Part One *Dialogues* – Cybernetics as an Anthropology

1 The Genesis and Growth of Cybernetics

The intellectual climate of the 21st century is not particularly favorable to the so-called "grand narratives" – intellectual approaches that aim to explain the entire reality available to human mind, or at least a large portion of it. It is commonly accepted that structuralism was the last such grand narrative, which seemed to serve as a metatheory of the humanities in the 1960s and 1970s. However, its predecessor in that regard – cybernetics – is rarely mentioned, even though it was even more prevalent between the end of the 1940s and mid-1960s.

Part One of this book is to be devoted to *Dialogues* – the one among Lem's works in which his fascination with cybernetics is the strongest.[6] In fact, *Dialogues* cannot be understood without referring to the swift career of the discipline. Therefore, before discussing cybernetics itself, I should outline briefly its history. This description of what cybernetics is will, however, come from an amateur. The mathematical tools and vocabulary used by the creators and proponents of cybernetics remain unavailable to me. I will be treating cybernetics as a phenomenon in the history of science and ideas, leaving mathematics in a sort of "black box," which is not to be opened, but which is being observed focusing on its location and functioning. It is justifiable, as the cyberneticists never limited themselves to producing mathematical arguments. The founding father of cybernetics himself, Norbert Wiener showed the path here (I will return to it). In fact, some branches of cybernetics detached themselves completely from science. And these branches happened to wither the earliest.

Cybernetics is commonly described as "a scientific study of control and communication in complex systems" – this is how it was defined by its creator, Norbert Wiener.[7] The general character of this description is quite significant, indicating not only a broad background and a variety of sources of the discipline, but also its broad scope. Wiener gave it a name derived from Greek.[8] "Kybernetes" means

6 "This book […] comes from a captivation with cybernetics." Stanisław Lem, "Przedmowa do drugiego wydania," in: *Dialogi*, 3rd edition (Kraków: WL, 1984), 5. All translations from *Dialogues*, which have not been translated to English in full, have been made for this work by Olga Kaczmarek.

7 Norbert Wiener, *Cybernetics: or the Control and Communication in the Animal and the Machine* (Cambridge: MIT, 1965), 11.

8 Ibidem.

"helmsman" and is derived from the verb "kybernao", meaning "to steer."[9] The term "governor" has the same root.

Cybernetics was largely born from war-time needs and was related to technologies of building quick counting machines – in both cases the purpose was to facilitate calculating trajectories of missiles targeting bullets. In an introduction to his book *Cybernetics, Second Edition: or the Control and Communication in the Animal and the Machine*,[10] which became the founding work of the entire discipline, Wiener describes in detail how the ideas of cybernetics were born during seminars he participated in at Harvard's Vanderbilt Hall in 1941–1944 together with mathematicians (including von Neumann), engineers, biologists and doctors.[11] This interdisciplinary gathering observed that there are numerous analogies between the functioning of new calculating machines and biological organisms when it comes to mechanisms of steering and control. It turned out some processes within calculating machines and human nervous systems can be described with the same mathematical formulae – that is, processes that include feedback and oscillations.[12] Research continued after the end of the war was conducted simultaneously in engineering and biology. This duality of research directions is characteristic of the entire cybernetics, and it will be important for the argument that follows.

Wiener himself played a pivotal role in shaping the new discipline – he stood behind its laws and ideology. As a child this versatile scholar and intellectual was fascinated by nature, and traces of such interests are clear in his works, which combine mathematics with physiology. It must have tickled the imagination of a young physician Stanisław Lem, when he read his books in Mieczysław Choynowski's seminar; learning English from them.[13] Wiener was not only a

9 *A Greek-English Lexicon compiled by Henry George Liddell and Robert Scott* (LSJ) ed. 1996 s.v. (s. 1004). Both words can be found in Homer (*Il. 19, 43*; *Od.* 9, 78; 3, 283). As early as Aeschylus (*Suppliants* 750, "shepherd of the ship") and Plato (*Phaedrus*, 247 c, "charioteer"), the word "kybernetes" is used metaphorically.

10 Idem, *Cybernetics: or Control and Communication in the Animal and the Machine* (Cambridge: MIT Press, 1948); all quotes and references from the 2nd edition (Cambridge: MIT Press, 1961).

11 Wiener, *Cybernetics*, 21 and following.

12 Such processes include movement disorders in Parkinson's disease.

13 Stanisław Lem, Stanisław Bereś, *Tako rzecze ... Lem* (Kraków: Wydawnictwo Literackie 2001), 43. "Choynowski set up Science Seminar for Jagiellonian University Research Assistants and on behalf of the group he approached innumerable research institutions in Canada and United States requesting books for the starved Polish academia. Seeing all these treasures, unavailable to me because of the language, I sat down to learning English with utmost diligence. I cannot say this was typical science I studied, because

mathematician, but also an engaged social critic, which can be best seen in his book *The Human Use of Human Beings. Cybernetics and Society* (1950), which is not a scientific work, but a collection of essays about science for a general public, oftentimes with a journalistic air to them. The fact that this particular book has become a popular guide to cybernetics shows that unlike other disciplines, cybernetics was tied to its social context from the very beginning – its creator himself has positioned it that way, and he did it on purpose. This was certainly aided by his powerful, authoritarian personality, which emanates from his determined arguments admitting no opposition and densely marking his texts, as well as from his very critical remarks about the postwar American society.[14]

Apart from contemporary needs and an intellectual osmosis between biologists and engineers, for Wiener the sources of cybernetics lied primarily in the development of thermodynamics and statistical mechanics in the late 19th century. He had especially great respect for one of the men behind both these disciplines – Josiah Willard Gibbs, whose long underestimated works greatly enriched statistical interpretation of energy transmission processes.[15] Information transmission is part of these processes, as Wiener and his colleagues remarked – and the information is treated as a physical quality here. In *Cybernetics*, Wiener provides basis for a mathematical description of information,[16] which was then developed further by his disciple, Claude Shannon. This is where physics and biology meet: according to Wiener a biological organism is an energy and information processing system.

Later cyberneticists developed the discipline much further and found some much earlier antecedents for it. They saw all thinkers and engineers involved in combinatorics and building calculating or moving machines as early cyberneticists, from Ramon Llull and Jaquet-Droz to Pascal and Leibniz (Wiener presented the latter as the "patron saint of cybernetics"). Even cabalist mystics

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it started with Wiener's *Cybernetics*, which I read almost like Champollion deciphering the hieroglyphs […] slowly […] with dictionary in my hand."

14 Cf. Norbert Wiener, *The Human Use of Human Beings. Cybernetics and Society* (Boston: Houghton Mifflin, 1950), Chapters 2, 7 and 9; quoted from the edition: (London: Free Association Books, 1989); idem, *Cybernetics and Communication*…, Chapter 8.

15 Ludwig Boltzmann is usually seen as the main creator of thermodynamics, but Wiener hardly ever mentions him. About Gibbs see *The Human Use*…, "Introduction," 7–15; and *Cybernetics*…, chapter 2, "Groups and Statistical Mechanics," 45–59.

16 *Cybernetics*, chapter 3, "Time Series, Information and Communication," 60–94.

with their search for Golem were listed in that context.[17] Mathematical roots of cybernetics were largely impacted by early game theory and von Neumann's theory of automata,[18] Turing's works on computability and the probability theory, which was being developed at the time by thinkers such as Andrey Kolmogorov and Ronald Fisher (all these names come up both in Wiener's and Lem's texts).

It was soon observed that

> certain kinds of machines and some living organisms – particularly the higher living organisms – can, as we have seen, modify their patterns of behavior on the basis of past experience so as to achieve specific antientropic ends. In these higher forms of communicative organisms the environment, considered as past experience of an individual, can modify the pattern of behavior into one which will in some sense or other will deal more effectively with the future environment.[19]

It was another step toward conceptually placing humans and machines on a par. A theory of "learning machines" started being developed, together with building such machines, initially quite primitive, and then increasingly complex.

In 1948 William Ross Ashby made the first Homeostat – "a physical model imitating the phenomenon of homeostasis [i.e. physiological balance in a variable environment] and the self-organizing capacities of the brain."[20] The Homeostat was in fact the first practical success of cybernetics. In the 1950s and 1960s cybernetics developed swiftly and had its big entry into such disciplines as biology, economy, technical sciences (including telecommunication), sociology, political science and other.[21] The marriage of cybernetics and biology gave rise to a discipline sometimes called bionics (usually biocybernetics) – and this was when for the first time there were publications on systems that combine biological and mechanical components, based on thorough research on the functioning of human nervous system.[22] I emphasize that so much, because such

17 Henryk Greniewski (1903–1972), one of the Polish cyberneticists referred to the myth, labeling his own theory of machines imitating humans as "the Golems theory."

18 John von Neumann's last unfinished work was titled *The Computer and the Brain* (New Haven: Yale University Press, 1958).

19 *The Human Use*…, 48.

20 *Mały słownik cybernetyczny*, ed. by M. Kempisty (Warszawa: WP, 1973), 147; it includes a detailed description of Ashby's Homeostat.

21 Cf. G. R. Boulanger, "Prologue: What is Cybernetics?," in: *Survey of Cybernetics. A Tribute to Dr Norbert Wiener*, ed. by J. Rose (London: Illiffe Books Ltd.), 7–12. The text is one of the manifestos of the omnipotence of cybernetics.

22 Cf. Michael A. Arbib, *The Metaphorical Brain. An Introduction to Cybernetics as Artificial Intelligence and Brain Theory* (New York-London-Sydney-Toronto: Wiley, 1972). Two parts of this book provide a detailed description of methodological and

systems (cyborgs) will be one of the main topics of Part Three of this book. For some time it seemed like creating a structure that would combine features of a biological organism and a machine is close. Research in economical cybernetics looked promising. New subdisciplines were formed too, such as socio- and psychocybernetics and military, medical, pedagogical and linguistic cybernetics (the latter producing the first attempts at machine translations). Researching all types of steering processes, scholars focused on problems such as the impact of steering signals and feedback on the quality and stability of control, the impact of the structure of the systems on their reliability and the resistance of steering systems to interference. It needs to be emphasized, given the liberties with terminology taken by later epigones of cybernetics, that all these notions originally had precise mathematics determinants, formed on the basis of advanced fields of the science. In the 1970s it was further enriched by linking cybernetics to the general system theory,[23] which made it possible to research complex steering systems, among other things.

While creating cybernetics, Norbert Wiener saw it not only as a new, revealing discipline of science but also as a remedy to the increasing atomization of sciences[24] and as a major tool shaping social life.[25] Very soon, however, in the 1960s it became clear that neither of these "metascientific" goals of cybernetics is or

scientific implications of two views: the evolutionary one according to which humans are animals, and the cybernetic one, according to which they are mechanisms.

23 It is a theory formed in 1930–1960 by an Austrian philosopher and biologist Ludwig von Bertalanffy (1901–1972), who claimed that a biological organism is not a simple sum of components, but constitutes a system characterized by unity and integrality, coordinating functions and processes, the organization of which is an important feature of life. The theory was to be an alternative to mechanistic and vitalist approaches in biology. It became an important argument for those who opposed reductionism in philosophy of science.

24 "For many years … I had shared the conviction that the most fruitful areas of the growth of the sciences were those which had been neglected as a no-man's land between the various established fields. Since Leibniz there has perhaps been no man who has had a full command of all the intellectual activity of his day. Since that time, science has been increasingly the task of specialists, in fields, which show a tendency to grow progressively narrower. A century ago there may have been no Leibniz, but there was a Gauss, a Faraday, and a Darwin. Today there are a few scholars who can call themselves mathematicians or physicists or biologists without restriction. A man may be a topologist or an acoustician or a coleopterist." (*Cybernetics*…, 2)

25 Significant part of *The Human Use of Human Beings* is devoted to discussions of the implications of the cybernetics on social life; cf. particularly chapters 6–9, 112–162.

can be achieved. Instead of quickly becoming a *mathesis universalis*, it started dividing into subdisciplines, which were losing connection with one another. The attempts to apply cybernetics to social sciences, which were in fact undertaken against Wiener's will,[26] soon failed, as they turned cybernetic terminology from a precise vocabulary into a set of blurry metaphors with no heuristic value (I shall provide examples of that later). The purely technical fields of cybernetics, such as the theory of automata, of adaptive control systems and of optimal and hierarchical control, as well as the more specialized biocybernetical research, met the same fate as all other subdisciplines: this atomization and formal sophistication have made them completely inaccessible for those who specialize in slightly other fields (not to mention amateurs). What happened was exactly what Wiener was trying to save the science from.

There are innumerable texts about cybernetics. Globally there are hundreds of monographs and dozens of thousands of articles. It is impossible to pin down the moment when all this production got relegated to the margins of real science, because naturally the cyberneticists themselves have never admitted it had happened. It can be said that the 1970s brought the final fading of classic cybernetics, even though it is also the moment when Heinz von Foerster announced the end of "first-order cybernetics" and the beginning of "second-order cybernetics" in a work titled *Cybernetics of Cybernetics*. He defined the former as cybernetics of observed systems, while the latter as cybernetics of observing systems (which means the discipline has not avoided the self-referentiality, which became overwhelming in social sciences and the humanities at the time). This "second-order cybernetics" is now represented by sociocybernetics, which investigates the so-called autopoietic – or self-reproducing – systems.[27] The

26 "Drs. Gregory Bateson and Margaret Mead have urged me, in view of the intensely pressing nature of the sociological and economic problems of the present age of confusion, to devote a large part of my energies to the discussion of this side of cybernetics … the human sciences are very poor testing-grounds for a new mathematics technique: as poor as the statistical mechanics of gas would be to a being of the order of size of a molecule, to whom the fluctuations which we ignore form a larger standpoint would be precisely the matters of greatest interest." (*Cybernetics*…, 24–25).

27 The term was first introduced in the 1970s by two Chilean biologists Humberto Maturana and Francisco Varela. It is a distant consequence of the notion of homeostasis and of learning machines, as well as of the general system theory. Niklas Luhmann incorporated it into his vocabulary. For more on sociocybernetics, see under "sociocybernetics" in: *International Encyclopedia of the Social and Behavioral Sciences*, ed. by N. Smelser, P. B. Baltes (Amsterdam, New York: Elsevier, 2001), vol. 21, 14.549–14.554.

highly abstract character of these inquiries situates them beyond the main scope of sociology and social sciences, although such theories did have considerable impact on, for instance, biology of ecosystems for a while (there existed a branch called cybernetic ecology).

