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ВІНЕР ЩОДО ПРИРОДИ УНІВЕРСУМУ

Відомо, що Філософія інформації – це область філософії, яка займається дослідженнями природи і основами інформації, в тому числі її динамікою, використання її природничо-наукового вивчення, розвитком і застосуванням методів теорії інформації і обчислювальних методів до філософських проблем. Поглиблюючись у роздуми Вінера та Флоріді стає зрозуміло, що інформаційна революція суттєво впливає не тільки на суспільство в цілому, але і на філософію зокрема. Таким чином, зроблено висновок, що вивчення філософії інформації та філософських проблем інформатики є сьогодні виключно важливою і актуальною проблемою науки і освіти не тільки з боку інструментально-технологічних проблем збору, зберігання, обробки і передачі інформації але і з боку вивчення інформаційних процесів у живій і неживій природі, а також в людському суспільстві.

Ключові слова: філософія, інформаційна революція, філософія інформації, Універсум

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WIENER ABOUT THE NATURE OF THE UNIVERSUM

It is known that the Philosophy of Information is a field of philosophy which engaged in the study of nature and the foundations of information, including its dynamics, the use and natural-science study, the development and application of methods of information theory and computational methods to philosophical problems. Deepening into the thoughts of Wiener and Floridi, it becomes clear that the information revolution has a significant impact not only on society as a whole, but also on philosophy in particular. Thus, it was concluded that the study of the philosophy of information and philosophical problems of computer science today is an extremely important and urgent problem of science and education, not only from the instrumental and technological problems of collecting, storing, processing and transmitting information, but also from studying information processes in a living and inanimate nature, as well as in human society.

Keywords: *philosophy, information revolution, information philosophy, Universum.*

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ВИНЕР ПРО ПРИРОДУ УНІВЕРСУМА

Известно, что Философия информации — это область философии, которая занимается исследованиями природы и основами информации, в том

числе её динамики, использования и естественнонаучного изучения, развитием и применением методов теории информации и вычислительных методов в контексте философии. Углубляясь в размышления Винера и Флориди становится понятно, что информационная революция существенно влияет не только на общество в целом, но и на философию в частности. Таким образом, сделан вывод, что изучение философии информации и философских проблем информатики является сегодня исключительно важной и актуальной проблемой науки и образования не только со стороны инструментально-технологических проблем сбора, хранения, обработки и передачи информации но и со стороны изучения информационных процессов в живой и неживой природе, а также в человеческом обществе.

Ключевые слова: философия, информационная революция, философия информации, Универсум.

In 1947, Wiener made an important discovery in understanding the fundamental role that information plays in the world, stating that "entropy is a measure of information" that is contained in any physical thing and is "lost" (becomes inaccessible for the needs of the formation of new physical entities), almost for any physical change. At the same time, he noted that information is a physical phenomenon, but it is not matter and not energy. The amount of information lost during this change is determined by the second law of thermodynamics; this information is sometimes referred to as "Shannon information", named after the colleague Wiener K. Shannon, who – essentially simultaneously with the first one – also made the discovery that "entropy is a measure of physical information" and then developed a mathematical theory of information and communication, which made him famous [1, p. 423].

According to Wiener, matter-energy and physical information are different physical phenomena that do not exist without one another: physical objects and processes consist of patterns of information encoded within the constantly changing flow of matter-energy. Thus, any physical object or process participates in the creative process of "entering into being" and destructive "care away" – when the old pattern of information decays and emerges a new one. This gives a new understanding of the nature of physical objects and processes.

Using modern language, Bainam writes, it can be said that all the physical entities in the Universum are information objects or information processes, including living things that store information in their genes and then use it in building such life blocks as DNA, RNA, proteins and amino acids. The nervous system of living beings also collects and processes information, making possible movement, perception, emotion and thinking.

Since physical changes in the world, including the final disappearance of any objects and processes, are due to irrecoverable loss of information, an increase in entropy that is governed by the second law of thermodynamics, Wiener found it

(understood as the loss of accessible physical information) the greatest natural evil. In doing this, he at the same time made the traditional distinction between "natural evil" (earthquakes, illnesses, floods, etc.) and "moral evil" (for example, human grievances, death, pain, etc.).

