

**CHALLENGING INTEGRALISM,
ARISTOTELIAN ENTELECHEIA, HYLE AND MORPHE (FORM),
AND CONTEMPORARY CONCEPTS OF INFORMATION,
TOUCHING UPON THE AETIOLOGICAL ISSUES OF CARCINOGENESIS**
(with reflecting feedbacks of Paul BEAULIEU, Ana BAZAC, Anna MAKOLKIN,
Leonardo CHIATTI, Milan TASIĆ and Dariusz SZKUTNIK)

Josef BREMER¹, Konstantin KHROUTSKI², Rudolf KLIMEK³, Ryszard TADEUSIEWICZ⁴

ABSTRACT. *The given paper reflects and unites the Integralist (originally independent) scholarly endeavors and results of the four authors, that were initially realized through the decades of preceding intensive scientific pursuits. In general, this collective work is devoted to a dedicated reader who strives to develop Integralist (systemic, holistic) research, and, chiefly – is interested in studying the methodological bases of such (Integralist) scientific activity. Another essential point is that our sought-for scholar recognizes (explicitly, or implicitly) – together with the indispensable significance of modern “scientific method” (that is based on the Dualist mathematical physicalism) – the Aristotelian teleological physics (archetype of Entelechial Hylemorphist naturalism), as the essential constituent of present-day Integralist research and development (in its contemporary forms, primarily including current theories of Information). In fact, up to now – in our time of urgent challenges, firstly aiming to approach the scholarly breakthroughs that would ensure progress in addressing the multiple and interrelated crises and challenges the world faced (including the acute problem of cancer diseases) – we all, still, entirely base our efforts (rigorously believing in) the methodological (cosmological – comprehensive, in general) principles of research that were established yet in the XVII-th century. Francis Bacon (1561–1626), who fiercely fought (and eventually won) against the Aristotelian naturalism (based on Entelechism and Hylemorphism) – in the name of triumph of Dualist idealism (mathematics) and physicalism (empiricism and reductionism), and their experimental (i.e. artificial) application – Bacon himself taught (in the 1620, in his famous “Novum Organum”) that “truth is rightly called the daughter of time and not of authority”⁵; and concluded that scientific gentlemen (of his time) were under “the spell of antiquity, of authors and of consent”, which had “so shackled men’s courage that (as if bewitched) they have been unable to get close to things themselves.” [Ibid.] In very deed, we have the same situation (but, four centuries later – already with quite an opposite meaning); and science certainly is not a religion (wherein, man pursues One the same religion and speaks exclusively the same language – of the given fundamental invariable “religious” doctrine), but, quite the contrary – the institute of science (as the essential constituent of culture) naturally undergoes the dynamic cycles of development and transformation; and, for this, in our XXI-st century – the time is ripe. The contents of the present article are given below.*

KEYWORDS: *theory of information, Aristotle’s entelechism and hylemorphism, aetiology of four causes, Aristotle as a biologist, contemporary formulas of information, Aristotelian influence on Thomas Aquinas, animate and inanimate information, Aristotle’s teleological scientific naturalism*

¹ Academia Ignatianum Cracow, POLAND.

² Novgorod State University after Yaroslav-the-Wise, Veliky Novgorod, RUSSIA.

³ Fertility Centre, Cracow, POLAND.

⁴ AGH University of Science and Technology, Cracow, POLAND.

⁵ See: Bacon, Francis (2000). *The New Organon*. Edited by Lisa Jardine and Michael Silverthorne. Cambridge: Cambridge University Press (first published 1620 as *Novum Organum*), p. 69.

Contents

Introduction: challenging issues of the theory of information

1. The *entelechia* and *hylemorphist* (Organicist – teleological) essence of Aristotle's scientific naturalism

1.1. Aristotle's entelecheia cannot be translated by the English "actuality"

1.2. Aristotle's naturalist (entelechia – from within) Bipolar and Triadic OrganonKosmology

2. Aristotelian four causes

3. Aristotle as a biologist

4. Contemporary Integralist achievements associated with teleological physics constituents

4.1. General theory of functional systems, as the outstanding neo-Aristotelian achievement of Pyotr Kuzmich Anokhin

5. Aristotelian influence on Thomas Aquinas

6. Ancient form (*morphe*) and contemporary information

7. Three basic Types of information: Aristotle's; Plato's; and Integralist

8. Information processing in living organisms

9. Animate (natural, *entelechia* – *from within*) and inanimate (artificial, *idealist* – *from without*) Types of information; and their relation to carcinogenesis aetiology

10. Two contemporary Integralist formulas of information: – $E = mc^2$ – of Rudolf Klimek; and $T = IC$ – of Ryszard Tadeusiewicz

Conclusion: contemporary concepts of information should equally use Aristotle's teleological scientific Naturalism

“Truth is rightly called the daughter of time and not of authority”
Francis Bacon, 1620.

Introduction: challenging issues of the theory of information

Etymologically, the English word “information”⁶ is derived from Latin *informare* – “to give form to the mind” (“to discipline”, “instruct”, “teach”). In turn, the ancient Greek word for form was *μορφή* (*morphe*; cf. *morph*) and also *εἶδος* (*eidos*) “kind, idea, shape, set”. The latter word (*eidos*) was famously used in a technical philosophical sense by Plato to denote the ideal identity or essence of something (developed in his theory of Forms, or theory of Ideas, wherein Plato argues that non-physical, but substantial forms, or ideas – represent the most accurate reality). Essentially, at present, *eidos* is chiefly associated with thought, proposition, even concept. Aristotle also uses the term *eidos*, but, basically – he applies the notion *morphe* for expressing the meaning of “form”. Herein, we face a hugely challenging problem (in respect to understanding the essence of Aristotle’s teleological physics; the same crux concerns the term *hyle* that is discussed in the paper). The point is that Aristotle’s *morphe* (although stemming from *eidos*) has, too, the meaning of constitutive nature, type and species – “appearance, constitutive nature, form, type, species, idea”⁷ [Peters, 1967, p. 46]. As it is provided in the judgment of Edith Stein, within her hylemorphic theory – “Aristotle’s *morphe* (*μορφή*, *forma*) may be considered the root of individual essence.”⁸

Noteworthy, Aristotle’s *morphe* is not static (as each Plato’s form) but essentially dynamic (having its/her/his own inherent generated potency); as it is sagaciously noted by Thomas J. Sheehan, “Aristotle expressed the movedness of natural beings as *morphe* in the sense of a being’s self-positing in *eidos*, that is, as *energeia* or *entelecheia*, but, as the rest of Greek philosophy, he left unarticulated the self-with-drawing hiddenness of *aletheia* itself.”⁹ [Sheehan, 1973, p. 22] Therefore, if the term “form” (which, in modern times, as rule – semantically points to the outer “visible shape or configuration of something”¹⁰ under study) – if this meaning of “form” (and matter) replaces the general meaning of *morphe* and *hyle* (the rational notions that have been contributed to the world culture by Stagirite) – then all this makes the study of Aristotle’s philosophy (and his Organicist Type of rationality – teleological physics, scientific naturalism) absolutely incomprehensible, in principle.

In the instant paper we are going to present the scientific significance that Aristotle’s basic rational notions possess in his theoretical investigations of nature (*physis* – φύσις), especially about the soul-brain relation, and to show in what scale

⁶ Referring to Wikipedia – <https://en.wikipedia.org/wiki/Information>.

⁷ See: Peters, Francis E. (1967). *Greek Philosophical Terms: A Historical Lexicon*. New York: New York University Press.

⁸ See: Baseheart, Mary Catharine. (1997). *Person in the World: Introduction to the Philosophy of Edith Stein*. Springer, Netherlands.

⁹ See: Sheehan, Thomas J. (1973). “Heidegger: From Beingness to the Time-Being,” *Listening*, 7: 17–31.

¹⁰ See: http://www.oxforddictionaries.com/us/definition/american_english/form

this role is logically and substantially consistent in comparison with the three essential approaches to studying information – two contemporary notions of information: 1) Chalmer’s idea of information as a fundamental law of organization; 2) Shannon’s and Weaver’s syntactical model of information transmission; and 3) the original Aristotelian – Organicist (Entelechial) Naturalist – bases of studying the informational phenomena and processes. In the latter relation, we aim at the development of current disputes on Aristotle’s aetiology (theory of four telic causes), thus essentially developing his other foundational conceptions (gnoseological, methodological, anthropological): of *telic* (τέλος, εντελέχεια) inherent natural activity; of potency (δύναμις) and activity (ενέργεια), which are the principles of an important dichotomy that is essential for the Bipolar and Triadic – dynamic and cyclic existence of each real (evident, tangible) natural thing; and of morphofunctional organ (μορφή – *morphe*, “form”).

Under these approaches, we strive to explore present-day theories of information from various standpoints, including the foundations of Aristotle’s Organicist (Entelechial) scientific naturalism. In this, in our examination, we deliberately use both the foundational treatises of Aristotle, as “Physics”, “On the soul”, and “Metaphysics”; and his biological works that have been many times unattended as sources for knowledge about his theory of form (μορφή – *morphe*), and which are important for the development of present-days theories of information. Emphatically, in his biological works Aristotle makes constantly mention of the form of an animal. Even short shaped analyze of his biological works could help us to clarify some of the many questions settled by him in his metaphysical publications about causes, body, soul and form (*morphe*).

Highest achievements in the realm of complex system physics can be considered as the top level of contemporary Integralist¹¹ studies. For that matter, the founder of the General systems theory – Karl Ludwig von Bertalanffy – he asserts that “Philosophy and its descendant, science, was born when the early Greeks learned to consider or find, in the experienced world, an order or kosmos which was intelligible and, hence, controllable by thought and rational action.” [Bertalanffy, 1972, p. 21]¹²; and, further on – Bertalanffy emphasizes that “one formulation of this cosmic order was the Aristotelian world view with its holistic and teleological notions.” [Ibid.] In connection with the authoritative opinion of Ludwig von Bertalanffy (with which we fully agree), and our own conviction – we generally agree that contemporary Integralist endeavors and “systems thinking as such has its roots in Aristotle's philosophy (Von Bertalanffy, 1972)” [Klijn, 1995, p. 25]¹³

¹¹ Within the framework of our (under development) Triadologic Biocosmological approach, we use to distinguish (among Three) the intermediate (Integralist) Type of rationality, and to highlight its cognitive autonomy – we, therefore, use the capitalized term for Integralist.

¹² Bertalanffy, Ludwig von (1972). “The History and Status of General Systems Theory,” In: G.J. Klir (ed.) *Trends in General Systems Theory* (New York: John Wiley & Sons), pp. 21–41.

¹³ Klijn J.A. (1995). *Hierarchical concepts in landscape ecology and its underlying disciplines*. Wageningen (The Netherlands), DLO Winand Staring Centre, Report 100:1–144.

1. The *entelechia* and *hylomorphist* (Organicist – teleological) essence of Aristotle's scientific naturalism

Aristotle and Plato, Greek greatest geniuses, occupy the unique position in the history of world culture, for their (super)systems of knowledge have been taken, explicitly or implicitly, as foundations (archetypes and patterns) – the Types of rationalities – for building the contemporary educational systems and general institutional organizations of science and other sociocultural activities. In this, we strongly argue (in BCA¹⁴) that Plato's Type of cosmology (i.e. all the existing forms of comprehensive rational knowledge that are reduced to Platonist Dualism and Idealism) – Plato's Type currently dominates (or dictates); while, in contrast, the polar Aristotle's naturalist Type of all-encompassing knowledge (essentially *Entelechia* and *Hylomorphist*) – Aristotle's Type of (Organicist) rationality falls into a disadvantage state of deep stagnation through the relation (general commitment) of global scholarly community. The urgent task, therefore, is to rehabilitate the genuine significance of Aristotle's (super)system of knowledge, taken as a whole – as the autonomic (one of the main Three) Type of rationality and Type of cosmology – (*Organon*)Kosmology – of the Organicist naturalism essence. Immediately, herein, in respect to the term *organon* – we refer to the essential note of Mariska Leunissen¹⁵:

The term *entelecheia* was coined by Aristotle, and designates a completed state resulting from an internal movement towards this state; see Ritter (1932; 1934) and Johnson (2005, 88–90). The traditional reading of *organikon* as “having organs” or “being composed of organs” (see, e.g., Ross 1961, 51, 313; Hamlyn 2001, 85) must certainly be wrong: elsewhere in the Aristotelian corpus the term *organikon* (coined by Aristotle; see Byl 1971, 132) always means “instrumental” and there is no reason to assume it means something different here. [Leunissen, 2010, p. 53.]

To be capable of finding a rational account of permanent change in the domain of natural beings and following this to plant foundation for biology and physics as an explanatory science Aristotle presents his framework of aetiological (causal) relations. He speaks about the cause (driving natural force) in terms of four different indications each illuminating both aspects of the more universal question: “what for the thing is?”; and “why something is?”

According to him, understanding and explaining a natural being indicates understanding of the four – on the one hand different, but on the other hand closely related to each other – views of it. To pose the mentioned questions means to identify main factors in the process of potentiality actualization. Significantly, Aristotle's aetiology is unambiguous and indispensable, in respect to its constituting essential foundational theories, at least the concept of *substance* [ὑποκείμενον]; of *four telic*

¹⁴ BCA – the Biocosmological Association, launched in Veliky Novgorod, Russia, in the 2010; its website: <http://en.biocosmology.ru/>

¹⁵ Leunissen, Mariska. *Explanation and Teleology in Aristotle's Science of Nature* (Cambridge: Cambridge University Press, 2010).

causes (aimed at the perfection of the inherent virtue and potency – ἀρετή και δύναμη, and ultimately generating the natural τέλος – the effect of life activity); of *potency and activity* [δύναμη και ενέργεια]; and of *motion and change* [κίνηση, μεταβολή, και αλλοιώτον]. They all are reduced to the Aristotelian integral *Organon* Kosmology – the essentially Organicist (of the Entelechial scientific naturalist) archetype of Stagirite; and, in principle (as we urge) – generated by him the ahistorical Type of rationality (i.e. that is universally active everywhere and in any time – at past, present and future epochs of natural and scientific development). Essentially, within the proposed Triadological approach – Aristotle's Organicist Type (of teleological scientific naturalism) is one of the main Three (equal) Types of rationality – together with the polar Plato's Type, with its external ontology and epistemology; and manifold expressions of the intermediate Integralist Type (wherein Information is the chief notion).

The main problem is, at present, under the demands of “modern scientific method” – that Aristotle's crucial conceptions and notions (as *entelecheia*, *dunamis* and *energeia*, *hyle* and *morphe*, *topos*, *kinesis* and μεταβολή, και αλλοιώτον, etc.) – they all currently are badly misinterpreted (or undeveloped). We do need, therefore, to rehabilitate urgently (for scientific use) their genuine (teleological, Organicist – Entelechial) significance, but doing all this in the foundational course of reinstatement the Triadologic essence of contemporary rational (scholarly) knowledge. However, the latter grand task is not the scope of the given exploration. As a first step, we should approach and start tackling the more sectoral issues, but which allow addressing the questions of cancer study and treatment of cancer diseases. In this perspective, the issue of Aristotle's *entelecheia* (which is badly excluded from modern academic analysis and debate) ought to be resolved.

To start with, we fully agree with Will Durant who, showing “The Story of Philosophy” [1926]¹⁶, essentially concludes that “Entelecheia – having (*echo*) its purpose (*telos*)¹⁷ within (*entos*); one of those magnificent Aristotelian terms which gather up into themselves a whole philosophy.” [Ibid., p. 69] In a similar manner, Wilhelm Windelband, in his “A history of philosophy” [1914]¹⁸, comes to a following conclusion:

Being is that which comes to existence in the processes of Nature. This self-realization of the essence in the phenomena, Aristotle calls entelechy. The central point of the Aristotelian philosophy lies, therefore, in this new conception of the cosmic processes as the realization of the essence in the phenomenon, and the respect in which it is opposed to the earlier

¹⁶ Durant, Will. (1962). *The Story of Philosophy: the Lives and Opinions of the Greater Philosophers*. (New York: Time Inc., Time Reading Program Special Edition, [first published, 1926]).

¹⁷ But we cannot agree with the translation of *telos* as “purpose”; for, *telos*, in Aristotle's meaning, is rather ‘the needed result of life activity’.

¹⁸ Windelband, Wilhelm. *A history of philosophy: With especial reference to formation and development of its problems and conceptions*. 2nd ed., trans. J.H. Tufts (London: Macmillan & Co., Ltd., 1914).

explanation of Nature consists therefore in carrying through in conceptions the teleology which Plato had only set up as postulate, and developed in mythical, figurative form. [Windelband, 1914, p. 140]

1.1. Aristotle's entelecheia cannot be translated by the English "actuality"

In the first place, we are to stress that Aristotle's (and, in general, Greek polysemous word) *telos* has not basically the meaning of "purpose", or "end", or "goal", but precisely epitomizes the idea of being complete, perfectly finished, i.e., ultimately – of having effectively fulfilled a goal (thus gaining the needed result of action). In turn, W.M. Ritter insightfully concludes, in respect to *telos*, "although "end" is commonly given as its equivalent it seems that for one difference *telos* never meant end as of a stick or a road, a very common meaning of our word."; and that "the Greek word *telos* has quite different associations from the English word 'end'." [p. 380] In his work, Ritter concludes "the significant fact that *telos* is not the original word for which "purpose" is substituted." [p. 382]; and, in general, arrives at a profound conclusion on *entelecheia* "as wholeness rather than purpose", as well as, referring to Aristotle – "that the *ontos* of ontology and of ontogeny of later times must be one and the same when a particular person is considered" [p. 400]; and that "the basic kindred between ontology and ontogeny, clearly seen (though not directly specified) by Aristotle, recognizes the ontological element in that *entelecheia*" [p. 393].

In fact, *entelecheia* never can be identified exclusively with "actuality" (and, thus, never can be translated as "actuality"). Essentially, due to Aristotle's basic conception – that "soul is the *entelecheia* of the body" (see citations below), and as soul cannot be present only in activity, and (at the same time) be absent in potency – the thing's (subject's) *entelecheia* naturally falls as much onto activity, as to its/her/his potency.

As well as a kind of stating that "substance is actuality" is a direct logical contradiction in reasoning. However, for instance, in J. Barnes' edition of *The Complete Works of Aristotle* [Barnes, 1984]¹⁹, we see:

But substance is actuality [*εντελεχεια*], and thus soul is the actuality [*εντελεχεια*] of a body as above characterized. Now there are two kinds of actuality [*εντελεχεια*] corresponding to knowledge and to reflecting. (*De Anima*, 412a21-23)

In another edition of Aristotle's *De Anima*, of Robert Drew Hicks [1907]²⁰, the word "actuality" (that replaces "*entelecheia*") also is used; however, therein, the translation is more conform to Aristotle's original Organicist (archetype of) rationality that is developed and introduced into the world culture by Stagirite.

¹⁹ Aristotle. *On the Soul* (trans. by J. A. Smith). In Jonathan Barnes, editor, *The Complete Works of Aristotle (The Revised Oxford Translation, Vol. 1*, pages 641–692. Princeton: Princeton University Press, 1984).

²⁰ Aristotle. *De Anima*. Ed. by R. D. Hicks (Cambridge: Cambridge University Press, 1907).

Below, the translated in English excerpt of Aristotle's *De Anima* is exemplified [Ibid., 1907]:

Such substance is actuality [ἐντελεχεια]. The soul, therefore, is the actuality [ἐντελεχεια] of the body above described. But the term 'actuality' [ἐντελεχεια] is used in two senses; in the one it answers to knowledge, in the other to *the exercise of knowledge*. Clearly in this case it is analogous to knowledge: for *sleep, as well as waking, implies the presence of soul* (all *italics* are mine. – K.K.); and, whilst waking is analogous to the exercise of knowledge, sleep is analogous to the possession of knowledge without its exercise; and *in the same individual the possession of knowledge comes in order of time before its exercise*. (De Anima, 412a21-28)²¹

In his thorough study of Aristotle's use of the term *entelecheia* (and interpreting Aristotle's studies precisely as naturalist explorations), William E. Ritter [1932]²² brings into focus that Aristotle already had the term *energeia* (his another invention), especially in discussing "the actual as contrasted with the potential" [p.380], but he felt "the need of a new term" [ibid.]. We are to highlight likewise the thoughtful conclusion of W.E. Ritter that *entelecheia* is the term of entire process (of ontogeny) and the issue of ontology [p. 386]; and that, paradoxically (but essentially), *entelecheia* is used more frequently in the *Physics* (as well as *Metaphysics* and *De Anima*) than in zoological treatises [p. 383]. Ritter speaks about "the deplorable perversion of Greek, especially of Aristotelian," and emphasizes Aristotle's "intrinsic «principle of motion» (growth and differentiation)" [p. 390] – "a whole series of stages till the full-fledged, functionally mature organ is present, i.e. has come-to-be" [Ibid.] In conclusion, Ritter speaks of *entelecheia* (and Aristotle's aim of its invention) as "«the entirety», the «complete reality» – germ, material, motion, form and whatever, if anything more, there may be that is «not separable from the things themselves»" [p. 390].

The judgments of the two renowned scholars are notable – John Herman Randall Jr. and David Charles – who express doubts as to whether "Aristotle can survive translation into the Latin substantives of the scholastic tradition". J.H. Randall stresses that modern scholars "have come at Aristotle from the standpoint of the later medieval developments and problems" [Randall, 1960, p. iv]²³; and that the early modern scientists (including Bacon, Descartes, and Kant) had "discarded Aristotle in rebellion against his religious interpreters." Randall also seriously doubts, "whether it is possible to state his (Aristotle's. – K.K.) fundamental functionalism in the Latin tongue." [Ibid.] In turn, David Charles argues that Aristotle, in his view, is not "the type of Aristotelian essentialist they (modern scholars. – K.K.) attack." [Charles,

²¹ Significantly, in this passage of *De Anima*, Aristotle speaks about the polar Sleeping and Waking cycles of life activity.

²² See: Ritter, William E. (1932). "Why Aristotle Invented the Word *Entelecheia*," *Quarterly Review of Biology*. Vol. 7, No. 4, pp. 377–404.

²³ See: Randall, John H. Jr. (1960). *Aristotle*. New York, Columbia University Press.

2000, p.3]²⁴ At least, we ought to pay attention to the conclusion of John Monfasani²⁵:

In translating history, one should wish to replicate the *res* of the original, not the *verba*. But in translating scientific texts, especially Aristotle, one must follow the Greek as closely as possible within the limits of literate Latin, neither adding or subtracting anything lest the translator substitute his understanding of the material in place of Aristotle's or of readers more insightful than the translator. [Monfasani, 2006, p.291]

1.2. Aristotle's naturalist (entelechia) – from within) Bipolar and Triadic Organon Kosmology

Notably, in the Wikipedia article "Physics (Aristotle)", a key point is emphasized: "For Aristotle, the motion of natural things is determined *from within* (*italics* is mine. – K.K.) them, while in the modern empirical sciences, motion is determined *from without* (more properly speaking: there is nothing to have an inside)."²⁶ Thus, in principle, we can defend the equality of the two polar Types of rational knowledge – of Aristotle's *internal* aetiology and gnoseology, which study the Organicist world-cosmos, and that is (*teleo*)driven by inherent Naturalist Entelechia (*from within*) causes and forces; and the contrary Plato's *external* ontology and epistemology – driven *from without* – which are basically Dualist and Idealist.