There still exist professional associations such as the American Society for Cybernetics (www.asc-cybernetics.org, the website includes numerous links to other sites of similar character), as well as journals, such as the monthly *Biological Cybernetics*.[28] Today's cybernetics is largely related to contemporary antireductionist theories, such as constructivism. The term includes attempts undertaken mostly by German scholars to encompass the entire human mental activity in one general theory, centered on the notion of "construction" (construction of reality in human cognitive apparatus) and employing the achievements of contemporary epistemology, system theory and system biology.

None of this means that cybernetics has not contributed anything to the mainstream world science after the period when it was one of the constituting disciplines. Fields such as IT, robotics, artificial intelligence (AI) (which cyberneticists wrote about as early as in the 1950s), the theory of automata, organization theory, telecommunication and system engineering also owe a lot to cybernetics. Economic cybernetics contributed to the development of management theory (including managing "human resources"), optimizing theory and decision theory. The specialists in neural networks, which were the thing of the time in the 1980s and 1990s, are especially indebted to cybernetics. The problem of complexity, which was in fashion at the time, investigated by both physicists (such as Stuart Kaufmann) and biologists (such as Ilya Prigogine), has a lot in common with system theory combined with an indeterminist philosophical orientation.

A detailed investigation of the growth of cybernetics in specific countries would be very time consuming. Nevertheless, it is important to glance at what happened with it in Poland, which is, I believe, a good sample, illustrating in detail the process of degeneration, which I have outlined earlier.

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28 The subtitle is *Communication and Control in Organisms and Automata*. The editorial team is international, mostly German, and the publisher is Springer-Verlag. The examples of titles from 2001 are: "Mathematical models of the eye movements in reading," "Synergetic analysis of spatio-temporal EEG patterns: Alzheimer's disease" and "Noise-inducted transition in excitable neuron models." The profile of these articles suggests loyalty to Wiener's methods and goals.

2 Cybernetics in Poland

The situation of cybernetics in Poland was peculiar. Up until 1956 it was seen as "a reactionary pseudoscience … a form of contemporary mechanicism … targeted against materialistic dialectics, against contemporary scientific philosophy established by I. P. Pavlov, and against a scientific approach to the laws of social life."[29] After that date, the political pendulum swung to the other side and very quickly – within a few years – cybernetics was made one of the main disciplines in the USSR, which was certainly connected to the utopian endeavors in social engineering undertaken there. Wiener and Ashby were translated into Russian in the 1950s.[30] Many volumes of translations from Western languages were published, as well as Russian works. The boom lasted until the 1970s and it quickly spread into USSR's satellite states.

First, in 1957, a number of translations of minor books were released; in 1959 Henryk Greniewski published his *Elementy cybernetyki sposobem niematematycznym wyłożone* [Elements of cybernetics laid out in a non-mathematical manner],[31] in 1960 Wiener's *Human Use of Human Beings* came

29 *Krótki słownik filozoficzny*, ed. by M. Rozental and P. Judin (Warszawa: Książka i Wiedza, 1955), 76–77.

30 For example: Wiener's *Kibernetika i obshchestvo*, 1958, and Ashby's, *Vvedenie v kibernetiku*, 1959, with an introduction by Kolmogorov; Wiener's autobiography was also translated, as well as his minor essays, such as "God and Golem, Inc. A Comment on Certain Points where Cybernetics Impinges on Religion," was translated as: "Tvorets i robot. Obnizdenie niekotorych problem, v kotorych kibernetika stalkivaetsja s religiej."

31 Henryk Greniewski (1903–1972) was a logician and a mathematician, a professor at the University of Warsaw, a disciple of Tadeusz Kotarbiński; cf. *Elementy*… (Warszawa: PWN, 1959); his other books on cybernetics include *Cybernetyka z lotu ptaka* (Warszawa: KiW, 1959), 2nd edition amended and co-authored by Maria Kempisty (Warszawa: KiW, 1962); or *Cybernetyka niematematyczna* (Warszawa: PWN, 1969). In the latter book, part one repeats the text of *Elementy*…, while part two consists of Greniewski's original input to the theory of complex systems, while part three includes his theory of Golems, that is, "models imitating humans in at least one of the following areas: (1) imagination and dreams; (2) mastering language or languages; (3) conceptual thinking (especially deduction); (4) introspection"; this part is accompanied by a rich "Historical background" section. Greniewski's works are elegant, clear and precise.

out, and in 1961 – Ashby's *Introduction to Cybernetics*.[32] The dates are important: they clearly show that Lem's *Dialogues*, which were first published in 1957 and were largely based on works by Wiener and Ashby, which Lem read in original English, were bound to fall on deaf ears.[33] It could hardly have been otherwise in a country where a year earlier the word "cybernetics" would have been used in the context defined by *Krótki słownik filozoficzny* ["A short dictionary of philosophy"][34] – if at all. In Lem's essay *Niebezpieczne związki* ["Dangerous liaisons"] (1962), devoted to vain attempts to apply Shannon's theory of information in the humanities, there is a following remark: "Eleven years ago I sat in the Czytelnik café in front of a learned gathering who were to decide about the publishing of *The Magellan Nebula*. This harmless book aimed for teenagers, was accused of smuggling, among other things, cybernetics, which I have not managed to successfully camouflage with a pompous term 'mechaneuristics'."[35] Moreover, as usual, Lem never provided any of the most basic explanations, instead dropping the reader right into the middle of his own observations, which constituted a very unorthodox approach to cybernetics. I shall try to prove how unorthodox it was later, for now suffice it to say that it could not have made understanding *Dialogues* any easier for the readers of their first edition (or the following ones).

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32 William Ross Ashby, *Wstęp do cybernetyki*, trans. by B. Osuchowska and A. Gosiewski (Warszawa: PWN, 1961); 2nd edition 1963 [original edition: An Introduction to Cybernetics (London: Chapman & Hall, 1958)]. It is an extensive, formal description of the functioning of a general model of a machine as a complex system (automaton), with a transition to biological systems in part three; it includes numerous references to Shannon's mathematical theory of information.

33 "I have probably written this book too early, so all these issues seemed outworldly and did not resonate as a whole, it went to waste completely" (*Tako rzecze … Lem*, 84).

34 It is telling to read *Dialogi o cybernetyce* ["Dialogues on cybernetics"] by Stanisław Bogusławski, Henryk Greniewski and Jerzy Szapiro from that perspective. The text was published in a quarterly *Myśl filozoficzna* [no. 4 (1954), 158–212]. In the introduction the authors write: "Dialogues are between a supporter of cybernetics – Z., and its critic – K. They are both conceived as members of the contemporary academic circles of the Polish People's Republic. The critic wants to subject cybernetics to a judgment from a Marxist point of view, whereas the supporter is a person of good will who wants to follow the progress of science, but he does not always choose the right path." The last sentence from Z. is: "After all, you are inviting an *ex*-follower of cybernetics [to join you in a thorough research – PM]." There are six dialogues. Lem probably read them and they might have influenced the form of his own *Dialogues* to some extent, but certainly not their content.

35 Trans. by Olga Kaczmarek from the Polish edition: Stanisław Lem, *Mój pogląd na literaturę* (Kraków: WL, 2003), 15.

Lem should then be located outside the entire Polish cybernetics – and it needs to be emphasized right away here. It is telling that one would search in vain for references to texts by Polish cyberneticists in his works, or even for their names. From the *Annexes* to *Dialogues*, it is clear that Lem saw the fall of cybernetics a few years before others saw its greatness.

Let us not get ahead of ourselves though. In 1962 the Polish Society of Cybernetics (PTC) was set up; its first chairman was Oskar Lange. The same year, he published a treaty titled *Całość i rozwój w świetle cybernetyki* ["Totality and development in light of cybernetics"], which includes an attempt at a cybernetic interpretation of Marxist laws of social development.[36] Summing up his very mathematical arguments, Lange suggests that cybernetics allows for discarding earlier philosophical interpretations of development processes:

> All these qualities, characteristic of biological processes, occur in a variety of physical and chemical processes, as well as sociological and economic ones. They occur in automata built by humans too. The intellectual apparatus provided by cybernetics allows us to explain them without recourse to the notion of an immaterial being, which would regulate the dynamics of nature and social development: to any "life force," "entelechy," "*elan vital,*" "soul", "spirit of the time" or "spirit of a nation," Adam Smith's "invisible hand," etc. At the same time this explanation does not negate the empirical fact that systems have a way of operating which cannot be derived from the ways of operating characteristic of its constitutive elements; they have their own law of development, and, finally, under certain conditions the development of any system is an ergodic process,[37] in which developmental disorders disappear with time, and the period of a process's ergodicity may be limited, the pace of disorders retraction and their scale which does not affect the system, can change over time, etc.[38]

This passage follows the same line as other attempts at determining the philosophical context of cybernetics (to which I will return later), and it is certainly the most intellectually thorough among Polish authors (Lem excluded).

After Lange's death (1965), Henryk Greniewski took over as a chairman of PTC – the most famous popularizer of cybernetics at the time. PTC initiated

36 It was included in the last volume of Lange's collected works: Oskar Lange, *Dzieła, vol. 7, Cybernetics* (Warszawa: Państwowe Wydawnictwo Ekonomiczne, 1977), 375; part one: *Cybernetyka a filozofia* ["Cybernetics and philosophy"] and part two: *Cybernetyka i ekonomia* ["Cybernetics and economy"].

37 Ergodic process – a process during which information about the system's initial state disappears; ergodic theory, one of the fields of statistical mechanics, studies ergodic processes.

38 Oskar Lange, *Dzieła* (Warszawa: PWE, 1977), vol. 7, 84–85.

a publishing series at PWN titled *Information and Control. A Series Devoted to Cybernetics*. Wiener's first *Cybernetics* was published in the series in 1971. A year earlier it published a book by Józef Konieczny titled *Cybernetyka walki* ["Cybernetics of combat"]. The conclusions of chapter two (*Łańcuch niszczenia* ["Chain of destruction"]) are as follows:

> Summing up all that has been said so far about the chain, system and destruction, one can provide a few precise conclusions that will be pertinent for a military cyberneticist.
> (1) Targeted destruction is a peculiar kind of action, which can only take place as part of a chain of destruction.
> (2) A destroyer consisting of a shooter, crew, weapon and missiles is a crucial component of any chain of destruction.
> (3) A theory of destruction based on at least four axioms: self-destruction, common sense, shield and sword, as well as universal destructibility seems close to reality …
> (6) Any object belonging to the chain of destruction can be in any state among three categories: vitality, readiness or activity …
> (8) Connections between elements are an important immaterial element of any chain; connections human-human and human-machine have a primary role.
> (9) History of any chain of destruction can be divided into three separate phases: composition, implementation and use …
> (11) Chains and their surroundings form systems of destruction, among which we can distinguish specifically destroying and destroyed systems … (78–79)

The author defined each notion in the fragment quoted above (such as "destroyer," "weapon," "shooter") precisely, using algebraic formulae. However, the explanatory power of these definitions is no bigger than that of the "conclusions" I have quoted here. The fact that works of Wiener and Józef Konieczny fill the same shelf is a clear symptom of the backwardness of Polish cybernetics.

In 1973 *Mały słownik cybernetyczny* ["A small dictionary of cybernetics"] was published, resembling similar publications in the USSR and East Germany.[39] It brought together the knowledge about complex systems and controlling them available at the time. It included information about computers available at that point, about neurophysiological processes (to the extent to which they had been researched by then) numerous entries on the theory of probability and game theory, as well as a mention that Norbert Wiener had family roots in Poland.[40]

In 1978 PTC started publishing a quarterly *Postępy Cybernetyki* ["Developments in Cybernetics"], which would come out up until 1993. The Institute for Research

39 *Mały słownik cybernetyczny*, ed. by M. Kempisty (Warszawa: Wiedza Powszechna, 1973), 533.

40 *Mały słownik* …, 504.

on Systems at the Polish Academy of Sciences still publishes a quarterly *Control and Cybernetics*. Both periodicals mostly consist of detailed expert treaties on various aspects of control in technical systems.

Oskar Lange and Henryk Greniewski treated cybernetics the way scientists usually treat their fields: as a tool to describe reality, but not as a key to the ultimate truth and theory of everything. Unfortunately, other Polish cyberneticists failed to follow this path.

The most famous among them at some point was Marian Mazur (1909–1983). He was an engineer by training, and a professor at the Warsaw University of Technology, who created a system of cybernetic psychology, laid out in his big *oeuvre*, *Cybernetyka i charakter* ["Cybernetics and character"].[41] The book reiterates words like "homeostat," "feedback," "information" and system as a mundane mantra; it is replete with mathematical formulae and diagrams that are supposed to depict the functioning of human psyche, and it is permeated with the author's devotion to scientific precision. The first chapter includes – a very accurate – list of sixteen differences between a scientist and a doctrinarian. The problem is, though, that his own theory and the way he lays it out makes it seem like a doctrine much more than a science in light of his own argument, which makes it ironic. Most of the book is taken up by enunciations about the advantages of cybernetics over other sciences and a discussion of the functioning of human psyche in cybernetic terms. The latter, however, has nothing to do with Wiener and his colleagues' research on nervous system, as Mazur is not interested in the physiological aspects of psychology. His arguments are merely a transposition of one terminology to another: classic (not to say common sense) psychological notions (such as character, temperament, emotions and impulses) are translated into cybernetic concepts. The entire operation remains unrelated to any empirical data, but it relies heavily on "life truths" that are scattered among innumerable prepositions, formulae and graphs. The crowning moment of Mazur's argument is the concept of five "dynamic types of character" (exodynamic, exostatic, static, endostatic and endodynamic), which, combined, can produce hundreds of configurations. Mazur is convinced it constitutes an absolute sum of knowledge about human character, grounded in unshakeable foundations of cybernetics and mathematics. Each type is illustrated with examples from literature and

41 1st edition (Warsaw: PIW, 1976); amended 2nd edition came out with a subtitle *Psychologia XXI wieku* ["Psychology of the 21st century"] (Podkowa Leśna: Wydawnictwo Aula, 1996); 3rd edition (Warszawa: Wyższa Szkoła Zarządzania i Przedsiębiorczości im. Bogdana Jańskiego w Warszawie, 1999).

history: Horace, Caligula, Proust and Carmen represent the exodynamic character; Petronius from Henryk Sienkiewicz's *Quo Vadis* serves as an example of an exostatic character, while Caesar and Cromwell – endodynamic and so forth.