Digital physics

Wiener's view of nature anticipated more recent studies and discoveries in recent physics. Thus, some of the "digital physicists", starting with John Wheeler, working in Princeton, are developing a "theory of everything", based on the assumption that the Universum is fundamentally informational in nature, that every object or entity in it is in fact a pattern of digital information encoded in matter-energy [1, p. 424].

Wheeler called his hypothesis "it from the bit" (it from bit), although the "bits" in this case are actually quanta (Quantumbits), or "qubits", which, taking into account the laws of quantum mechanics, can be both extended and discrete, positive and negative at the same time [1, p. 425].

The hypothesis "it is from bit" Wheeler was studied and developed by other modern scientists. Bainam, for example, in support of this thesis quotes from the works of Professor Massachusetts Institute of Technology Seth Lloyd and popularizer of science Charles Seifa. The first of them writes: "The universe is the greatest of existing things, and the bit is the smallest possible unit of information.

The universe is made of bits. Each molecule, atom and elementary particle imprint bits of information. Any interaction between these particles of the universe processes information by changing these bits... I guess, thinking of the Universum, that it's not just machines, but a machine that processes information. In this paradigm, there are only two initial quanta: energy and information that are on an equal footing and turning off each other.

Seifa also explains in detail and figuratively that every physical thing in the world is made up of information that is subject to the action of physical laws: "Information is not some kind of abstract concept; these are not facts, not figures, not data and not names. This is a specific property of matter and energy which can be quantified and measured.

Each bit of information is just as real as the weight of a lead pig or the energy contained in an atomic warhead, and like the mass and energy, information is subject to a set of physical laws that dictates how to behave, how information can be manipulated, transmitted, duplicated, washed or destroyed. Everything in the Universum must obey the laws of information, because everything in it's formed by the information contained in this thing [2, p. 425].

Thus, Seifa believes, any creation on earth is a creation of information that is in the center of human cells, knocking on its brains, packed in every atom, an open and undiscovered elementary particle where it have been transmitted, read and scattered. Each star, the galaxy, all their countless numbers are saturated to the limit with information that can flow and travel; it constantly flows, moving from place to place, spreading through the cosmos [1, p. 426].

Although the Wiener understanding of the Universe's nature, Bainam points out, does not require that the information from which all physical objects are composed must necessarily be digital, now there are some data in favor of what it should be like. One of Wheeler's last students, Jacob Vekenstein, discovered in 2003 the so-called "Vekenstein constraint", which places an upper limit on the amount of information that can be contained in a given volume of space.

The maximum number of information units located inside a specific volume has been fixing by the interface that closes this space – one qubit for four "Planck squares" of this surface. That why, the physical information that constitutes the essence existing in this Universum is, apparently, finite and digital, so that only so much and no more can it be contained within a given specific volume of space [1, p. 426].

Wiener about human nature

Human beings can also be understood as fundamentally informational entities, according to other material objects of the Universum, including animals. Homo, therefore, is an essential pattern of physical information that lasts for a while despite the constant change of molecules that occurs due to biological metabolism. According to Wiener, "We are only twists in the river of perpetually flowing water. We are not something that exists, but patterns that are themselves... The individuality of the body is something like a flame... more a form than at least a bit of substance" (quoted in: *ibid.*).

Because of metabolic processes, the matter of the human body which continuously exchanged with molecules and atoms that are outside its body. Nevertheless, the pattern of information that's coded in the person's body remains similar to himself, changing very slowly. It's that information pattern that preserves for a time the life of a person, its functionality and identity. Nevertheless, it will someday change significantly, and the inevitable result will be growing violations and death – the ultimate destruction of the information paradigm that constituted someone being [1, p. 426].