In the *Physics*, Aristotle stresses the essential Bipolarity and Triadicity of the real world, and emphasizes the decisive role of analogy in realizing scientific pursuits:

So there is a sense in which the ultimate principles of the sum of changing things are two, but a sense in which they are three; (190b30-31)

...these two principles ("the contraries")²⁷ are inadequate, for they cannot possibly act or be acted upon directly each other. This difficulty, however, disappears if we admit, as a third principle, a non-antithetical 'subject' [υποκείμενον] (190b34-35)

...we may escape the duality of the opposition by considering one of its terms taken singly as competent, by its absence or presence, to accomplish the whole change [μεταβολή]. Then there will only be the 'ultimately underlying' factor in Nature [υποκείμενο φυσικόν]... And of this 'underlying' factor we can form a conception by analogy; (191a7-11).

...to be regarded as the more 'essential' factor [οὐσία τοῦ εἶδους] of a thing

²⁴ See: Charles, David (2000). *Aristotle on Meaning and Essence*. Oxford, Clarendon Press.

²⁵ See: Monfasani, John (2006). "George of Trebizond's Critique of Theodore Gaza's Translation of the Aristotelian 'Problemata'." In: De Leemans P. and Goyens M. (eds.), *Aristotle's Problemata in Different Times and Tongues*, Leuven University Press, pp. 275–294.

²⁶ See at: https://en.wikipedia.org/wiki/Physics_%28Aristotle%29

²⁷ The note of translators.

[υποκείμενο]; but that there are three principles altogether, (191a7-11)²⁸.

Primarily, we need to focus on Aristotle's foundational theory of potency (δύναμις) and activity (ενέργεια), which are the principles of an important dichotomy that is essential for the Bipolar and Triadic – dynamic and cyclic existence of each real (evident, tangible) natural thing. At present, the notion *entelecheia* (which is crucial in Aristotle's *potency/activity* theory) is hardly applicable in the practice of a modern scholar; and, moreover – its genuine meaning is misunderstood.

2. Aristotelian four causes

In our approach, aiming at the development of Integralist knowledge – we strive to explore present-day theories of information from various standpoints, including the foundations of Aristotle's Organicist (Entelechial) scientific naturalism. In this, in our examination, we deliberately use both the foundational treatises of Aristotle, as "Physics", "On the soul", and "Metaphysics"; and his biological works that have been many times unattended as sources for knowledge about his theory of form (*morphe* – μορφή), and which are important for the development of present-days theories of information. Emphatically, in his biological works Aristotle makes constantly mention of the form of an animal. Even short shaped analyze of his biological works could help us to clarify some of the many questions settled by him in his metaphysical publications about causes, body, soul and form (*morphe*).

In accordance with Aristotle, "science" means "causal knowledge", in other words knowledge about what causes are is crucial for every science. We have knowledge of anything only when we have understood its causes.

Since we think that we understand something when we know its explanation, and there are four sorts of explanation (one, what it is to be something; one, that if certain items hold it is necessary for this to hold; another, what initiated the change; and fourth, the purpose), all of them are proved through the middle term. [Aristotle, *Posterior Analytics*, 94a20]²⁹

This can be taken together in the following way: we request to know the essence (the "sauciness"), the necessary conditions, the (efficient) cause, and the purpose (*telos*). In this sense Aristotle's "causes" are often better thought of as "explanations" or "reasons". In his "Metaphysics" Aristotle refers back to an artist's or a craftsman's workings to describe four types of causation that are at the basis of the natural world:

'Cause' means (1) that from which, as immanent material, a thing comes into being, e.g. the bronze is the cause of the statue and the silver of the saucer, and so are the classes which include these. (2) The form or pattern,

²⁸ Translations are taken from: Aristotle. *The Physics*. Books I–IV, LCL 228. Trans. by P.H. Wicksteed and F.M. Conford (Cambridge: Harvard University Press [first published in 1929], 1957).

²⁹ Aristotle (1993). *Posterior analytics*. Translated with a commentary by Jonathan Barnes, (Oxford: Clarendon Press, 2nd edition).

i.e. the definition of the essence, and the classes which include this (e.g. the ratio 2:1 and number in general are causes of the octave), and the parts included in the definition. (3) That from which the change or the resting from change first begins; e.g. the adviser is a cause of the action, and the father a cause of the child, and in general the maker a cause of the thing made and the change-producing of the changing. (4) The end, i.e. that for the sake of which a thing is; e.g. health is the cause of walking. For 'Why does one walk?' we say; 'that one may be healthy'; and in speaking thus we think we have given the cause. The same is true of all the means that intervene before the end, when something else has put the process in motion, as e.g. thinning or purging or drugs or instruments intervene before health is reached; for all these are for the sake of the end, though they differ from one another in that some are instruments and others are actions. [Aristotle, *Metaphysics*, V, 2, 1013a]³⁰

Take as an example the relation of Phidias to his 21 marble sculptures (completed and dedicated in 438 BC): The quantity of marble that he used to manufacture the group of statues is the material cause. Phidias is the efficient cause; he produced the group of statues. The final cause is the goal of making that group of statues. Phidias created the sculptures for the sake of honoring Athena Parthenos. When Phidias hews a part of one of the sculpture according to the requested form (e.g. of Zeus), it was the form that functioned as the organizing cause of that part of marble. Form is causally in charge for the structural arrangement of material objects.

In turn, in the *Physics*, Aristotle emphasizes the decisive role of analogy in realizing scientific pursuits – that “there will only be the ‘ultimately underlying’ factor in Nature [υποκείμενο φυσικῶν]... And of this ‘underlying’ factor we can form a conception by analogy; (191a7-11).” As we also know well, Aristotle placed sufficient emphasis on the differentiation of the notions “natural” and “artificial”; and “he never proposed an explanatory theory of organisms that would make artificial products of them, as is really the case with the modern mechanistic theory of life.” [Ritter, 1932, p. 388]. However, in the excerpt given above, regarding *hyle* (as we can see) – Stagirite applies the analogies³¹ of “bronze”, “silver”, and “marble”. On the other hand, he lived in the era with little or no objective biological knowledge, and he knew nothing about the advances of modern biology (especially, of biochemistry, molecular biology, and integrative physiology – to use effectively his basic “method of analogy”). Therefore, it is possible to assert that Aristotle (having the modern information available) – would certainly prefer (for demonstrating a true *hyle*) the examples of nitrogenous bases (nucleotides), or amino acids, or chemical elements; or the “functional blocks” (referring to A.M. Ugolev’s conception of “universal

³⁰ Aristotle, *The Metaphysics*, Arcadia ebook 2016, Edited by Roger Bishop Jones (Book 5, sec. 2). Translated by W.D. Ross.

³¹ Equally to Aristotle’s “analogy” (in studying the intrinsic natural principles) – we have introduced the method of “essential metaphor”; for instance, see: Khroutski, 2015.

functional blocks”)³² – as the genuine analogies of *hyle*. The essential point is that *hyle*, which is a purely Aristotle’s term and (in the definition of F.E. Peters) that “does not have its origins in a directly perceived reality – as is true in the case of extension or magnitude (*megethos*, q.v.) – but emerges from an analysis of change (*Phys.* I, 190b-191a)”. In this case (of using “matter” instead of *hyle*), as we clearly see – Aristotle’s conceptual constructions become really unavailable for understanding. One more conclusion of F.E. Peters is essential:

Hyle, then, is the primary substratum of change (*hypokeimenon*, q.v.; *Phys.* I, 192a), the “thing” that receives the new *eidos* (*Meta.* 1038b; for the Platonic antecedents, see *genesis*). But to call it a “thing” is misleading. *Hyle* is like a substance (*tode ti*; see *Phys.* I, 190b, 192a), but it is not such because it lacks the two chief characteristics of substance: it is neither a separate existent (*choriston*, q.v.) nor an individual (*Meta.* 1029a) [Peters, 1967, p. 89]³³

Aristotle explicates the question “why something is” and “what for the thing is” in a fourfold way, which helps us to catch the status of the notion of “form” (*morphe*) in his methodology (it means if we examine his above indicated conception of the four causes): Material (or *Hyletic*) Cause: that as the result of whose presence something comes into being – e.g., the marble of a statue (or, in our contemporary era of high objective knowledge, for analogy – we certainly should select amino acids or nitrogenous bases – nucleosides, nucleotides, organic molecules, which are essential biomolecules in all life-forms on Earth). Formal (*Organic* or *Morphogenetic*) Cause: the form or pattern (or, the “functional organ”), and which can refer to the essential formula and the classes which contain it – e.g., the ratio 2:1 and number commonly is the cause of the octave-and the parts of the formula. Efficient (*Generative*) Cause: The origin of the first beginning of change or rest; e.g., the person who plans is a cause, the father is the cause of the child (or, of the generation of a “functional organ”). Final (*Telic* or *Effective*) Cause: The same as “end”; e.g., as the “end” of walking is health. For why does a man walk? “To be healthy,” we say, and by saying this we consider that we have delivered the final cause. Essentially, likewise, as we are going to discuss below – *Telic* Cause is the generation (achievement, eventual actualization) of a needed effect – the result of action.

Aristotle, who rebuts Plato’s theory of forms as eternal (i.e. a temporal and a spatial) entities, still uses “form” (*morphe*) as a technical term. The quoted passage reveals that knowing the form or structure of an object, i.e., the information, is a necessary requirement for understanding it. Insofar information is an essential aspect of classical epistemology.

The Aristotelian concept of “form” – *morphe* (i.e. a cause which is not itself a

³² See: Ugolev, Alexander M. (1987). *Estestvennye tekhnologii biologicheskikh sistem* [Natural technologies of biological systems]. Leningrad, Nauka. 317 pp. (In Russian).

³³ See: Peters, Francis E. (1967). *Greek Philosophical Terms: A Historical Lexicon*. New York: New York University Press.

material part of the body, but is active in its development and determines – mostly thought constraints – its principal features) relates in fact straight to the modern, scientific concept of “information”, as something that is transmitted across generations and determines the development of the organisms. Even the teleological perspective of his teaching on the human soul and of his physics, which seemed to have been decisively eliminated by the mechanistic character of Cartesian and Newtonian physics, has been partly scientifically rehabilitated by present-day biologists and information scientists³⁴.

We, likewise, in respect to Aristotle’s general physicalist attitude (and, referring to Helen S. Lang’s³⁵ studies) – we ought to stress that all four causes of Stagirite are basically *telic* (not only the Final cause). In the first placed, as the scholar states: “although the term «teleology» is regularly applied to Aristotle, it is a modern one, and is quite definitely fixed in meaning by contemporary use.” [Lang, 1998, p. 36] Thus, due to this misinterpretation, “Aristotle’s teleology is often identified with his account of «final causes» as if, apart from them, the rest of his physics (or philosophy more generally) were not teleological.” [Ibid., p. 274]. Essentially, regarding Aristotle’s foundations of science – Helen Lang focuses on “the active orientation of potency toward actuality”, and that it is crucial to the account of “things that are by nature.” [Ibid., p. 47] Therefore, in Aristotle’s theory, “what is potential is not thereby passive: in natural things what is potential is caused by its proper actuality because it is actively oriented toward it.” [Ibid., p. 64] The scholar concludes that “this active orientation of the potential for the actuality that completes it lies at the heart of the order and teleology of nature.” [Ibid.] Another important point argued by Helen Lang is that Aristotle’s “position stands in sharp contrast not only to Plato but also to later philosophy, including the Stoics and Philoponus [Ibid.]

In this vein (and we also address this issue below, in the Section 5, therein dealing with Thomas Aquinas’ concept of “*in-form-atio*”) – we can afford the Biocosmological and Integralist (both, internal and external, but, primarily, *from within*) interpretation of the meaning of “information”: as “*in-*” (based *within* – endogeneously), “*form-*” – *morphe* (as morphofunctional structure – *telic functional organ*), and “*atio*” (essentially, as aetiological force – basically acting *from within*).

3. Aristotle as a biologist

Aristotle may be regarded as the founder of Comparative Embryology and Comparative Anatomy. He approved different modes of classifying the animals – not only in conformity with their structure but also in the way dependent on function such as their manner of life or of their mode of reproduction. One among others subjects of his investigations was the mechanism of inheritance:³⁶ What are the causal

³⁴ See e.g. Jonas, Hans (1984). *The Imperative of Responsibility. On Search of an Ethics for the Technological Age*. Chicago: University of Chicago Press.

³⁵ See: Lang, Helen S. (1998). *The Order of Nature in Aristotle's Physics: Place and the Elements*. New York: Cambridge University Press.

³⁶ Henry, Devin (2006). “Aristotle on the Mechanism of Inheritance,” *Journal of the History of Biology*, Vol. 3/39, pp. 425–455. “Aristotelian form get passed on to an offspring in the act of

mechanisms behind the transmission of this kind of biological form (*morphe*)?

“Some offspring take after their parents and some do not; some after their father, some after their mother, as well in respect of the body as a whole as in respect of each of the parts, and they take after their parents more than after their earlier ancestors, and after their ancestors more than after any casual persons. Males take after their father more than their mother, females after their mother. Some take after none of their kindred, although they take after some human being at any rate; others do not take after a human being at all in their appearance, but have gone so far that they resemble a monstrosity, and, for the matter of that, anyone who does not take after his parents is really in a way a monstrosity, since in these cases Nature has in a way strayed from the generic type.” [Aristotle, *Generation of Animals*, 767b1-11]³⁷

The causal explanation for that Aristotle is looking should demonstrate in what way some of the features that differ among members of a species can be methodically led back, by means of a mechanism of inheritance (heredity), to those same features in their ancestors. He does not say precisely which features are inherited, but it is clear that at least some of them will be features below the level of the species – creatures that vary from one individual to the next.

After critics of the Pythagora’s “traveling library” notion that semen collected inheritable features Aristotle offered an inherence theory that was remarkably new for its time: perhaps females, like males, cooperate in delivering actual material to the fetus – a form of female semen. And perhaps the fetus is formed by the reciprocal contributions of male and female elements. Using analogies, he called the male contribution a “principle of movement”, where “movement” was not word for word “motion”, but “instruction”, or “information”. In contemporary terminology we could name that “movement” a “code”. The actual material exchanged during sexual intercourse was merely a substitute for a more obscure and mysterious exchange. Matter, in point of fact, wasn’t really matter; what transfers from man to woman was not matter, but an information message. Like a carpenter’s handwork to a piece of wood, male semen transported the instructions to flesh of a child.

The male does not emit semen at all in some animals, and where he does this is no part of the resulting embryo; just so no material part comes from the carpenter to the material, i.e. the wood in which he works, nor does any part of the carpenter’s art exist within what he makes, but the shape and the form are imparted from him to the material by means of the motion he sets up.” [Aristotle, *Generation of Animals*, 730b12-13]

reproduction? What are the mechanisms underlying the transmission of biological form? In other words, how exactly does human beget human(horse beget horse, etc.)?”. Ibid., p. 425.

³⁷ Aristotle, *Generation of Animals*, Harvard University Press, Loeb Classical Library, Translated by A.L. Peck <http://www.loebclassics.com/view/aristotle-generation_animals/1942/pb_LCL366.401.xml>.

The transmission of inheritance, as Aristotle apprehended it, was intrinsically the transition of information (“motion he sets up”) that was needed for the establishing of an organism from the ground up. Information was then used to build an organism from the Ground up: message grows material body. So what happens if an organism matured? It generated male or female semen once more – transforming material back to message. But if inheritance was transmitted as information, then how was that information encrypted? In this, however, taking into account the Bipolar and Triadic essence of Biocosmological (*OrganonKosmological*) real processes (κίνησις, μεταβολή, και αλλοιώσιον of real things), and the essentially Integralist essence of the notion Information – we need to distinguish (in this complex field) between the external – *from without* – Dualist (Plato’s) Type of influence, of which “message” is a clear representation; and the opposite (*from within*) potencies and activities, aimed at the self-evolutionary releasing (liberating) of the inherent (genetic) potential functions.

Then, in responding to the questions: What was the “crypt” of inheritance?; and What for this crypt exists?; and How was the informational material bundled and transported from one human body to the next?; Who encrypted the informational code, and who retranslated it, to bring off a human person? – We can argue that the self-evolving hierarchy of ascending levels of life organizations (in accordance with Aristotle’s natural Kosmic hierarchy given in his *De Anima*) – is the eternal Kosmic order of dynamic Organicist existence. Thus, the Organicist Kosmos (Biocosmos; and Aristotle’s *OrganonKosmology*) is ever Hierarchic and Heterogeneous, as well as Bipolar, Dynamic and Cyclic – Triadic, and of natural *entelechiā ontogenesis* essence, realizing its/her/his self-ascending in the complexity of organization (and its exhaustion and corruption at the end of each cycle), and, ultimately, executing its/her/his macro-evolution (individual ontogenesis). In this *OrganonKosmos*, each thing is predisposed to achieve its/her/his ultimate *topos* (place), but doing this not for the sake of further eternal movement in a chaotic space (as in Plato’s biocosmology). Quite the reverse, in Aristotle’s Kosmos, each entity is the manifestation of *entelechiā* and *hylēmorphism* – by carrying into execution, eventually, the natural *telic* Functionalist (Entelechial) unity of *hylē* and *morphe*, and its/her/his Organicist (wholesome efficacious) – *hylēmorphist* – activity.

In his “The History of Animals” (*Historia Animalium*) Aristotle understood “history” as a term analogical to our contemporary “biological systematic”, i.e. as the study of the spreading of living forms, study of the scientific arrangement of information about animals. The primary function of this study is to realize the goal of causal explanation. The targeted explanations make use of reference to goals and functions of the animals:

“These preceding statements, then, have been put forward thus in a general way, as a kind of foretaste of the number of subjects and of the properties that we have to consider in order that we may first get a clear notion of distinctive character and common properties. By and by we shall discuss these matters with greater minuteness.

After this we shall pass on to the discussion of causes. For to do this when the investigation of the details is complete is the proper and natural method, and that whereby the subjects and the premises of our argument will afterwards be rendered plain.” [Aristotle: *The History of Animals*, 491a10-12]³⁸

To “pass to the discussion of causes” means for Aristotle to paid considerable attention to the problems of reproduction and heredity, examining what factors cooperate in what ways. Aristotle’s teleology with its final cause played an extraordinary important role in his biological researches. He was profoundly convinced that no organ was given to an animal without a goal. Thus he was cautious to distinguish between final and variable features. Final features were those essential to an animal species, while variable features consisted of qualities that develop rather than being naturally endowed.

The causes concerned in the generation of the works of nature are, as we see, more than one. There is the final cause and there is the motor cause. Now we must decide which of these two causes comes first, which second. Plainly, however, that cause is the first which we call the final one. For this is the Reason, and the Reason forms the starting-point, alike in the works of art and in works of nature. [Aristotle: *On the Parts of Animals*, 639b10]

Animals are multilayered systems organized for the purpose to perform a holistic set of functions and operations. First of all, the biologist Aristotle searches to demonstrate the priority of goal-causation to moving-causation³⁹, then the priority of analysis of an animal’s form (which, according to him, is equitable with the soul of animals⁴⁰). In the next step he is going to analyze the material components of the animal (that is its body⁴¹), and the occurrence of a particular kind of hypothetical and conditional necessity that is efficient where goals and form acquire primacy.

Inside of his “Parts of Animals” Aristotle begins by delineating his purpose. He is going to arrange a set of standards for judging natural investigations. This arrangement occurs on the basis: 1) of the discussing the suitable levels of suchlike analysis; 2) of the investigations of the modes of causality and necessity that are used in biological explanations; 3) of the relation of form (*morphe*) to matter (*hyle*) in living objects.

³⁸ Aristotle, *The History of Animals*, Translated by D’Arcy Wentworth Thompson <http://classics.mit.edu/Aristotle/history_anim.1.i.html> In: Aristotle: *On the Parts of Animals*, Translated by William Ogle <http://classics.mit.edu/Aristotle/parts_animals.html>. Aristotle’s presents an attempt to deliver causal understanding about the sort of information one finds sorted in History of Animals chapter I-IV, i.e. information about the uniform and non-uniform parts of animals.

³⁹ “The mode of necessity, however, and the mode of ratiocination are different in natural science from what they are in the theoretical sciences; of which we have spoken elsewhere. For in the latter the starting-point is that which is; in the former that which is to be.” Aristotle: *On the Parts of Animals*, 640a5.

⁴⁰ Cf. Aristotle, *On the Parts of Animals*, 641a.

⁴¹ “...the body, if it is to do its work, must of necessity be of such and such a character, and made of such and such materials.” Aristotle: *On the Parts of Animals*, 642a11.

4. Contemporary Integralist achievements associated with teleological physics constituents

All this is entirely appropriate for the contemporary scientific conceptions (achieved within the contemporary Functionalist systemic approaches), like that of “functional organ” and “dominant” of Alexey A. Ukhtomsky⁴² (which a kind of predecessor of P.K. Anokhin’s notion of “functional system”); and wherein “the theory of dominant” means “a universal biological principle that determines activity of all living systems” [Egiazaryan and Sudakov, 2007, p. 198]⁴³. Another strong (neo-Aristotelian) conception of “universal functional blocks” (that are very close to Aristotle’s notion of *hyle*) is realized by the Russian scholar (physiologist) Alexander M. Ugolev [1985, 1987]⁴⁴; the latter is accomplished within Ugolev’s general scholarly approach of “modern functionalism”. In the Chapter 5, of his monograph on “natural technologies” [1987], entitled as “Universal functional blocks as the basis of complex functions organization” – Ugolev discloses the essence and significance of “functional blocks”.

In relation to Ugolev’s “functionalist” endeavors, we cannot fail to distinguish and evaluate the research model and conception (called “mosaic”) that is thoroughly explored and elaborated by Georges Chapouthier – a specialist in biology and medicine, and who is a deep thinker. Herein, in respect to “mosaic” – Chapouthier applies “the artistic sense of the term, the «whole», an image, leaves autonomy to its diverse parts, its tesserae, which keep their form, their color or their brilliance.” [Bouraoui, 2016]⁴⁵ The scholar’s approach, as genuinely Integralist – that naturally unites (synthesizes) “two great principles” of polar essence – “of juxtaposition and integration and leading to mosaic structures” [Chapouthier, 2013, p. 209]⁴⁶ In general, author’s “mosaic conception,” similarly to Ugolev’s and Anokhin’s genuine Integralist approaches (that are discussed) – Chapouthier strives to reach the “universality of the construction of complexity” [Bouraoui, 2016]; and his “principles of juxtaposition and integration leading to mosaic structures, can be found in several

⁴² Whose indispensable works still are not translated into English; see: Ukhtomsky, Alexei A. (1950). *The Dominant as a Factor of Behavior*. Collected Works, in Vol. VI. Leningrad: Leningrad University Press. (in Russian); a valuable resource is the collective monograph: Mihai Nadin (eds.) *Anticipation: Learning from the Past. The Russian/Soviet Contributions to the Science of Anticipation*. Heidelberg: Springer, 2015; which Part 1 is devoted to “Alexei A. Ukhtomsky and Dominance Studies”.