Mazur's work is one of the countless attempts to overcome humanities' perennial weaknesses: blurriness of notions. It is an attempt, which sees cybernetics as a remedy to this ailment – a science combining physics and biology, which in Mazur's view consequently included mathematics and psychology. The attempt ended the same way as all other endeavors of the kind: confirming an old truth that in the humanities precision in terminology is paid for with their meaning. The book's reviews published by scholars in the humanities basically all boiled down to this one point.[42] Nevertheless it became quite popular with technicians and engineers, and the author spent the last few years surrounded by a circle of loyal followers (the so-called "Mazurians"). Traces of Mazur's influence can be seen in writings of an eminent Polish scholar of religions, Andrzej Wierciński.

Lange applied cybernetics to economy, Mazur – to psychology, and Józef Kossecki undertook an ambitious attempt to apply it in social sciences. Kossecki saw himself as Mazur's disciple and had a passion for quoting him extensively. He accepted Mazur's theory of psychological types. His most important achievements include two books: *Cybernetyka kultury* ["Cybernetics of culture"][43] and *Cybernetyka społeczna* ["Social cybernetics"].[44] The first one discusses history and culture – globally – in terms of cybernetics. Here, too, those terms have no connection to their homonyms known from the works of Wiener, Ashby and their forerunners. When analyzing history, Kossecki relies on syntheses and popular works about foreign cultures written by other specialists. The result is a "third-degree essay" of sorts – a text based on texts that are already a rewriting of other texts, but which are treated as source material. The distance from any actual sources, historical, cultural or even cybernetic is monstrous. I will quote a passage about the history and culture of Poland. It is representative of the whole work.

> Analogous processes are observed in the history of the Polish nation. During feudalism we had strong nobility, which served as a homeostat. However, as capitalism developed the nobility was growing weaker, becoming less and less capable of serving as a nation's homeostat, while the Polish bourgeoisie was not strong enough. It is no surprise that this is the period when the country was partitioned – the absence of a strong social class

42 Cf. Małgorzata Szpakowska, "Z życia żółwi," Twórczość, no. 4 (1977), 119–122.

43 Józef Kossecki, *Cybernetyka kultury* (Warszawa: PIW, 1974).

44 Józef Kossecki, *Cybernetyka społeczna* (Warszawa: PWN, 1981); amended 2nd edition.

> serving as the nation's homeostat at that time increased the likelihood of the fall of the entire state – although, of course, this was not the sole reason of the fall. (81)

In the later work, *Cybernetyka społeczna*, Kossecki's ambitions have grown and the contents of the previous book are elaborated upon extensively. The author produced detailed analyses of economic and historical processes, focusing on modern Europe and introducing his periodization (whereas earlier he would only roughly separate epochs). For example, chapter 13 is titled "Cybernetic Analysis of International Politics," and its section 13.3 is "Cybernetic analysis of international politics between the Congress of Vienna and the First World War." For each of the periods, the author calculates the percentage of "control factors" for each country in the global political scene. A yet newer work by Józef Kossecki featuring cybernetics (but also discussing the role of secret organizations in history and politics) has an extremely long title, which is nevertheless worth quoting in full: *Elementy nowoczesnej wiedzy o sterowaniu ludźmi. Socjotechnika, socjocybernetyka, psychocybernetyka. Skrypt dla oficerów policji* ["Elements of modern science of human control. Social engineering, sociocybernetics and psychocybernetics. A manual for police officers"]. He recommends Marian Mazur's theory as a modern useful tool for police investigators.

One could expect that Józef Kossecki is the last link in the intellectual chain of Polish social cybernetics. That is not the case however. In 1986 the "Książka i Wiedza" publishing house released a book by Olgierd Cetwiński, titled *Między buntem a pokorą* ["Between revolt and submissiveness"]. In the introduction the author declares himself indebted to Mazur and Kossecki's achievements. It is a study of cybernetic psychology and political sciences, in which the terminology of cybernetics (or rather, by then, merely cybernetic imagery) has become even blurrier than in the writings of Cetwiński's idols. The last chapter ("Quo vadis, Polonia?") contains a cybernetic account of Polish history between 1795 and 1981. Here is an excerpt:

> … the Polish Enlightenment is a period when a dynamic template of correlational homeostasis developed. The process was powerful: even though the Polish society had been incorporated into other typically homeostatic systems (the dynamic Prussian one, and the more stagnant Russian and Austrian ones), it managed to retain its own type of homeostasis, and even grew its own homeostat and its own battery to some extent. The invaders realized that. Hence their later efforts – coming after the failed uprisings – aimed at disempowering the Polish correlator … The nation's survival through the partitions was largely – if not solely – made possible by the fact that it retained a correlational system of homeostasis. It will not be an exaggeration to compare it to the type known from Athens. (298–299)

The above gives an idea about the Polish works on social cybernetics. It is worth adding that in 1988 Piotr Sienkiewicz – the editor-in-chief of *Postępy Cybernetyki* – published a book *Poszukiwanie Golema. O cybernetyce i cybernetykach* ["Searching for Golem. On cybernetics and cyberneticists"].[45] It is an intelligent and thorough overview of the history and themes of the field. The author writes: "If I were to point to one of the living authors as 'the father' of social cybernetics, I would point to Stanisław Lem with no hesitation" (118). I fear, however, that Lem would not approve of the idea that he might have been the spiritual father to Marian Mazur and Józef Kossecki – nor would they likely be satisfied with the concept.

This overview of Polish social cybernetics should not be treated as a full picture of the discipline as a whole, not in Poland, and certainly not in the world in general. It would be an extremely distorted image. Technical cybernetics and bionics developed quite differently; they never lacked precision, quite the opposite: precision and narrow subject matters locate them at the other end of the spectrum than the lucubrations I have quoted. It proves the diversity within the field of cybernetics, which I have pointed out before. Where did it come from?

The answer requires that I produce an interpretation of the phenomenon of cybernetics in the science and culture of the 20th century. I will make such an attempt – preliminary, of course – and it will be the final part of my introduction to an analysis of Lem's *Dialogues*.

45 Piotr Sienkiewicz, *Poszukiwanie Golema. O cybernetyce i cybernetykach* (Warszawa: KAW, 1988), 258.

3 Philosophical Implications of Cybernetics

The philosophical positioning of cybernetics was never clearly delineated. While explaining the place of his new field within the intellectual history, Wiener mentioned Leibniz, as well as Augustine and the Manicheans,[46] but he was never particularly interested in the consequences of the emergence of cybernetics for contemporary philosophy. Cybernetics strongly, albeit misleadingly, resembles the 18th-century mechanicism. It is misleading because Descartes and La Mettrie sought to apply mechanistic interpretation to a physical and mental **whole** that is a human, which means they saw consciousness as correlative to mechanistic processes as well.[47] The cyberneticists – and I mean the early ones – never shared that view.[48] They would not touch on the problem of consciousness at all.[49] Human body was interesting to them on the level of

46 *Human Use of Human Beings*…, 11, 34–35. It includes a juxtaposition of two basic perspectives: Augustinian and Manichean. Modern science exemplifies the Augustinian view, as it assumes intelligibility of nature, its "goodness" (the "bad," Manichean nature would interfere with the cognitive process, through arbitrary changes in the laws of physics for example).

47 About Descartes, cf. *Cybernetics: or Control*…, chapter 1: "Newtonian and Bergsonian Time," 40–41.

48 Of course, many of the proponents of cyberneticists were – likely unconsciously – mechanicists. Karl Steinbuch, for example, the author of *Automat und Mensch* (Berlin: Springer Verlag, 1961; 4th edition 1971), declares in the very first chapter, titled "Cybernetic Anthropology" (!): "The main thesis of this book is as follows: What can be observed in intellectual functions, are introducing, processing, storing and exporting information. In no case is it proven or even likely that explicating intellectual functions requires accepting assumptions that go beyond physics."

49 Here is a sample of Wiener's style of dealing with what is today phrased as the mind–body problem: "We have already spoken of the computing machine, and consequently the brain, as a logical machine. It is by no means trivial to consider the light cast on logic by such machine, both natural and artificial. Here the chief work is that of Turing. We have said before that the *machina ratiocinatrix* is nothing but the *calculus ratiocinator* of Leibniz with an engine in it; and just as modern mathematical logic begins with this calculus, so it is inevitable that its present engineering development should cast a new light on logic. The science of today is operational; that is, it considers every statement as essentially concerned with possible experiments or observable processes. According to this, the study of logic must become a study of the logical machine, whether nervous or mechanical, with all its nonremovable limitations and imperfections. It may be said by some readers that this reduces logic to psychology,

neurophysiological processes, of nervous impulses – they were not interested in consciousness and subjecthood. They were careful to avoid metaphysical speculation, aiming for the discipline to exhibit scientific precision. In his work *The Computer and the Brain* (1958), which was mentioned here earlier, von Neumann gave a description of logical operations in a computer and nervous impulses (in accordance with contemporary level of technology and knowledge) and wrote: "the most immediate observation regarding the nervous system is that its functioning is *prima facie* digital" (40, 44). Later, however, it turns out that the analogy is merely superficial (so, literally, *prima facie*), as in fact "the language of the brain is not the language of mathematics" (81). There is no declaration of the kind that "human is a machine." von Neumann cannot be counted among cyberneticists, but Wiener, too, writes at the beginning of chapter 7 of *Cybernetics: or Control…* titled "Cybernetics and Psychopathology": "I therefore wish to disclaim in advance any assertion that any particular entity in psychopathology … is due to a specific type of defect in the organization of the brain as a computing machine. Those who may draw such specific conclusions from the consideration of this book do so at their own risk" (144). And elsewhere in the same book (chapter 5: "Computing machines and the nervous system") he observes: "The mechanical brain does not secrete thought 'as the liver does bile,' as the earlier materialists claimed, nor does it put it out in the form of energy, as the muscle puts out its activity. Information is information, not matter or energy. No materialism which does not admit this can survive at the present day" (132).

Cyberneticists were not particularly interested in the ethical implications of their research either. Another quote from Wiener is probably the strongest statement on the subject:

> Those of us who have contributed to the new science of cybernetics thus stand in a moral position which is, to say the least, not very comfortable. We have contributed to the initiation of a new science which, as I have said, embraces technical developments with great possibilities for good and for evil. We can only hand it over into the world that exists about us, and this is the world of Belsen and Hiroshima. We do not even have the

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and that the two sciences are observably and demonstrably different. This is true in the sense that many psychological states and sequences of thought do not conform to the canons of logic. Psychology contains much that is foreign to logic, but – and this is the important fact – any logic that means anything to us can contain nothing which the human mind – and hence the human nervous system – is unable to encompass (*Cybernetics: or Control…*, 124–125).

> choice of suppressing these new technical developments. They belong to the age, and the most any of us can do by suppression is to put the development of the subject into the hands of the most irresponsible and most venal of our engineers. The best we can do is to see that a large public understands the trend and the bearing of the present work, and to confine our personal efforts to those fields, such as physiology and psychology, most remote from war and exploitation. … I write in 1947, and I am compelled to say that it is a very slight hope. (28–29)

Wiener's persona of a public intellectual kept struggling with his soul of an academic. The former would draw powerful visions of social change brought about by cybernetics, while the latter – as we have seen – rejected the possibility of investigating society with the use of cybernetics, even though he never concealed his interest in social sciences:

> As to sociology and anthropology, it is manifest that the importance of information and communication as mechanisms of organization proceeds beyond the individual into the community. On the one hand, it is completely impossible to understand social communities such as those of ants without a thorough investigation of their means of communication, and we were fortunate enough to have the aid of Dr. Schneirla in this matter. For the similar problems of human organization, we sought help from the anthropologists Drs. Bateson and Margaret Mead; while Dr. Morgenstern of the Institute for Advanced Study was our adviser in the significant field of social organization belonging to economic theory. His very important joint book on games with Dr. von Neumann, by the way, represents a most interesting study of social organization from the point of view of methods closely related to, although distinct from, the subject matter of cybernetics. (*Cybernetics: or Control*…, 18–19)

Yet, elsewhere in the same book he states:

> It may be that there is a mass sociology of the human animalcule, observed like the populations of *Drosophila* in a bottle, but this is not a sociology in which we, who are human animalcules ourselves, are particularly interested. We are not much concerned about human rises and falls, pleasures and agonies, *sub specie aeternitatis*. Your anthropologist reports the customs associated with the life, education, career, and death of people whose life scale is much the same as his own. Your economist is most interested in predicting such business cycles as run in their course in less than a generation or, at least, has repercussions which affect a man differentially at different stages of his career. Few philosophers of politics nowadays care to confine their investigations to the world of Ideas of Plato. (*Cybernetics: or Control*…, 163–164)

Social cybernetics emerged, grew and captivated many. To what effect I have shown on the Polish example. Why was it so? Why cybernetics had such a huge impact, incomparable to the impact of any of the natural sciences? Of course, thermodynamics, for example, developed rapidly in the 19th century and inspired a philosophical metaphor of the world as a heat engine that became

quite popular in the humanities in the late 19th and early 20th century.[50] But neither in this nor any other case can we observe such an overwhelming adoption on an entire vocabulary of a discipline. There has never been any social thermodynamics, which would inspire someone to calculate loops of hysteresis for the French Revolution.