The information nature of the personality makes it possible for it to interact with other information entities in the environment. Wiener wrote: "Information is the name for the content of what is exchanged with the outside world, when we are adapting to it, and what makes this adaptation talk about it. The process of obtaining and using information is the process of our adaptation to the chances of the external environment and our effective life within this environment. The needs and complexity of modern life make great demands on this information process, than ever before. To live effectively is to live with adequate information. Therefore, communication and control are the essence of both the inner life of man and his life in society" [1, pp. 426–427].

The physical structure of any animal (and man, including) determines the nature and complexity of the information process into which this animal can be engaged. In this regard, Wiener accentuates the enormous potential for learning and creative action possible to man – unlike the rest of nature – thanks to his physiology,

which gives him, in addition, intellectual equipment that contributes to adaptation to the most radical changes in the environment.

The genius of cybernetics believes that there is a fundamental connection between the purpose of human life and the kind of internal information process taking place in the human body. In his opinion, the flowering of personality is the highest goal of life. At the same time, the former understood in the sense of realizing the entire human potential and the diversity of choices and actions. To flourish, a person must engage in a wide range of such informational actions such as: perceptions, organization, remembrance, conclusion, decision-making, planning, action, etc. Consequently, the flowering of a person is highly dependent on information processes [1, p. 427].

Artificial Agents

Beginning with his book *Cybernetics*, Wiener describes human beings (as well as other animals) as dynamic information-procedural systems with components that internally connected through feedback circuits.

Such internal communication unites animals (including people) in such a way that all their different parts can work together for a common goal in a concerted manner. In *Cybernetics*, Wiener suggested that machines will be created that function in a similar way. Some of them will make decisions and implement them themselves, while others will even self-learn and modify their future behavior, again in such a way as to take into account their past. The scientist expressed concern about the possibility that when cars become trains and make decisions themselves, this can lead to significant ethical risks. He has especially worried about the possibility of careless creation of "artificial agents" that people will not be able to control – agents who can act on the basis of values that human beings do not share: "A machine... that can learn and make decisions based on its training, in no way is not obliged to do them as we would have done or in an acceptable way for us" [1, p. 428].

To prevent this kind of disaster, Wiener believes, ethical rules are needed for artificial agents. In 1950, in the work of *Human use of human beings*, Wiener predicted that machines would connect with people as active members of the society. Some of them, including, will participate together with the person in the creation, sending and receiving of messages functioning as «cement» linking the society into one whole. Bainam notes that the thesis of this book is the assertion that society can be understood only by studying the messages and communicative devices that are in it; and that in the future the development of these latter, messages between man and machine, machines and man, between the machines themselves will play an ever greater and greater role.

Wiener predicted that in the future there will be digital computers with robotic devices. Similar robots will be installed in the workplace and replace thousands of human workers, both white and blue collar workers. He also foresaw the emergence of artificial limbs and other human-created body parts, cybernetic prostheses that would merge with human bodies to help persons with disabilities. Such devices, said Wiener, can even be used to empower people with unprecedented strengths and

capabilities. He foresaw societies in which cyborgs play a significant role, and therefore there will be a need to establish an ethical police force to control the behavior of these latter.

Wiener also foresaw the onset of the "machine age" or "machine era" when machines would be integrated into the society in which they would create, send and receive messages, gather information, make decisions, act, reproduce themselves and even connect with human bodies, creating beings with new possibilities. And these were not only assumptions, since he saw the design and creation of early versions of gaming machines (playing checkers, chess, "into war", "into business"), witnessed the emergence of artificial hands with motors that were controlled by the mind of a person, as well as reproducing themselves sensors [1, p. 429].

The question of whether a car can be alive, he thought was more of a semantic problem than a scientific issue, indicating that, since certain behavioral analogies between machines and living organisms are observed, it can be considered as an example to whom as more suited.

However, Wiener believed that questions about the "intellectual capabilities" of machines, if properly formulated, can be truly scientific.