⁴³ See: Egiazaryan, Galina G. and Sudakov, Konstantin V (2007). “Theory of functional systems in the scientific school of PK Anokhin. Journal of the History of the Neurosciences 16: 194–205.

⁴⁴ See: Ugolev, Alexander M. (1985). *Evolyutsiya pishchevareniya i printsipy evolyutsii funktsiy: elementy sovremennogo funktsionalizma* [Evolution of digestion and principals of evolution of functions: elements of modern functionalism]. Leningrad, Nauka. 544 pp. (In Russian); Ugolev, Alexander M. (1987). *Estestvennye tekhnologii biologicheskikh sistem* [Natural technologies of biological systems]. Leningrad, Nauka. 317 pp. (In Russian).

⁴⁵ See: Bouraoui, Hédi (2016). “Interview of Georges Chapouthier by Hédi Bouraoui,” *Revue CMC Review* Vol. 3, No 2. URL: <http://cmc.journals.yorku.ca/index.php/cmc/issue/view/2280/showToc>

⁴⁶ See: Chapouthier, Georges (2013). “Biocosmology and biology – their fruitful collaboration,” *Biocosmology – neo-Aristotelism* Vol. 3, No. 2 (Spring 2013), pp. 201–211.

other fields involving complexity: memory, consciousness, language, drawing, music, technical objects, mathematics, social structures, dialectics and ethical stances.” [Chapouthier, 2013, p. 201]; and which have the universalizing perspectives ahead. In his *mosaic* conception, essentially, “complex living structures are built as «mosaics» or as entities where, at each level, properties of the «whole» leave a large degree of autonomy to the properties of the component parts.” [Chapouthier, 2010, p. 92]⁴⁷ In general, this is a purely Aristotelian substantiation. However, as a true Integralist scholar – Georges Chapouthier considers himself as “an Aristotelian who aims to adapt the message of Aristotle for the modern world” [Bouraoui, 2016]; at that he adds, emphatically, that “Aristotle’s conception of the universe is fundamentally biological.” [Ibid.] Certainly, we (authors of this paper) fully support and put our names to this statement.

There are many other bright (essential) achievements and contributions (within the scope of Biocosmological Integralist endeavors). As for the studies that interlink genuine Integralist approaches with biomedical fields of research, and, at that, introduce (as a substantive constituent) a distinct and lucid analysis of Aristotle’s teleological naturalism – we are to highlight several outstanding works. In 2013, Arthur Saniotis and Maciej Henneberg presented a joint profound work, entitled “Conceptual challenges to evolutionary biology: a necessary step” that received a lively response and discussion. Notably, in responding to this sound research – three critical works immediately appeared: Georges Chapouthier’s “A need for holistic spectacles”⁴⁸; Stephen Modell’s “Medical and public health implications of biological essentialism and reductionism”⁴⁹; and Konstantin Khroutski’s “Forming and evolutionary vector to the Aristotelian pole of scientific Organicism (Biocosmology)”⁵⁰.

A special direction is the development of rational holistic foundations that refer both to Western and Eastern traditions of research. In this vein, the in-depth studies of Karl W. Kratky and Felix Badelt deserve attention. Karl Kratky addresses the study of (bi-)polarity and triadicity in various circumstances, including the important Chinese cosmological foundations and the notions of *yin* and *yang*, *qi* and *taiji*; the triads in Indian and Tibetan medicine systems; as well as in homeopathy; and concerning the contemporary issues that include the theory of Metasympathetic nervous system, by Alexander D. Nozdrachev; and Nikolay P. Brusentsov’s concept of “Ternary dialectical informatics”; and some BCA’s propositions.⁵¹ In the same perspective, of

⁴⁷ Chapouthier, Georges (2010). “Reflections on the consequences of Biocosmology in modern biology,” *Biocosmology – neo-Aristotelism* Vol. 1, No. 1 (Winter 2010), pp. 92–98.

⁴⁸ Chapouthier, Georges (2013). “A need for holistic spectacles,” *Biocosmology – neo-Aristotelism* Vol. 3, No. 1 (Winter 2013), pp. 17–19.

⁴⁹ Modell, Stephen (2013). “Medical and public health implications of biological essentialism and reductionism,” *Biocosmology – neo-Aristotelism* Vol. 3, No. 1 (Winter 2013), pp. 20–27.

⁵⁰ Khroutski, Konstantin (2013). “Forming and evolutionary vector to the Aristotelian pole of scientific Organicism (Biocosmology)” *Biocosmology – neo-Aristotelism* Vol. 3, No. 1 (Winter 2013), pp. 28–51.

⁵¹ Kratky, Karl W. (2015). “Bipolarity and triadicity in various contexts,” *Biocosmology – neo-Aristotelism* Vol. 5, No. 2 (Spring 2015), pp. 144–157.

exploring the parallels and substantive foundations between the Western and Eastern rational thoughts, focusing upon the old Chinese patterns – Felix Badelt has undertaken and realized a thorough examination of the issue. [2014a, 2014b]⁵²

Still, there are a few references to Aristotle in the works of Asian scholars, for instance, in the works of Li Runhu⁵³, and Chengxin Zhao with Li Tong⁵⁴. However, we hope, it is their big perspective ahead. Indeed, although the languages of comprehension are different (of Asian naturalism and Aristotle's Organicism) – but our general standpoint (in BCA) is that their essence is one the same; i.e. related to the same (Organicist) Type of Rationality (Type of cosmology). In other words, both approaches belong to the Organicist naturalism, wherein (although language systems and conceptual apparatus are different) – the main notions and concepts refer to the naturalist (belonging to Nature) causes and forces that act *from within*; and which are essential Organicist, i.e. Bipolar, dynamic and cyclic – Triadic; self-evolving, Functionally (essentially – entelechially) Heterogeneous and Hierarchic, etc. At this, to the point, the term “dialectic” (that is currently appreciated and dominating), but which is really inopportune, even inappropriate (for, it belongs ultimately to Plato's pole of abstract reasoning). Therefore, the grand task of translation Asian great naturalist cosmologies into Aristotle's (Organicist, *entelechial*) and Integralist (*holistic*, of complex systems) languages is within our grasp.

Eventually, special significance ought to be referred to the three more comprehensive researches: of Rudolf Klimek (who is the co-author of this article); of Peter Heusser, whose work is aimed at the study of “active information” and “a modern revival of Aristotle's «formative cause», applicable in physics, biology, psychology and medical anthropology”⁵⁵; and of Spyridon A. Koutroufinis' recently published work on “Modern biological neo-teleologism vs. Aristotle's genuine *telos*”⁵⁶. In the latter, the author starts with the fact that “in the first half of the 20th century the attempt was made to banish all teleological thinking from biology.” [Koutroufinis, 2016, p. 414]; and that these change agents had been very successful in realizing their unfavorable intent. Hopefully, in the first half of XXI-st century, in

⁵² Badelt, Felix (2014a). “Human evolution based upon old Chinese patterns? Rationally realizing psychosocial evolution through a well-balanced polarity in thinking, behavior and feeling,” *Biocosmology – neo-Aristotelism* Vol. 4, Nos. 1&2 (Winter/Spring 2014), pp. 138–152. ; Badelt, Felix (2014b). “WU-XING for psychology – An ancient model to discuss psychosocial evolution and degeneration” *Biocosmology – neo-Aristotelism* Vol. 4, No. 3 (Summer 2014), pp. 284–301.

⁵³ Runhu, Li (2015). “Traditional Chinese medicine's holistic thoughts,” *Biocosmology – neo-Aristotelism* Vol. 5, No. 1 (Winter 2015), pp. 126-130.

⁵⁴ Zhao, Chengxin and Tong, Li (2016). “Naturalistic perspectives of traditional Tibetan medicine and contemporary relevance,” *Biocosmology – neo-Aristotelism* Vol. 6, No. 2 (Spring 2016), pp. 273-285.

⁵⁵ Heusser, Peter (2011). “«Active information» – A modern revival of Aristotle's «formative cause», applicable in physics, biology, psychology and medical anthropology” *Biocosmology – neo-Aristotelism* Vol. 1, Nos. 2&3 (Spring/Summer 2011), pp. 161–166.

⁵⁶ Koutroufinis, Spyridon A. (2016). “Modern biological neo-teleologism vs. Aristotle's genuine *telos*” ” *Biocosmology – neo-Aristotelism* Vol. 6, Nos. 3&4 (Summer/Autumn 2016), pp. 414–426.

turn, we will be lucky in our attempt to break this blockade.

In the given (of teleological physics) perspective, a series of essential works likewise was presented by Dariusz A. Szkutnik, who started with studying the scholarly heritage of Hans Driesch's vitalism; but, further on – he presented detailed analysis and accurate assessment of scientific developments within the General theory of functional systems, by Pyotr K. Anokhin. D. Szkutnik's last contribution is entitled as “In search of the specific parameter of life – general methodological comments”⁵⁷. In very deed, P.K. Anokhin's functionalist approach holds a special place in the development (rehabilitation) of genuine Aristotle's *entelechia* naturalism. To start with, we cannot pass over the basic notion of the “result of action”, in P.K. Anokhin's framework of the General theory of functional systems.

4.1. General theory of functional systems, as the outstanding neo-Aristotelian achievement of Pyotr Kuzmich Anokhin

In his monograph “Biology and Neurophysiology of Conditioned Reflex” [1974]⁵⁸, Anokhin substantiates the concept of “systemogenesis as an evolutionary basis for the development of unconditioned reflexes” [Anokhin, 1974, pp. 65–105]; and “The functional system as a basis of the physiological architecture of the behavioral act” [ibid., pp. 190–254]. Likewise, the scholar emphatically refers to the deep-rooted (of the neo-Aristotelian essence) tradition among Russian physiologists, firstly naming Sechenov, Vvedenskii, and Ukhtomskii, and their contribution to the development of the naturalist phenomenon of “conditioned (internal) inhibition” [ibid., pp. 255–272]. Eventually, in his approach, Pyotr Anokhin realized a grand discovery – of a very important new quality of physiological functions – their “anticipation of future events” [Egiazaryan and Sudakov, 2007, p. 198]⁵⁹. In general, he formulated the concept of a specific apparatus on which the properties of reinforcement are imprinted and that permanently estimates the parameters of practically achieved results by reverse afferentation. Anokhin called it “the apparatus acceptor of action results” [Ibid.]. In turn, if we have apparatuses for the “anticipation of future events” (and this is the objective fact that has been proved by Anokhin and his colleagues) – then this is the direct confirmation of internal (*from within*) bases for the realization as of thing's (subject's) current processes, as of its/her/his entire ontogenetic (evolutionary) levels of growth and development.

“The anticipation of future events is the fundamental principle of anticipatory reflection as developed by Anokhin”⁶⁰ [Bardram, 1997, p. 20]; this fundamental

⁵⁷ Szkutnik, Dariusz A. “In search of the specific parameter of life – general methodological comments,” *Biocosmology – neo-Aristotelism* Vol. 6, Nos. 3&4 (Summer/Autumn 2016), pp. 453–464.

⁵⁸ Anokhin, Pyotr K. (1974). “Biology and Neurophysiology of the Conditioned Reflex and its Role in Adaptive Behavior. Oxford: Pergamon Press.

⁵⁹ Following the conclusion of authors, Egiazaryan and Sudakov [2007].

⁶⁰ Bardram, Jakob E. (1997). “Plans as Situated Action: An Activity Theory Approach to Workflow Systems.” In *Proceedings of the Fifth European Conference on Computer Supported Cooperative Work* (ECSCW'97), Lancaster, UK. Kluwer Academic Publishers, pp. 17–32.

principle essentially realizes the “planning recurrent actions through anticipatory reflection” [Ibid.] Konstantin V. Sudakov concludes that “functional systems form mechanisms that anticipate actual events and correct the results by comparing their parameters with those required by dominant needs of the organism.” [Sudakov, 1998, p. 411]⁶¹ We cannot but stress the other crucial qualities of P.K. Anokhin’s General theory of functional systems, identified by Konstantin Sudakov, firstly that it provides a level of universality – that “Universality, constructivity, and practical usefulness of the principal scheme of the functional system allows its application to phenomena of different classes (machines, organisms, society” [Sudakov, 1998, p. 171] Sudakov highlights the principal elements of functional system’s “central architecture” proposed by P.K. Anokhin: 1. Stage of afferent synthesis; 2. Stage of decision making; 3. Stage of formation of the acceptor of the action result; 4. Stage of activity of the system directed toward obtaining a result; 5. Result of the system activity. [Ibid., pp. 172–173]

All the more important, in respect to Anokhin's theory of functional systems – is the uncovering of cardinal principles (realized by K.V. Sudakov), and which genuinely have the essence of a Copernican revolution in scientific knowledge. Sudakov writes:

...the theory of functional systems⁶² puts forward certain new ideas:

1. It denies the prime importance of external stimuli in behavior. The behavior of a living organism is determined, in addition to external stimuli, by internal needs, genetic and individual experience⁶³, and effects of situational stimuli that create the pre-stimulus integration of excitations, which is activated by the triggering stimulus.

2. Systemic excitation that forms the goal-directed behavioral act does not unfold in a linear manner; rather, it involves the anticipation of actual results of the behavioral activity...

3. The goal-directed behavioral act is not terminated after the action, as suggested by reflex theory; rather, it continues until the useful adaptive result satisfies the dominant need, and the appropriateness of reverse afferentation is evaluated by the acceptor of action results⁶⁴.

Essentially,... Functional systems, caused by dominant needs⁶⁵, determine the activity of living organisms that transform their environment. [Sudakov, 1997, p. 412]⁶⁶

⁶¹ Sudakov, Konstantin V. (1998). “To the Centenary of P.K. Anokhin, a Great Russian Physiologist,” *Integrative Physiological and Behavioral Science*, Vol. 33, N0. 2, pp. 171–175.

⁶² In general outline (in our Biocosmological approach), we can confidently replace the notion “functional system” into Aristotle’s *entelecheia*, although the latter has the deeper and broader significance.

⁶³ I.e. – *from within*.

⁶⁴ I.e. – *from within*.

⁶⁵ I.e. – *from within*.

⁶⁶ Sudakov, Konstantin V. (1997). “The theory of functional systems: General postulates and principles of dynamic organization (dedicated to the Anokhin Centenary),” *Integrative Physiological and Behavioral Science*, October-December 1997, Vol. 32, No. 4, pp. 392–414.

Undoubtedly, the notions of “anticipation of future effects” and “anticipation of actual results”; or “result of activity” and “acceptor of action results”; or “internal dominant needs” and “internal determinative stimuli”; or “functional organ” and “functional system” – which are cornerstones in the theories of Ukhtomsky, Anokhin and Ugolev (mentioned above) – all these notions are incomprehensible, in principle, within the modern “new scientific method” and that is considered to be a sacred and inviolable type of modern mentality (and it is a privilege of a modern scholar always to believe in this “new scientific method”, and s/he never can criticize it; although this “new method” was established yet in the XVII-th century by Francis Bacon and other outstanding Modern European thinkers), and wherein the observer (modern scholar who ought to follow Plato’s cosmology) is strictly (dualistically) separated from the natural world, and who treats the nature (natural world) as the external chaotic (mechanical) interrelation of materialist (tangible) bodies, and which are totally devoid of internal telic qualities. Not surprisingly, contemporary conscientious scholars declare of the existing dominance (or dictatorship, of “the new inquisition”⁶⁷; or “a new intellectual apartheid”⁶⁸ – of the One philosophy and One science over all the alternative sources.

In this respect, a substantive reference is made by Evgenie A. Yumatov – to P.K. Anokhin’s [1969] judgment that, “specific mechanisms of subjective consciousness generation cannot be described analytically, even though their exact information relation to the initial parameters of the objective world is beyond doubt”⁶⁹. In this paper, the author states that subjective states of individuals reflect real psychophysiologic processes, and that the question how the brain generates its inner spiritual world remains one of the greatest secrets of the Nature⁷⁰.

At the same time, an essential point is that not only Russian physiologists (Sechenov Ukhtomsky, Pavlov, Anokhin, Ugolev, Simonov, whose achievements are discussed) but the entire modern scholarly tradition of Russian science (since the XVIII-th century) has essentially the naturalist (of teleological naturalism) character. Indeed, the achievements of Russian scholars fully and clearly exemplify this assertion. Among their great advances, the following major accomplishments ought to be mentioned: “*the inherent principles of a civilization*” in the cyclic civilizational theory by Nikolay Ya. Danilevsky; “*goal-directedness*” of evolutionary processes by Karl Ernst von Baer; the physiological conception of “*internal inhibition*” and the basic psychological notion of “*free will*” by Ivan Sechenov; “*Tectology: the universal science of organization*” by Alexander A. Bogdanov; the conception of the ruling

⁶⁷ See: Wilson, Robert Anton. (1987). *The New Inquisition: Irrational Rationalism and the Citadel of Science*. Falcon Press, Phoenix, Arizona, USA.

⁶⁸ See: Christian, David. (2002). “Science in the Mirror of «Big History».” In: Albert Van Helden (auth.), Ida H. Stamhuis, Teun Koetsier, Cornelis De Pater, Albert Van Helden (eds.) *The Changing Image of the Sciences*. Springer, Netherlands. Pp. 141–170.

⁶⁹ The cited work is: Anokhin, P.K. (1969). The psychic for of the reality reflection. In: Pavlov, T., Ed., *Lenin’s Theory of Reflection, Science and Art*, Sofia, Part 1, Chapter 3, 109, (in Russian).

⁷⁰ See: Yumatov, Evgenie A. (2013). “The psychophysics of a human brain subjective activity,” *World Journal of Neuroscience* Vol.3, No. 2, pp. 61–68.

orthogenetic “*internal principle*” in the evolutionary theory of “*nomogenesis*” by Lev S. Berg; intrinsic “*cyclic development*” of economic processes by Nikolay Kondratieff; “*the goal reflex*” and “*unconditional reflex*” in Ivan Pavlov’s theoretical constructions; “*the dominant theory*” and the conceptions of “*functional organ*” and “*chronotop*” by Alexei A. Ukhtomsky; “*intrinsic activity of living matter*” by Vladimir Vernadsky and his theories of *biosphere* and *noosphere*; “*the general theory of functional systems*”, based on the conception of the leading significance of the inner “*result of action*” by Pyotr Anokhin; Pitirim Sorokin’s conception of the “*immanent determinism*” of a sociocultural system and his cyclic theory of social change (“*social and cultural dynamics*”); “*the concept of universal functional units*” in the field of evolutionary biology, by Alexander Ugolev; “*the need-informational theory of emotions*” by Pavel Simonov; the concept of “*passionarity*” by Lev Gumilev, and others – all these fundamental concepts (and their psychophysiological and sociocultural conceptual constructions) are reduced to Nature-centrism (AnthropoKosmism) and include the leading significance of Organicist *intrinsic* cyclic activity and the whole-organizing and *inherent (entelechial) teleo-driven* causes (similar to the Aristotelian *telic* causes). Essentially, these leading entelechial causes which are independent of human consciousness or of any transcendent or transcendental (or empiricist) ideas – exactly these *entelechial* potencies and forces, and *hylemorphist* functional organs (in accordance with the domination of the due inherent life cycle) realize consistently the wholesome ontogenesis (evolution) of the given subject of life: bio-organism, the individual, society, state, civilization, biosphere, noosphere.

In actual fact, we can call this galaxy of Russian (and from other countries) scholars as the generation of (using the language of programmers) *Aristotle 4.0*. Really (and it was done in the paper of 2014⁷¹), we can distinguish at least four generations of Aristotle’s (Organicist) Type of rationality viable historical application: *Aristotle 1.0* is the emergence of his original great (super)system of knowledge and its further development (since the 4th century B.C.); *Aristotle 2.0* is the Medieval construction of onto- and cosmotheological Integral knowledge; the next is *Aristotle 3.0* – of the epoch of Renaissance (14–17th centuries), including German Idealism, and which were the pre-stage of the following Modern era (since the 16th century). Eventually, *Aristotle 4.0* is described and explained on the example of the achievements of Russian (and Soviet) scholars (and scientists from other places), but which progress has not been sufficient to profoundly alter the course of the dominating Type of rationality (which still is Plato’s Dualism and the mathematical-physicalist – external, non-naturalist (transcendental), *from without* – relation to the natural world). Hopefully, the new generation – *Aristotle 5.0* – will emerge and gain momentum.

Meanwhile, we have to note – Russian (and from other countries) outstanding

⁷¹ See: Khroutski, Konstantin S. (2014). “Rehabilitating Pitirim Sorokin’s grand triadologic concept: A Biocosmological approach,” *Biocosmology – neo-Aristotelism* Vol. 4, Nos. 1&2 (Winter/Spring 2014), pp. 6–41.

scholars (whose works partially are discussed in this paper) – still they all personally did (do) not associate their scientific proposals (scholarly breakthroughs) with Aristotle's true (super)system of Organicist (Entelechial) knowledge (for, maybe, they were merely unaware of the genuine teleological scientific naturalism of Stagirite; and, thus, were confronted with the challenge, all over again – of “re-inventing the wheel”). For instance, as regards the scholarly contribution of Konstantin V. Sudakov, the renowned Russian scientist (follower of P.K. Anokhin) – he used for the expression of his basic approach (in developing the theory of information) the Russian word “gran” – “informational gran”⁷² (Russian «грань» is translated into English as facet; edge, plane, margin, borderline, etc.), but Sudakov translated it as “gran”, for, possibly, he could not find the proper English term. The latter is not surprising, as both (Anokhin and Sudakov, in their development of the theory of information, and doing this in the era of dialectical – Marxist – materialism primacy) – they factually were busy with the “re-invention of the wheel”, i.e. tried to rebuild the Aristotelian entelechial naturalism, but, in the given (our current) historical condition – this grand task was (is) impossible, in principle. In contrast, the use of the genuine Aristotelian theory (*Organon*Kosmology) really provide a scholar with fast and simple, and reliable methodological tools for understanding and explaining the teleological issues and Integralist challenges.

At any rate, the scientific discoveries of scholars within the *Aristotle 4.0* generation (in the realms of aetiology and methodology, in the first place) – these scholarly contributions fully support and clearly represent Aristotle's basic naturalist principles, firstly of Bipolarity and Entelechial Triadicity (Functional organ's cycles of potency and activity); in analogy – of Diastole and Systole, and Homeostatic cardiac activity, of the heart as a whole physiological organ; or of Sleep processes and Awake activities, and Homeostatic physiological body, as a whole; and wherein each (of the Three) cycle and realm is autonomic – independent in its organization, and permanently (and synchronously) animate – in relation both to potencies and activities.

