

HERITOLOŠKO-FILOZOFSKE IDEJE U ISTRAŽIVANJU PRIMENE OBNOVLJIVIH IZVORA ENERGIJE

HERITOLOGICAL-PHILOSOPHICAL IDEAS IN THE RESEARCH OF THE RENEWABLE ENERGY SOURCES IMPLEMENTATION

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Uporedo sa razvojem istraživanja obnovljivih izvora energije, poslednjih godina razvija se i moderna energetska paradigma u vezi sa različitim aspektima primene ovih izvora, odnosno energetske tranzicije. Filozofski aspekti odnose se na specifičnosti novih perspektiva posmatranja problema i načina rezonovanja u okviru tehnofilozofske tradicije, kao i u kontekstu savremenih okolnosti primene obnovljivih izvora energije. Heritološku dimenziju daje usmerenost na očuvanje civilizacijskih vrednosti i etičko ponašanje. U ovom radu u fokusu su heritološko-filozofske ideje prisutne u savremenoj akademskoj praksi.

Ključne reči: obnovljivi izvori energije; tehnofilozofija; heritologija

Along with the development of renewable energy research, in recent years, develop and a modern energy paradigm in relation to various aspects of the application of these sources, or energy transition. Philosophical aspects relate to the specifics of new perspectives on observation of problems and ways of resonating within the technophilosophical tradition, as well as in the context of the contemporary circumstances of the using renewable sources of energy. Heritological dimension gives focus on the preservation of civilizational values and ethical behavior. In this paper, the focus is a heritological-philosophical idea present in modern academic practice.

Key words: Renewable energy sources; technophilosophy; heritology

1 Introduction

The areas of heritology, philosophy and renewable energy sources, in the multidisciplinary field of research, unite the issue of presence and protection of cultural and civilization values [1]. The wider framework for these researches give complex issues of education and development of technologies, which are reflected in the way of thinking and planning the maintenance of environmental standards, support for society and local communities, as well as the creation of a perspective for sustainable development. It is noticed that the building of critical perspectives is predominantly related to the proper view to issues of environmental justice, related to collective identities and poverty [2], and that very little attention is dedicated to the preservation of culture and civilisation, specifically values of the intangible heritage. Therefore, in this paper, using the method of comparative analysis, we examine the heritological-philosophical ideas of theory and practice contemporary researchers and academic communities, Ideas that build intellectual space and the ways of forming attitudes on important issues of modern use of renewable energy.

Academic practice of energy philosophy in recent years indicates development of specific fields of philosophy: environmental philosophy (ecocentric philosophy of energy) [3], connecting to Intellectual history of Innovation (genealogical history) [4] and exploration of the space in which energy

transition is taking place [5]. Bibliographic reviews indicate that research is based on the narrow circle of traditionally used sources of techno-philosophy, such as: *Philosophy of the Enlightenment* [6], *The Philosophy and Practical Application of Industrial Research* [7], *Technics and civilization* [8], *Philosophy, Technology, and the Arts in the Early Modern Era* [9], *Can technology replace social engineering?* [10], *The concept of energy and its early historical development* [11], *Energy and equity*, [12], *Question concerning technology and other essays* [13] and similar themes. Having that in mind, in this paper, we also propose a view of other significant sources that would enrich academic practice and expand the intellectual basis for the study of renewable energy sources in the context of civilization values.

2 Energy and context of different civilizations

Each systematization of philosophical ideas about energy, in the context of the history of ideas, as a rule starts with Aristotle (Ἀριστοτέλης, 384 b.c. – 322 b.c.) [14]. In addition to the basic concepts of energy (ἐνέργεια) and entelechia (ἐντελέχεια), the concepts were also significant placed in Aristotle's *Categories* (Κατηγοριαί), through ontological and logical definitions of movement: genesis (γένεσις), disappearance (φθορά), increase (αύξησις), decrease (μείωσις), modification (ἀλλοίωσις) and a change in place (κατὰ τόπον μεταβολή) [15]. The attitude towards Aristotle's intangible heritage, in the history of ideas, is a parameter based on which directions of philosophical thought are interpreted. In this sense, it is possible to compare different lines in connecting intellectual thought about Aristotle and civilization values.