Wiener saw in society and societies cybernetic systems of the second level, since their members themselves are cybernetic systems. In his opinion, the social system is the same organization as the individual; it's also linked in a single whole by a communication system, and has a dynamics in which the feedback processes play an important role. The same can be said of bee honeycombs, colonies of ants, herds of animals. Information processing, data flow is the key to understanding their nature and successful operation. Communication, therefore, is the central phenomenon of society. In the horizon of such an understanding, Wiener's discussion of the nature of society often includes reflections on communication networks and their role in the life of society [1, p. 430].

Floridi about the nature and goodness of the Universum

From the point of view of methodology, notes Baynam, Floridi is "constructivist" who adheres to the view that the ultimate reality (the Kantian noumenal world of "things-in-themselves") is unknowable, is something of a "black box", and one can not look at anyone. Therefore, even if it admits something or imposes some limitations on our experience, people will never know why and how it happens. In an attempt to understand things in oneself, the best that we can do is to design models of ultimate reality. Knowledge, truth and semantics, according to Floridi, refer to them, and not to it, which will forever remain unattainable.

The world given to us in the experience (the Kantian phenomenal world) is the total sum of our models of reality. Thus, people live in another world, when they significantly change the objects and / or processes within their models. This is not one of the versions of relativism, since it is possible to compare models in terms of their ability to accommodate assumptions and limitations of an unknowable ultimatum reality. Semantic information must be "well-formed, meaningful and true".

The so-called untrue information, according to Floridi, is not information at all, but misinformation. Genuine information is true.

His models are constructed using the "abstraction method", which Floridi and his colleague (J.W.Sanders) developed on the basis of formal methods of computer science. Their philosophical method consists in choosing a set of "observables" at a given level of abstraction. Attributing certain "behaviors" to these "observables". It is possible to build a model of the analyzed entity, and then test the first in experiment, observations and experiments. The best models are those that most successfully correspond to "informationality, coherence, elegance, explicitness, connectivity, predictiveness, etc." and provide successful interactions with the world [1, p. 433].

Floridi proves that at a certain level of abstraction, all objects in the universe are data structures consisting of "indefinite points, devoid of uniformity." These latter are rather Platonic in nature than physical data, and therefore do not obey the laws of physics. The consequence of this, Floridi believes, is information realism, the point of view according to which the world is the totality of information objects dynamically interacting with each other. At the information level of abstraction, therefore, each existing entity is a "data structure", an "information object" consisting of platonic "relationships", described as "indefinite points devoid of uniformity" [1, p. 433].

Information ethics

But the Universum is not only made up of information objects, it is also fundamentally good, and this goodness does not depend on human ethical judgment. This is the basic metaphysical assumption of "macroethics" (his term) of Floridi, which he calls still information ethics. According to Baynam, this latter, on the one hand, is similar to traditional ethical theories such as the ethics of virtue, deontology, consequentialism or contractualism, since it is intended for use in all ethical situations, but, on the other hand, it is different from traditional theories, because more is aimed at supplementing them with further ethical reasoning, rather than replacing oneself; and it also moves away from focusing on human actions, character and values. Thus, Bainam observes, the reflections of information ethics, under specific conditions, can completely be in harmony with traditional ethical judgments, but a situation is possible in which the latter will be stronger than the provisions of the first.

According to Floridi, any entity in the Universum, if viewed from a certain level of abstraction, is an information object, and each such object has a characteristic data structure that constitutes its true nature, and therefore he considers the universe to be "this infosphere". Each entity (in the infosphere) can be destroyed or damaged by changing its characteristic data structure, which also hinders its "flowering" [1, p. 433].

If we leave aside all anthropocentric ethical considerations – from such theories. For example, as deontology, utilitarianism, contractualism and the ethics of virtues – then any entity existing in the infosphere, from the information level of abstraction, will still have at least a modicum of ethical values, for the Universum is

fundamentally good and the information itself, understood not semantically, but in terms of the data structure, has at least some minimal value [1, pp. 433–434].