5. Aristotelian influence on Thomas Aquinas

An interesting comment, in this regard, is given by Gareth B. Matthews, who notes the sincere utterances of Thomas Aquinas, that “Thomas was struck in reading Aristotle's *Physics* how a term like *morphe*, whose obvious meaning is the external shape or contour of an object, is used in graded ways to mean any property of a thing, then its constituting essential element. All this in the first book of the *Physics*.” [Matthews, 1992, p. 92]⁷³ Herein, we can conclude (propose) that Saint Thomas Aquinas treated (and used) Aristotle's conceptual constructs mainly from the pole of basic theological dispositions (i.e. from Plato's, and not from the truly Aristotelian – Organicist and naturalist – theoretical foundations themselves, as they originally are);

⁷² See: Sudakov, Konstantin V. (2013). “Gran information system of organization of mental brain,” *I.P. Pavlov Russian medical biological herald*. Vol 21, No 3, pp. 28–36 (in Russian).

⁷³ See: Matthews, Gareth B. (1992). *Thought's Ego in Augustine and Descartes*. Cornell University Press.

and, in fact, that Thomas Aquinas did not accept the foundations of Aristotle's genuine naturalist constructions. In all circumstances, however, the medieval ontotheological and cosmotheological advances (and the highest rational achievement of this epoch – the philosophy of Thomas Aquinas) – they all contributed greatly to the world culture, in a substantial way – having realized the excellent forms of Integralist knowledge that unite (synthesize) equally the means both of Aristotle's Organicist (*entelechiā hylemorphist*) naturalism, and Plato's Dualist idealism (and materialism); but, of all, ultimately – building on the backbone (of) and aiming at the pole of Transcendent (Transcendental) Idealist forms that rule the world *from without*. The natural theology of Thomas Aquinas is especially the magnificent example of Integralist knowledge that is constituted of the two polar (opposite and independent) – autonomic – natural sources (potencies, types, *eidei*) of rational knowledge: Aristotle's Naturalist (based on the principles of entelechism and hylemorphism); and Plato's Dualist (based on idealism and mathematical physicalism).

Through the lens of this study, the Aristotelian influence on the higher-level philosophical concept of form is shown at best in the work of Thomas Aquinas⁷⁴. The concept of *in-form-atio* is a key one in Thomas Aquinas' epistemology and ontology. Aristotle's hylemorphism is translated by Aquinas as the process of „in-forming” matter (*informatio materiae*). Such process is expounded within the framework of Christian creational metaphysics that directs Aquinas to clearly distinguish between physical and biological “in-formation” processes: between the biological process that brings a new life into the world *per modum informationis* and a no biological process that brings something to life *per modum creationis*⁷⁵. Particularly he differentiates the “in-formation” of the body by the soul – from the divine creational activity (*per modum creationis*).⁷⁶ Accordingly, information is something that emerges from and represents an action on the underlying material, namely action of its formation. The mentioned difference between information and creation was foreign to Greek reasoning.

Following Thomas Aquinas' interpretation of the Aristotelian concepts of form (*eidos* or *morphe*) and matter (*hyle*), both principles cause the unity of an individual being (see the mentioned above *informatio materiae*⁷⁷) in the sense listed by the Oxford English Dictionary: “information” is “the action of ‘informing’ with some active or essential quality: (inspiration, animation, J.B.)”⁷⁸.

⁷⁴ Cf. R. Busa, Index Thomisticus <<http://www.corpusthomicum.org/it/index.age>>.

⁷⁵ Cf. Marcos, Alfredo. Bioinformation as a Triadic Relation, in: G. Terzis, R. Arp (ed.), Information and Living Systems: Philosophical and Scientific Perspectives, Cambridge/MA: MIT Press, 2011, p. 55–90 [p. 56].

⁷⁶ Cf. R. Capurro, Past, present, and future of the concept of information, in: José María Díaz Nafria & Francisco Salto Alemany (eds.) What is really information? An interdisciplinary approach, Tripple, 2/7, 2009, p. 125–141. [p. 128].

http://www.academia.edu/377686/What_is_really_information_An_interdisciplinary_approach

⁷⁷ Thomas, Summa Theologiae, 1a 110 2, cf. P. Adriaans, Information, Stanford Encyclopedia of Philosophy, 2012 <<http://plato.stanford.edu/entries/information/>>.

⁷⁸ Simpson, J., Weiner, E., Eds.; *Shorter Oxford English Dictionary*, 2nd ed.; Oxford, UK: Clarendon Press: 1989. (II, 7)

Consequently “in-formation” remains a shaping process. While “in-formare” means to bring some material (the counterpart of the concept “form”) into another form or shape, the material remains the same.

To bring something into a form does not change what is brought into this new shape: in-formation is not in-materialization! The material remains the same, but the way it is presented changes: the same material appears in a new shape [Lenski, 2010]⁷⁹.

For Aquinas “in-formatio” was an action rather than a thing, namely, that of shaping and its result [Marcos, 2011, p. 56]⁸⁰. On the Aristotelian and Aquinian version, souls (i.e. an every conscious, functioning person) are not reducible to information. They use information in different ways to bring about their goals in the surrounding material world. In turn, within Aristotle’s naturalist approach – information has the entelechial and hylemorphist essence; and, in distinction from “in-formare” – directly refers to the Bipolar and Triadic essence of a real thing.

6. Ancient form (*morphe*) and contemporary information

Aristotle’s form (*morphe*) is both the cornerstone notion in his theoretical approach to the soul-body relation, and in building his entire (all-encompassing) cosmology (and the archetype) of rational, essentially naturalist (of entelechial hylemorphism) knowledge. However, in this work, we attempt to resolve the particular challenges (generally aiming at the development of informational theory), thus chiefly focusing on mind-body problem.

An explanatory role which Aristotelian form plays in his theoretical approach to the soul-body relation is logically coincident with David Chalmers’s idea of information as a basic law of organization that ties the conscious person to the natural world. Form and information are two concepts that select the same referent: a fundamental principle of organization that links conscious personal mind to matter. He makes a sententious point about the causal nature of information when he says that:

If the principle of organizational invariance is to hold, then we need to find some fundamental organizational property for experience to be linked to, and information is an organizational property par excellence.” [Chalmers, 2007, p. 366]⁸¹

Each kind of mental representation is an “organizational property for experience

⁷⁹ Lenski, Wolfgang (2010). Information: A Conceptual Investigation, *Information* 1(2): 74–118; doi:10.3390/info1020074

⁸⁰ Marcos, Alfredo (2011). Bioinformation as a Triadic Relation, in: G. Terzis, R. Arp (eds.), *Information and Living Systems: Philosophical and Scientific Perspectives*, Cambridge/MA: The MIT Press.

⁸¹ Chalmers, David (2007). Naturalistic Dualism, in: Max Velmans, Susan Schneider (eds.), *The Blackwell Companion to Consciousness*, Oxford: Blackwell Publishing, pp. 359–368.

to be linked to”, no less than by definition. Along these lines information is more related to “pure content”. Chalmers names his philosophical view as a naturalistic dualism of consciousness. He negates that it can be explained by materialistic-physical theories, because consciousness is itself not physical. It means that all experiences are incorporated and reproduced as immaterial information – in both conscious and unconscious representation. But information, if not material, is embodied in the material entities. In the end it is a kind of feature of the material objects. According to Chalmers the fundamental theory of consciousness could be grounded on information:

Physical realization is the most common way to think about information embedded in the world, but it is not the only way information can be found. We can also find information realized in our phenomenology. ... States of experience fall directly into information spaces in a natural way. [Chalmers, 1996, p. 283-284]⁸²

If he is in the right place then information has a dual aspect: it is nor matter nor energy. It requires matter to be embedded transitional in the brain. And it requires energy to be brought forward. Phenomenal experiences that pass to us as e.g. visual sensations, consist of information that is nothing but a kind of radiant energy. The pure (mental) information content being in one brain can be passed on to other brains, by converting it to energy for the purpose of communication; other brains can then include the same information (possibly with significant differences in some items) for use by other minds (functionally speaking: the “multiply realizable” software in different brains' hardware).

The Aquinian (truly Integralist) point of view of formal causation (that includes the Aristotelian naturalist constituent), and Chalmers's view of information (that is more close to the polar Plato's – Idealist – Type of rationality) presents the insight on how conscious agent (or conscious soul) might have a special kind of causal influence in relation to the material world. Information implicitly drops a hint that there is something outside, what's more – it requires something outside of a conscious person. The latter (to exert a “causal influence in relation to the material world”, and to require “something outside of a conscious person”) are the typical properties of the Plutonian *exogenous* aetiology and epistemology.

In general, Information⁸³ always has the direct relation to the related form (*morphe*), thus – to the actual tangible thing. Therefore, in each case, Information (in its general meaning; and from the standpoint of Aristotle's *Organon* Kosmology) – Information naturally includes three basic properties: a) the already existing experience (the given level of ontogenetic organization); b) naturally ordered sequence of hierarchical ontogenetic (evolutionary) potencies – to be actualized on

⁸² Chalmers, David (1996). *The Conscious Mind: In Search of a Fundamental Theory*. Oxford: Oxford University Press.

⁸³ Highlighting the Integralist essence of Information, and, for that – typing the word from the capital letter.

the future levels of ontogenesis; and c) the naturally existing self-acting mechanisms (subordinated to the Organicist natural laws), which are actualized in the spontaneous ascendance on the consistent levels of evolutionary development (with their ascending complexities of organization). Substantially, this natural hierarchy and its self-evolution, etc. – all this is the natural (cosmic) properties (natural laws), which have not been (and cannot be) created *from without*, but always are naturally substantiated and launched initially *from within*.

Therefore, Information, as the genuine Integralist notion (i.e. which naturally unites and synthesizes the means from both poles and actual Types of rationality: Aristotle's; and Plato's) – this Integralist Information is naturally the backbone of ontogenetic (*Kosmogentic* – of macrocosmic ontogenesis) Changeability – from lower to higher (in complexity of integrated elements) levels of organization. Essentially, in this approach – the meaning of (Integralist) Information is close to Aristotle's *Entelecheia* (*entelechias* – their ontogenetic hierarchy) of a subject.

It is important to note that the key point for Chalmers's proto-theory of consciousness was Shannon's concept of information. For the engineer C. "Shannon information is a transmittable state that is not defined semantically, as a meaning of intentional content, but as one of the "set of possibilities".⁸⁴ Similar is it for Chalmers, who says: "physically realized information is only information insofar as it can be processed."⁸⁵ Information is a basic concept underlying both physics and phenomenology, characterizing the psychophysical laws that connected the physical and the psychical (mental) states or entities.

First of all the contemporary impact of information technology on the natural, social and human sciences has made the common, semantically notion of information a highly controversial concept. Shannon's article "A Mathematical Theory of Communication"⁸⁶ is a milestone work, referring on the one hand loose to the common use of information with its semantic and pragmatic dimensions, while on the

⁸⁴ "[This principle states] that not the speaker but the listener decides on the meaning of a message, since it is the latter whose understanding of the set of possibilities constrains the possible meaning of the message, no matter what the speaker may have had in mind." D. Baecker, *Why Systems?*, in: *Theory, Culture & Society*, 1/18 pp. 59–74 [p. 66].

⁸⁵ D. Chalmers, *The Conscious Mind: In Search of a Fundamental Theory*, p. 181. Cf. M.A. Boden, *Mind as Machine: A History of Cognitive Science*, Oxford: Oxford University Press, 2006, p. 1233.

⁸⁶ C. E. Shannon, *A Mathematical Theory of Communication*, Printed in: *The Bell System Technical Journal*, Vol. 27, 1948, pp. 379–423, 623–656. "The fundamental problem of communication is that of reproducing at one point either exactly or approximately a message selected at another point. Frequently the messages have meaning; that is they refer to or are correlated according to some system with certain physical or conceptual entities. These semantic aspects of communication are irrelevant to the engineering problem. The significant aspect is that the actual message is one selected from a set of possible messages. The system must be designed to operate for each possible selection, not just the one which will actually be chosen since this is unknown at the time of design." Quoted from: <<http://www.mast.queensu.ca/~math474/shannon1948.pdf>> p. 1-54 [p. 1]; See also: C.E. Shannon, W. Weaver, *A Mathematical Model of Communication*. Urbana, IL: University of Illinois Press, 1949.

other hand redefining the concept within an engineering framework. The fact that the concept of knowledge communication has been labeled with the word “information” seems, at the first onset, a linguistic accidental circumstance. Commonly information is *prima facie* something that runs between a sender and a receivers. While Shannon's definition of information is quantitative one with reference to selections from a stock of physical symbols, it is, rather, a theory of signal or message, not of classical information transmission. Shannon and Weaver's original model of information transmission consisted of five elements:⁸⁷ 1. An information source, which produces a message. 2. A transmitter, which encodes the message into signals. 3. A channel, to which signals are adapted for transmission. 4. A receiver, which 'decodes' (reconstructs) the message from the signal. 5. A destination, where the message arrives. A 6-th element, noise is a dysfunctional factor: any interference with the message traveling along the channel (such as 'static' on the telephone or radio) which may lead to the signal received being different from that sent.

According to D. Chandler's conception, the strong points of Shannon's and Weaver's model are its simplicity, generality, and quantitateness. Such benefits made this model attractive to several disciplines of science. It also pulled legitimate academic attention to human communication and “information theory”, leading to searching for further theory and research. Chandler critiques the Shannon's and Weaver's model by stating: It assumes communicators are isolated individuals and it provides no allowance for: 1) differing purposes, 2) differing interpretations, 3) unequal power relations, 4) for situational contexts.

7. Three basic Types of information: Aristotle's; Plato's; and Integralist

Returning to David Chalmers' contributions, and evaluating his achievements in developing the actual forms of contemporary Integralism and Information theory – we likewise are to note that he describes his position as a “naturalistic dualism”, wherein he doubts that consciousness can be explained by physical theories, because consciousness is itself not physical, as well as “qualia” are not physical. In general, Chalmers' chief notions, as qualia, or his universal “psychophysical laws”, or his strong statement that consciousness is present in everything in the Universe, starting from elementary particles and ending in macroobjects – all this certainly is connotative with Aristotle's genuine all-encompassing *Organon* Kosmology. However, his main book totally lacks the references to Aristotle.

All this is very typical for our modern (and postmodern) time, for, the attitudes of modern societies and cultures are such that we follow (after the XVII-th century) strictly the unified and monolinear standards of rational (scholarly) activity that acknowledge as legitimate exclusively the Dualist (external, from without) cosmologies: aetiologies, epistemologies, methodologies, anthropologies, etc., while Aristotle's teleological physics is strictly prohibited (taboo). Therefore, as the inevitable stage, at present, 95% of modern scholars (or more), due to their

⁸⁷ Cf. D. Chandler, The Transmission Model of Communication, 1994/2000, <<http://visual-memory.co.uk/daniel/Documents/short/trans.html>>.

educational curriculum and the further formative influence of their social milieus (that currently – globally – are unipolar and uniform) of their practical activities (careers) – 95% of modern scholars involuntary have become (developed into) subconscious Platonists.

However, alternatively, in our Triadologic approach – we encourage scholars to distinguish Three Types of Physics (i.e. of all-encompassing significance – covering all natural phenomena and processes: inanimate and animate, the latter – biological and anthropological:

1) Aristotle's (teleological) Physics⁸⁸ that is enrooted in the endogenous (internally generated – *from within*) aetiology, gnoseology, methodology, and anthropology; and which is based on *entelechism* and *hylemorphism*, and that is (as the Type of knowledge) is essentially *definitive* (focused on the study of *telic* substances);

2) the contrary Plato's (dualist) Physics, enrooted in the basic assumption of the existence of the highest realm of “eternal forms”, and wherein the natural world is created (by a Transcendent demiurge or Transcendental human consciousness) *from without*, on the basis of these “forms” and within the materialistic (mechanic chaotic) space; with its exogeneous (xenogenetic – acting *from without*) aetiology, epistemology, methodology, and anthropology; and which is based on idealism and mathematical materialism (mechanicism); and that is essentially *explanatory* (i.e. materially reductionist and mechanistic);

3) Integralist (homeostatic) Physics, enrooted in manifold holistic cosmologies (including theories of Information); and which unite (synthesize) both polar (Aristotle's, and Plato's) means of rational (scholarly) acitivity, chiefly aiming at the achievement of harmonious existence and ontogenetic growth and development, i.e. through generating organizational and methodological setups (systems, structures) that provide life activity within stable homeostatic, but narrow (within the ‘golden mean’) interval (range) of life conditions.

Herein, likewise, it is relevant to state that a true naturalism means precisely following the order of nature – *natural laws*⁸⁹ (as, basing on evidence, they are). At present, (in the XXI-st century), however, we still are reaping the fruits of the XVII-th century bias against (a true) naturalism, i.e. we generally think (in Modern era) that, as it is stated in a modern dictionary: “Naturalism in philosophy, as it is in science, is the search for explanations that involve only Nature, ones that in particular do not involve supernatural ideas, or, more particularly, explanations that involve only material objects and their motions.”⁹⁰ However, the paradox is – such a ‘naturalism’ (without supernatural ideas) is taken from the “supernatural” (Plato's)

⁸⁸ Which is, to the point (for, Aristotle is the worldwide recognized Father of science) – is the basis (foundation) of all the modern edifice of science.

⁸⁹ We made an attempt to express these Organicist “natural laws” in the author's work (Khroutski, 2010), entitled as “All-Embracing (Triune) Medicine of the Individual's Health: A Biocosmological Perspective” (*Journal of Futures Studies*. Vol. 14, No. 4:65–84; accessible at: <http://www.jfs.tku.edu.tw/sarticles.html>)

⁹⁰ See at: <http://www.informationphilosopher.com/freedom/naturalism.html>

basis – of the primary supreme world of transcendent “eternal forms”, of which human mind (her/his consciousness) is able to exercise the acts of reminiscence (in respect to these transcendent *eternal forms*), and, thus (alike demiurge) – further to create (recreate) the constructive forms within the surrounding materialistic (mechanical chaotic world⁹¹) – in the given place, around her/him, or within her/his field of research and practical activity (ultimately basing on mathematical grounds and advances).

In turn, the genuine naturalism (of which Aristotle’s teleological physics is the first true supersystem and archetype of knowledge), and in respect to which the whole modern biology can be called as the “Ode to Aristotle’s naturalism” (taking into account the objective truths of genetics, or the evidence of dynamicity, cyclicity, bipolarity and triadicity of life processes, as well as their functionality and self-evolving ontogenesis). A great paradox is that the evident Bipolarity and the endogeneous (*from within*) Changeability, Dynamicity and Cyclicity – Triadicity (and their principles of feedbacks), and the ascending self-evolving (*entelechia* *hylemorphist*) Organicist ontogenesis, up to the higher Noospheric level of sociocultural organization, but of all – within the naturally Finite, Hierarchic and Heterogeneous Kosmos (Universe); all this, still, in an inexplicable way (maybe, due to the heavy inertia in scientific thinking, established since the XVII-th century) – still the genuine Aristotelian naturalism (and its evident natural laws, mentioned above) continue to be long-neglected (taboo, prohibited) in our current (post)modern scholarly communities’ endeavors.

8. Information processing in living organisms

Shannon and Weaver’s model bring together the technical aspects of the information transmission. They suggested a mathematical-technical theory of communication in connection with the basic organization of communication technology. In contrast to that bio-chemical processes in living organisms build a parallel distributed network. However the contemporary available technical models of parallel computation need corrections in order to cover adequately the processes in the biological systems⁹². T. Deacon suggests model levels of organization in living organisms that could be seen as model for information processing in such systems.⁹³ He makes a distinction between subsequent three levels of natural information (for a person), where each subsequent level subsumes the prior level: 1. Syntactic information: Shannon theory that describes data (signals) as used in data communication⁹⁴; 2. Semantic information: Shannon’s theory together with another

⁹¹ I.e., which has no relation to Aristotle’s nature – *physis* (φύσις), and Aristotle’s teleological physics.

⁹² Cf. Fisher, J.; Henzinger, T.A. Executable cell biology. Nat. Biotechnol. 2007, 25, p. 1239–1249.

⁹³ Cf. T. Deacon, *Incomplete Nature. How Mind Emerged from Matter*; W.W. Norton & Company: New York, NY, USA; London, UK, 2011.

⁹⁴ Shannon and Weaver formally stated: “The word information, in this theory, is used in a special sense that must not be confused with its ordinary usage. In particular information must not be

theories on a level that describes intentionality, abruptness, reference, representation, used to define the relation to object or referent; 3. Pragmatic information (behavior): Shannon's theory connected with another theories (including Darwin's theory of evolution) on a level that describes interpretation used to define pragmatics of agency⁹⁵.

The mentioned three levels of organization of information can be seen as parallel to the three Aristotelian causes (three hierarchically organized formative processes). Nevertheless, it should be emphasize that the relationships Aristotle-Deacon are just meaningful parallels between levels and not at all any sort of direct mappings. Deacon and Koutroufinis explain the origin of dynamical levels in the relationships between material entities/structures and their corresponding processes. The hierarchy of levels of emergent dynamics constitutes dynamical depth of a system, described as follows:

A system with greater dynamical depth than another consists of a greater number of such nested dynamical levels. Thus, a mechanical or linear thermodynamic system has less dynamical depth than an inorganic self-organized system, which has less dynamical depth than a living system. Including an assessment of dynamical depth can provide a more precise and systematic account of the fundamental difference between inorganic systems (low dynamical depth) and living systems (high dynamical depth), irrespective of the number of their parts and the causal relations between them. [Deacon & Koutroufinis, 2014, p. 404]

Dynamics generate intrinsic constraints and transitions from homeodynamics (e.g., processes at or near thermodynamic equilibrium), to morphodynamics (e.g., non-chaotic dissipating processes such as exemplified by self-organizing systems) and to teleodynamics (e.g., self-preserving processes such as exemplified by living systems) [Deacon & Koutroufinis, 2014, pp. 413–415]. Each transition has increasing autonomy from extrinsically imposed constraints:

Since constraints are a prerequisite for producing physical work, the increasing autonomy of constraint generation with dynamical depth also corresponds to an increasing diversity of the capacity to do work. Thus the flexibility with which a dynamical system can interact with its environment also increases with dynamical depth. [Deacon & Koutroufinis, 2014, pp. 417-418]

What Deacon and Koutroufinis term dynamical depth then, is this hierarchically structured complexity and irreducibility of constraint-generating dynamics, such as distinguishes teleodynamics from morphodynamics and morphodynamics from

confused with meaning" (C.E. Shannon, W. Weaver, A Mathematical Model of Communication, Introduction).

⁹⁵ T. Deacon, S. Koutroufinis, Complexity and Dynamical Depth, Information 5, 2014, p. 404–423 [p. 407].

homeodynamics. A teleodynamic system unquestioningly unified within its organization information about those aspects of its environment that are specifically relevant to its self-maintenance and reproduction.

Enough profound parallels can be shown between info-computational stepped structure of cognition and basic dynamic depth of homeodynamic, morphodynamic and teleodynamic processes on the one hand, and Aristotle's three nested levels of soul (vegetative, animal and human) in his hylomorphic (founded on the matter-form connection) view of life on the other hand⁹⁶. Aristotle's soul, as we saw, is the life itself, that is, cognition as a self-referential process. Contemporary biology understands life as based on single cells, from which progressively more complex organisms successively develop and evolve with more and more layers of cognitive information-processing compositions.