One of the intellectual lines flows through the Middle Ages in which knowledge about Aristotle's doctrine is transmitted through *Liber De Persona Et Duabus Naturis Contra Eutychem Et Nestorium* [16] (Boethius Severinus, 480—524), *Dialogus de Grammatico* (Anselm of Canterbury, 1033/4–1109) [17], *Metalogicon* (John of Salisbury, 1115—1180) (Fig. 1b) [18], *Didascalicon :De studio legendi* (Hugh of Saint Victor, c. 1096 –1141) (Fig. 1a) [19]. Contemporary research shows that many of the medieval instructional methods might prove beneficial to contemporary educators [18].

We also follow an interesting intellectual line in Arabian philosophy, where the Avicenna (980–1037) the creator of the School System in the Islamic world and Ibn Rushd (Lat. Averroes, 1126 – 1198) transmit, change and develop Aristotle's philosophy [20]. Abû Nasr al-Fârâbî (870 – 943) helps Islamic understanding of Aristotle's logic [21]. Some of the writings have made it easier for the Christian interpretation of Aristotle: thanks to Ibn Rushd, in Paris we find integral Aristotelism representatives such as Siger Van Brabant, one of the most fascinating figures of the medieval period [22].

In the next civilization step, Gerard of Cremona (Gerardus Cremonensis; c. 1114 – 1187), Italian translator of scientific books from Arabic into Latin, made it possible the Western world meets Aristotle's philosophy. St. Thomas Aquinas, as an innovator manages to express the Christian ideology in synthesis to Aristotelian terms, and wrote several important commentaries on Aristotle's works, (Fig. 1c)[23]. We find the visualization of this civilizational transmission in the picture from the Louvre Museum collection in Paris: Triumph of St Thomas Aquinas, “Doctor Communis”, between Plato and Aristotle, by Benozzo Gozzoli (1471) [24].

These were the beginnings of the journey of Aristotle's ideas through various civilizations. The integral course of all intellectual lines that have then developed to date, transcends the boundaries of this article. However, what we know for sure today, we have not revealed all the intellectual lines that have developed on the basis of Aristotle's work there are questions that are still very discussed [17, 25], not everything is written about the influence of Aristotle on the development of technical sciences, so we continue to search for complete explanations, in all science and geographic meridians [26].



Fig.1. Different civilization steps in the transmission of Aristotle's ideas: a- Hugh of Saint Victor writing his „Didascalicon“. Miniature in the manuscript Leiden, Bibliothek der Rijksuniversiteit, Vulcanius 45, fol. 130r. (detail) [27] ; b- First page of *Metalogicon* by John of Salisbury (detail) [28]; c - *Super Physicam Aristotelis*, 1595 [23]

3 Heritological - philosophical intellectual framework: One civilization line of harmonization

Unlike the previously mentioned sources that thematization of *space* (how the ideas are transferred from the spaces of Ancient Greece to Arabic and Latin civilization), in this review, in focus is thematization of the issues of *time* (different ways transferring ideas over time, in global civilization). At the same time, we point to the specific higher form of organization of knowledge model (Canon), which enables the heritological transfer of ideas over time. It is again a view of one of the possible intellectual lines.

Serbian-American Inventor, Physicist, Engineer, and Futurist, Nikola Tesla (1856–1943) [29], wrote about transporting natural processes in technological processes, in his philosophical treatise *The Problem of Increasing Human Energy - With Special Reference to the Harnessing of the Sun's Energy* [30], (Fig 2a). He emphasized that "[...]windmills, solar machines and machines were initiated by natural heat have limits available for the amount of power...". Visionary he was considering the possibility that electricity was obtained directly from the Sun, connecting it with Maxwell's theory („[...] This might be the case if the Maxwellian theory is true...“), according to which electrical vibration of all speeds should come from the Sun. He also anticipated the finding of new ways to obtain energy from the Sun, in accordance with its philosophy about the time in which an invention occurs, when a new situation occurs, i.e. some new principle for that.