Cybernetics offered something more though than any other discipline – or so it seemed at the time; it combined two fields of basic research: physics and biology. It focused on human body, human nervous system on a par with machines and their circuits and control systems. All these objects of study are categorized with the same terminology, but without vulgar mechanicism. **Cybernetics was then a way to go beyond the nature–culture dichotomy**, beyond the question about a qualitative difference between humans with their symbolic world and the rest of the natural world. Or at least it very much seemed like such a third way is possible, a way between arts and science, which were just then definitively parting ways, a phenomenon powerfully described in C. P. Snow's essay *Two Cultures*.[51] Certainly, there was something extremely appealing in the idea that a human, an animal and a machine are equal as systems primarily determined by the circulation of information in their control centers. The impression was that both scientists and humanities scholars received a universal shared model for all the phenomena they were dealing with. There was no reductionism involved – a human was not seen as a mere type of a machine, but as an entity equivalent to it, differing in structure and possibly some aspects of functioning.

Things could have seemed that way for those who first encountered cybernetics soon after it was created, in the 1950s, reading Wiener and Ashby – this is what the first wave of enthusiasm for the field looked like. This is also how later people such as Mazur and Kossecki saw cybernetics. However, a close reading of cybernetics' foundational texts reveals that this universality was in fact an

50 Cf. J. David Bolter, *Turing's Man: Western Culture in the Computer Age* (Chapel Hill: The University of North Carolina Press, 2014), 31–32. Bolter's remarks on philosophical and scientific metaphors prevalent in particular periods in the history of Europe (clock, steam engine, heat engine and computer) repeat and elaborate on Wiener's observations from *Cybernetics: or Control*… (cf. chapter 1: "Newtonian and Bergsonian Time," 38–39). The whole period of positivism of the 19th century is an arena of mutual interactions between science and philosophy too.

51 The essay constituted the text of a lecture given by Sir Charles Percy Snow (1905–1980), a physicist and novelist, in 1959. It started a long and turbulent discussion about the role of the humanities and science in the society and culture of the second half of the 20th century.

illusion. **Cybernetics did not combine physics and biology in full; it only combined some narrow areas of these fields**. It did not explain either humans or any other complex systems completely in their actions and functions – it was in fact only interested in some of their very abstract characteristics. Henryk Greniewski described it as follows:

> Speaking in a bit of a joke (and one should not underestimate the didactic value of jokes): cybernetics does investigate animals, humans and telegraphs, but only in the way in which elementary geometry investigates both tree cutting, stone splitting and cutting metals. The same thought can be phrased "seriously" (for sticklers among the readers, of course): cybernetics investigates what is common in the process of communication for human nervous system and a telegraphic line in a highly abstract manner; similarly elementary geometry (or, more precisely, solid geometry) does deal with analyzing solid figures into its components, "forgetting" that they are approximate idealizations of actual solids, and remaining quite "uninterested" in whether the solid is actually a piece of wood, a stone or a metal. The applicability of cybernetic tools to all kinds of matter is neither new nor unique in science. The same quality applies to the arithmetical terminology for example, or the aforementioned geometry and probability theory. You can count stones, just as well as animals, humans or social bodies. Probability theory is equally applicable to decay of atoms in a radioactive body, and to the death rate of animals and people, and to draws and lotteries. (*Elementy*…, chapter 3.3: "Comparative Remarks on Terminology," 57)

It is a great shame that the Polish social cyberneticists never took these words to their hearts. Their colleagues from other countries similarly ignored Wiener's remarks about the risk related to applying cybernetic notions together with the methodology of the sciences in general to the object of social sciences. Here is one more of those remarks:

> I mention this matter because of the considerable, and I think false, hopes which some of my friends have built for the social efficacy of whatever new ways of thinking this book may contain. They are certain that our control over our material environment has far outgrown our control over our social environment and our understanding thereof. Therefore, they consider that the main task of the immediate future is to extend to the fields of anthropology, of sociology, of economics, the methods of the natural sciences, in the hope of achieving a like measure of success in the social fields. From believing this necessary, they come to believe it possible. In this, I maintain, they show an excessive optimism and a misunderstanding of the nature of all scientific achievement.
> All the great successes in precise science have been made in fields where there is a certain high degree of isolation of the phenomenon from the observer. …
> It is in the social sciences that the coupling between the observed phenomenon and the observer is the hardest to minimize. On the one hand, the observer is able to exert a considerable influence on the phenomena that come to his attention. With all respect to the intelligence, skill, and honesty of purpose of my anthropologist friends, I cannot think

> that any community which they have investigated will ever be quite the same afterward. … There is much in the social habits of a people which is dispersed and distorted by the mere act of making inquiries about it. In another sense from that in which it is usually stated, *traduttore traditore.* (*Cybernetics: or Control*…, chapter 8: "Information, Language, and Society," 162–163)

Claude Shannon said in an interview: "Somehow people think it [mathematical theory of information] can tell you things about meaning, but it can't and wasn't intended to."[52]

There was no shortage of skeptical voices either, doubting cybernetics as a whole. For example John R. Pierce wrote in 1961 with a shade of subtle irony:

> Some words have a heady quality; they conjure up strong feelings of awe, mystery, or romance. … I don't believe that *cybernetics* is quite such a word, but it does have an elusive quality as well as a romantic aura. …
>
> The trouble is that each of the many fields that Wiener drew intro cybernetics has a considerable scope in itself. It would take many thousands of words to explain the history, content, and prospects of any one of them. Lumped together, they constitute not so much an exciting country as a diverse universe of overwhelming magnitude and importance.
>
> Thus, few men of science regard themselves as cyberneticists. Should you set out to ask, one after another, each person listed in *American Men of Science* what his field is, I think that few would reply cybernetics. If you persisted and asked, "Do you work in the field of cybernetics?" a man concerned with communication, or with complicated automatic machines such as computers, or with some parts of experimental psychology or neurophysiology would look at you and speculate on your background and intentions. If he decided that you were a sincere and innocent outsider, who would in any event never get more than a vague idea of his work, he might well reply, "yes."
>
> So far, in this country the word cybernetics has been used most extensively in the press and in popular and semi-literary, if not semiliterate, magazines. I cannot compete with these in discussing the grander aspects of cybernetics. Perhaps Wiener has done that best himself in I Am a Mathematician. Even the more narrowly technical content of the fields ordinarily associated with the word cybernetics is so extensive that I certainly would never try to explain it all in one book, even a much larger book than this. … cybernetics includes most of the essence of modern technology, excluding the brute production and use of power. It includes our knowledge of the organization and function of man as well. Cybernetics almost becomes another word for all of the most intriguing problems of the world. … Thus, even if a man acknowledged being a cyberneticist, that wouldn't give us much of a clue concerning his field of competence, unless he was a universal genius. …

52 The interview was made in November 1989 by John Horgan, quoted in: Idem, *The End of Science. Facing the Limits of Knowledge in the Twilight of the Scientific Age* (New York: Basic Books, 2015), 213.

> Happily, as I have noted, few scientists would acknowledge themselves as cyberneticists, save perhaps in talking to those whom they regard as hopelessly uninformed. Thus, if cybernetics is overextensive or vague, the overextension or vagueness will do no real harm. Indeed, cybernetics is a very useful word, for it can help to add a little glamor to a person, to a subject, or even to a book. I certainly hope that its presence here will add a little glamor to this one.[53]

Pierce mildly suggests that cybernetics is really an all-encompassing word, that can mean nearly anything, and it certainly is a scientific utopia. Was not the same written 15 years later about structuralism, and then, 30 years later – about post-modernism, the subsequent potential "universal perspectives"?

On the other hand, David Jay Bolter in his *Turing's Man*… – which is a remarkable attempt to root the computer technology within the Western culture as a whole – writes about cybernetics:

> Wiener's work with servomechanisms to aim antiaircraft guns and to do much else besides had convinced him that forms of life could be understood not as Cartesian clockwork, which was too crude and rigid, but rather as electromechanical or even electronic devices. … he stressed direct contact with the world – experiments with the muscles of the cat, improved prostheses for amputees, sensing equipment, and so on. Current workers in artificial intelligence show less interest in such direct contact with the world and more interest in abstract thought. Wiener was still only halfway along the line from Descartes to Turing. He wanted machines to imitate the man who acts in the world as well as the man who reasons, to explain muscle action in terms of feedback loops as well as chess in terms of digital program. He relied on hardware devices for his metaphor of man and demanded a close correspondence between man and the machine made to imitate him. Vacuum tubes were meant to be a physical substitute for neurons, servomechanisms for nerves acting upon muscles. This line of thinking was forthright and compelling, and led do attempts to build a brain (in theory, seldom in practice) using simple electronic components. Those following Wiener's approach spoke of creating artificial brain cells and neutral networks and allowing the machine to learn as a baby was presumed to do – presuming with Locke that the baby's mind was a tabula rasa at birth. But the theory of neural networks, which was developed mathematically, met with little or no practical success. In general, Wiener's preferences gave way to others in the 1950's, as computer hardware and especially programming languages became more sophisticated. Unfortunately, the elegant name of cybernetics … smacking perhaps of the antiquated technology of the war years, also gave way to "artificial intelligence." (192–193)

53 John R. Pierce, *An Introduction to Information Theory. Symbols, Signals & Noise* (New York: Dover Publications, Inc., 1980), 208–210, 227–228. The book is in fact an extensive layman's manual introducing Shannon's theory and its derivates.

Bolter is locating Wiener in the development plan of information and computer technology, which is not entirely true about the history of cybernetics, and this bias is particularly clear in the statement that artificial intelligence is simply a different name for cybernetics (Bolter apparently does not know that many institutions still use the name). It is equally unacceptable to say about the first *Cybernetics*, as Bolter does in his annotated bibliography to *Turing's Man*, that it contains a "notion of identity of man and machine" – it's clearly simplifying things too much. What is important for us here is that Bolter, too, sees cybernetics as a sort of scientific utopia.

Summing up what has been said and quoted here before, I could say that cybernetics is an example of a process where the intentions of the creators have little to do with those of their successors. The former have great ambitions hoping the latter would put them to life. The latter put them to life the way they see fit and the way that is possible given the available materials. The scenario repeats itself continuously throughout the history of science and culture, producing results of varying quality. In the case of Norbert Wiener the very creator was torn by mutually contradictory tendencies: scientific precision and the visionary scale.

It is quite possible that cybernetics was one of the great myths of the 20th century science. Its extraordinarily broad perspectives drew hordes of enthusiasts, believers and maniacs, who eventually dragged the discipline far from its origins, close to conspiracy theories and would-be-universalisms, and all the areas of human intellectual activity where doctrinaire shibboleths prevail over genuine curiosity, and the Ultimate Certainty produces deep thinking but neutralizes brains.

4 Introduction to *Dialogues*

Lem's *Dialogues*, just as many other of his works, underwent significant transformations. The first edition[54] included eight dialogues, between Hylas and Philonus, written between 1954 and 1956. The second edition[55] was supplemented with two annexes, each consisting of two separate texts. The first annex (*"Dialogues" after 16 years*) is strictly about cybernetics, the second one contains two sizeable treaties, originally published in *Studia Filozoficzne*.[56] Their content, although going beyond cybernetics, should be discussed separately in this chapter, as it connects cybernetics with other fields Lem is interested in.

The full title of the first edition is *Dialogi o zmartwychwstaniu atomowym, teorii niemożności, filozoficznych korzyściach ludożerstwa, smutku w probówce, psychoanalizie cybernetycznej, elektrycznej metempsychozie, sprzężeniach zwrotnych ewolucji, eschatologii cybernetycznej, osobowości sieci elektrycznych, przewrotności elektromózgów, życiu wiecznym w skrzyni, konstruowaniu geniuszów, epilepsji kapitalizmu, maszynach do rządzenia, projektowaniu systemów społecznych* ["Dialogues on atomic resurrection, theory of impossibility, philosophical advantages to cannibalism, test-tubes sadness, cybernetic psychoanalysis, electric metempsychosis, evolution's feedback, cybernetic eschatology, personalities of electrical networks, deceitful electronic brains, eternal life in a chest, constructing geniuses, capitalism's epilepsy, management machines, designing social systems"]. The readers could easily feel overwhelmed just opening the book. The fact that it was not understood is best testified to by the number of reviews that came out: a note in *Nowa Kultura*[57] (describing it as a "read for the select audience") a summary in *Nowe Książki*[58] and a review by

54 Kraków: WL, 1957.

55 Kraków: WL, 1972; reprinted in 1984.

56 "Etyka technologii i technologia etyki," *Studia Filozoficzne*, no. 3 (1967), 107–142; "Biologia i wartości," *Studia Filozoficzne*, no. 3–4 (1968), 35–78.

57 *Nowa Kultura*, no. 29 (1957), 25.

58 Danuta Kępczyńska, *Nowe Książki*, no. 17 (1957), 1054–1055. The author traces the sources of *Dialogues* back to the ancient forms of the genre. The obvious statement will be equally clear to other critics, but it does not seem like any major conclusions could be drawn from it. And "invoking Philonous and Hylas is obviously a joke, which is best in the first dialogue, made so archaic, so it 'exudes' the smell of agora and ancient Greece" (*Tako rzecze… Lem*, 84). Of course, the long title itself is styled in an archaic manner characteristic of the early print era.

Wacław Sadkowski in *Trybuna Ludu*,[59] including statements such as "Philonous's long rants become boring and pointless"; and the conclusion "[*Dialogues* are] completely devoid of excitement, creative anxiety and – so to speak – the pathos of seeking the truth." It is hard to imagine a more inaccurate judgment about this or any other of Lem's works. And that is about it when it comes to the response the first edition of *Dialogues* received in the Polish press, although it needs to be said that journalists at the time were very accustomed to saying things in an indirect manner (which is what Sadkowski might have been doing there), and cybernetics (especially as it was presented in *Dialogues*) was not a subject that could be praised openly. To be precise I should add that the second edition was met with complete silence, while the only (but thorough) review of the third one was written by Marek Oramus.[60] As to the *Annexes*, their reception boils down to texts such as a few sentences' long mention in a press review in *Twórczość*[61] where the author (Andrzej Kijowski) states: "No dictionary of foreign words will be enough to translate Lem's scientific and philosophical code into a layman's parlance." Until now *Dialogues* have also been very carefully omitted from Polish monographs on Lem's works.[62]

The causes of the situation are rather clear. The subject of *Dialogues* was foreign to most Polish readers, and the author – as I have mentioned earlier – did not include any basic explanations in the book, employing (consciously or unwillingly?) a method that Oramus later described as "natural selection of readers."[63] *Dialogues* surprised the readers of Lem the novelist,

59 *Trybuna Ludu*, no. 223 (1957), 6. Lem wrote about this review: "I cannot quite understand, because it is as if someone said: this omelette does not fulfill the criteria for a beefsteak. It does not, because it was not meant to be literature" (*Tako rzecze… Lem*, 84).