In *De anima*, II, 412b5, Aristotle defines *psychè* as “the first *entelecheia*⁹⁷ that is *organikon*⁹⁸.” Thus, in Organicist reality, in each natural body – both *hyle* and *morphe* (form) are *teleo*driven and relate eventually to the eventual (actual) *Organon* (Functional organ). In this, we can discern *first entelecheia* that actualizes (on the inherent consistent *hyletic* basis) the given Functionalist potency (gives birth to the appropriate *morphe* – form – Functional organ); and further launches the *second entelecheia*'s (the given morphofunctional) activity, thus eventually providing the needed effects for wholesome life activity. Thus, *first entelecheia* (that produces *morphe* – morphofunctional structure), and *second entelecheia* (that produces the needed effects – the functional results of activity) – they are quite opposite (Bipolar) to each other, but naturally united within the one Organicist – Inherent, Bipolar, Dynamic, Cyclic and Circlic Ascending – Spiral naturalist mode of life activity.

In all cases, to repeat this important moment, once again – Aristotle's *hyle* is not the chaotic mechanical matter, kind of the building stones ('bricks') for the creation of new constructions by artificial ('*from without*') work – by realizing divine or anthropocentric activities; but, quite the opposite, it is a kind of *telic* elements (like nucleotides, or amino acids, or chemical elements) – the predisposed “functional blocks”⁹⁹, with their intrinsic ('*from within*') forces (energy) to contribute to the processes of self-organization and production of the need-driven functional structures, and their further actual generation of the needed effects (results or products of life activity).

The evolution of life and mind is stimulated by the ability of living organisms to act on their own account and interact with their environments. Interesting for research

⁹⁶ Cf. G. Dodig-Crnkovic, The Architecture of Mind as a Network of Networks of Natural Computational Processes, *Philosophies*, 1, 2016, pp. 111–125, oi:10.3390/philosophies1010111.

⁹⁷ Replacing the usual “actuality” and “body” into the original *entelecheia* and *organikon*, for (as explained above) – these (English) words are no longer viable terms in contemporary scholarly milieu, in relation to the scope of Aristotle's Organicist naturalism – they, therefore (in principle), cannot be used for the translation of Aristotle's original texts.

⁹⁸ Emphasizing, once again, that originally, from Greek – *organikon* means instrumental (functional).

⁹⁹ Referring to the theory of Alexander M. Ugolev (1985, 1987).

of the relationships between body and mind is the evolution of progressively more complex structures that lead to the emergence of new information-processing levels, from the basic mass-energetic via self-organization to self-referential (semiotic) levels. The traditional development of the natural sciences, including biology and medicine, was determined mainly by examining their material structures (morphology, anatomy, histology, pathology, etc.), and through the analysis of energy processes (biophysics, biochemistry, physiology, pathology).

Aristotle states in *the Physics*: “Then there will only be the ‘ultimately underlying’ factor in Nature [υποκείμενο φυσικς]... And of this ‘underlying’ factor we can form a conception by analogy; (191a7-11).” In general, developing the approach of Rudolf Klimek (and his emphasis on the studying of the phenomenon of life) – we strongly propose that Integrative physiology (“by analogy”) could directly disclose for us the main secrets of Nature; and offer great opportunities in understanding and applying the naturalist laws of living subjects organization. In the same perspectives, we encourage scholars to introduce new foundations of the theory of information – Information as the third part of the universe^{100,101}; and as the Third basic constituent of the Triadic (Triune, and Triadological) Universe – of all this in respect to exploring the determinants of health and illness, and as the organizing and guiding factor of life processes¹⁰², starting from studying the aetiology of carcinogenesis.

According to K. Khroutski, the perspective of developing the notion of virtual information (as the basis for Integral approaches) is really important¹⁰³. To this point “virtual” is the essential notion for Aristotle (that is synonymous to our contemporary term “genetic”, and which originally means the thing’s or subject’s potency for perfect activity), i.e. which is the actualization of the primary intrinsic telic potency due to Aristotle’s Potency/Activity theory; and if we succeed to integrate it into BCA-Triadological approach – the more it will be significant!¹⁰⁴ H.Walach revealed the concept of a weak or generalized quantum theory preserving one central element of the quantum mechanical formalism: the handling of non-commuting or complementary observables as well as morality and ethics^{105,106}. His model predicts a

¹⁰⁰ Klimek, Rudolf (2014). “Threefold material informational energetic reality: $E = mc^2$,” *Biocosmology-Neo-Aristotelism*. Vol. 4, No. 4 (Autumn 2014), pp. 393–402.

¹⁰¹ Klimek, Rudolf (ed.) (2015). *Psychoneurocybernetic conquest of carcinogenesis and cancers*. New York: Nova Science Publishers.

¹⁰² Klimek, Rudolf (2016). “Life, cancer and virtual information,” *Biocosmology – neo-Aristotelism* Vol. 6, No. 2 (Spring 2016), pp. 255–272.

¹⁰³ Khroutski, Konstantin S. (2013). Forming and evolutionary vector to the Aristotelian pole of scientific Organicism (Biocosmology)” *Biocosmology – neo-Aristotelism*. Vol. 3, No. 1 (Winter 2013), pp. 28–51.

¹⁰⁴ Khroutski, Konstantin S. (2016). “Reinstating Aristotle’s Comprehensive Organokosmology and the genuine language of his organicist naturalism archetype,” *Biocosmology-Neo-Aristotelism*. Vol. 6, Nos. 3&4 (Summer/Autumn 2016), pp. 394–413.

¹⁰⁵ Walach, Harald (2005). “Generalized Entanglement: A new theoretical model for understanding the effect of Complementary and Alternative Medicine,” *J Alternative Complementary Medicine* 11:549–559.

generalized form of entanglement, i.e. non-local correlations across distance and time, that are not mediated through signals, but through make-up of the system as such. We argue that such a generalized version of entanglement (GET) is in fact a systematic novel interpretation and supported integrative role of equivalence equation: $E = mc^2$ 107, 108, 109, 110, 111.

The material (*hyletic*) components of living organisms at every level of their organization can perform their necessary biological function only when they have an appropriate structure (*morphe*). This applies to single molecules whose biological role, to a lesser extent, is determined by their chemical composition, and to a greater level – the structure (*morphe* – the functional systemic organization) of the molecule and its shape. We observe that the intracellular structures (organelles and their structures) also play a role that belongs to them only when they have a specific shape (*morphe*) and arrangement. Entire cells may act as useful units (in the case of single-cell organisms), or properly fulfill their role in biological multicellular structures – only if they have the correct shape (substantial *telic* organization) and arrangement. The same – *telic* organization, with its/her/his readiness to execute the due ontogenetic Functionalist activity – can be said of entire organs and of complete biological organisms including man.

9. Animate (natural, *entelechia* – *from within*) and inanimate (artificial, *idealist* – *from without*) Types of information; and their relation to carcinogenesis aetiology

In this, it is important to distinguish between dead (cold, inanimate – *from without*) and quick (alive, animate – natural, *from within*) patterns of matter (*hyle* – ὕλη), energy (potency – δύναμη; and activity – ἐνέργεια), and information (that is a modern synthesizing notion; and which deeply corresponds to the Aristotelian *entelecheia* – ἐντελέχεια). Essentially, Aristotle's *hyle* is animate (*telic*, predetermined for self-motion and finitely finding its concrete inherent *topos* – τόπος), while matter, inversely – is inanimate (dead), and it can be infinitely exchanged within the surroundings. Substantially, *hyle* is alive – animate, *telic* and quick, naturally realizing its *kinesis* (κίνησις) and *metabolism* (μεταβολισμός) – in searching, moving, growing, developing and self-evolving, and eventually reaching

¹⁰⁶ Walach, Harald (2013). "The Concept of Complementarity and its Role in Quantum Entanglement and Generalized Entanglement," *Axiomathes* 23 (3):443–459.

¹⁰⁷ Klimek R, Czajkowski K, Kojas Z, Szymański W, Śpiwankiewicz B (2013). Psychoneurocybernetic etiopathogenesis of cancers. *Curr Gynecol Oncol*. 11(3):202–209.

¹⁰⁸ Jasieczek, Dariusz and Klimek, Rudolf (2013). "Informatonosis – an information disease affecting the society," *Int J Prenat Perinat Psychol medicine*. 25: 22–31.

¹⁰⁹ Schenker, Joseph G. (2010). *Ethical dilemmas in perinatal medicine*. New Delhi: Jaypee Brothers Medical Pub.

¹¹⁰ Szkutnik, Dariusz A. "In search of the specific parameter of life – general methodological comments," *Biocosmology – neo-Aristotelism*. Vol. 6, Nos. 3&4 (Summer/Autumn 2016), pp. 453–464.

¹¹¹ Tadeusiewicz, Ryszard (2010). "Place and Role of Intelligent Systems in Computer Science," *Computer Methods in Materials Science*. Vol. 10, No. 4, pp. 193–206.

its Functionalist *topos*, in the higher level of Telic organization, for its/her/his perfect Functionalist (Entelechial) acitivity.

In turn, equally, energy that flows *from without* – through a living organism, and is extracted from the environment in different forms and is released back into the environment, again in various forms – it is temporarily (and, often, in ascending order) used for the development of life processes, but, basically, this is a type of external – cold (inanimate, aimless, dead) – energy. *Vice versa*, the potency of a living subject is an animate (*telic, entelechial*) energy. To the point, all this, to a certain extent, has some conformity with D. Chalmers's notion of “zombies”, wherein “zombie is just something physically identical to me, but which has no conscious experience – all is dark inside.” [Chalmers, 1996, p. 96] Therefore, when people are educated and implanted the xenogenetic principles and attitudes, and they accept and follow them (in opposition to their own inherent genetic potencies) – they really can be treated as a kind of “zombies”; and the process of xenogenetic principles' active implanting (of creating stereotypes) in human minds – as “turning into zombies” of a specific person (or group of persons, or broader population).

In the article “Psychosomatic aspects of infertility”¹¹², Rudolf Klimek gives a good example of ‘dead information’, in the Fig. 1 – “Real and mirror informational pictures”. This example shows that we have synchronously two opposite types of the same information – “each person can immediately see their own informational image by looking in a mirror in which her/his picture seen (the mirror pattern form) does not contain a single atom of his body, but is only the resonant result of feedback information.” [Ibid.] In other words, we always have (at one the same time) – the viable (*entelechial* – endogeneous) pattern of information that has its/her/his *entelecheia* (and its/her/his potency and activity); and the inanimate (abstract – exogenous) pattern. Likewise, in an emphatic manner – the same example is given in the attractive video-film¹¹³, created by the Polish Society of Hyperthermia.

Therefore, reflections and images on various surfaces, as well as printed matter and electronic files (electronic and printed information), i.e. the innumerable amounts of books in libraries and the overwhelming contemporary digital storages – they all are the clear examples of ‘dead information’. Contrariwise, for instance, the sequences and relationship of amino acids (in polypeptide chains); or the ontogenetic sequences and relationship of genes, and their potencies (of entelechial energy) appropriate releasing and, thereafter, of their phenotypic realization in the activities of cells, tissues, organs, physiological systems, and the organism as a whole – these are already the examples of animate (*entelechial*) information that is rationally expressed in Aristotle's (archetype of) *Organon* Kosmology.

Therewith, the essential moment is that ‘dead – inanimate aimless *from without* – information’ (although it is necessary for the biological and cultural evolution) but it is insufficient (for, it cannot fully replace the subject's ‘viable – animate entelechial

¹¹² Accepted for publication in the book, ed. J.G.Schenker – “Human Reproduction: From State of the Art to Future Developments” (Springer).

¹¹³ The link to this film –

<https://drive.google.com/file/d/0ByqSCLVIMFtcMHJUSjEyX0dOM3M/view>

from within – information’, therefore – ‘dead information’ is unable to ensure the individual’s (subject’s) wholesome – healthy natural – ontogenesis. In this approach, and developing the thesis that chronic non-infectious (and non-traumatic) diseases (firstly focusing on their aetiological issues, including carcinogenesis) – they all have a direct relevance to the non-utilization of the subject’s inherent ontogenetic energy. In pursuit of this objective, we have made targeted initial efforts to tackling the given issue [Khroutski, 2002]¹¹⁴. Its section 6 states that the “Diseases of Civilisation” are the ‘Civilised Man Diseases’ – Diseases of the Civilised Man’s Non-Utilised Creative Energy”; while section 7 argues that “Difficulty in Satisfaction of Man’s Basic Urges is the Chief Psychological Reason for the ‘General-Illness of the Personality’”; and, further on – main postulates on the aetiogenesis of modern chronic diseases are substantiated. Concerning the issue of the current “global aetiological paradox”, see likewise the author’s paper [Khroutski, 2010]¹¹⁵.

The critical moment in exploring carcinogenesis lies in the fact that malignant tumors emerge *from within* the genome of a man. Therefore, the usual empirical and analytical modes of carcinogenesis research, i.e., both, primarily, realizing *from without* the empirical examination (and experimental study); and, next, applying and using abstractional (non-personalized) mathematics-based methods – they all have their limitations, firstly, they are incapable (as in respect to all CNID) to deal with the aetiology of cancer diseases. All the more we need the methodologies that deal with the inner (endogeneous) causes and forces of natural life processes, first and foremost – drawing our attention to the teleological scientific naturalism of Aristotle, the Father of modern science. All the more it is important that (applying the framework and abilities of the contemporary theory of information) – Rudolf Klimek studies the processes of “self-organization of cancer cell” [Klimek, 2016, pp. 262–265]¹¹⁶.

In general, the identity of each organism, as well as any other biological entity is determined by the entelechial and hylemorphic form and the arrangement of its material (*hyletic*) components (largely determined by biological – Biocosmological – genes) that constitute the hierarchical heterogeneous ontogenetic coherent order – but within the dynamic Bipolar and cyclic Triadic succession of entelechial dominance – of self-ascending evolutionary levels of Organization.

10. Two contemporary Integralist formulas of information: – $E = mc^2$ – of Rudolf Klimek; and $T = C$ – of Ryszard Tadeusiewicz

It is the shape (morphofunctional structure) and spatial (topical) arrangement – of anything from molecules to galaxies – that is an expression of informational (entelechial) order. The direction of the flow of energy is also an expression of the

¹¹⁴ Khroutski, Konstantin S. (2002). “Epistemology of civilised man diseases,” *E-Logos*. URL: <http://nb.vse.cz/kfil/elogos/epistemology/khrout1-02.htm>

¹¹⁵ Khroutski, Konstantin S. (2010). “All-Embracing (Triune) Medicine of the Individual’s Health: A Biocosmological Perspective,” *Journal of Futures Studies*. Vol. 14, No. 4, pp. 65–84. (accessible at: <http://www.jfs.tku.edu.tw/sarticles.html>)

¹¹⁶ Klimek, Rudolf (2016). “Life, Cancer and Virtual Information,” *Biocosmology – neo-Aristotelism* Vol. 6. No.2 (Spring 2016), pp. 255–272.

informational order, although in the functional sphere, rather than the structural one. The scale here is irrelevant. The ordered components can be subatomic objects (arrangement of quantum states), microscopic objects (atoms), objects in the middle scale (including humans) or objects in the macro scale – up to astronomical sizes. The only thing of importance is that the components of these objects are not arranged randomly, but are organized in a certain way according to quantum equivalences of information (*entelecheia*) matter (*hyle*), and energy (*dunamis* and *energeia*): $E =^i mc^2$ – the formula of Prof. Klimek, where the equal sign (=) in the formula denotes matter and energy as equal and the same (and which is a pure Aristotle's *hylemorphism*), and – raised to the power of information (=i) – it defines the information's part in the reality (in the form of *the result of action*, thus essentially relating to Aristotle's *entelecheia*).

R. Tadeusiewicz developed a method of the abstract modeling of reality, based on the development of an (imaginary) information model of human reality, subsequently testing it in practice¹¹⁷. Through such models, and not only through theoretical considerations, truth can be defined as the existence of each event in a quantum state, from its beginning to its end (*telic*) form (again relating to Aristotle's *entelechism* and *hylemorphism*). This is so because the beginning of each event belongs to its cause, but at the same time is already part of its effect (and that is a pure *entelechism*). The decision about the truthfulness of an event can be in accordance with it, or it can be a lie based on bad conscience. Truth is an informational event resonates with human Conscience ($T =^I C$). Naturally, that dealing both with animate (the individual's ontogenetic – *entelechial* – predispositions) and inanimate (social norms and moral principles) – subject's Conscience ought to resonate equally with both poles of Truth. Conscience, therefore, can be treated as always the genuine (natural) relatedness primarily to the individual's ontogenetic basis. In this line, as a general deviation – the twentieth century has realized the introduction of a dangerous informational illness in people bent on wealth and power, who intimidate and lie to others (and who executed their influence *from without*). In other words, in the twentieth century, a small group of people, being preoccupied with the satisfaction of their own ambitions and needs in power (but who chiefly used the exogeneous – dead inanimate – information, thus succeeding in brainwashing and zombifying people, in a way detrimental to their natural – inherent, animate, wholesome – ontogenetic development, i.e. their natural rights, health and happiness) – this hidden “elite” has usurped the natural potentials for mankind normal evolution. It is enough to apply existing law to their cases to end this medical terrorism^{118,119}.

The word ‘truth’ as the informational opposite of ‘lie’ has a triple meaning,

¹¹⁷ Tadeusiewicz, Ryszard (2015). Biocybernetics links medicine and technology. In. Klimek R. (ed). *Psychoneurocybernetic conquest of carcinogenesis and cancers*. New York: Nova Science Publishers.

¹¹⁸ Jasiczek, Dariusz and Klimek, Rudolf (2013). “Informatonosis – an information disease affecting the society,” *Int J Prenat Perinat Psychol medicine*. 25: 22–31.

¹¹⁹ Jasiczek Dariusz; Klimek Rudolf; Štencl Jan; Tadeusiewicz Ryszard and Tholt M. (2012). Obstetrical prevention of human cancers. *Neuroendocrinology Letters*. 33(2):118–123.

because it is not only the name of an event (structure or process) thus proving its real existence, but also meaning the true identity with the name of each structure or process it describes. The concepts of truth and lies, like good and evil, are used to define the psycho-emotional state of a man, who has the capacity to be astounded. Astonishment is a fact felt by people, it exists just like emotions of friendship or love. Unfortunately, these concepts, until recently, were considered in isolation from the three-fold reality of matter (*hyle*), energy, and information (*entelechia*l potencies and activities). Everyone knows that certain words can easily lead to loss of friends, a break of friendly relations, and maybe (not always) a loss of love, but it never leads to the disappearance of remorse. Man, by living and working, defines his relationship with his own existence, which is linked with self-evaluation of his achievements and his motivation for performing them. Using concepts and words invented by people, and their cybernetic interpretation, one can understand and describe reality. For example, BCA demands increased methodological medical procedures on the side of health and not only on the side of predominantly diseases, as is the case today.

Every human reacts to his own consciousness (which resonates with information field, ultimately – with her/his ontogenetic basis) to the sounds, signs and words of directly observed material objects and / or to the indirect energetic changes in their material form of existence. Symbols represent or express certain concepts in logic, mathematics, music, chemistry, astronomy, physics, and art. Philosophically, every word has the function of substituting a certain occurrence, creating a corresponding psychological or emotional state in a person's mind, her/his current experience and her/his current (ontogenetic) highest level of the individual's (subject's) informational self-actualization (of the actualization of her/his *entelechia*l ontogenetic potencies). This is where moral self-evaluation lies – called human conscience, which, independent of free will, shows the congruency of man's existence with the laws of nature. Each person can express information about his inner human state to the outside, but cannot negate his conscience. The concept of truth is one of the natural laws, which people with the lack of understanding thereof, try to conceal in self-made laws or rules. Man is endowed with free will (that certainly has a direct relation to her/his *ontogenetic entelecheia*), which ensures a good, functioning social life, as long as the eternal laws of nature are followed. Humans do not create these laws, but can only strive to understand them better in order to use them. Luckily conscience also fulfills gratifying functions, such as the feeling of satisfaction or happiness which comes from performing a good deed, or even from simply differentiating good from evil.

Every form of organization is equal to information. According to the theory of information developed by Claude Shannon and then developed by many researchers, information is the opposite of entropy, which is a measure of chaos, disorder and lack of knowledge. Information decreases entropy in both (Bipolar) ways: a) in Plato's type by introducing any kind of instructing "message" *from without* (relevant to a structure or a process); and, b) in Aristotle's type – by releasing the inherent (endogeneous – *entelechia*l – *from within*) pattern of energy – to be further realized in self-dependent activity and eventual achievement of wholesome effects. In the

former, the amount of information in the “message” is measured by the decrease entropy that is caused by the “message”. In the latter, the formula ($T = I \cdot C$) and method of Prof. Tadeusiewicz can be applied, thus focusing at a results-based evaluation of a subject’s (its/her/his) wholesome activities.

Shannon linked entropy with the distribution of probabilities. If the probabilities of all states (or all structures) are the same, then entropy will be at its maximum. However, if a message arrives which states that some states are more likely than others, then entropy decreases. Specifically, when one of the states reaches a probability of 100% (i.e., becomes unavoidable), then entropy decreases to zero. The amount of information in the message will then be equal to this initial entropy which the message diminished to zero. This is because the measure of the amount of information is essentially a measure of entropy loss – both magnitude of entropy and amount of information are expressed using the same units. These units are bits, which are very important in computer science and telecommunications, but which also apply to informational processes in living organisms. The relationships between the theory of information, biology, and medicine allow for a new way to look at the processes of biological and medical procedures.

The concept of entropy was initially introduced by physicists (Rudolf Clausius) for the quantitative measurement of the degree of chaos in physical systems. It served to explain the one-way direction of many phenomena and processes, especially in thermodynamics. Its use has far-reaching consequences in, among other things, astrophysics, because it describes the evolution of stars, galaxies and planetary systems, clearly showing that entropy changes only in one direction – it increases. The universe today is still structured: we have very hot stars and a dramatically cold vacuum of space. But the stars are constantly expelling their energy via radiation, which results in their eventual demise (sometimes in a giant supernova explosion). This can be observed all over the universe, wherever we are able to look through our telescopes and space probes. This process will still last for billions of years! But finally all the stars will burn out their nuclear fuel, and the whole universe will settle into a state of uniform temperature. All processes will cease, especially those related to human life. This possible variant of the end is called the heat death of the universe.

At the same, based on the Organicist (natural) law of Bipolarity (the evident essential Bipolarity of Nature – Cosmos) – we can argue the existence of the two poles of entropy. Indeed, while in the space evolution we have entropy that ever increases; on the contrary (polarly), we have the entropy of a developing embryo that ever decreases. Therefore, from the standpoint of a naturalist, and taking into account the stated above reasoning and examples (and that the Organicist natural laws do exist, although being neglected since the XVII-th century) – we can claim that if we have essential processes that ever increase; then, naturally (always) we have the processes (of the same order) that ever decrease (and *vice versa*). In our case, this is all the more evident as we know about the Cosmic origination of the Earth’s life processes (including, in general evolution, the eventual sociocultural progress), and that each human (biological) body is constituted of atoms (and the same energy, i.e. of *hyle*) that belong to (have been originated within) the whole Universe (Cosmos), as

the whole Organism, without any separate localization.