The history of ideas also belongs to Mihajlo Petrović Alas (1868 –1943), Serbian mathematician and an academician, who leaning towards Platonism and who tried to constitute mathematical phenomenology (*Elements of Mathematical Phenomenology*, 1941), (Fig 2b), as a universal science that would cover a issues wide range of natural, technical, humanities and social sciences, linguistics and art. He thought that one of the most significant analogies exists among the phenomena of the electric current, heat transfer and the flow of fluids: „[...] It is so complete that these three types of phenomena, with their multiple and diverse variations, represent from an analytical point of view, one of the same problem, the solution of which only needs to be interpreted in three different ways.” [31].

In its capital book *A Climate. a philosophical study* (drafted 1929; redrafted 1931; revised 1935.) [32], Japanese philosopher Watsuji Tetsurō (1889-1960) has connected culture and civilization with Climate phenomenon. Carter and McCarthy writing in *Stanford Encyclopedia of Philosophy*, that Watsuji Tetsurō considered that each nation is shaped by its climate, specific geography, history and culture. His methodology of calling to awareness of the interconnectedness of all things, resulted to watching a human as an unified structure of the past, present and future. Also, Watsuji thought ethics was as a pattern of proper and effective social interactions: „[...] ethics is the study of the ways

in which men and women, adults and children, the rulers and those ruled, have come to deal with each other in their specific climatic conditions.“ [33]

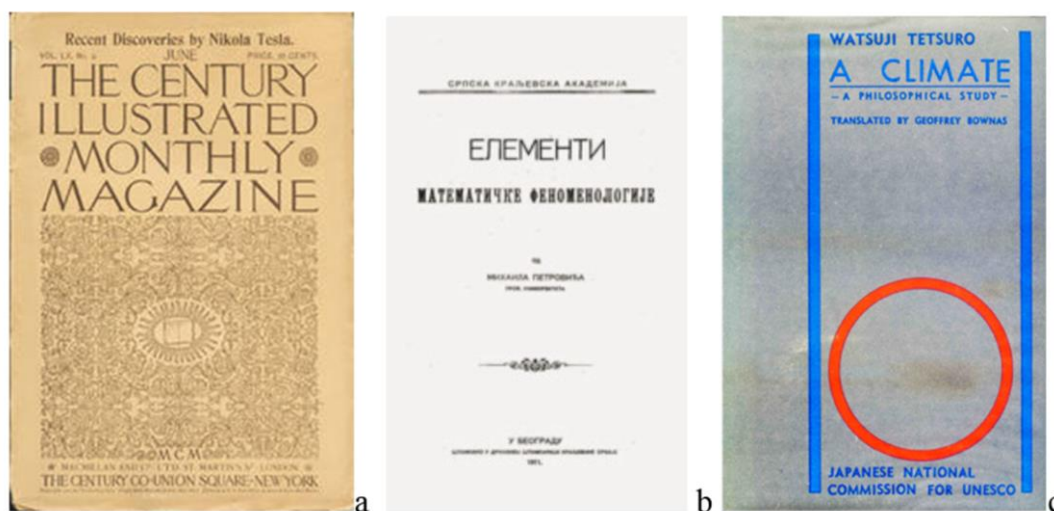


Fig 1: a- The edition of *The Century Illustrated Monthly Magazine* in which Tesla published an article *The Problem of Increasing Human Energy - With Special Reference to the Harnessing of the Sun's Energy*, 1900. [30]; b- *Elements of Mathematical Phenomenology* by Mihailo Petrović Alas, 1911. [31]; c- *A Climate: A Philosophical Study*, 1961.[32]

In the same time, about the climate, Milutin Milanković writes in his paper, *Kanon der Erdbestrahlung und Seine Anwendung auf das Eiszeitenproblem* published in 1941 in Belgrade (Fig 2a) [35] and the first translation in to English (*Canon of Insolation and the Ice-Age Problem*) was published in 1969 in Jerusalem [36]. His research about the distribution of solar radiation at the Earth's surface, a few decades later, still inspires contemporary research. For example, in a study *A long-term numerical solution for the insolation quantities of the Earth* [37], Jacques Laskar, astronomer and member of the French Academy of Sciences, with coauthors from *Astronomie et Systèmes Dynamiques* and *University of Santiago*, emphasizes that: “[...] The first computations of the variations of the obliquity (angle between the equator and orbital plane) due to the secular variations of the orbital plane of the Earth are due to Pilgrim (1904), and were later used by Milanković (1941) to establish his theory of the Earth’s insolation parameters. Since then, the understanding of the climate response to the orbital forcing has evolved, but all the necessary ingredients for the insolation computations were present in Milanković’s work.”