60 "Entuzjasta w sieci sprzężeń," *Przegląd Techniczny*, no. 26 (1985), 44.

61 Dedal (i.e., Andrzej Kijowski), *Twórczość*, no. 2 (1969), 142.

62 Passages from Małgorzata Szpakowska's *Dyskusje ze Stanisławem Lemem* ["Discussions with Stanisław Lem"] (amended 2nd edition, Warszawa: OPEN 1997, 93–99, 155–168, which include a detailed analysis of *Dialogue 7*) and Jerzy Jarzębski's *Wszechświat Lema* ["Lem's universe"] (Kraków: WL 2003, 37, 137, 162–163) are exceptions from the rule. See also: Marian M. Leś, *Stanisław Lem wobec utopii* ["Stanisław Lem on utopia"] (Białystok: Towarzystwo Literackie im. Adama Mickiewicza, 1998), 72–80 (on *Dialogue 7*'s relation to *Eden*).

63 Marek Oramus. "Entuzjasta…"; Umberto Eco admits to a similar approach in his "Postcript" to *The Name of the Rose.* Joyce's remarks about "the ideal reader suffering from an ideal insomnia" are generally known. This opens up possibilities to interpret

the humanities never understood them and the scientists – just never noticed them.[64]

It does not mean that Lem's earlier works: *The Astronauts*, *The Magellan Nebula*, *Time Not Lost* trilogy containing *Hospital of the Transfiguration* and a number of short stories were praised by the critics. The reviews, while much more numerous, were characterized by a lack of understanding of these works comparable to the reviews of *Dialogues* quoted earlier. The history of Lem's reception is one of the sad themes of the Polish culture after 1945. Following it highlights a number of issues: from the backwardness of the Polish humanities and science in regard to world trends, to an old man's frustration and author's bitterness (he was never particularly easy-tempered, as can be seen in the *Letters* published in Polish in 2002). This not being my main subject here, I have to limit myself to these remarks, returning to them occasionally, as I will be discussing Lem's works.

Undoubtedly Lem has been somewhere between the humanities and science from the beginning, and even though (or perhaps because) he was moving between the two areas with bigger ease than most specialists can boast in their respective fields, he remained an outsider in both. In literature, he was perceived as the storyteller whose fantastic narratives were freckled with weird terms; the scientists were suspicious of his way of turning their professionalized knowledge into stories. It was only in the 1970s that critics such as Małgorzata Szpakowska, Jerzy Jarzębski and Stanisław Bereś undertook successful attempts to build a strategy to read Lem.

Dialogues is the one work by Lem that lost most of their appeal with time. I do not want to say they are obsolete. But the thing is cybernetics, their main subject, is obsolete – which Lem himself admitted in the first annex. I will try to analyze whether they can be read today. I assume here that cybernetics as presented in *Dialogues* is the first stage of Lem's anthropology, and the specificity of how it is laid out in the book is that it goes beyond purely technological issues. I do not have to add that Lem extended the scope of cybernetics' relevance in a way that is quite unlike what Polish social cyberneticists did.

Lem's writing as erudite and hermetic in a manner characteristic of some of the currents of modernism.

64 After the first edition, the only reaction in the field came from Greniewski, who mentioned *Dialogues* in his *Elementy cybernetyki*…

In the later, "mature" criticism of Lem, insofar as it is, to a very limited extent, devoted to *Dialogues*, they are notoriously read through a political lens.[65] The entire terminology is supposed to serve as a smokescreen, and the first six dialogues would allegedly serve as a misleadingly long introduction to the main component of the work – *Dialogue 7* devoted to a critique of the socialist political system and the centrally planned economy. This is an acceptable interpretation of course, but limited; it turns *Dialogues* into a political pamphlet and dooms it – this time inevitably – to historical oblivion, as any pamphlet would be. It is also difficult to believe that Lem could write this whole book only to smuggle in an attack on the political system.

In order to look at *Dialogues* from a broader perspective, it is necessary to start by determining the most obvious textual links. The form of the book relates back to Plato and Lucian in the history of literature – they picked the form to emphasize some fundamental aspects of their philosophical and literary thought. But there is also a more immediate reference – *Three Dialogues between Hylas and Philonous* by Berkeley, which is where Lem found the names of his interlocutors: Hylas and Philonous. The first of these names means "bodily," "material," "concrete," metaphorically also "earthly"; the second one means "thought liking," "cerebral," "intellectual." Both for the English bishop and for Lem, in accordance with the meanings of the names, Hylas is a naive enthusiast, while Philonous a thoughtful sage, which has obvious consequences in the disproportionate structure of the dialogues.

65 Cf. Jerzy Jarzębski, "Lata młodzieńcze i dojrzałość cybernetyki", in: Stanisław Lem, *Dialogi*, Collected works (Kraków: WL, 2001), 486. Małgorzata Szpakowska, *Dyskusje* ..., 155 and following.

5 The Structure of *Dialogues*

Let us investigate the text of the *Dialogues* themselves. Discussing it seems appropriate here, because this is the one book by Lem that is extremely poorly known to contemporary readers and, it seems, rarely read. Even in this summary I will be introducing elements of interpretation.

The first dialogue includes a discussion of paradoxes of achieving physical immortality through copying an organism's molecular structure. Philonous proves to Hylas that copying a living organism necessitates rejecting the classic notion of personal identity, as the duplicated individual is identical with the original, but it is not the same, not even if the original individual ceases to exist the moment the copy is formed (the word "moment" is itself impossible to determine with any precision). It is closely related to the question of consciousness. This particular dialogue can now be brought up in the context of the current discussions about ethical and philosophical aspects of cloning. The issue of "multiplied identities" is one of Lem's favorites and is taken up on numerous occasions in *Summa Technologiae*.

The second dialogue is a short outline of what would then in the 1960s be called the mind–body problem, and which, on the other hand, is just a phase of the perennial philosophical problem: the problem of consciousness and its relationship with matter. At least one sentence from the dialogue merits quoting: "It is highly probable, that if atoms were not such complex objects, characterized by such peculiar qualities as the uncertainty principle, if instead they were, say, tiny hard balls, then the world made of them would look quite different from the real one – and it seems very likely that no living creature could be made of such atoms, nor any neuronal structures that could be basis of psychological processes" (page 38 of the Polish edition from 1984). In this sentence, Lem anticipates the consciousness theory developed 25 years later by Roger Penrose, according to whom consciousness theory is correlated with quantum processes in the microtubules of human neurons.[66] The critics of the theory emphasize that Penrose made a logical error of *ignotum per ignotum* while building it, as the

66 Cf. Roger Penrose. *The Emperor's New Mind: Concerning Computers, Minds and the Laws of Physics* (London: Vintage, 1990). Idem, *Shadows of the Mind. A Search for the Missing Science of Consciousness* (Oxford: Oxford University Press, 1994). See also: *The Large, the Small and the Human Mind* (Cambridge: Cambridge University Press, 1997).

impact of the quantum processes on the human nervous system is just as much of a riddle for us as consciousness.

The fifth chapter of Wiener's *Human Use of Human Beings* might have been an inspiration for the initial two dialogues. In it Wiener considers biological organism as an information processing system and he writes for example:

> In other words, the fact that we cannot telegraph the pattern of a man from one place to another seems to be due to technical difficulties, and in particular, to the difficulty of keeping an organism in being during such a radical reconstruction. The idea itself is highly plausible. As for the problem of the radical reconstruction of the living organism, it would be hard to find any such reconstruction much more radical than that of a butterfly during its period as a pupa. (103–104)

It is significant that Lem adopted Wiener's scientific and cognitive optimism, and he ignored his warnings and dark visions of the future and nature of our species. He would later surpass Wiener's pessimism though.

The third dialogue presents Lem's original approach to Shannon's notion of information (mathematically described as the opposite of entropy), as he tries to describe the human ontogenesis (the development of the fetus) in terms of information processing. Lem emphasizes that ontogenesis seems to contradict the second law of thermodynamics: the degree of the order in a system increases with time instead of decreasing; and then he argues that this is in fact an illusion. He introduces key cybernetic notions here: "feedback" (64), "the threshold of minimum complexity", beyond which "the system becomes capable of producing other systems of equal complexity" (63).[67]

The fourth dialogue touches on some more issues related to defining consciousness (or more precisely the impossibility of defining it). It then discusses the immense difficulties of reproducing human sensorium and motility in machine systems. Lem reveals deep understanding of these complications – a kind of understanding, which the robotics experts only gained 20 years later.

The fifth dialogue continues the subtle discussion of the essence of consciousness. Lem investigates the subject with a determination that derives from the difficulties that arise from the cybernetic interpretation of life, especially an intelligent life, and even more specifically life of a human being understood as a biological entity with consciousness that cannot be reduced to biological terms.

It needs to be pointed out here that generally speaking, the first six dialogues revolve around two major issues:

67 This is really an early cybernetic concept of what will then become "information farming"; cf. Chapter 15 of this book.

– an attempt at defining consciousness for the purpose of machine construction (mind–body problem);
– an attempt at defining biological evolution in terms of building complex systems.

However, the main subject of the conversations between Philonous and Hylas is in fact confirming the impossibility of succeeding in these attempts, at least insofar as they are based on the set of notions currently in use within our culture. Even though it is not stated explicitly anywhere, the entire intellectual work done by the interlocutors is only proving how ineffective it is. We may presume this was not Lem's original intent while setting about writing *Dialogues*. It does not mean that *Dialogues* are intellectually shallow. Their internal contradictions are like the aporiae that dismantle the grand philosophical systems from within, with the only exception being that the author and his protagonists realize it fully and are not trying to deny it, while the big authors of philosophical systems were always striving to prove the coherence of their systems. Lem is usually reluctant to claim that cybernetics solves the issues discussed in *Dialogues*.

All these problems, so thoroughly discussed by Hylas and Philonous, nearly overlap with the issues analyzed by experts in artificial intelligence (AI). The term is never mentioned in *Dialogues*, but the field itself was only being born at the time when he was writing them. I will discuss the links between Lem's thought and AI in Part Two of this book, while analyzing relevant sections of *Summa Technologiae*.

I should return now to the discussion of the fifth dialogue. At its core there is the attempt to define a physiological correlate of consciousness as a type of **network**. Such neuronal networks were the object of cyberneticists' study from the very beginning of the discipline; they created their mechanical models, which were an approximation of a real network of the brain of humans and higher animals. It was assumed that the mechanism of brain's functioning boils down to interconnections within such a network; and the only reason why we cannot explain it in full is that it is unimaginably complex. This is where the popular saying that human brain is the most complicated structure in the universe came from. It turned out to be even more correct than it was originally thought – after a period of enthusiasm in research on neuronal networks, the developments in neurophysiology led to a discovery that the functioning of a brain relies on many other mechanisms, and cannot be reduced to neuronal connections.

Philonous uses the moment to dismiss a suspicion that cybernetics, which treats consciousness as a correlate of mechanical processes (i.e., that a neuronal network is a type of a mechanism), is in fact a new version of mechanicism:

> [The older, 18th century] concept of 'mechanicism' had the following characteristics: that the whole can be reduced to a sum of its parts, that every process can go either forward or back and a mechanism is ahistorical, i.e. it is not shaped by its past. You can dismantle it freely, and then put back together – it will not affect its functioning. You can reverse it, and it will go back to its starting point. Based on the knowledge of how far along in the process one of the parts is, you can always predict where it shall be at any given moment in the future, as long as you know all the forces that influence the mechanism. The point is such statements are only valid for systems such as a watch or steam engine, but they cannot be applied to biological or quantum phenomena. (114–115)

The notion of a network that has an entry, an exit, a control center and feedback is then extended to include counting machines, defense systems and animals with their behavior. Lem supplements this purely cybernetic approach with a semiotic aspect. He does not stop at the statement that information circulates within networks, he also points out that problems can arise from disruptions in circulation, especially if there is an excess of information or if the functioning of feedback mechanisms is flawed. He will return to the issue in the seventh dialogue. When Hylas asks: "Pray, tell me, what is the purpose of the very complicated way in which you describe processes and phenomena that have been studied by psychology so thoroughly?" (128), Philonous responds with a lecture on how the description of a model of a network is in fact identical with the model itself,[68] and concludes the lecture, saying: "We find ourselves in an astonishing situation in which the simplest logical description of the network turns out to be **the network itself**, in which **logic begins to be transformed**, to grow into neurology" (130). It is an echo of Turing's idea of "logic incarnated in a machine," although tilted toward biology.[69] Lem will develop the thought further in *Summa Technologiae*, when writing about "information farming."

At the end of the fifth dialogue, Lem makes a brave attempt to define free will in cybernetic terms. The result is as follows:

> In this sense network acquires information in a twofold manner: firstly, from the outside, and secondly through a recombination of symbols, which have not been connected in a given way before within the network. "The internal richness" and the "integrity of

68 It is in fact but a version of the old problem of the representation of reality in its model; one that was probably best summed up by Borges in the short story in which a ruler of an empire orders a 1:1 map of his state from cartographers. The problem of "map and territory" will return in *Summa Technologiae* with the description of "pantocreatic" methods.

69 It will not hurt to mention that Turing's last work, to which he only managed to create notes, was supposed to be an extensive book about morphogenesis.

> the network" define its character. Such network operates on "free will," thus manifesting its "character."
> The above entails that the network is responsible for each of its acts, as it is "free" in its decisions. It is responsible for its character shaped in previous decisions since it first came into existence. No decision was fully predetermined; it could have been ("accidentally" or not) modified. (144)

And so the free will of this particular network commonly known as mind or soul is a matter of stochastics, the probability mechanisms in the processes of distribution of information. This could be seen as Lem's *idee fixe*: his fascination with probability theory. His later works, and especially *The Philosophy of Chance* will be permeated by it.