Therefore, from the information level of abstraction, the damage to the data structure of an information object, if there is no higher ethical considerations from traditional anthropocentric theories, leads to an unjustifiable "depletion of the infosphere". Floridi calls such harm or destruction "entropy." Although he recycles this term from physics, he does not mean the entropy of thermodynamics, which obeys the laws of the first. Instead, it – in its meaning – is an unjustified depletion of the infosphere, which can be avoided or minimized. In this regard, he proposes the following "fundamental principles" of information ethics:

0. entropy should not be inflicted in the infosphere (no law);
1. The last should be warned of its appearance;
2. entropy must be removed from the infosphere;
3. The prosperity of information entities, as well as the entire infosphere, needs to be promoted through the preservation, cultivation and enrichment of their properties [1, p. 434].

Thus, information ethics, seeing in any existing essence an information object with at least minimal moral value, shifts the focus of ethical reflection from the action, character and value of the human agent to the "evil" (harm, separation, destruction) from which the objects in the infosphere suffer. With this approach, any existing entity: humans, animals, organizations, plants, non-living artifacts, digital objects in cyberspace, intellectual property items, stones, Plato's abstractions, potential entities, disappeared civilizations – all can be interpreted as potential agents that affect others essence; but can – and as potential passive elements (lit. "sufferers", "patients", – "potential patients"), affect the other entities. Thus, Floridi's information ethics, Baynam believes, can be characterized as a non-anthropocentric ethical centered on the patient-centered aspect, in contrast to the traditional centered on the agent-centered theories of anthropocentric theories.

Some critics of his information ethics assert that his metaphysical attitude about the Universum's ineffective benefit is not necessary and unreasonable. Answering, Floridi writes: "It is about whether there can be good and being two sides of the same concept as Evil and Nothingness can be. A reader familiar with the history of Western philosophy is too much to talk about classical thinkers, including Plato, Aristotle, Plotinus, Augustine, Aquinas and Spinoza, who developed and substantiated this fundamental equation in various ways. For Plato, for example, Good and Being are internally connected. The Universe of Plato is permeated with value to the very roots, the value there is from the very beginning, and not imposed by some late-coming species of mammals – as if before evolution had a chance to stumble upon homosapiens, this Universe was value-neutral a reality devoid of any moral value "[2].

According to Florida, to look at something in a certain way, that is, to take a special level of abstraction in order to simulate it – a process that always has some purpose. If this latter is done well and fruitfully, then the very chosen prospect of

consideration is justified. In this case, notes Baynam, Floridi, understanding the Universum as internally good and consisting of information objects, their relationships and processes, reaches at least three significant things:

1. It gives meaning to that respect and reverence that people experience when they contemplate the vast and beautiful Universe (Taoists, Buddhists, Platonists, Aristotelians, Stoics, Spinozists, etc.).

2. Develops a way to apply moral criteria and sanity to a rapidly growing number of artificial devices and agents (robots, webbots, cyborgs, virtual communities, etc.) that billions around people.

3. Indicates a way of understanding the distributed moral responsibility within complex social agents, such as corporations, organizations, government structures, etc. [1, p. 435].

Bainam points out that Wiener was right when he predicted and described in the future the emergence of a society that would need ethical rules and procedures for the management of artificial agents. And the modern society now corresponds to this description. Therefore, the information ethic proposed by L. Floridi and J.W. Sanders has the following goal:

1. Give an effective description of the characteristics of the agent itself.

2. Provide a report on that good and evil that artificial agents can bring with them.

3. Explain how and why artificial agents can be considered morally sane, even if they "have no mind" and, accordingly, are devoid of mental states [1, p. 435–436].

Because a human being is a paradigmatic example of an agent, the characteristics of the latter must correspond to the human; In addition, they also need to approach softbots, robots and other artificial agents, such as virtual communities, organizations, corporations and governments. The characteristics developed by them include three criteria by which the entity must conform to be an agent.

1. Interactivity: the agent and his environment must interact with each other.

2. Autonomy: The agent must be able to change its own state, regardless of the interactions with that environment. Thus, the agent must have at least two states and be within certain limits cut off from his environment.

3. Adaptability: Interacting the agent with the environment should be able to modify the transitive rules, through which he can change his state. That is: the agent's ability to change his own states should develop on the basis of his own past interactions. On human beings or animals, we can say that they "learn from their own experience" [1, p. 436].

