technological advancements.

When the West started to be profoundly critical of the new media, net art or the paradigm of *art&science* with reference to culture and social qualities, during one decade Poland had to move from stalls with pirated video cassettes to the question of copyright on the Internet. To some extent Polish media culture of the 1990s is a form of a piracy culture.

Two works by Krzysztof Wodiczko are an interesting comment on the transformations of Polish technological culture along with its dystopian dimension of the 1980s and the emerging hyper-consumption of home electronic devices of the early 1990s. He made these works in the 1980s before he emigrated from Poland, creating abroad leading works of global media art.

To commemorate the anniversary of Hitler's attack on Poland, in 1985 Wodiczko presented one of his public projections in Warsaw, most often on monuments or public buildings. Commenting on the political situation of the Eastern Bloc, the artist projected onto a copy of the Colleoni Monument in the yard of the Academy of Fine Arts an image of a tank (on a plinth), a skeleton of a horse (horse) and a police baton (instead of the original weapon). When comparing this apocalyptic image of Wodiczko's projection with his later work, made in Berlin in 1990 shortly after the fall of the Berlin Wall, one may create a condensed and provocative history of Poland's difficult road to democracy and the creation of

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[59] Manovich, op. cit., p. 6.

the culture of hackers or makers. Wodiczko projected onto the Berlin-based Lenin Monument an image of a vendor from Poland, dragging behind him a trolley full of cheap electronic equipment, a representative of what we might call an apostle of private property. All of a sudden we can own technology, Wodiczko implied, but we cannot do much with it. For us it is but a pile of equipment to be bought and sold; we still do not regard it as a major tool of social critique of the media and we still have not regained technology in the artistic or cultural respect, but only as a consumer item.

At that time critical art was one of the clearest phenomena of art life. It was rooted in the contestation culture of the 1980s. In fact, this very last decade of communism was the time of birth of a model of critical art in Poland, marked on the one hand by the symbolic *Polentransport* by Joseph Beuys of 1981, when the artist donated over three hundred of his works to the collection of Muzeum Sztuki in Łódź, believing that the ideas of Solidarity are a real fulfilment of his artistic and political demands of the third way. On the other hand, it was marked by the art of the founding father of the critical current in Poland, Zbigniew Libera, who was involved in Kultura Zrzuty in the early 1980s.[60] It was in the mid-1980s that Libera's first video observations were made: *Obrzędy intymne* (*Intimate Rituals*), *Iskra* (*Spark*), or a later work called *Jak tresuje się dziewczynki* (*How To Train Little Girls*).[61] No doubt at that time, strong interest in the human body in its social, political and performative aspects became the prime focus of Polish art. Few artists in Poland addressed the relation between the body and technology.

Actually, it was only at the beginning of the new millennium that a new awareness of technological tools and artists' interests in them were born. This applies especially to the generation of the digital natives, with their new experiments and other creative practices. They increasingly more often used scientific ideas to expand the field of their explorations. The first media labs were set up, being collectives of artists, scientists and engineers, offering work at the crossroads of various creative disciplines and theoretical discourses. After years of oblivion, ideas of experimental studies and research and art centres in and outside of universities reappeared. There were more and more participatory initiatives open to media education, projects combating technological exclusion of specific social groups and concepts of building relations between art and science, which had been dormant in the 1980s and 1990s, and confirmed by this very publication. New creative practices often surprise, change one's perception perspective and introduce major chang-

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[60] Kultura Zrzuty was active from 1981–1987. This was an informal group of young artists, e.g.: Włodzimierz Adamiak, Zbigniew Wińczyk, Andrzej Ciesielski, Andrzej Dudek-Durer, Janusz Dziubak, Jerzy Frączek, Henryk Jasiak, Jacek Jóźwiak, Jacek Kryszkowski, Zbigniew Libera, Łódź Kaliska, Zofia Łuczko, Mikołaj Malinowski, Anna Płotnicka, Wacław Ropiecki, Zygmunt Rytka, Tomasz Snopkiewicz, Andrzej Sulima-Suryn, Jerzy Truszkowski, Zbyszko Trzeciakowski and Grzegorz Zygier.

[61] Polish critical art of the 1980s and 1990s was often analysed in scientific texts. See e.g. Jacek Zydorowicz, *Artystyczny wirus. Polska sztuka krytyczna wobec przemian po 1989 roku*, Warszawa 2005; Izabela Kowalczyk, *Ciało i władza: polska sztuka krytyczna lat 90.*, Warszawa 2002; Anda Rottenberg, *Przeciąg: teksty o polskiej sztuce lat 80.*, Warszawa 2009.

es and redefinitions in the very complicated paradigm known as art. Many of the practices elude traditional artistic criteria and move towards the interdisciplinary and transdisciplinary, as to both the tools used and the messages conveyed. In his *Ikonosfera* of 1972, Mieczysław Porębski expressed this very state of affairs. In the fourth part of his treatise called *Mechanizmy i strategie wyboru*, he addressed one of the most difficult topics in reflection on art, i.e. the limits of art and its assessment. He wrote that art is involved in a permanent game trying to salvage its traditions, while new phenomena, also on the relations between artistic and scientific work, emerge with difficulty, are unique and disseminate slowly.[62] He summed up:

> This is the game art is playing today, its strategic goal being the preservation of its own continuity in our variable world, which is not stationary but highly cumulative, where continuity is preserved not by a strict enforcement of identity but, conversely, by consent for its rejection and consequently by a constant expansion of the category of phenomena traditionally seen as "artistic." In this way each "strategic" deviation from the norm is nothing else but a flexible form of adjustment under chronic variability.[63]

Referring specifically to the information turn, he boldly asked:

> Has this boom not exceeded one or another escape velocity, when all ties with any tradition, both the classical and conservative one and the subversive and innovative one, ceases to operate and new, previously unknown laws come into play?[64]

While writing these words over 40 years ago, Porębski supplemented them with a short sentence that any answer to the question posed would be premature.[65] Twenty-five years after Poland having regained independence, in a situation of virtually unlimited possibilities of artistic experimentation, but also at a time of threats of technological development and advanced research, new creative practices are often pursued within teams made up of artists, engineers, scientists, representatives of the social sciences and the humanities. They are one of the major spaces of forging a critical reflection for the social debate on the real impact of science in different spheres of life. Modernity is marked by permanent technological and scientific breakthroughs which redefine contemporary cognitive paradigms. Their changes and progress are so fast that we are unable to valorise or classify them, or to evaluate their possible social applicability. *Art&science* is therefore a vital space for contemporary artistic practices. Art, entering multiple and multifaceted relations with technological tools and scientific research, is a zone of distance and critical reflection on today's acceleration.

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[62] Porębski, *Ikonosfera...*, p. 229.
[63] Ibid.
[64] Ibid., p. 230.
[65] Ibid.

Work on tactical media, bio art and nano art, the entire broad culture of hacktivism, net art and many other phenomena developing today, stem from the need to redefine scientific knowledge and make it socially available. Art, which responsibly uses scientific cognitive strategies, transforms them and enters into a dialogue with them. Today it is gaining special significance as a space of mediation and negotiation between society and closed systems of transmission of scientific data. Therefore, it is important for creative endeavours to reclaim and "hack" knowledge from the closed circuit of laboratories. Thus, such art addresses ethical problems and poses questions regarding the progress of the discourse of social responsibility with respect to the technological and biological openness of today's human being.