The sixth dialogue considers the possibilities of building a network, which would be an exact equivalent of a real human brain. So again, it belongs to the field we now call AI. In order to strengthen the image of difficulties involved in reproducing consciousness and psychological content in a machine, Lem begins the dialogue with a reference to Dostoyevsky's *Notes from Underground*. Philonous says: "It is extraordinary, unheard of and thus particularly difficult, verging on laughable, to speak about the tragic and sublime sides of human essence and psyche in the language of a physicist or a designer" (147). He then discusses in detail the technicalities of the project of transplanting a brain to a network built specifically for that purpose. Such an artificial brain, it is claimed here, might be many times more effective than the biological one. Hylas's objections to this view represent – ahead of the time – the opponents of AI, who are afraid of the possibility that humans would be dominated by "smarter" machines. Philonous's replica could be descried as a "critique of computer fetishism," that is of the uncritical attitude to machines' alleged omnipotence (166–168). Lem states (which turned out to be prophetic) that progress in building "artificial brains" is mostly threatening to the society insofar as it pushes people into thoughtless consumption.[70]

For Lem the possibility of reproducing human brain in an artificial structure, based on an assumption that both are structurally and functionally equivalent,

70 Already in the 1950s, Lem knew that the notion that digital computers might become "smarter" than people is absurd. The title story in the *Sesame* collection masterfully showed the falsity of the belief that computer could think creatively. (The collection only had two editions, in 1953 and 1954. Lem never agreed for it to be published again because of the political connotations and naivety of the plots in most of the short stories.) One can add, in the spirit of Lem, that perhaps one day we shall build machines that can outgrow us intellectually, but these will not be digital computers. The motif would return in *Summa Technologiae*.

is, as Philonous phrases it on Lem's behalf, the only form of immortality available to people. So the problem put forth at the beginning of the book – whether we can attain physical immortality – is finally solved here, although with many restrictions. The idea will return later in the project of autoevolution that is *Summa Technologiae*. Lem will develop some of his bolder vision there, again being ahead of his time and other authors.

Clearly, cybernetics is merely a basis for Lem (even though he considered this to be the best basis) that he uses to take his thinking beyond technology and science – toward philosophy or even eschatology, but nowhere in his thinking does he delve into speculative, immaterial metaphysics.

On to dialogue seventh, the longest one, which Lem devoted fully to the project of cybernetic sociology, and an original critique of the socialist system and the centrally planned economy. It is introduced by Philonous: "The society is paradoxically more alike to an electronic brain than a living organism as a system (an organized set) of elements connected through feedback" (172). The first instrument of analysis is the notion of "delayed reaction to stimulus," which in processes analyzed cybernetically leads to oscillation in subsequent stages of these processes, regulated by feedback.

The phenomenon has been known to physics and technology, as well as economy for a long time. Lem is trying to prove that the same notions can be used to analyze processes of biological evolution and social processes as well. Both are nonlinear in his view. In natural sciences, the term is used to describe a type of processes, the variability of which cannot be described in a universal way, which means the rules of these processes change in time, unpredictably, in a stochastic manner. The dynamic of change in biological and sociological systems is very different. Philonous described it as follows:

> When we juxtapose the rules of dynamic for biological populations and social systems, we see, that the former can exist long-term in an unchanged form only if they achieve dynamic balance, if they are internally durable, whereas the latter can exist long-term also if they lack internal stability. It derives from the fact that social system can be stabilized forcefully. This is why changes in social systems have historically mostly been violent, and would take up the form of coups or revolts, as opposed to the non-violent dynamic of biological evolution.
>
> In social systems numerous parameters oscillate, with the economic oscillation being mostly primary, while political and cultural ones are secondary. These secondary oscillations, which lead to changes in human behavior through changes in psychological attitudes, impact the primary ones, which shows the cyclical, feedback-related character of the phenomena. Oscillation of social systems known from history generally had a tendency to increase its amplitude, which after a series of hard perturbations usually led

> to destruction of the old system by revolutionary forces, targeted against forces striving to save and preserve the existing structure unchanged. (184)

The argument may seem worryingly similar to Kossecki's revelations from *Cybernetyka społeczna*, but Lem is careful to avoid illustrating his theses with specific historical examples, either here or elsewhere. It is not only for the fear of political censorship, but also – perhaps primarily from the point of view of the point of the text – because of the huge difficulty of translating his highly abstract statements into the language of specifics. We might recall here the quote from Greniewski's popular lecture on the perils of abstract cybernetic notions.

On the many subsequent pages Philonous is developing an interpretation of two main socioeconomic systems in front of his patient interlocutor: capitalism and socialism. He interprets them in terms of systems, feedbacks, oscillations, focusing on methods preventing oscillations that are harmful for the system. Lem smuggles in his critique of socialism here, which is emphasized by the critics. Philonous talks about a tendency for "decision to flee up" (206), a phenomenon that social theorists often call "flotation of responsibility." For Lem it looks as follows:

> … within the relatively limited group of those in power there gradually grows such a concentration of feedbacks regulating production, that "the information capacity" of the group is exceeded and there arises a necessity to expand the central management. This would be equivalent to an organism devoid of automatisms, i.e. automatic reactions. It would have to consciously, with concentration control, the heartbeat, blood pressure and chemistry, breathing, tissue transformation processes, etc. Such an organism could not do anything other than working to retain relative balance in its life processes.
>
> Centralization involving increasing the number of feedbacks, blocks (or limits the transfer) of information, while extending its paths. Instead of short connections between supply and demand, there are layered "switching stations" in the systems. As a result of extending the paths of information transfer there occur significant delays between stimulus and reaction … Above all the delay in production processes, i.e. the time elapsing between changes in demand and the resulting changes in supply, significantly impacts oscillation in capitalism.
>
> In the socialist model the most important delay is caused by extended feedback loops (perimeter – center – perimeter). (208–209)

In later interviews Philonous engages in a detailed analysis of a whole range of consequences of this delay process for the social system, from economic to psychological. However, no specific name, fact or description of authentic situations is mentioned. In the final stage of the conversation, Philonous outlines a project of "a cybernetic social utopia," explaining to Hylas what mechanisms should be improved and how in order for "a properly functioning" social system, that

is, one without harmful delays and oscillations, to be created. When Hylas asks: "Can you present to me the relationship between cybernetic sociology and the kind of sociology and economy that is generally known today?," Philonous responds: "As of yet, there is no cybernetic sociology in a real sense; there are only early beginnings, individual discoveries and methodological research guidelines. The discipline will only emerge, when the general information theory, the most important and the most complex part of cybernetics, develops its mathematical tools enough and when there has been enough observational and experiential facts to produce generalizations" (237). However, for the reasons I have described earlier, the discipline has never in fact emerged.[71]

The last, eighth dialogue is devoted to a preliminary venture into social psychology from the cybernetic perspective. Lem is trying to determine the impact of individual variability within a population on the functioning of a social system – and *vice versa*. The attempts conclude in the statement:

> Simplifying and shortening the matter, we can say that all occurrences within the social system that happen through force, repression, and prohibition have in fact one aim: of turning a non-linear system into a linear, in the simplest way, that is by decreasing the number of degrees of liberty offered to individuals who are elements of the system … In other case, the more liberty is offered to individuals, the more unlimited disturbances to collective processes ensue, because the range of occurrences on the social scale increases; there occur new contradictory opinions, changeable individual reactions, radically opposed views and actions; as these phenomena progress, the systems is less and less linear and it is more and more difficult to retain its internal coherence and to predict future developments. (263–264)

At the end of the work, Lem many times and strongly emphasizes his confidence about the possibility of creating an optimum social system through scientific means – cybernetic, of course. Philonous characteristically states: "Politicians are, from the point of view of academic sociology, a sort of healers of social ailments, practical institutionalists without education in the area at best" (275); and his last words are: "Despite all disappointments, failures and tragic mistakes, people will build a better world. If they were not to act with that thought, we would lose all faith in humanity and its potential, in which case it would be better not to live at all my friends" (287).

71 Małgorzata Szpakowska gives a much more detailed analysis of *Dialogue 7* in her book.

6 Attempt at an Interpretation

What does it all lead to? I should perhaps start with a commentary to the last dialogue. Similarly to Lem's early novels, it is a declaration of faith in our species' auto-creative power. Yes, we are all capable of making a leap into the realm of enlightened happiness. Science would be our stepping stone. If we read what Lem had to say about human nature in the last years of his life – in his column *Rozważania sylwiczne* ["Silva rerum deliberations"] – it will turn out that with age he turned from a noble progressive to a determined conservatist, as one would be hard pressed to find anything other than bitter rants on the unchangeability of human vices in his late texts. With time he himself thought that "*Dialogues* are characterized by an excessive hope and faith in cybernetics."[72]

The observation is only an aside, although it would be possible to write an interpretation of his entire work along this evolutionary line, with the intermediary stage of moderate skepticism, when his best novels were written.[73] This modest vision could also be compared to the grand project of autoevolution from *Summa Technologiae*, which I will analyze in Part Two of this book and which was created still at the "optimist" stage of Lem's thought. At this point, however, I am primarily interested in what can be learned from *Dialogues* in the 21st century.

Lem's plan was ambitious to say the least. *Dialogues* seem to be a preliminary project of a total anthropology based on the fundamentals of cybernetics, a project outlined with a great care for methodological moderation.[74] That this is "an anthropology," and not merely "a sociology" is visible from the range of the problematic, which is not limited to social issues only, but which in fact ranges from metaphysics to psychology. Lem clearly made it his goal to summarize all the most fundamental problems of the human world, and especially those, which ensue from the rapid intrusion of technology into it.

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72 *Tako rzecze … Lem*, 85.

73 The last two dialogues could also be seen as a "metautopia" – a way of considering "the conditions of possibility of all future societies, which could be scientifically (i.e., cyberneticially) organized."

74 A more malicious critic could write that *Dialogues* really contain anything the author was interested in at the time. Indeed, *Dialogues* could be described as somewhat incoherent in structure and excessively complicated in arguments presented, but the qualities do not really occur frequently enough to disqualify the work as a whole.

The scope makes it hard to produce an interpretation of *Dialogues*. In Chapters 1 and 2, I suggested that cybernetics split into two heterogeneous branches: the very technical science and the vague social commentary. *Dialogues* do not really belong to either. They are too general for the technological cybernetics, and too detailed for its social counterpart. They are an intellectual project of their own.

How valuable is the project really though? The critique of the socialist system was certainly accurate, but, just as many other such critiques, expressed in a more common language, it had no actual effect. The futurological visions in *Dialogue 7* and *8* did not come true in the least bit (Lem himself would mock the formerly trendy futurology in the 1970s and 1980s). The philosophical issues caused by the introduction of information technology into the living world (e.g., mind–body problem, and the philosophical foundations of artificial intelligence, AI) were described in *Dialogues* with rare precision and insight, but in 2017 we are, it seems, equally removed from their solutions as we were back in 1957. It seems that if Lem planned *Dialogues* that would actively contribute to the social practice – the intention was not fulfilled.

Dialogues could also be treated as a purely intellectual endeavor, a survey showing that cybernetics could be effectively applied as a tool for analyzing the social world. It requires turning a blind eye on the explicitly interventionist tone of the two final dialogues. However, even in this case it turns out that they have not achieved this goal to a satisfactory degree. Not because they were trivial or derivative – quite the opposite – but because the cybernetics itself has been removed into the archives of ideas and science. In their basic shape *Dialogues* (sauf the annexes) are a fortress built for a lost army. It is a sad paradox – as Lem saw the imminent failure earlier than others, and yet he wrote the book that exceeded the achievements of the other Polish cyberneticists (and likely foreign, too) many times, while the others continued to defend the position of their discipline, when it was already marginalized.

It begs notice that *Dialogues* prove that there is a full analogy between the universe of cybernetic notions and the world of human problems; or – in other words – that it is possible to translate the old system of notions describing the world into the system of cybernetic notions, and that it would lead into an at least partial solving of social and philosophical issues. Mazur's *Cybernetyka i społeczeństwo* was a similar attempt, but intellectually infinitely more primitive. I need to point out that the attempts to frame the social world from a cybernetic perspective are not explanatory in character – either scientifically, or philosophically. Similarly to structuralism, for example, cybernetics did not **explain** reality;

it **described** it. This description seemed so revelatory for more than a decade that it was expected to explain everything.

This analogy positions Lem when writing *Dialogues* beyond the opposition of naturalism and culturalism. This, too, should be emphasized, because the question about the type of view he held on human nature surfaces often in the critical texts. His view on the matter was by no means unchangeable and coherent, as Lem is neither a meliorist nor a pejorist, just as he is not merely a naturalist or merely a culturalist – in this latter case the methodology and theory he took up in *Dialogues* place him beyond this particular opposition. For the interlocutors of *Dialogues*, human is a creature biologically constituted – the evolution process, itself shaped by the laws of physics, determines "the boundary conditions" of our existence and growth. Yet within this frame our growth goes beyond the materialist concept of nature. From the very beginning Lem assumes that there is a nonbiological element in us as well.[75] His penchant for social engineering, which is clear in *Dialogues* for the first time, is a constant quality in his work. It will keep coming back in *Summa Technologiae* as well (although only in a limited way), and in many other works of fiction, from *Eden* to *The Star Diaries*.

One could ask here, whether the phrase "cybernetics as an anthropology" is not internally contradictory, derived from the fact that the former is a science, while the other belongs to the realm of *Geisteswissenschaften* and in some its variants has nothing to do with any kind of scientific character.[76] Indeed, there is a fundamental aporia here, but it does not lie in the terminology, but in its deepest premises behind the very foundations of the book. **Lem tries to explain human there using terms that were coined for a very different purpose**. Because he is treating cybernetics as the foundation for a specific anthropology, none of the problems taken up by the interlocutors in *Dialogues* is fully solved. The subject of the conversations and the method of considering it are heterogeneous, but not in the hundreds of details, which are discussed accurately and fruitfully, but in the most general plan of the whole, when it turns out, that all arguments are entangled like the geoglyphs on the Nazca desert, the patterns of which can only be seen from the bird's eye view.

75 Which I would not want to describe as "spiritual," "transcendent" or in any other way at this point. The theme of Lem's anthropology and its place between naturalism and culturalism will be a recurrent one in later parts of this work.