However, a broader, civilization context of *Kanon der Erdbestrahlung und Seine Anwendung auf das Eiszeitenproblem* provide research in the field of cultural anthropology. Milanković's canon ranked comparative with *Nomocanon* (Code of Law) (Fig. 2b) who had prepared at the beginning of the 13th century by Saint Sava, personality that had a double legitimacy: orthodox monk and founder of the autocephalous Serbian Orthodox Church. St. Sava's *Nomocanon*, the highest church and state legal act in medieval Serbia, and the oldest preserved Serbian legal act, based the *Synopsis of Stephen the Ephesian* (6th century) with the commentaries of Aleksije Aristin (gr. Ἀλέξιος Ἀριστηνός, b. ? - d. after 1166) [38] and Byzantine *Canonic Syntagma in fourteen titles* (unknown author, 6th century), which he translated and editing from Greek and which he supplemented and Byzantine chronicler and theologian Jovan Zonaras (gr. Ἰωάννης Ζωναράς, 12th century) [39]. The part of the Laws related to church law consisted and *Nomocanon of John Scholastica*, Rules of the Holy Apostles, Rules of the Holy Fathers, Decisions of Ecumenical and Local Councils and Mosaic legislation (3rd and 5th books of Moses).

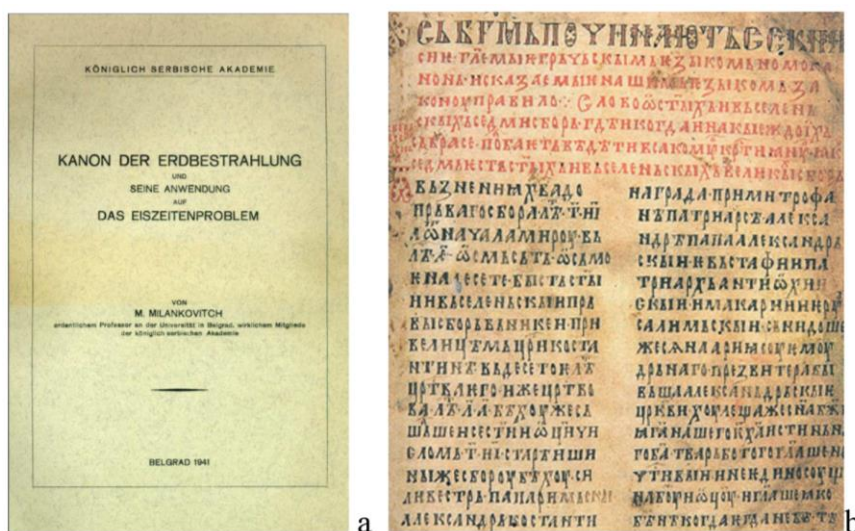


Fig. 2 : a - *Kanon der Erdbestrahlung und Seine Anwendung auf das Eiszeitenproblem*”, 1941, Royal Serbian Academy [35]; b – *Nomocanon of St. Sava, Ilovick copy created in 1262 at the monastery of St. Archangel Michael in Ilovica (detail)* [40]. Is kept in the Library of the Sciences Academy in Zagreb [41]

St. Sava's *Nomocanon* contains the interpretations and evaluation of the rules, as well as their adaptation and harmonization of the social context of Serbia in a way that enables the transplantation of theory of the symphony in Serbia [40]. As it stands out in the *Hilandar Monastery* web presentation, in the section *Writings and Gospels*, “[...] The part related to Civil Law consisted of: Excerpts from Justinian's Novels (around 550), a legal collection compiled by John Scholastic, *Collectio tripartita*, a collection of laws from Justinian's legislation and Prochiron (City Law) from 879, a collection of Byzantine civil, criminal and procedural law. By transplanting (receiving) Roman-Byzantine law, Serbia became an integral part of European and Christian civilization.” St. Sava's *Nomocanon* enacted at the council in the *Žiča monastery* in 1221 [42].