So, there are always enclaves in which entropy decreases spontaneously, e.g. as the developing embryo. Not only a human or animal one, as germination and propagation of bacteria also shows this anti-entropic character. Focusing on man, we see that the fetus develops from the fertilized egg, becomes a more and more complex structure, which thus represents, through its morphology (*morphe* – morphofunctional organization) and physiology (*energeia* – physiological functional activity) – a growing amount of information. After birth, the baby is still developing physically and mentally, which is (following its/her/his natural, Bipolar and Triadic, (onto)genetic route of development) again accompanied by a growing amount of information (in various forms), contained in its growing body. The rule of entropy refers to the entire universe, if we have taken into account the equation of equivalence of matter, energy and information¹²⁰. The Organicist laws of the universe are more impressive in relation to biological growth and development: the decrease of entropy stops (the body reaches full maturity), upon which a gradual increase in entropy begins (as the expression of ontogenetic cyclicity and finiteness). That is why we get sick, grow old, and die. This process is most visible in cancer, whose cause is purely informational. The signals ordering the arrest of cell proliferation stop, and the effects – observed using even currently available imaging technology show that cancerous structures are characterized by significantly increasing entropy in their surroundings, unlike healthy tissue. However, as tumors still possess “anti-entropic character”, and as it was argued in the section 7 – all this shows that life energy (in older patients with cancer diseases) is not run short, but the main cause is that older persons are more vulnerable to non-realization of their own inherent (viable wholesome – *entelechia*) energy (vital potentials). In point of fact, an older person everywhere is considered as less useful for society. The hypothesis is, therefore, that the social inclusion (of mental and physical abilities-talents) of older people – will seriously reduce the rate of their cancer diseases. Stated differently, the main cause of carcinogenesis is hidden in the non-utilization of the man’s inherent (*entelechia*) ontogenetic potentials, i.e. non-utilization of her/his animate informational resources.

In general, thereby, the foundational rehabilitation of Aristotle’s whole (Organicist) Type of rationality (his genuine teleological physics) – firstly, the lifting of the ban that was imposed on the Aristotelian scientific naturalism, yet in the XVII-th century (and which is sustained chiefly due to the dominating Anglo-Saxon influence, with its mightiness and stubbornness) – inasmuch as Aristotle’s *entelechia* (Informational – animate – *from within*) scientific naturalism is the essential and indispensable constituent (equally with Plato’s mathematical physicalism, including the external inanimate – *from without* – information) – for the normal (effective) realization of contemporary Integralist (Informational) approaches – all this is the primary task of top priority! At least, this is a totally intolerable and unacceptable

¹²⁰ In the Biocosmological approach (instead of habitual “matter, energy, and information”), it is more relevant to focus basically on (and use terminologically) the telic ‘*entelecheia, hyle, morphe and information*’.

situation that we, in the XXI-st century – still are subdued to the foundations of science that were established yet in the XVII-th century.

Conclusion: contemporary concepts of information should equally use Aristotle's teleological scientific Naturalism

In this article we address an important question in both Aristotle's science and philosophy, and also have drawn attention to the achievements of Stagirite in biology, focusing therein on the causal structures that are behind the transmission of biological form (morphofunctional structures); and, analogically – behind the transmission of information. In our approach, we substantiate the significance of Aristotle teleological (Entelechial) scientific naturalism as the Type of (Organicist) rationality (that is equal to other two Types: the polar – Plato's; and intermediate – Integralist); and which – Aristotle's genuine (*entelechial hylemorphist*) physics, in contemporary patterns – is the essential constituent for realizing true contemporary Integralist frameworks (and which are comprehensible and applicable exclusively within the recognition of natural – Bipolar, Dynamic, Cyclic – Triadological (and Triune) reality of rational knowledge; and which guiding principles are proposed and developed by the Biocosmological Association). In this (dynamic Triadological) framework, we argue that the genuine contemporary Integralist approaches constitute the intermediate position (with its own basis, as axis) that naturally unites (synthesizes) the rational means from both poles (and polar Types of rationality): Aristotle's *entelechial hylemorphist* Naturalism, that is *dynamic* and *cyclic*; and endogeneously Changeable, Hierarchical and Heterogeneous – Ontogenetic, and wherein causes and forces act basically *from within*; and the polar Plato's Dualist Idealism (Materialism), wherein causes and forces act *from without*, and the leading role is assigned to the *mathematical physicalism* that is the main method of scientific research. Essentially, all Three Types (and methods) – two polar: Aristotle's and Plato's; and the intermediate – Integralist – are equally indispensable for genuine scholarly endeavors.

Aristotelian soul is not reducible to syntactic understanding of information, more likely the soul makes use of information in different ways to acquire their goals in relation to the material and social world. In general, we have made an effort to provide a theoretical basis for substantiating the natural existence of the two essential, equal in their significance (but polar, opposite to each other in their rational importance) types of information, and which form the polar scopes of study. The first direction (and the first type that we call "inanimate") is associated with very influential Shannon's and Weaver's theory of information. It is worth mentioning, at once, that Shannon and Weaver did not intend that their model should be applied to human-to-human communication. Semantic and biological aspects did not play an essential role in their model, for information (in their theory) refers only to the physical act of transmitting data (*from without*) from one technical system to another. That statement should not be forget, when somebody is going to adopt Shannon's and Weaver's model in social or biological science fields (such as communication sciences, organizational analysis or embryology). The second direction (type and

scope of information exploration) is Aristotle's teleological (Entelechial) scientific naturalism, wherein information is "animate" and naturally acts *from within*. Aristotle teleological physics is based on the idea that not only living beings, but all cosmic systems have an intrinsic nature and value, which, at present, can be named as *information*, and which is a *telic* part of the whole cosmic informational (noetic) field for all real natural (*entelechial hylemorphist*) structures and their (dynamic cyclic – Bipolar, Triadic – Ontogenetic) processes.

According to Aristotle, as we argue – human organism (each real thing) is driven by the endogenous (*from within*) potencies (causes) and active forces, and which are naturally hierarchical and heterogeneous (in Functionalist relation), and essentially finite (dynamic, cyclic, and *telic* – effective-terminative). Thus, organism's reproductive material contains a set of "codes" which are derived from the various potentials of its nature. These "codes" we indicate, function both as specialized transmitters for communicating the parts of the parent's inheritable form during the act of procreation, and the fundamental – coherent ontogenetic hierarchical neg-entropic – sequence of naturally ascending *telic* potencies (in potential capabilities of complex organizations). It could not be unambiguous said that such (*entelechial hylemorphist*) in-form-action in matter (*hyle*) will contribute for come up of the acting subject. Information in a living organism is rather conceived as type of constraint. The more it is essential, therefore, to state that Aristotle's comprehensive (super)system (archetype) of knowledge – *Organon*Kosmology, i.e. his all-encompassing naturalist – Entelechial Hylemorphist – aetiology, gnoseology, methodology, anthropology, etc., that is the real Type of (Organicist) rationality, and which essentially ahistorical, i.e. active and seminal within all epochs of cultural evolution: past, present, and future. In the paper, we pay special attention to the interrelation of Aristotle's and medieval understanding of form, and their dynamic of further influence on the modern using of the term of "information".

However, at present we have a crucial moment (which we call, using medical term – as 'cosmological insufficiency'). The point is that Aristotle's *entelechial* scientific naturalism (which is an equal main representative among the Three main Types of rationality) currently is not only badly misinterpreted, but factually forbidden (under taboo) – both directly (a modern scholar is afraid of using it as 'unscientific' method); and indirectly (due to the heavy conventional inertia and commitment of modern global scientific communities for rejection of Aristotle's teleological physics). In our paper, we try to show that this is an absolutely unacceptable state of things. We hope that our work (and, in general, our main Integralist approach) will contribute to shifting (to some extent) of the perception and adopting of Aristotle's Organicism (as the autonomic essential Type of rationality) and, thus – will contribute to the efficacious scholarly resolving of current crises' problems and contemporary challenging issues, including the problems of cancer diseases.

References

- Anokhin, Pyotr K. (1974). *Biology and Neurophysiology of the Conditioned Reflex and its Role in Adaptive Behavior*. Oxford, New York: Pergamon Press.
- Aristotle (1907). *De Anima*. Ed. by R. D. Hicks. Cambridge: Cambridge University Press.
- Aristotle (1942). *Generation of Animals*. Ed. and transl. A. L. Peck. Cambridge, Mass.: Harvard University Press.
- Aristotle (1957). *The Physics*. Books I–IV, LCL 228. Trans. by P.H. Wicksteed and F.M. Conford (Cambridge: Harvard University Press [first published in 1929]).
- Aristotle (1984). *On the Soul* (trans. by J. A. Smith). In Jonathan Barnes, editor, *The Complete Works of Aristotle* (The Revised Oxford Translation, Vol. 1, pages 641–692). Princeton: Princeton University Press.
- Aristotle (1987). *On the parts of animals*, Books I–IV. Transl. by W. Ogle. New York: Garland Pub., 1987 (first published, London, K. Paul, French & Co., 1882).
- Aristotle (1993). *Posterior analytics*. Translated with a commentary by Jonathan Barnes. Oxford: Clarendon Press, 2nd edition.
- Aristotle (2016). *The Metaphysics*, Arcadia ebook. Edited by Roger Bishop Jones (Book 5, sec. 2). Translated by W.D. Ross.
- Bacon, Francis (2000). *The New Organon*. Edited by Lisa Jardine and Michael Silverthorne. Cambridge: Cambridge University Press (first published 1620 as *Novum Organum*).
- Bertalanffy, Ludwig von (1972). “The History and Status of General Systems Theory,” In: G.J. Klir (ed.) *Trends in General Systems Theory* (New York: John Wiley & Sons), pp. 21–41.
- Badelt, Felix (2014a). “Human evolution based upon old Chinese patterns? Rationally realizing psychosocial evolution through a well-balanced polarity in thinking, behavior and feeling,” *Biocosmology – neo-Aristotelism* Vol. 4, Nos. 1&2 (Winter/Spring 2014), pp. 138–152.
- Badelt, Felix (2014b). “WU-XING for psychology – An ancient model to discuss psychosocial evolution and degeneration,” *Biocosmology – neo-Aristotelism*. Vol. 4, No. 3 (Summer 2014), pp. 284–301.
- Bouraoui, Hédi (2016). “Interview of Georges Chapouthier by Hédi Bouraoui,” *Revue CMC Review* Vol. 3, No 2. URL: <http://cmc.journals.yorku.ca/index.php/cmc/issue/view/2280/showToc>
- Capurro, Rafael (2009). Past, present, and future of the concept of information, in: José María Díaz Nafria & Francisco Salto Alemany (eds.) *What is really information? An interdisciplinary approach*, Tripple, 2/7, pp. 125–141 [p. 128].
- Chalmers, David (1996). *The Conscious Mind: In Search of a Fundamental Theory*. Oxford: Oxford University Press.
- Chalmers, David (2006). *The Conscious Mind: In Search of a Fundamental Theory*, p. 181. Cf. M.A. Boden, *Mind as Machine: A History of Cognitive Science*, Oxford: Oxford University Press.
- Chalmers, David (2007). Naturalistic Dualism, in: Max Velmans, Susan Schneider

- (eds.), *The Blackwell Companion to Consciousness*, Oxford: Blackwell Publishing, pp. 359–368.
- Chapouthier, Georges (2010). “Reflections on the consequences of Biocosmology in modern biology,” *Biocosmology – neo-Aristotelism* Vol. 1, No. 1 (Winter 2010), pp. 92–98.
- Chapouthier, Georges (2013a). “A need for holistic spectacles,” *Biocosmology – neo-Aristotelism* Vol. 3, No. 1 (Winter 2013), pp. 17–19.
- Chapouthier, Georges (2013b). “Biocosmology and biology – their fruitful collaboration,” *Biocosmology – neo-Aristotelism*. Vol. 3, No. 2 (Spring 2013), pp. 201–211.
- Charles, David (2000). *Aristotle on Meaning and Essence*. Oxford, Clarendon Press.
- Durant, Will (1962). *The Story of Philosophy: the Lives and Opinions of the Greater Philosophers*. (New York: Time Inc., Time Reading Program Special Edition, [first published, 1926]).
- Christian, David. (2002). “Science in the Mirror of «Big History».” In: Albert Van Helden (auth.), Ida H. Stamhuis, Teun Koetsier, Cornelis De Pater, Albert Van Helden (eds.) *The Changing Image of the Sciences*. Springer, Netherlands. Pp. 141–170.
- Deacon, Terrence (2011). *Incomplete Nature. How Mind Emerged from Matter*. New York, London: Norton & Company.
- Deacon, Terrence and Koutroufinis, Spyridon (2014). “Complexity and Dynamical Depth,” *Information* 5, pp. 404–423 [p. 407].
- Dodig-Crnkovic, Gordana (2016). “The Architecture of Mind as a Network of Networks of Natural Computational Processes,” *Philosophies* 1:111–125.
- Egiazaryan, Galina G. and Sudakov, Konstantin V (2007). “Theory of functional systems in the scientific school of PK Anokhin,” *Journal of the History of the Neurosciences* 16:194–205.
- Fisher, Jasmin and Henzinger, Thomas A. (2007). “Executable cell biology”. *Nat. Biotechnol.* 25:1239–1249.
- Henry, Devin (2006). “Aristotle on the Mechanism of Inheritance,” *Journal of the History of Biology*, Vol. 3/39, pp. 425–455.
- Heusser, Peter (2011). “«Active information» – A modern revival of Aristotle’s «formative cause», applicable in physics, biology, psychology and medical anthropology,” *Biocosmology – neo-Aristotelism*. Vol. 1, Nos. 2&3 (Spring/Summer 2011), pp. 161–166.
- Jasiczek Dariusz; Klimek Rudolf; Štencl Jan; Tadeusiewicz Ryszard and Tholt M. (2012). Obstetrical prevention of human cancers. *Neuroendocrinology Letters*. 33(2):118–123.
- Jasiczek, Dariusz and Klimek, Rudolf (2013). “Informatonosis – an information disease affecting the society,” *Int J Prenat Perinat Psychol medicine*. 25: 22–31.
- Jonas, Hans (1984). *The Imperative of Responsibility. On Search of an Ethics for the Technological Age*. Chicago: University of Chicago Press.
- Koutroufinis, Spyridon A. (2016). “Modern biological neo-teleologism vs. Arisototle’s genuine *telos*” ” *Biocosmology – neo-Aristotelism*. Vol. 6, Nos. 3&4

- (Summer/Autumn 2016), pp. 414–426.
- Khroutski, Konstantin S. (2002). “Epistemology of civilised man diseases,” *E-Logos*. URL: <http://nb.vse.cz/kfil/elogos/epistemology/khrout1-02.htm>
- Khroutski, Konstantin S. (2010). “All-Embracing (Triune) Medicine of the Individual’s Health: A Biocosmological Perspective,” *Journal of Futures Studies*. Vol. 14, No. 4, pp. 65–84.
- Khroutski, Konstantin S. (2013). Forming and evolutionary vector to the Aristotelian pole of scientific Organicism (Biocosmology)” *Biocosmology – neo-Aristotelism*. Vol. 3, No. 1 (Winter 2013), pp. 28–51.
- Khroutski, Konstantin S. (2014). “Rehabilitating Pitirim Sorokin’s grand triadologic concept: A Biocosmological approach,” *Biocosmology – neo-Aristotelism*. Vol. 4, Nos. 1&2 (Winter/Spring 2014), pp. 6–41.
- Khroutski, Konstantin S. (2016). “Reinstating Aristotle’s Comprehensive Organokosmology and the genuine language of his organicist naturalism archetype,” *Biocosmology-Neo-Aristotelism*. Vol. 6, Nos. 3&4 (Summer/Autumn 2016), pp. 394–413.
- Klimek R, Czajkowski K, Kojs Z, Szymański W, Śpiewankiewicz B (2013). Psychoneurocybernetic etiopathogenesis of cancers. *Curr Gynecol Oncol*. 11(3):202–209.
- Klimek, Rudolf (2014). “Threefold material informational energetic reality: $E \rightleftharpoons mc^2$,” *Biocosmology-Neo-Aristotelism*. Vol. 4, No. 4 (Autumn 2014), pp. 393–402.
- Klimek, Rudolf (ed.) (2015). *Psychoneurocybernetic conquest of carcinogenesis and cancers*. New York: Nova Science Publishers.
- Klimek, Rudolf (2016). “Life, cancer and virtual information,” *Biocosmology – neo-Aristotelism* Vol. 6, No. 2 (Spring 2016), pp. 255–272.
- Kratky, Karl W. (2015). “Bipolarity and triadicity in various contexts,” *Biocosmology – neo-Aristotelism*. Vol. 5, No. 2 (Spring 2015), pp. 144–157.
- Lang, Helen S. (1998). *The Order of Nature in Aristotle's Physics: Place and the Elements*. New York: Cambridge University Press.
- Lenski, Wolfgang (2010). “Information: A Conceptual Investigation,” *Information* 1(2): 74–118
- Marcos, Alfredo. (2011). Bioinformation as a Triadic Relation, in: G. Terzis, R. Arp (ed.), *Information and Living Systems: Philosophical and Scientific Perspectives*, Cambridge/MA: MIT Press, pp. 55–90 [p. 56].
- Modell, Stephen (2013). “Medical and public health implications of biological essentialism and reductionism,” *Biocosmology – neo-Aristotelism*. Vol. 3, No. 1 (Winter 2013), pp. 20–27.
- Monfasani, John (2006). “George of Trebizond’s Critique of Theodore Gaza’s Translation of the Aristotelian 'Problemata'.” In: De Leemans P. and Goyens M. (eds.), *Aristotle’s Problemata in Different Times and Tongues*, Leuven University Press, pp. 275–294.
- Peters, Francis E. (1967). *Greek Philosophical Terms: A Historical Lexicon*. New York: New York University Press.
- Leunissen, Mariska (2010). *Explanation and Teleology in Aristotle’s Science of*

- Nature*. Cambridge: Cambridge University Press.
- Randall, John H. Jr. (1960). *Aristotle*. New York, Columbia University Press.
- Ritter, William E. (1932). "Why Aristotle Invented the Word *Entelecheia*," *Quarterly Review of Biology*. Vol. 7, No. 4, pp. 377–404.
- Runhu, Li (2015). "Traditional Chinese medicine's holistic thoughts," *Biocosmology – neo-Aristotelism* Vol. 5, No. 1 (Winter 2015), pp. 126–130.
- Shannon, Claude E. (1948). "A Mathematical Theory of Communication," *The Bell System Technical Journal*, Vol. 27, 1948, pp. 379–423, 623–656.
- Shannon, Claude E. and Weaver, Warren W. (1949). *A Mathematical Model of Communication*. Urbana, IL: University of Illinois Press, 1949.
- Schenker, Joseph G. (2010). *Ethical dilemmas in perinatal medicine*. New Delhi: Jaypee Brothers Medical Pub.
- Sudakov, Konstantin V. (1997). "The theory of functional systems: General postulates and principles of dynamic organization (dedicated to the Anokhin Centenary)," *Integrative Physiological and Behavioral Science*, October-December 1997, Vol. 32, No. 4, pp. 392–414.
- Sudakov, Konstantin V. (1998). "To the Centenary of P.K. Anokhin, a Great Russian Physiologist," *Integrative Physiological and Behavioral Science*, Vol. 33, NO. 2, pp. 171–175.
- Sudakov, Konstantin V. (2013). "Gran information system of organization of mental brain," *I.P. Pavlov Russian medical biological herald*. Vol 21, No 3, pp. 28–36 (in Russian).
- Szkutnik, Dariusz A. "In search of the specific parameter of life – general methodological comments," *Biocosmology – neo-Aristotelism*. Vol. 6, Nos. 3&4 (Summer/Autumn 2016), pp. 453–464.
- Tadeusiewicz, Ryszard (2010). "Place and Role of Intelligent Systems in Computer Science," *Computer Methods in Materials Science*. Vol. 10, No. 4, pp. 193–206.
- Tadeusiewicz, Ryszard (2015). Biocybernetics links medicine and technology. In. Klimek R. (ed). *Psychoneurocybernetic conquest of carcinogenesis and cancers*. New York: Nova Science Publishers.
- Ukhtomsky, Alexei A. (1950). *The Dominant as a Factor of Behavior*. Collected Works, in Vol. VI. Leningrad: Leningrad University Press. (in Russian)
- Ugolev, Alexander M. (1985). *Evolutsiya pishchevareniya i printsipy evolyutsii funktsiy: elementy sovremennogo funktsionalizma* [Evolution of digestion and principals of evolution of functions: elements of modern functionalism]. Leningrad, Nauka.
- Ugolev, Alexander M. (1987). *Estestvennye tekhnologii biologicheskikh sistem* [Natural technologies of biological systems]. Leningrad, Nauka.
- Walach, Harald (2005). "Generalized Entanglement: A new theoretical model for understanding the effect of Complementary and Alternative Medicine," *J Alternative Complementary Medicine* 11:549–559.
- Walach, Harald (2013). "The Concept of Complementarity and its Role in Quantum Entanglement and Generalized Entanglement," *Axiomathes* 23 (3):443–459.
- Wilson, Robert Anton. (1987). *The New Inquisition: Irrational Rationalism and the*

Citadel of Science. Falcon Press, Phoenix, Arizona, USA.

Windelband, Wilhelm (1914). *A history of philosophy: With especial reference to formation and development of its problems and conceptions*. 2nd ed., trans. J.H. Tufts. London: Macmillan & Co., Ltd.

Yumatov, Evgenie A. (2013). "The psychophysics of a human brain subjective activity," *World Journal of Neuroscience* Vol.3, No. 2, pp. 61-68.

Zhao, Chengxin and Tong, Li (2016). "Naturalistic perspectives of traditional Tibetan medicine and contemporary relevance," *Biocosmology – neo-Aristotelism*. Vol. 6, No. 2 (Spring 2016), pp. 273–285.

Reflecting feedbacks on the “*Challenging Integralism*” – the article of Josef Bremer, Konstantin S. Khroutski, Rudolf Klimek, Ryszard Tadeusiewicz, entitled “Challenging integralism, Aristotelian *entelecheia*, *hyle* and *morphe* (form), and contemporary concepts of information, touching upon the aetiological issues of carcinogenesis”¹ – that include the responses:

- *Looking for an Integral Biocosmology – Critical comments on the “Challenging Integralism” Paper*, by Paul Beaulieu;
- *Matter, information and cancer: Notes related to the “Challenging Integralism”*, by Ana Bazac;
- *Sema/sign, semasia/meaning and toying with semantics in Aristotle’s translated texts: Response to “Challenging Integralism”*, by Anna Makolkin;
- *Some additional reflections on the “Challenging integralism”*, by Leonardo Chiatti;
- *Biocosmology and the “Socratic problem” in philosophy – Remarks on the “Challenging integralism”*, by Milan Tasić;
- *Epigenetic phenomenology of entirety: General comments and observations on epigenetic information (induced by the article on “Challenging Integralism”)*, by Dariusz Szkutnik.