In order to determine whether a given entity is an agent, it is necessary to specify the level of abstraction on which the first is considered, since something on one level can be regarded as an agent, but at another level of abstraction – not. For example, a person is undoubtedly an agent – if we take into account our understanding of what a human person is – but viewed as only a physical object located in a fixed part of space-time, this person at such a level of abstraction is not agent.

Floridi and Sanders define the concept of a "moral agent" as follows: Any action can be morally qualified if and only if it can cause moral good or evil. An agent can be called moral if and only if it is capable of morally qualified action. The term "action" for Florida and Sanders does not imply that her agent has mental states like intentions or beliefs, not to mention "free will" (in all traditional meanings of the word). "Action" for them is just an activity, as a result of which an agent causes an effect. For example, an agent who is a computer "worm" that someone sent to the computer network of the nuclear power plant, where he develops and executes a decision, causing a catastrophe, is engaged in a morally evil action – despite his complete "brainlessness" and a complete lack of intentions or knowledge.

Similarly, a "brainless" computerized medical agent that saves a patient's life by injecting an appropriate medication during a crisis is involved in a morally good deed [1, pp. 436–437].

Further, Baynam also considers the response of Floridi and Sanders to criticize their understanding of the morality of "brainless" essences. Objections indicate that the latter can not be held responsible for what they are doing. Floridi and Sanders answer that this objection does not distinguish between "accountability", which allows "disapproval" and "condemnation" – and "responsibility", the bearer of which can be subject to condemnation and praise, punishment and reward. [1, p. 437].

Comparison of Wiener and Floridi

Despite the fact that the information era has only recently appeared, it has already included far-reaching technical, scientific, economic, political, social, psychological and philosophical shifts. Bainam limited himself to considering only a part of the relevant philosophical ideas of Norbert Wiener and Luciano Floridi concerning the nature of the Universum, man, artificial agents and society. Wiener was a pioneer who helped create most of the sciences and technologies that triggered the information revolution. He also had an impressive ability to "see from afar" many of the resulting social and ethical challenges of the current situation of the information society.

A few decades after it – equipped with new tools and results of computer science, system theory, logic, linguistics, semantics, artificial intelligence, philosophy of consciousness, philosophy of science and theoretical physics – Floridi made his ambitious program of information philosophy to put the concept of information in the bed of philosophy.

At the first comparison, notes Bynham, the views of Wiener and Floridi seem very similar. So, they both consider the Universe to be essentially informational – made from dynamically interactive information objects and processes. Both see information objects in human beings. Both say that entropy is an essential evil. However, a superficial glance deceives, since Wiener is a materialist, and Floridi is a Platonist, therefore they interpret the central ideas of entropy and information very differently. For the first, the information that constitutes the universe is physical and subject to physical laws. It is rather syntactic than semantic. This is the kind of information that carries radio waves, telephone lines, and television cables. It is

encoded in the DNA of every living entity and is contained in any subatomic particle. All physical entities, including human beings, according to Wiener, are patterns of such information that exist for a while, but gradually flows, decomposes and dissipates. Entropy is a measure of this erosion and dispersion. Wiener did not question whether the information from which the universe consists is digital or analog [1, p. 439].

However, for Florida, the information from which the world is built is unphysical and therefore does not obey physical laws, including the second law of thermodynamics. This Platonic information is the "indefinite points of the lack of uniformity", which constructs data structures not only of such familiar things as tables and chairs, people and computers, but also intangible Platonic entities, like possible creatures, intellectual property, as well as unwritten stories of disappeared civilizations (1, p.440).

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КОНЦЕПТ ЧАСУ ЯК ТОЧКА ПЕРЕТИНУ ФІЛОСОФСЬКОГО ТА МУЗИЧНОГО МИСЛЕННЯ (Е. ГУССЕРЛЬ – А. ВЕБЕРН, А. БЕРґСОН – О. МЕССІАН, Т. АДОРНО – А. ШЕНБЕРГ)

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