76 I am thinking here of German philosophical anthropology for example (Scheler, Plessner, Gehlen). On the other hand I am not discussing here the science *par excellence*, that is physical anthropology, and the positivist versions of cultural anthropology.

If *Dialogues* cannot be treated as "a manual of society building," or as "a treaty on the first principles" – then there is one more, third way to interpret it. They can be seen as an important stage in the author's intellectual development. I believe *Dialogues* cannot be understood without the knowledge of what cybernetics used to be, just as Lem's later works cannot really be understood without knowing about *Dialogues*. The themes that will be important in *Summa Technologiae*, *The Philosophy of Chance*, *Science Fiction and Futurology*, not to mention the less prominent theoretical texts and fictions, were first taken up in *Dialogues*. The author took them up, and then critically recapitulated them in the annexes, to which I shall now turn.

The first annex, *Dialogues after 16 years*, includes two texts: *Losing Illusions: From Intelectronics to Information Technology*, and *Applied Cybernetics: An Example from the Field of Sociology*. In the first one, Lem summarizes the history of cybernetics between 1957 and 1971 in detail, pointing out how it diverges from cybernetic predictions of it. The overview includes the links between cybernetics and the theory of information, information technology conceived as a study of building and programming computers, semiotics, neurophysiology and genetics. Emphasizing again the huge difficulties of trying to conceive of all these disciplines coherently together, he admits that he has fallen short of this task. On the other hand, the growing problems with reproducing the working of the brain in machine systems – problems that were rarely foreseen by anyone apart from Lem back in the 1950s (such as the technical difficulties in building systems freely imitating human motile capacity, spacial orientation, shape recognition, etc.) – led to this particular trend in the development of cybernetics, which was most interesting to Lem, being largely slowed down. But even this failure leads Lem to some valuable conclusions. He asks: "if indeed we build computers, but we are incapable of building brain simulators, because the first task proved to be immeasurably easier than the latter one, then why did the natural evolution choose the more difficult of these two tasks?" (317–318). The answer contains one of the most fundamental theses of Lem's all philosophical writings: it happened so because the biological evolution is a stochastic process, not targeting any particular goal, and therefore testing innumerable variants throughout hundreds of millions of years – whereas human projects and products nearly always have a specific goal, and hence, in comparison with the products of biological evolution, they are highly narrowly specialized. The statement is trivial and obvious to any student of biology when phrased this way, but Lem will draw far-reaching conclusions from it. I will discuss them further throughout this work. The rest of the annex

is devoted to some of the most important problems troubling contemporary cybernetic and computer technology.[77]

The text about "applied cybernetics," on the other hand, develops in *Dialogue 7* – it is an in-depth analysis of the pathologies of the system of centrally planned economy in communist Poland. By the time Lem wrote *Dialogue 7*, these pathologies have become striking – here he only pointed out the increasing "undercurrent" of informal relations that underlay the failing state machine.[78] The cybernetic terminology he uses to describe these phenomena departs considerably from correspondence with the technical terminology of Wiener, Ashby and other forefathers of the discipline, and it becomes more and more similar to the elaborate imagery I wrote about when discussing Mazur and Kossecki[79] – but, of course, Lem uses the terms with intellectual mastery that cannot be compared to what those authors were capable of. The pertinent quotation would be:

> When the central authority loses the view of the existing state of things, because it unknowingly set in motion pathological steering circuits, which, abusing the regulative cycles, cause disturbances on other levels, gradually the entire economic organism of the society falls into tracks of unpredictable changes. A superficial judgment might lead to a conclusion that the emergence of informal managing groups is a positive phenomenon as a spontaneously born form (sic!) allowing for overcoming the obstacles. From this point of view the only alternative to such groups being formed are completely haphazard actions: when an excessive and physically impossible plan cannot be carried out in full, the options are to carry out a part of it, with the part either chosen haphazardly, or by choosing a part that is privileged through a silent agreement of "informal management." This type of argument, however, is essentially false. There is no such alternative. The plan is never carried out haphazardly, because those who implement it are not logically

77 Among other issues it includes the sentence: "But if as a result of gradual merging of computing machines and memory banks there emerge national, continental, and later even planetary computer network, which is a realistic direction of development, the whole system, constituted by humans and these networks, may take up a dynamic trajectory, quite divergent from the civilizational hopes" (321). This is the earliest harbinger of the Internet that can be found in Lem's writings.

78 Cf. Małgorzata Szpakowska, *Dyskusje*…, 166–167. Szpakowska points out that a society relying on a network of informal relations following the principle of *do ut des* was satirized by Lem in his short story *Profesor A. Dońda*, never translated into English.

79 Metaphors like that can already be found in the main body of *Dialogues*. Philonous speaks of "a crisis which is analogous to 'a short circuit' in a neuronal network – an epileptic attack," to which Hylas exclaims: "Oh, then crises are the epilepsy of capitalism?"; to which Philonous responds: "With a grain of salt, one could say that" (187). The metaphor is given by Hylas, who is naïve, so it is not necessarily to be treated seriously.

> programmed automata, but humans. Each of them is at first trying to act in accordance with the accepted procedures, but since they encounter resistance – the infamous objective difficulties – those who formally are still partners become, in fact, rivals, just as they would be in a free market economy, with the one significant difference that the situation of competition, i.e. of colliding efforts from individual managers, not foreseen in the plan, is simply illegal. Yet, it exists; if not everything will be carried out, the fulfillment of specific parts is determined based on criteria and circumstances previously unaccounted for: personal relationships and connections. (339)

It is hard not to admire such an insightful analysis. In an essay from the early 1980s (*Mój pogląd na literaturę*)[80] Lem wrote that "the diagnosis of our ailments with elements of forecast, which I gave in the 2nd edition of *Dialogues*, turned out to be terribly true" (199). And in the collection of interviews with Stanisław Bereś, Lem said: "I was myself astonished, how much of what I have written [in *Dialogues*] was confirmed."[81] However, this critique of the communist Poland contained in *Dialogue 7* and the essay *Cybernetyka stosowana* lost its power with the fall of communism, and it only continued to make sense as an example of excellent social critique.

Annex 2 consists of two essays, which have little to do with cybernetics, but a lot with *Summa Technologiae* – they were published after its first edition. By discussing them here, I will introduce the second part of this work, which will be devoted to Lem's *Summa Technologiae*.

Ethics of Technology and Technology of Ethics was originally a paper delivered at a conference on moral dilemmas in science, held by the Department of Philosophical Questions in Natural Science of the Institute of Philosophy and Sociology of the Polish Academy of Science (December 24–25, 1966). It is an attempt to determine the mutual influence between two evolutionary lines of the contemporary civilization: the technological progress and the transformation of ethical norms. It seems that the issue has not lost its pertinence, and in fact, at the beginning of the 21st century it only became more burning than it was in the 1960s; a mention of cloning, euthanasia and of the constant progress in the technologies of genetic modifications should be enough to prove it (I will return to these issues at the end of Part Three). For Lem, other illustrations of the problem included the prevalence of drugs and other addictive substances – which were no less a problem then than they are now – the introduction of the contraceptive pill and the generally increasing ease of life in the Western societies. He summed it

80 Reprinted in amended version in *Teksty Drugie*, no. 2 (1990), and in the collection *Mój pogląd na literaturę*…, 193–214.

81 *Tako rzecze Lem*…, 84.

up in the following pithy words: "The forceful implementation of 'improvements' can set off an 'axiological implosion' – i.e. a collapse of the system of values: it may lead to a situation in which living is very easy, but not really worth it" (371); and "The task of technology cannot be to constantly aim for a 'short circuit' of all the possible needs, desires or directives with their objects, because where one can obtain everything immediately, nothing has value, which derives from a certain hierarchy of goals and various degrees of difficulty in overcoming them" (373).

For Lem, the very notion of ethics is devoid of any transcendental connotations – he is coherently a rationalist in that regard. He states:

> By ethics we shall mean a vaguely delineated set of rules of "the social game." Some of these rules are certainly instrumental in character, and their occasional ethical aspect depends, among other things, on the whole set of rules, i.e. the entire culture. We believe that it is the situations of interpersonal contacts that have an ethical aspect. Determining which of these situations have an ethical aspect to them and how they can be judged in that regard is the clearest when we look at a given case from the perspective of a particular culture; the range of situations classified as ethical and the very criteria turn out to be variable (although not infinitely variable!), when looked at from various cultures. Judgments about interpersonal situations within a particular culture are especially divergent when they are made by observers positioned outside the given cultural environment, which implies an observer who grew up in a different culture. (379)

It implies that there are no universal values, but for Lem it also means that the emergence and development of ethical systems is independent from the biological foundations of the human species; otherwise there would have to be some ethical universals, because the biological diversity within the human population is too limited to justify the diversity in symbolic systems. Anthropological research has not yielded a discovery of a principle, value or norm that would be present in **all** human cultures. Thus, Lem rejects sociobiology *avant la lettre*, as Richard Dawkins and Edward O. Wilson had not even written their major works by then. So, again: neither naturalism nor culturalism. What is it then?

In the summary that concludes the text there is a following passage:

> According to the hypothesis presented here, "the ethical" constitutes a component of how group behavior is controlled, with maximum probability of occurring in particular situations; this component – together with how group behavior is programmed as a whole – can be seen as a result of three sequential processes combining to instill these behaviors: accidental events (such as fluctuation of climate), Markov processes (which perpetuate effects of a random deviation from the initial state through positive feedback) and cumulative processes (e.g. techno-evolutionary processes). These processes produce a model of "human nature" characteristic of a particular culture, and they determine a corresponding system of norms and ethical judgments, which from

> the perspective of a participant of the culture is not merely a product of certain probabilistic references, but is endowed with a symbolic meaning. (419–420)

What would that mean? Above all it means that for Lem, ethics, or, more precisely, the emergence and development of ethical systems and norms for societies, constitute a stochastic process, a random and unpredictable one. This sentence of mine expresses in a colloquial language what the quoted excerpt stated with utmost precision. The notion of "Markov processes" plays a fundamental part in this essay and in Lem's thought on culture in general, so it calls for a closer explanation. Markov processes or Markov chains[82] are a type of stochastic process characterized by a principle that stage *n* of such a process depends only on the stage directly preceding it *n – 1*, and no other earlier stage. Systems that undergo Markov processes are hence systems that "forget the past," in a sense that from the current stage and state of the system one cannot derive anything about its earlier stages, and *vice versa*: no later stage can be determined from it (with the exception of the one following it directly). In nature an example of a Markov process would be the motion of a particle suspended in a fluid called the Brownian motion. For an amateur such motion is completely random, but mathematicians have developed an elaborate formalism to describe it. Surprisingly, Markov processes can yield results that seem orderly to a human mind. A computer generating sequences of letters following the rule "to *x* add a letter which most often follows it in Polish," will produce sequences of letters imitating words of the language, but prevalently meaningless.[83] This is exactly a Markov process.

In Lem's view the development of ethics in societies is such a process, and in fact the entire culture and history of the humankind can be interpreted in this manner. *The Philosophy of Chance* will largely be devoted to proving this claim. In *Ethics of Technology*…, he draws further conclusions from it about creating models of societies' evolution, and this is what he is mostly interested in (social engineering again). He pays no attention to the philosophical consequences of this position, even though they are just as interesting and unprecedented in the Western philosophy. Following the spirit of the 20th century, Lem dispels

82 Andrey (Andrei) Andreyevich Markov (1856–1922) was a Russian mathematician and one of the authors of the probability theory; he was a professor at a university in Petersburg and a member of the Petersburg Academy of Science. His research on processes that were later named after him started from a study of sequences of letters in Pushkin's *Eugene Onegin*.

83 Similar processes are in play in *The Cyberiad*, in the short story *The First Sally (A), or Trurl's Electronic Bard*, where the Electronic Bard – a poetry producing machine – recites a poem during its trial run, which starts from: "Pev't o' tay merlong gumin gots…"

any illusions we may have about an overarching meaning of our existence and actions; the absence of such meaning is obvious to him, which he makes it the implicit underlying premise of his argument. And it is not merely an unjustified statement of absurdity of existence that so many other philosophers made. The absurdity of our existence is not pure nonsense for Lem. The fate, which steers our existence, is not blind. Our randomness is not completely random – it is governed by mathematics.

Can it make us feel any better?[84] It depends on one's personal attitude. For many there will likely be no perceptible difference between randomness governed by the laws of stochastics and randomness that has no justification. Yet, for some, perhaps even many, an attempt to make our condition, in itself lacking external roots, a part of a mathematical formula, an attempt undertaken by Lem not only, and not even primarily in this essay, can be a sort of consolation, as Jerzy Jarzębski put it.[85]

For example, in *Ethics of Technology*…, there is a noticeable shift in Lem's worldview since writing *Dialogues*. It is no longer an expression of joy of planning a perfect society, the cognitive optimism, which allowed him to manipulate the cybernetic terminology for the purpose of producing a new anthropology, is gone. Instead there is a careful skepticism, and his reflection on the links between the human world and the rest of the reality has become much sharper.

Lem did not take the stochastic model of culture and ethics out of thin air. It has been proven on a broad empirical basis,[86] but, of course, it does not go beyond being a hypothesis, and one that is not easily subjected to verifying procedures. The two-part title becomes understandable only after the model has been outlined. While "ethics of technology" seems like an almost self-evident concept and it certainly was not foreign to people in the second half of the 20th century, as it is not at the beginning of the 21st century, "technology of ethics"

84 Lem would never ask this question. He would likely say that the purpose of thinking is not to make us feel better. Nevertheless I want to point to this trace of existentialist interpretation, at least tentatively, as many such themes of coping with absurdity come up in his novels, including *Solaris* and *The Magellan Nebula*.

85 Cf. Jarzębski, *Kosmogonia i konsolacja*, in: *Wszechświat Lema*…, 68–102. The term "consolation" here, drawn from classical rhetorics, is justified by the assonance between it and the word "cosmogony" in the title of the essay ["Cosmogony and consolation"], but it probably also points to the fact that, perhaps against the author's will, Lem's whole argument is somehow elitist.