¹ Recommended bibliography (example): Chiatti, Leonardo (2017). “Some additional reflections on the «Challenging integralism».” In: Bremer, Josef; Khroutski, Konstantin S.; Klimek, Rudolf and Tadeusiewicz, Ryszard. “Challenging integralism, Aristotelian *entelecheia*, *hyle* and *morphe* (form), and contemporary concepts of information, touching upon the aetiological issues of carcinogenesis (with reflecting feedbacks of Paul Beaulieu, Ana Bazac, Anna Makolkin, Leonardo Chiatti, Milan Tasić and Dariusz Szkutnik),” *Biocosmology – Neo-Aristotelism* Vol. 7, No. 1 (Winter 2017):8–111; pp. 90–92.

LOOKING FOR AN INTEGRAL BIOCOSMOLOGY – CRITICAL COMMENTS ON THE “CHALLENGING INTEGRALISM” PAPER

Paul BEAULIEU¹

ABSTRACT. *This paper discusses some core elements that are essential in the delimitation of an integralist approach of the biocosmology domain. These elements are brought to the attention based on the extensive presentation of some of the structuring concepts exposed in the following paper insert in the present issue of the BCJ: Challenging Integralism, Aristotelian Entelecheia, Hyle and Morphe (Form), and the Contemporary Concepts of Information, Touching Upon the Aetiological Issues of Carcinogenesis by Bremer, Khroutski, Klimek and Tadeusiewicz.*

After a brief contextualization of what we think to be the orientation of the missions of Plato and Aristotle in the field of the advancement of knowledge during the “axial age” we proceed to the discussion of three essential elements for the development of a comprehensive Integral Biocosmology. These elements are a) the axis of the integrative approach; b) the triadic nature of the reality; c) and the civilizational necessity for the evolutionary advancement in the development of human cognitive faculties.

KEYWORDS: *Aristotelism; Integral biocosmology; Platonism; Anthropology of knowledge*

Contents

Introduction

1. The identification of the axis of an integral approach
2. The Triadic nature of the reality
3. The development of human cognitive faculties

Introduction

The domain of cosmology went through successive reformulations across centuries and it became a difficult task for scholars to perform comparative studies of the foundational assumptions related to the world hypothesis (Pepper-1942) that sustain their evolving perspective on the order of the reality.

Each of the previous major periods of civilization has generated its particular definition of the reality based mostly on their own stage reached in the development

¹ School of Management Sciences, University of Quebec in Montreal, Montreal, CANADA.

and the evolution of their prevailing knowledge capabilities. The Egypto-Chaldean period, that went approximately from 3 000BC to the beginning of the Greco-Roman period (around 750BC) saw the development of a cosmology based on the tradition of a suprasensible perception of the reality and the universe. The cosmology² of that civilizational period and its related ontology were still oriented to the universal dynamics that structure the reality of the universe. Their representations of this universal dynamics and order were based on their “sentient” cognitive capabilities and they communicated their cosmology mostly in the form of narrative anthropomorphic³ mythologies. The cosmology of that period presents a radically different perspective on the dynamics of the reality and its cosmology of the living. They knew that the universe is a living organism because their higher knowledge institutions were still able of suprasensible perception during that period. They also perceived and knew that every living entity is made of formative-forces⁴ that structure the embodiment of human beings, as well as other living organisms, and their actualization throughout the flow of time. For us that live in a so materialist civilizational period heavily turned to technological artifacts, this is a very difficult task to adequately mind the living cosmology and worldviews⁵ that prevailed around the world during such a civilizational period.

The civilizational period that followed, the Greco-Roman that goes from the mid-VIIIth century BC to the early XVth century AD saw the development of a radically new wave of cosmology. This is the civilizational period that saw the deployment of the axial age (as labeled by Karl Jasper) where “quasi-synchronized” cultural revolutions occurred throughout China (with Lao-tzu), Middle-East (with Zoroaster) and in the Mediterranean region (with Pythagoras). This is the period that saw the emergence and the development of the individual self-consciousness and an expansion in the interest for material side of the perceived world and its related human conditions. We can see that there exists something like an evolutionary path in the development of human cognition of the world that change the perceptions and the representations that human beings and cultures generate about the reality and the cosmology of that reality.

The early contributions to the emerging early philosophy and the study of nature by the pre-Socratics draw the first stage of these new developments. The cosmology’s

² It would better to say “many” because there was many cultural variant of the prevailing cosmology during that period. Nevertheless, these variants shared a relative common orientation even if the specific nomenclatures changed.

³ The choice of an anthropological analogy to frame their interpretation of the cosmogony of the universe was done in accordance with the needs for the development of the future expression of the human individualized-self.

⁴ In the same sense as Aristotle’s “Formative Cause” and as explained in this journal by Heusser (2011).

⁵ There are some interesting contributions about the history of cosmology but most of these are very short and limited in the understanding of the subtleties of these cultures: Harrison (2000 and 2003), Tresch (2014), and Kragh (2013).

narratives⁶ from Plato and Aristotle are embedded in the structural changes that happened during this radical “turnaround” in the cognitive attention of humans and societies. Plato’s cosmology is positioned in the orientation the Pythagorean approach (see Kahn-2001 and Fideler-1988) of the reality and most of his philosophical teachings are focused on the development of the self and collective consciousness and judgments. Plato spent a long learning period in the Egyptian institution of higher learning of that time⁷. Plato’s mission was to conceptualize the development path of the knower’s self as well as his cognitive abilities in regard of his relation to the world and the structuring-forces intricately embodied into the reality. His Pythagorean cosmology is mostly formulated to serve as a framework of understanding for judicious perception of the reality in its integrality (see Steiner-1973/1923 and Uzdavinyas-2004).

Aristotle on his side dedicated his contribution to the development of a reflexive mode of conceptual thinking of the world. In that sense he framed and developed the mental capabilities that will be essential for an objective understanding of the full spectrum of the reality and about its dynamic of manifestation or actualization.

Because their missions for the advancement of the civilizational period in term of knowledge development of humanity were relatively different, but nevertheless complementary, it has always been a vain enterprise to place their contributions on a continuum made of opposition. Through every phases of cultural renaissance⁸ of the ancient teachings there were always scholars to work and conclude on the essential complementarity of the theories and knowledge pragmatic of Plato and Aristotle.

These preliminary contextualization’s remarks were given as an introduction to some very short comments that we have been asked to provide in regard of the paper submitted by our colleagues (Bremer, Khroutski, Klimek and Tadeusiewicz) which is in the actual issue of the “Biocosmology – neo-Aristotelism”-Journal⁹.

In the following sections we want to raise the attention about some core elements that are necessary to the adequate delimitation of an integralist approach of cosmology and of course of biocosmology based on the treatment that is done on these in the cited paper.

⁶ We must be cautious about the fact that our understanding of their philosophical narrative is heavily dependent on the state of the inherited transmission (and translation) of their intellectual productions and writings. When the emperor Justinian 1er banished the philosophers from Athens in 529 the following centuries saw many major lost and destruction of key texts and teachings from Plato and Aristotle.

⁷ This is also the case for Pythagoras who spent almost twenty years in Egypt and Middles-East before his extradition to Babylon and later his coming back to Greece with the intent to found a totally new path of knowledge, that is “Philo Soph-IA” (the love intuitive- identification with that who contains the Cosmic Intelligence – the Chaldean IA).

⁸ Let us remember the School of Alexandria, The Arun al-Rashid House of Wisdom, the Carolingian renaissance, the Chartres School and the Scholastic period, the Florentine Academy and its Nordic version, and all contemporary initiatives.

⁹ The paper *Challenging Integralism, Aristotelian Entelecheia, Hyle an Morphe (Form), and the Contemporary Concepts of Information, Touching Upon the Aetiological Issues of Carcinogenesis*. In this issue (Vol. 7, No. 1).

The three essential elements for the development of a comprehensive Integral Biocosmology are the following¹⁰: a) the axis of the integrative approach; b) the triadic nature of the reality; c) and the civilizational necessity for the evolutionary advancement in the development of human cognitive faculties.

The main contribution on the definition of an Integralist Approach in Biocosmology has been done in this Journal, since its early beginning and up to now by the professor Khroutski (2006; 2008a; 2008b; 2010a; 2010b; 2014; 2015; 2016a; 2016b; 2017)¹¹. His efforts, as well as those of many of his colleagues, contributed significantly to the renewing of the interest in the theories from Aristotle on the dynamics of the organism and to the understanding of the Aristotelian etiology.

1. The identification of the axis of an integral approach

We don't think that the main axis for an integral approach is to be defined in term of *from within* and *from outside*. As we know, the etymology of that notion refers explicitly to the wholeness and to the integrity of the reality. To be integral in the approach is to perceive and investigate all of the reality.

If we adopt an intellectual reflexive position and cognitive process on reality we are condemned to experience a divisive knowledge of the reality. We stay in the duality, even in the perspective of the entelechial dynamics of Aristotle ethology.

The Plato's doctrine on formative-ideas or living archetypes as define by the authors is not adequate:

Plato's (dualist) Physics, enrooted in the basic assumption of the existence of the highest realm of "eternal forms", and wherein the natural world is created (by a Transcendent demiurge or Transcendental human consciousness) *from without*, on the basis of these "forms" and within the materialistic (mechanic chaotic) space; with its exogeneous (xenogenetic –acting *from without*) aetiology, epistemology, methodology, and anthropology; and which is based on idealism and mathematical materialism (mechanicism); and that is essentially *explanatory* (i.e. materially reductionist and mechanistic)¹².

Such a description is the materialist interpretation and reductionist approach of Plato doctrine. This is a "corrupted" understanding of Plato metaphysics that can't serve as a valid polarity on the integration's intent. The original doctrine from Plato was in the orientation of non-dualist cognition of the world. With the lost of the spiritual practice of the philosophical posture the Ideas and formative-forces have

¹⁰ We are actually preparing a more extensive paper on the delimitation and the definition of the domain of *Integral Biocosmology* studies.

¹¹ It would be of great interest for the international community of scholars that professor Khroutsky bring all the pieces together in the format of a book that consolidates the structuring element of this extensive corpus of doctrine on the Aristotelian perspective on the dynamic and cosmology of the organism.

¹² In page 37.

been reduced to simple intellectual reflexive thoughts generated from human thinking activity supported by the “mirror” of the brain inside the physical body. More, the Kantian phenomenological hypothesis on the limits of human knowledge of the reality (the thing in itself) introduced an enormous error in the understanding of the human potentialities for integral cognition of the reality.

The valid axis of the integrative approach for the cosmological understanding of living organisms should be on the axis that goes from the intuitive knowledge of the spiritual plan of the reality to the physical aspect of this same reality that appears through the senses-based cognition and intellection of the reality of the world. This is always the same and unique reality but accessed in its different plan of existence. And necessarily this integral approach of the order and formative dynamic of the reality commands the mastery of the different path of knowledge that gives access to the different plans of the same reality.

Such an integrative approach of the reality must be applied to the many levels or scopes of the reality: from the unicellular organism up to the totality of the living universe; from the individual up to the larger collective organism that constitutes the humanity; from physical embodied entities up to the non-physical entities; from the infra-material to the highest emanations’ entities of the spiritual plan; and for all the hierarchies of ecosystems (visible and suprasensible).

2. The Triadic nature of the reality

Since so many centuries human cultures lost the effective understanding of the triadic nature of the reality. Certain societies, mostly in Orient but also in Occident, kept in their traditional knowledge the trace of an ancient knowledge of the Triad as the core structuring dynamics of the whole universe. This is a fundamental element of the cosmology of the reality and of the biocosmology of the living entities (organisms).

In that respect, Aristotle was already misleading a major part of the reality. His dualist definition of the living organisms in term of physical body and soul ignore the third constitutive element that serve as the center seat of any animated being or entity, that is itself as a spirit. A comprehensive integralist approach of organisms needs to be able to know effectively these organisms in their spirit, soul and physical body aspects and to perceive the triadic entanglement of these three aspect into one single united living reality.

Many religious and theological organizations around the world and through centuries experienced intense debates in relation to the cosmological fundamental question of the triadic nature of the reality and of its cosmogenesis¹³. It is certainly a need for the advancement of the civilizational impulse of the humanity to find the way of the rediscovery of the threefolding of the reality and of the manifestation processes.

¹³ The Middle-Age saw the major cosmological project of the Chartres School to perfuse all the cultural system of the Occident with this debate and its related symbolic aesthetics about the triadic aspect of the cosmos; see Wetherbee- 1990.

3. The development of human cognitive faculties

Many symptoms that we can observe point in the direction of the civilizational necessity for an evolutionary progression in the development of human cognitive faculties (Abrams and Primack- 2011; Helmreich- 2016; and Talbot- 2016 and 2017).

The scientific investigation and collective validation of the formative-forces that are at the root-causality dynamic of the entelecheia formative movement to perfection of the organism will be possible only if we find the effective practice for the development of a suprasensible observation and cognition of the spiritual aspect of the reality. These formative-forces can't be scientifically observed and analyzed based on the physical senses or any technological proxy-artifacts that operate at the physical or at the infra-physical plan of reality.

In conclusion, this means that a sound scientific integral approach of the biocosmology of the reality will require the development of new human knowledge capabilities. When Plato and Aristotle were confronted to the necessities of the advancement of the Greek culture they knew that it required the development of the conceptual and rational capabilities. For the actual advancement of human potentialities the biocosmology collective initiative must find its way to the new knowledge of the integral reality.

References

- Abrams, Nancy Ellen and Primack, Joel R. 2011. *The New Universe and the Human Future. How a Share Cosmology Could Transform the World*. New Haven (CT): Yale University Press.
- Bremer, Josef; Khroutski, Konstantin; Klimek, Rudolf and Tadeusiewicz, Ryszard. 2017. "Challenging Integralism, Airstotelian *Entelecheia*, *Hyle* and *Morphe* (Form), and Contemporary Concepts of Information, Touching Upon the Aetiological Issues of Carcinogenesis," *Biocosmology – Neo-Aristotelism* Vol. 7, No.1 (Winter 2017): 8–55.
- Fideler, David R. (ed). 1988. *The Pythagorean Sourcebook and Library. An Anthology of Ancient Writings Which Relate to Pythagoras and Pythagorean Philosophy*. Grand Rapids (MI): Phanes Press.
- Floridi, Luciano. 2017. Why Information Matters. *The New Atlantis*. 7–16.
- Harrison, Edward. 2000. *Cosmology. The Science of the Universe*. Cambridge (UK): Cambridge University Press.
- Harrison, Edward. 2003. *Masks of the Universe. Changing Ideas on the Nature of the Cosmos*. Cambridge (UK): Cambridge University Press.
- Helmreich, Stefan. 2016. *Sounding the Limits of Life*. Princeton (NJ): Princeton University Press.
- Heuser, Peter. 2011. 'Active Information' – A Modern Revival of Aristotle's 'Formative Cause', Applicable in Physics, Biology, Psychology and Medical Anthropology. *Biocosmology – Neo-Aristotelism*. 1(2&3): 161–166.

- Kahn, Charles H. 2001. *Pythagoras and the Pythagoreans. A Brief History*. Indianapolis (IN): Hackett Publishing Company.
- Khroutski, Konstantin S. 2006. Biocosmology – Science of the Universal Future. *E – Logos Electronic Journal for Philosophy*. 1–32.
- Khroutski, Konstantin S. 2008a. The Evolutionary Time of Awakening: Do we Need a Third (neither Eastern, nor Western) Way in the World Evolution? *Journal of Futures Studies*. 12(3): 101–108.
- Khroutski, Konstantin S. 2008b. Biocosmology – Rehabilitating Aristotle’s Realistic Organicism and Recommencing Russian Universal Cosmism: Response to Arthur Saniotis. *Eubios Journal of Asian and International Bioethic*. 18(4): 98–105.
- Khroutski, Konstantin S. 2010a. On Biocosmology, Aristotelism and the Prospects of Becoming of the Universal Science and Philosophy. *Biocosmology – Neo-Aristotelism*. 1(1): 4–17.
- Khroutski, Konstantin S. 2010b. All-Embracing (Triune) Medicine of the Individual’s Health: A Biocosmological Perspective. *Journal of Futures Studies*. 14(4): 65–84.
- Khroutski, Konstantin S. 2014. Rehabilitating Pitirim Sorokin’s Grand Triadologic Concept: A Biocosmological Approach. *Biocosmology – Neo-Aristotelism*. 4(1&2): 6–41.
- Khroutski, Konstantin S. 2015. In Defense of Aristotle’s Biocosmology as the Comprehensive Supersystem of Knowledge: Eight Critical Comments on the Article of M. Benetatou. *Biocosmology – Neo-Aristotelism*. 5(1): 28–50.
- Khroutski, Konstantin S. 2016a. Aristotle’s Biocosmology – Teleological Functionalist Naturalism – as the Type of Rationality. *Biocosmology – Neo-Aristotelism*. 6(1): 20–40.
- Khroutski, Konstantin S. 2016b. Reinstating Aristotle’s Comprehensive *Organon* cosmology and the Genuine Language of his Organicist Naturalism Archetype. *Biocosmology – Neo-Aristotelism*. 6(3&4): 394–413.
- Kleinhans, Maarten G., Buskes, Chris J.J. and de Regt, Henk W. 2010. *Philosophy of Earth Science*. In: (ed) Fritz Allhoff. *Philosophies of the Sciences*. Oxford (UK): Blackwell.
- Kragh, Helge S. 2013. *Conceptions of Cosmos*. Oxford (UK): Oxford University Press.
- Pepper, Stephen C. 1942. *World Hypothesis*. Berkeley (CA): University of California Press.
- Sölch, Dennis. 2016. Wheeler and Whitehead: Process Biology and Process Philosophy in the Early Twentieth Century. *Journal for the History of Ideas*. 77(3): 489–507.
- Steiner, Rudolf. 1973. *The Riddle of Philosophy*. Spring Valley (NY): The Anthroposophic Press.
- Talbott, Stephen L. 2016. Reviving the Organism. *In Context* #36. 18–23.
- Talbot, Stephen L. 2017. *Evolution and the Purposes of Life*. The New Atlantis. 51:63–91.

- Tresch, John. 2014. *Cosmologies Materialized: History of Science and History of Ideas*. In: *Rethinking Modern European Intellectual History*. New York (NY): Oxford University Press.
- Uzdavinys, Algis (ed). 2004. *The Golden Chain. An Anthology of Pythagorean and Platonic Philosophy*. Bloomington (IN): World Wisdom.
- Wetherbee, Winthrop. 1990. *The Cosmographia of Bernardus Silvestris*. New York (NY): Columbia University Press.

**MATER, INFORMATION AND CANCER:
NOTES RELATED TO “CHALLENGING INTEGRALISM,
ARISTOTELIAN ENTELECHEIA, HYLE AND MORPHE (FORM), AND
CONTEMPORARY CONCEPTS OF INFORMATION, TOUCHING UPON
THE AETIOLOGICAL ISSUES OF CARCINOGENESIS,”**

by Josef Bremer, Konstantin Khroutski, Rudolf Klimek, Ryszard Tadeusiewicz

Ana BAZAC¹

ABSTRACT. *Starting from the main messages of Biocosmological Association (BCA) and the above mentioned article that was introductory in the 14th international symposium on biocosmology (Cracow, July 2017), the “telos” of the paper is twofold: first, to point a methodological view on the approach of matter-information relationships according not on only to Aristotle’s theory of matter and form but also to the modern physics. Actually, Aristotle perspective is consonant with – and, at least sometimes, fruitful for – the most modern research in physics and cosmology –. Aristotle’s intertwined holism and teleology helps also to understand – and this is the second purpose of the paper – in which sense is cancer a deviation from life processes and, at the same time, a specific “life” against which the human beings must oppose not only the knowledge of quantum phenomena as well as of the chemistry and biology of the living and man, but also the telic understanding of the human life. This means in fact not only ill people’s active struggle through the interest towards the social (and not only the individual) problems, but mostly the necessity of permanent assuming of social ideals as both “prophylaxis” of chronic illnesses as cancer and enrichment of the healthy individual’s life.*

KEYWORDS: Aristotle, Biocosmological Association, matter, form, information, entelecheia, telos, cancer, life, social ideals.

Contents

Introduction

1. METHODOLOGICAL REMARKS RELATED TO THE NATURAL BASIS OF CANCER

1.1. Matter and information according to Aristotle’s matter-form relationships

1.2. Meanings of *entelecheia* and the physical laws

1.3. *Telos*, consciousness and cancer

1.3.1. *Anti-matter and cancer*

1.3.2. *Information and cancer*

1.3.3. *Life and cancer*

2. METHODOLOGICAL REMARKS RELATED TO A SOCIAL TOOL AGAINST CANCER

Instead of conclusions

¹ Polytechnic University of Bucharest, ROMANIA.

Introduction

The ontological constituency of the Universe – or Multiverse – is increasingly more reinterpreted in proportion as the fathoming of the macro-*kosmos* and micro-*kosmos* advances and one once more wonders about the congruity of these two existences and according as science and philosophy feel to need each other as never before.

In the present era of spectacular discoveries which seem to approach a “final” state of the human knowledge (that led over time to the dramatic increase of energy dissipation and its uncontrollable processes, so the final state of knowledge takes place through its practical results²), from the standpoint of the scientific cognisance only it is rather about a *transitional* epoch: when on the one hand, the new discoveries – which continue those of the last century – emphasise marvellous structures of organisation and self-organisation of systems and sub-systems, very simple “laws” of their movement and change toward complexity³, and an unbelievable fitness of the human *logos* to that of the *kosmos* in both its dimensions – macro and micro –: therefore, the new discoveries push toward a *holistic* and *integrative* scientific approach; on the other hand, still there is an *inertia* of the fragmented⁴ research and technology transposing this research, so an insufficient

² Kováč, Ladislav. (2008). “Finitics: A plea for biological realism”, *EMBO Reports* 9, pp. 703-708; but also Kováč, Ladislav. (2016). “Life's arrow: the Epistemic Singularity”, *EMBO reports* DOI 10.15252/embr.201642902, e201642902.

³ My view is that, though the Cartesian-Newtonian mechanistic pattern arose as a second moment after the ancient holism and preceded the present tendency to an integrative/holistic approach – therefore, historically, there are three moments in the methodology of the scientific approach of things – methodologically there are only two and, what is important, is that they do not substitute each other, they are *complementary*. Concretely, the mechanistic pattern puts in parenthesis the environment of things studied and dissected but does not forget it/it is helped to enlarge its image of things, while the present holistic tendency cannot develop without a dry focus on the elements/parts as proofs of holism. (Complementarity appears when we consider the different meanings of *telos* in the mechanistic and holistic science: if the *telos* is *from within* a system – as in the holistic approach – a future cause, previous to its effect, seems natural; if the *telos* is *from without* a mechanism, a “future” cause transforms into a present/even past one: as a programme of the functioning).

However, the problem is not theoretical (epistemological), but practical: the separated sciences offer separated solutions, and cannot design a coherent worldview for ordinary people (and not only). These separated sciences have their own dogmatism and one aspect is their refusal of/incompetence to integrating themselves with philosophy. In its turn, a certain philosophy that does not integrate in its horizon the most recent techno-science (and thus remaining obsolete scholastics) considers sciences as “mechanistic” and proposes as alternative able to giving a worldview different kinds of spiritualism as ultimate truth of the world.