Researching the question of canon, as a heritological form of knowledge transfer, in *Encyclopedia Britanica*, in a determinant of *History of technology*, we find: “[...]The modern philosophy of progress, cannot be read back into the history of technology; for most of its long existence technology has been virtually stagnant, mysterious, and even irrational.” [43] However, when it comes to canons, philosopher of science, university professor of cultural anthropology and cultural diplomacy, Aleksandar Petrović emphasizes that there is no canon limitation: both canons, St. Sava's and Milanković's, connect Heaven and Earth. St. Sava this made through Symphony of Church and State, and Milanković through the Heaven Mechanics and chronology of the Earth. In his essay *Perfect Law of Freedom* Petrović explains that “[...] in Interpreting of St. Sava, how much in our power is, we say that through the centuries, the light of the Serbian culture, have the canon nature. This light we can see the best of through the prism of two canons, St. Sava's *Nomocanon* and *Canon* by Milutin Milanković”. [44]

This opinion fits into the Serbian intellectual tradition of understanding the culture and civilization of which is one of the most prominent intellectuals of his time, Slobodan Jovanović (1869 – 1958), a Serbian and Yugoslav writer, historian, lawyer, philosopher, literary critic, diplomat and politician. Slobodan Jovanović wrote about valorization of culture of nation and he considered that in cultural observation very important to take into account all the branches of spiritual life: not only his science, but also his faith, literature and art, politics and law, army and economy, customs and entertainment. [45]

If we make a brief overview of the basic ideas that make up the civilization line presented in this paper (Tab. 1), we determine that it is shown to agree with the definition of culture that gives in the early 21st century give *Metzler Lexikon Kultur der Gegenwart*: Culture represents everything that is the sum of “historical, individual and common, practical, aesthetic as well as mythical and religious forms of expression”. [46]

Table 1: One of the possible civilization lines

Scientist	Philosophical view	Harmonisation
Nikola Tesla	The Problem of Increasing Human Energy - With Special Reference to the Harnessing of the Sun's Energy	Human energy and Sun's Energy
Mihajlo Petrović Alas	Elements of mathematical phenomenology	Universal science and particular analogies
Watsuji Tetsurō	A Climate: A philosophical study	Culture and civilization with Climate phenomenon
Milutin Milanković	Kanon der Erdbestrahlung und Seine Anwendung auf das Eiszeitenproblem	Sun and Earth
Saint Sava	Nomocanon	Symphony of Church Law and State

As he emphasized the philosopher, writer and historian of the Middle Ages, Umberto Eco, "[...] In every century, the way that artistic forms are structured reflects the way in which science or contemporary culture views reality. The closed, single conception in a work by a medieval artist reflected the conception of the cosmos as a hierarchy of fixed, preordained orders." [47] How Modern Theorists notice, Umberto Eco agree on the complexity of such a world in the difficult times of the Middle Ages with the Byzantine historian Nicetae Choniatae [48]. They especially considered the indicative quote: "[...] Even Saraceni are merciful and mild compared to these people carrying on the shoulders of Christ's Cross" [49-51]. In the analysis of the methodology, which is still transmitted from the Middle Ages, until today, the historian's opinion also confirm: "[...] repeating of consecrated role models is the feature of the Middle Ages, and foundation on which society sets its own canons, building such a layered image of yourself and the world, made up of many already known images that give the necessary rhythm of the present." [52]

4 Conclusion

Heritological - philosophical ideas on energy, Sun, Earth and climate, are instruments for the development of new methodological directions in the research of the context for the development of new technologies and implementation of renewable energy sources, in framework of civilization values.

Research has shown that reviews of history of ideas can be useful in detecting intellectual lines that connect ideas in space and time, as well as need to be new reviewed by the paradigm that claims the *Modern Philosophy of Progress, Cannot Be Read Back Into The History of Technology*. On the contrary, contemporary research shows that we are still not sure that we have reached the final interpretations of all the heritological-philosophical ideas about energy, which have so far passed through space and time, until contemporary civilization.

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