86 Cf. *Dialogi*, 383 and following. The issue is taken up more thoroughly in *The Philosophy of Chance* and *Science Fiction and Futurology.*

becomes understandable only if we allow for a possibility of modeling the development of societies using mathematical tools. This is not something we know – it is a part of Lem's vision of the future. We are aware that the technological progress is not concordant with the changes in ethical norms, which do not follow immediately. But we are still far away from these processes happening simultaneously, not to mention from modeling ethics *a priori*.

"Technology of ethics," however, is not a naïve science fiction that would describe people who are completely dependent on psychotropic drugs or virtual projections (Lem offers a grotesque image of such a reality in *The Futurological Congress*). This is about something else: we are at the beginning of this writer's next major narrative. He starts questioning the very distinction between the natural and the artificial here.[87] I will discuss the details in Part Two of this book. Here I would only point out that within "technology of ethics" this distinction loses its meaning, because Lem considers the possibility of controlling societies' ethical views not through any kind of repressions (be it political, ideological, physiological or symbolical), but on the basis of the stochastic model through which technologically advanced civilizations are capable of deciding about the fundamental parameters of their development to some extent; and this is exactly due to the stochastic nature of the process. Lem, however, is very clear about this potential being minimal and very restricted by various factors, among which neglecting individual human qualities of members of the given civilization is the least significant. He is not thinking about totalitarian *Gleichschaltung* here, but about reducing the number of parameters that need to be included in the model. Thus, he admits that the entire model is a mathematical construct rather than a sociological one, or, in fact just a preliminary attempt at producing such a construct, because no formalism has been proposed in the end.

The essay *Biology and Values* touches upon ethics from a slightly different angle, although still within the perimeters of the probability theory and close to cybernetics. It begins with a distinction between autonomous values, nonrelational values (treated as facts) and non-autonomous values, that is, instrumental, relative to something (treated as qualities) (426–427). In the first chapter, "Axiology and Physics," he asks "when and how instrumental values are formed, where do they come from" (437), to which

> one has to respond that the difference between presence and absence of axiology, just as the difference between a real goal and absence of a goal, can be conceived of with use of the same method that would allow us to understand a difference between a bald

87 Cf. Jarzębski, *Wszechświat Lema*…, 97 and following.

> head and a head full of hair. When a stone falls due to gravity, we do not ask whether it made a decision about accelerating its speed during the fall. When a virus approaches a cell, we are in a sphere of classificatory instability … If we assume the virus does not make a decision in the axiological sense of the word … we fall into trouble with amoebas … etc. In fact the point is: if we can grasp the whole model of functioning of a given homeostat with the same precision with which we can grasp the working of, say, an electrical doorbell, then "decisions taken" will need to be replaced with causal relations, possibly involving a feedback loop, and the "goals of actions" will be replaced with probability chains, producing structures which in borderline cases (mouse, monkey, human) achieve a status of **models** of homeostat's environment. "Values" turn out to be simply a kind of relations between physical states, relations that statistically determine the behavior of the given system. (437)

Here Lem is trying to explain the notion of instrumental value in terms of biological cybernetics, which has been very problematic for other philosophers. The "relations" he mentions are transfers of information between elements of a system in his view. The system and the "homeostat" are signs of this being another attempt to produce anthropological cybernetics. This time Lem is trying to use it to solve a classic problem of philosophical ethics.

What is next? When analyzing the links between physics and semantics (discussing the case of influence of symbolic meanings on human physiology in taboo), in passing Lem produces a thesis about the relationship between the emergence of language and the emergence of regularities in human behavior:

> So, when random occurrences turn into a regularity, semantics emerge as invariable. Hence, clearly, the meaning of "taboo" cannot be found in a physical section of brains, just as no other meaning can, because we are speaking of something that has not existed as a physical phenomenon (as ergodics of language creation) since primeval times. In their dynamic stillness we can only observe late results of primeval causes … So the program of "physicalizing culture" will likely by utopian forever. If it were to become a reality, values would turn out to be "superfluous" entities, like Laplace's demon (*entia praeter necessitatem*). (440–441)

After this strong statement Lem returns to the question of the genesis of instrumental values. He explains the homeostatic functioning of living organisms and then writes – and here comes the core of the argument – that "instrumental values" are qualities of objects of states that contribute to retaining the balance within homeostats (both in humans and other living creatures). The definition is based on the fact that all homeostats and only they can be defined as systems that have a goal (i.e., retaining balance in a changeable environment), and a presence of a goal is what Lem sees as the necessary condition of an instrumental value.

On the other hand, he interprets autonomous values as a special type of information that has a strong influence on the system; so strong that in extreme cases

the system can disrupt or even destroy its homeostasis (as in a case of "dying for one's faith"). Lem does not explain where the special information comes from or what exactly is its influence. The problem of links between physics and semantics comes up again. And the immediately occurring question of how to distinguish between a value-producing homeostat from one that does not necessitates an answer that: "the decision is determined by the cumulative conclusion from long periods of observation" (450). There is no general rule, a law of nature, that would determine the presence of either type of values for a particular homeostat, be it a human or a clam. Concluding, Lem points out certain logical difficulties deriving from a consideration of complex, multilevel homeostatic sets (451–454) and finishes by saying:

> If active orientation on values ends up amounting to optimalization of ultra-stable states, the science will develop toward biology and physics meeting half-way: the former will dump the ballast of completely anachronic axiological terms that goes beyond the instrumental, and the latter will absorb the sphere of instrumental values in parts of its theory of anti-entropic systems, as an element of the general theory of physical systems. (454–455)

Lem is trying to combine anthropology, biology and cybernetics here, implying that the former will disappear when the latter two are merged. He is very close to pure naturalism here, but he is careful to avoid any open declaration that would reduce humans to a purely biological species. If he did so, his entire argument would become pointless, because the notion of ethical "value" would lose its meaning altogether. He is still in trouble here, because he is trying to bridge heterogeneous disciplines and discourses. He is in the shadow of cybernetics as a *mathesis universalis*.

The entire second chapter of *Biology and Values*, "Biology and Technology," is a discussion of another such bridging attempt. It is devoted to a study of biological evolution in technological terms, with some axiometrics added for good measure. In short: does questions about the value of evolutionary solutions make sense, and hence can evolution be described as a construct? The problem remains unsolved though.

In the third chapter, "Intermittent and Continuous Evolution," Lem discusses certain aspect of biological evolution as a Markov process and as a game (as in game theory) and compares them to technological evolution. Finally, in the fourth chapter, "Biology and Non-instrumental Values," Lem considers whether biology can contain the notion of autonomous value, which is "a typically cultural phenomenon, very well known to anthropologists, for example, as scholars who practically devote all their efforts to trace and compare them" (482–483;

Lem's view on what cultural anthropology is was already a bit obsolete). He claims such values can be traced in these qualities of biological organisms that are not capable of survival and reproduction, that is, in "redundant" information, such as the plumage of some of the bird species. It could perform the same functions it has in a more modest version. However, there is caveat here: we do not actually know, and we will not any time soon, where exactly the threshold of "system's information utility" lies. If it makes sense at all to speak of autonomous values in nature, they only be derivative to more fundamental phenomena (484–485). It is a clear contradiction that Lem does not even mention: by definition autonomous value cannot be derivative to anything. The question of consciousness through which and for which such value can be constituted is completely omitted here. If, however, for Lem this notion is completely independent from its original anthropological sense, he never provides a new definition. It is another example of contradictions that come from juxtaposing divergent vocabularies.

The last chapter of the essay, titled "Axiometrics of Progress" is another failed attempt, and Lem admits that in the very first paragraph: "The cumulative effect of how far evolution went from a single cell to a human seems obvious with this range as an expression of progress. But when we want to evaluate this huge improvement with some sort of axiological measurements, we encounter insurmountable obstacles" (486). The point is we can meaningfully show progress within certain evolutionary lines, groups, organs or physiological systems. However, the method fails us when applied to evolution as a whole.

"J. Huxley, for example, juxtaposes an eagle with a tapeworm, demanding that the reader realizes the amazing 'progress,' between the two forms. Who is to judge it critically? It is only our aesthetical criteria that lead us to believe that an eagle's existence is beautiful and heroic, whereas a tapeworm's is opportunistic and ugly" (491). The same applies to comparisons between people and insects for example. It is not about aesthetics though, but about adaptability and specialization. And what about culture, this very human product? Indeed, Lem would say, we have achieved more than any other species with it, but we have **no** guarantee whatsoever that these achievements will last. He expresses a view here that could almost be seen as a manifesto of culturalism:

> The rules of cultural development are not bioevolutionary and therefore evolution cannot be a source of knowledge about cultural obligation – nor the other way round: cultural criteria cannot be applied to evolution. Consequently, the place where the evolutionary process extends beyond its natural monoselective (i.e. solely biological) stochastics, the "anthropogenetic locus of evolution," cannot be located at the top of value ladder used by a biologist interested in axiometrics. This place serves purposes that cannot be measured on a biological scale. It is the very place where scale itself is

> being reevaluated: it is the moment when biology is being evaluated from the point of view of culture. (501–502)

For Lem "culture" is by essence different from "civilization" or "technology", because he can see no way of describing it with the same language as the one he used in *Dialogues* to discuss the latter concepts together with "machine" and "nature".

Why did Lem actually write that essay? He poses questions in it to which he has no answers, as he himself admits. He proposes theses that are based on contradictory premises, he is hesitating between a naturalist and culturalist anthropology, and at times he seems to question the point of anthropology all together. What is the purpose of it all?

I believe his intention can be described as follows. Evolutionary biology has been entangled in a prevailing contradiction from the very beginning of its existence, ever since *On the Origin of Species by Means of Natural Selection*, or even earlier, starting with Buffon and Lamarck. Evolution understood the way Darwin suggested is a nondirectional process, nontheological and governed by impersonal laws. Living creatures are subject to such evolution, and especially we, humans, are. Evolutionary biology as a science should follow its own basic premises and describe evolutionary processes without judgment. Moreover, it is not supposed to (or the scholars in evolutionary biology, to be more precise and avoid the hypostasis, are not supposed to) describe the evolutionary process as a process in the common understanding of the term, as a sequence of events, with a beginning and an end, and consequently with its causes, values and goals. This is how evolutionary biology **ought to be** studied. This is how its texts **ought to be** written. In reality, however, this was never so. Up until our times the greatest biologists who wrote synthetic and popular accounts of their field, have not been able to refrain from a teleological narrative, presenting evolution as a sensible, directed process, the aim of which (and let us not even mention causes here) is us, of course. Using the terms of literary analysis (and I will not be the only one to do so), one can say that the **narrative and rhetoric** of evolutionary biology have always contradicted the discipline's basic premises. It is hardly surprising though; it not only shows the unwavering vanity of the "crown jewel of creation" – it also proves Roland Barthes' remark that "human is a story-telling creature." Darwin's revolution produced a general model of biological reality, but in practice it turned out to be impossible to follow its premises, and an evolutionary biologist cannot help but **tell the story** of the discipline, just as a historian does. Except that in biology this rule has bigger impact on the results of research. A historian studies the human world and by presenting sequences of events in

various configurations, he or she makes sense of the historical process, but telling it does not contradict the very premises of the discipline, as is the case for a biologist who theoretically cannot tell the story of evolution and judge it. But how else can it be described, especially from the bird's-eye view?

No need to add that these remarks apply only to a limited number of authors, both in biology and history. But they do apply to those among them who had the greatest impact on the shape of both fields. Biologists themselves have noticed the problematic character of the discourse of evolutionary biology a long time ago, and ever since the 1960s the discipline is striving to avoid value judgments, as does history. I would claim that Lem's essay *Biology and Values* was his attempt to deal with those contradictions. Having recourse, once again, to cybernetics and systems theory, Lem tried to combine three disciplines here: biology, cybernetics and anthropology (its axiological variety), expecting to succeed in eliminating the problem of value judgments about facts of evolution by reducing the very notion of value, *via* cybernetics, to a category of evolutionary biology. However, he must have realized success is impossible in this case – and perhaps hence the culturalist tinge in the conclusion. Lem's failure may (again perhaps) be partially caused by the fact he did not draw a clear enough line between the discourse of biology, with its narrative and rhetoric, and its object: the reality itself. If such suggestion is true, it could be explained by his fascination with Turing's vision of unified physics and logic: such a vision, applied more broadly, makes the very notion of scientific discourse pointless. Logics becomes incarnate in computers, and similarly biological theories could be identified with a practice of programmed evolution, in which case the very distinction between theory and practice, the artificial and the natural would be dismantled. Lem was deeply fascinated by such a possibility, as will be seen when I analyze *Summa Technologiae*. In *Biology and Value* this fascination might have turned against him.[88]

Both essays from the second annex to *Dialogues* went completely unnoticed. Philosophers of ethics were not interested, understandably, because Lem's

88 In his philosophy of science Lem pays little attention to scientific discourses, paradigms or the entire problematic of the impact of the language of science on its content and methodology. When he was writing his main works such issues were not being discussed. However, it is tempting to say that had Lem become interested in these issues when they became popular, he could have given more precise answers to many of his own questions.

arguments have nothing to do with the 20th-century philosophical ethics. They had no influence of its further development either.[89]

Dialogues with the annexes are both a complex and heterogeneous structure. The *leitmotif* is the conviction that cybernetics can be a cure to the ailments of science, and also, something Lem does not say explicitly anywhere, that cybernetics will help build a holistic anthropology that would combine computer science, sociology and genetics. Even then, however, at the early stage of his philosophical development, Lem was too subtle a thinker to believe his own vision without reservations. If *Dialogues* can be of any interest today, it is because they carry the **whole** history of a certain illusion – from feisty parades, through harsh combat to capitulation.

As I have mentioned a few times before, *Dialogues* are the first stage in the development of Lem's philosophical thought. The second stage is *Summa Technologiae*. Part Two of my book is devoted to this work.

89 In an interview Lem admitted: "I never read anything on ethics, I know nothing about it." (Zbigniew Taranienko, "O biosferyczny parlament świata. Rozmowa ze Stanisławem Lemem," *Argumenty*, 1970, 38.) Assuming we believe this statement to be true, there would be a mutual lack of interest between Lem and philosophical ethics.