⁴ There is an official methodology of fragmentation/fragmenting methodology in research and application management; for example, Rivera-Ferre, Marta G. (2012). “Framing of Agri-food Research Affects the Analysis of Food Security: The Critical Role of the Social Sciences”, *International Journal of Sociology of Agriculture and Food* Volume 19, issue 2, pp. 162-175 speaks about the ‘official framing’ that *separates the natural from the social* and considers the problems *more technical than social*; and its necessary ‘alternative framing’: trans-disciplinary and not neglecting the complexity and the contextuality.

attention to the necessity to integrate this research and technology, and for this reason a backwardness of the correlations of the fragmented research and a weak understanding of the science-philosophy relationship.

The two domains where this backwardness manifests are that of *the non-living – the living* correlations and that of the *natural and human/social/cultural* integrative approach.

From the standpoint of science-philosophy relationship, one has to note at least two aspects: first, an up-to-date philosophical analysis is valid when it includes the more modern scientific outlooks between its problems/starting points, data and proofs, and thus when transforms its concepts/gives new meanings to its concepts; only in this manner can we speak about philosophical theories, and not simple hypotheses; second, science needs philosophy just by the instrumentality of the philosophical concepts whose history is *sine qua non* for philosophy and its operability in science⁵. And just when it is about a transitional epoch as ours one needs to remember and revisit philosophical concepts in order to help science to conceive of new better theories.

One of the most interesting contemporary experiments of this process of renewal of science-philosophy relationship is the Biocosmological Association (BCA) (<http://en.biocosmology.ru/>) with its journal and, especially, with its developments of Aristotle's philosophy and science according to the present results and problems of science; or, with the use of Aristotle for the criticism of the present state of the methodology of the scientific research; or, with the interpretations of the most modern scientific findings through historical lens where Aristotle's concepts serve to interpret and relate these findings in an integrative perspective. Indeed, the main tenet of BCA is the insufficiency of the Newtonian type *efficient cause – effect* fragmented analysis of the existence and, not only the alternative of a holistic and organisational complexity approach, so belonging to a wider range of theorists (let's remember, outside the Russian space, only Nicholas Rashevsky and Robert Rosen), but also the old Aristotelian ground with concepts like *telos* and *entelecheia* whose meanings and openness are plentiful for the present scientific understanding of the world.

Following Aristotle too with his highest appreciation to science/philosophy (and also to the value of the good), the Stoics spoke about science as a virtue because it is the knowledge of the good; (virtue was the disposition to live consistently in the *whole* life). And even though physics was not a science of the good, yet it was a virtue: motivating people's thoughts and action because it was the knowledge of nature in its wholeness and people could live consistently with nature only understanding it⁶. This ancient line of thinking, implying what later on Rosen defined

⁵ As we know, science does not need the history of its concepts and theories, because it works – and aims at producing workable theories – with testable and put to test concepts and theories, and this process of testing always selects some – the newest – theories, by sending the others in the museum of scientific disciplines.

⁶ Menn, Stephen. (1995). "Physics as a Virtue", In: *Proceedings of the Boston Area Colloquium in Ancient Philosophy*, Vol. 11, Brill, pp. 1–34.

as the science of complexity⁷ – responding to “why” and considering Aristotle’s four causes, instead of the “how” of the Cartesian-Newtonian mechanistic view that reduces systems to machines and syntactic computable models, separates these “machines” from their context, reduces the whole to its parts: and thus annuls the difference between the non-living and the living – was forgotten by the mechanistic science of reduction to simple models undifferentiating between the non-living and the living. Or, is the standpoint of BCA (and mine), it is urgent to abolish the inertia of this type of science.

The starting point of BCA was the domain where its founding father professes: medical art, which is a special field where the integrative and holistic approach is needed, and especially today. This is also the reason of the stressing of life processes as *models* not only for the inanimate/the comprehending of the inanimate, but especially for the existence of the human beings: as in a new round of discussions of Kant’s questions, where the first – what can we know? – is subordinated to the next ones (what should we do? and What may we⁸ hope?).

In the following, it is my reading of some problems raised in the article because they are a fertile ground for further developments.

1. METHODOLOGICAL REMARKS RELATED TO THE NATURAL BASIS OF CANCER

1.1. Matter and information according to Aristotle’s matter-form relationships

Because cancer is a real process involving material changes, the first problem is the understanding of its “materiality” and its relationship with the constituents of the world. The link is not too far, because the authors interpret these constituents in Aristotle’s terms, these ones too interpreted in an original way.

First: the interdependence of *matter* and *information*, as Aristotle’s interdependence *matter-form*. In fact, and letting aside the possibility to discuss them as *concepts* (thus, to circumscribe them to each other), *ontologically* only *united* they form the entities (*substances*). And only united, as substances, have they *actuality*, certifying the objective *existence* of matter and form/information. Neither matter – that is a *principle* (*Physics*, I, 7, 191a), but not only as a (subjective) epistemological result but also as a ground for the existence of substances – nor form/information do exist outside their unity. Actually, information is physical but only a property of matter.

From this point of view, the problem of priority at cosmological level is not important: the possibility of separate matter from information, as the “prime matter” ambiguously considered by Aristotle because he inherently mixed up both the ontological/real and its translation into concepts and cognisance existent in the human mind and consciousness, does not add much to the functioning of living beings and man. After a possible first existence of “pure” matter immediately following the Big

⁷ Mikulecky, Donald C. Robert Rosen: *The Well Posed Question and Its Answer – Why Are Organisms Different From Machines?*, <http://www.people.vcu.edu/~mikuleck/PPRISS3.html>.

⁸ I changed Kant’s first person singular to the first person plural.

Bang – but this matter was not devoid of energy and thus it contained within it a force that was to be multiplied as a result of the movement (“encounters” and clashes) of this prime matter – this “pure” matter began to move and develop (developing its inner forces and manifesting also “only” as energy) generating information /*sparks in fluctuations of reaction-diffusion patterns* and becoming information for the movements which are the answers of matter to both its environment and its inner forces and energy; information has two versants, one is the *communication* outside the considered entity and the other is the *learning* from this “act” of communication: therefore, the appearances of matter (with or without mass – as the photons – and with (as the quarks) or without charge/independent force from the field this form of matter interacts within it, and so on and so forth) are always dependent on both their inner *relations* and their *movements*. Because of relations – reaction/inhibition-diffusion – instability appears, the probability of the position of particles of matter gives their waves form, stationary and non-stationary waves further shape the appearance of matter, i.e. of the medium of movement and existence. And since movement supposes interaction it supposes information: actually, information mediates in matter’s manifestation as wave. And this happens also in the living. The normal development of the organism of living beings and man concerns just the *interconnection* – in fact, the strong intertwining – of *matter, energy* and *information*. This intertwining explains the “from within” development of structures till the living beings, therefore, the transition from non-living (quanta, atoms, molecules) to living *in a living organism*: the parts (including the non-living) do not explain themselves in an isolated way, but only in the whole organism that contains them; and concretely, the inferior levels of quanta and atoms are integrated within the *immediate level* of molecules developing functions as transporting/carrying, hosting, molecular recognition⁹: thus, reacting to two types of information (from the molecular level and from the inferior ones). This level prepares and integrates within the superior one¹⁰ etc., all parts being explained from their fitness within the whole. An organism, let say, of the human being, is explained by the principles of *duplication/juxtaposition* and *integration* functioning in a “mosaic”¹¹, and even changes in ontogeny reflect the series of novel appearances resulted from new integrative processes of the living in new environments¹². Anyway, matter is a *potentiality*, as Aristotle says, transformed

⁹ This process exists also at the level of non-living; see Matache, Mihaela. Elena Bogdan, Niculina Hădăde. (2014). “Selective Host Molecules Obtained by Dynamic Adaptive Chemistry”, *Chemistry – A European Journal* Volume 20, Issue 8, February, pp. 2106–2131.

¹⁰ For exemple, the “mirror cells,” or mirror neurons are based on the above-mentioned functions of molecules. See Stamenov, Maxim I. and Vittorio Gallese. (Eds.) (2002). *Mirror Neurons and the Evolution of Brain and Language*. Advances in Consciousness Research, Volume 42, Amsterdam/Philadelphia: John Benjamins Publishing Company.

¹¹ Chapouthier, Georges. (2001). *L’homme, ce singe en mosaïque*. Paris: Odile Jacob; Chapouthier, Georges. (2009). *Kant et le chimpanzé. Essai sur l’être humain, la morale et l’art*. Paris: Belin; Chapouthier, Georges. (2012). “Mosaic structures in living beings in the light of several modern stances”, *Biocosmology – Neo-Aristotelism* Vol. 2, No. 1-2, pp. 6-14.

¹² Gould, Stephen Jay. (1977). *Ontogeny and Phylogeny*. Cambridge, Ma., London, England: The Belknap Press of Harvard University Press.

into actuality only through its unification with form/information which, in its turn, is potentiality too without matter.

Therefore, the essence or what gives the singularity of an entity is the form/information, i.e. the essence is the *whole* of the entity, or just that which gives *that* peculiar substance: information mixed with its specific matter and energy and giving their “form”. In this respect, Chalmers’ thesis of information as a fundamental law of organisation is absolutely logic. Still the form/information cannot exist by itself, because it reveals through its function, so in movement; and the function of information “requires” the matter on/with which it develops. But nor matter (*hyle*) exists by itself, as the ultimate and passive substrate of things, but only intertwined with form/information: because, as in the most modern physics of *relations* (but starting from Leibniz), in Aristotle matter “emerges from an analysis of change (as in *Phys. I*, 190b-191a)”¹³, as the authors have underlined. We become aware of the constituency of things only seeing their movements and change. Information is an *encounter* (term from Althusser), a *clash* of states (a state and its environment), an *event* (term from Hegel to Badiou) leading to the constitution of another event, of something new, of *change*. (This means for example that we can have only relations/encounters, as it is emphasised by the quantum physics; and that the relations as such give the objectivity but, at the same time, the relativity of matter – as particle and wave –: i.e. their *potentiality* from the standpoint of quantum physics, but also from that of the hypostases of matter as particle and wave¹⁴).

Matter is the “something” as energy and information are “something”: actually, they are more than a “something”, they are understandable (even through deconstruction) only in their *concrete* form of *unity* in movement and change. Without information¹⁵, matter “re”-becomes a “something”: information is that which

¹³ Bremer, Josef; Khroutski, Konstantin; Klimek, Rudolf and Tadeusiewicz, Ryszard. (2017). “Challenging integralism, Aristotelian *entelecheia*, *hyle* and *morphe* (form), and contemporary concepts of information, touching upon the aetiological issues of carcinogenesis,” *Biocosmology – Neo-Aristotelism* Vol. 7, No.1 (Winter 2017). P. 18.

¹⁴ de Broglie, Louis. (1941). *Continu et discontinu en physique moderne*, Paris: Albin Michel, p 30: there is a ‘potential presence’ of the particle in all the points of the region of the space occupied by the wave; and Moldoveanu, Florin. (2016). “Reconstruction of the quantum mechanics from physical principles: method and interpretation”, *Noema*. XV, pp. 135-143: quantum physics annihilates the *local realism* of classical mechanics; on the level of the physical, a quantum system exists between the values obtained experimentally; quantum physics contradicts the intuitions of classical mechanics operating only with macroscopic bodies and thus predicting them *before* experimental measurements: on the contrary, quantum physics predicts only *probabilities* which exist only *after* measurements.

¹⁵ The unity of matter and information, their equal ontological position, was promoted by the philosophical hypothesis of the Romanian electronics engineer Mihai Drăgănescu in 1979 and 1985 (*Profunzimele lumii materiale* [The depths of the material world] and *Ortofizica* [Orthophysics]). However, and though he said that Aristotle was his model, he had a mechanical image about the relationship between matter and information: matter was *passive* and the whole world was the result of random coupling-decoupling between this passive matter and the active information, and information was *exterior* to matter, permanently added to it; information put a meaning in the passive matter [this one very interestingly equated with ‘orthoenergy’, the

gives its specific, concrete quality¹⁶, i.e. the unity of the “substance”/being (as the human organism); the problems of *deviation*, significant for man, are related only to the *concrete* unity of matter and information / substances/beings.

In Aristotle, as in the authors’ view (and in mine), this unity is the internal process of constituency and change of a substance, not an external (“from without”) action of form on matter: information is not added from outside and matter is not a passive receiver. And thus, movement and change always imply the logical transition back and forth between the state of *potentiality* (δύναμις) and that of *actuality* (ἐνέργεια), in order to constitute, preserve or transform the unique concrete substance/entity/being. The logic – or crypt, as the authors say – of the unique concrete substance/being is, however, not an abstract finality of the whole being, but only a “mosaic” of local crypts: for the existence and the “good” of the local organised matter. The ascending levels of life organisations are only “self-evolving”¹⁷. Concerning cancer, we could conceive it as *process interfering at a local level within the given organism and its normal transitions* from the moments of potentiality to actuality and vice versa in order to achieve always a final state of harmony. Cancer imposes a new harmony – that is its own harmony – turning the laws and the *telos* of the organism into its own laws and *telos*.

1.2. Meanings of *entelecheia* and the physical laws

Consequently, perhaps the most important, because integrative, concept of Aristotle – in the light of which the authors have worked their theses – is *entelecheia* (ἐντελέχεια), meaning just the *complete* state resulting from the *internal* processes of constituency and destruction, so of motion and change or reason to be, of a concrete substance.

primary energy that – it’s my interpretation – is the Aristotle’s prime-matter, but, opposite to Aristotle, this passive matter would continue forever (for the permanent coupling and decoupling with information) together with the already *unities* of matter and information] but the result would not be an in-formed matter, so able to resonate/”communicate” and complicate in the process of constructing the world, this level of existence would be only a ‘phenomenological’ ground for the next level of existence, that of structures (or, again my comment, of Aristotelian substances).

Therefore and letting aside the congestion of superfluous new-coined terms and fanciful architecture, the equal ontological position of matter and information was countered and covered by an approach: where the ontological and the epistemological (our concepts representing approximated images of the real) substituted each other (and without noticing the substitution), where the meaning and the signification (of reference) were separated, and where matter and information are *exterior* to each other and nevertheless may give birth to an ‘infra-consciousness’ of the deep matter constituting, as he developed after 1989, within a Fundamental Consciousness of the Existence. Drăgănescu’s panpsychism – but he never has quoted other famous panpsychists – has its origin in the ‘phenomenological information’ of the deep matter and allows he coupling of the deep phenomenological world and the structural one. See Drăgănescu, Mihai. (2003). *The Fundamental Phenomenological Information of the Universe*, <http://www.racai.ro/media/Racai1.pdf>.

¹⁶ Like, for example, the memory of water: as a result of water’s movement/circulation.

¹⁷ Bremer, Josef, Konstantin Khroutski, Rudolf Klimek, Ryszard Tadeuszewicz, p. 22.

Therefore, the reason to be of a substance/entity/being is both the “final” end of the processes generating the substance/entity/being and the complete state¹⁸ that is the sense of all these processes. The *complete/final/“ultimate”* state always means not the moments of the constitution of this state, so not the inferior/basic levels of existence, but the superior level of the entity these inferior levels are parts of and have aimed at from their *inner* mechanisms; for example, from a biological standpoint, for the human being the final state is not the blastula, the gastrula, the different forms of the embryo until the 8th week from fertilisation, nor the foetal period, but the human after its birth/as it was born, since “man begets man”¹⁹.

The authors’ emphasis that “*entelecheia* never can be identified exclusively with ‘actuality’”²⁰ has a deep physical significance:

- that an entity or being is circumscribed within its confines of being, determined by the inner constitutive mechanisms of that being;
- that the constitution of a *final, i.e. complete/“ultimate”* state, involves different *spaces* of reality and different levels of *laws* describing the patterns of the constitution of the final state: the laws describing the physical constitution of the universe (the four fundamental forces – the strong nuclear force, the weak nuclear force, the electromagnetism, and gravity –); the “methodological” laws describing the constitution of things (their persistency and change, or “why is there something instead of nothing”: conservation, symmetry, continuity and transfer, self-organisation / autopoiesis (self-generation), the free energy principle, the principle of least action²¹, the principle of minimum energy, the maximisation of flow access / the easier pattern of flowing and configuration (design)/ the time direction of global optimisation²²/the evolutive sense of movement – evolution according to its etymological meaning as rolling/falling/throwing/twisting/developing forward²³ from within – and thus that to give away an obstacle –; proportionality of parts and scaling); the chemical and physico-chemical laws of matter and transformation; the adaptation of morphology of structures to their

¹⁸ Idem, p. 14: “the “wholeness”.

¹⁹ Aristotle. (1989). *Metaphysics*, 12, 1070a 11, *Aristotle in 23 Volumes*, Vols.17, 18, Translated by Hugh Tredennick. Cambridge, MA.: Harvard University Press; London; William Heinemann Ltd. [First edition of this translation 1933].

²⁰ Bremer, Josef, Konstantin Khroutski, Rudolf Klimek, Ryszard Tadeuszewicz, *ibidem*.

²¹ See Terekhovitch, Vladislav. *Metaphysics of the Principle of Least Action*, <http://arxiv.org/abs/1511.03429>.

²² Bejan, Adrian and Sylvie Lorente. (2004). “The constructal law and the thermodynamics of flow systems with configuration”, *International Journal of Heat and Mass Transfer* 47, pp. 3203–3214; Bejan, Adrian and Sylvie Lorente. (2011). “The constructal law and the evolution of design in nature”, *Physics of Life Reviews* 8, pp. 209–240.

²³ Opposite to *revolvō* (*re-volvo*) – to roll back etc.

environment²⁴; the complementarity of symmetry and parallelism. And all these laws, demonstrated in mathematical formalism and experiments, are somehow very *simple*: 1) supposing a permanent transition of reality in its different states, and this transition means the inclusiveness of potential and transitional states (from temporal, spatial, and qualitative standpoint) within reality; and 2) assuring the relation/"solution" of movement with the less effort/expense of energy and, in the living, the best adaptation for survival. Nevertheless, these laws do not show that all inanimate things would have their *teloi* – according to a mysterious internal force (and tantamount to the existence of information as such, as some neo-spiritualists think) –: they show only the functions of elements in the frame of relational constitution of the existence and things / only the functional characteristic of relations; only the living beings have an unconscious *telos* reflecting their conative force (namely, their survival as their supreme "good"), and only man has a conscious *telos* aiming at the good, as Aristotle was inclined to insist and Koutroufinis reminded us²⁵.

The completeness of things is explained through their history, and this history is a factor and, at the same time, a component of reality. Thus, *entelecheia* is not strange to the *history* of entities. Then cancer is a process whose *many* historical aspects *intertwine*, and its treatment cannot ignore the *multiple* character of causes and their intertwining.

Man has a privileged status in the world: he has access – in different ways, of course – to more and more spaces of reality and the fathoming of the intertwining of the laws, and just this status of "in-betweenness"²⁶ allows him to learn to somehow control reality: then to put his own *telos* in things (first, to give meanings to them). This control is never fully, just because of the infinite character of *relations between the levels of reality* – where the inferior/basic ones have their autonomy towards the superior ones – and mainly it depends on the *values* promoted by man. *Carcinogenesis reflects these constraints of the human control*.

But if ἐνέργεια is the *act/internal effort* (ἐργον) toward the realisation of the τέλος of things, it is *entelecheia* as both end and function²⁷, it logically precedes

²⁴ Xu, Fei. Weihua Guo, Weihong Xu, Yinghua Wei, Renqing Wang. (2009). „Leaf morphology correlates with water and light availability: What consequences for simple and compound leaves?", *Progress in Natural Science* 19, pp. 1789–1798.

²⁵ Koutroufinis, Spyridon A. (2016). "Modern biological neo-teleologism versus Aristotle's genuine *telos*", *Biocosmology – Neo-Aristotelism* Vol.6, No. 3 & 4, Summer-Autumn, pp. 414-426.

²⁶ Suteanu, Cristian. (2013). "The causal network of in-betweenness", *Biocosmology – Neo-Aristotelism* Vol. 3, No.4, Autumn, pp. 608-618.

²⁷ Aristotle, *Metaphysics*, 9, 1050a 21-23: "For the activity is the end, and the actuality is the activity; hence the term "actuality" is derived from "activity," and tends to have the meaning of "complete reality".

potentiality²⁸ and once more *telos* as the for the sake of and thus *entelecheia* have also a decisive role in the preservation of the equilibrium of the organism, even by counteracting – at least, for a while – the carcinogenesis in the inferior levels (we may think to Haken's synergetics).

1.3. *Telos*, consciousness and cancer

Nevertheless, all the laws and levels coexist and are interdependent. Consequently, one has to not reduce the treatment and prophylaxis of cancer to the strengthening of the psyche – though one may think that if the logic of *kosmos* as general order/principles of order giving a coherent state is intelligible, so if man's logic superposes on the logic of things, the mind of man could control this logic, and not as an external emphasis of the instrumentality of the logic of things but as an inner force of this logic, at least concerning man's organism – but nor to the medical intervention at the levels of functionality of organs or chemistry of cells. The importance of the *telos* of the entire organism – for the entire organism is the point of the logic of development of matter and information – does not annul the *teloi* of the organs and cells. Though the *telos* of organism as “the what's the point”/ « *à quoi bon* » of the entire development entails the integration of organism in its entire environment and the unitary logic approaching this integration, the understanding of this integrative process upwards does not annul at all the integrative process downwards. But nor the integrative process annuls the relative independence of the subordinated processes and subsystems. This is just because (concerning our problem) the *teloi* of organs and cells *arise from the manifestation* of physical (quantum and electric charges), chemical (atomic) and biological (molecular, cells) relationships within the organs and cells. Indeed, these relationships are not only material, formal and efficient – reflecting Aristotle's first three causes – but also telic: they have their own *telos*, “all four causes of Stagirite are basically *telic* (not only the Final cause)”²⁹. Applying this grasping of Aristotle's causes, we obviously may conceive that all the deep physical and chemical relations within cells, and then these relations and the biological ones in and between organs prove an “active orientation of potency toward actuality”³⁰. Here, in this *moving interval* between potentiality and actuality, the *deviation* from the normal state of all these relations takes place.

The fact that the *telos* was equated by some ones with consciousness was first the result of the difficulty to understand the superposition and intertwining of different levels of reality (quantum, chemical, biological and macro-body (organism)) and the concrete transfers from one level to another. The solution was *panpsychism*. Secondly, information was equated with consciousness and thus the conscious nature of everything was again considered. The fact that consciousness inherently means *telos* is a little embarrassing when one has in view destructive phenomena like cancer, but nor this problem was insolvable for speculation, is it not?

²⁸ See also Menn, Stephen. (1994). “The Origins of Aristotle's Concept of 'Ενέργεια: 'Ενέργεια and Δύναμις”, *Ancient Philosophy* 14, pp. 73-114.

²⁹ Bremer, Josef, Konstantin Khroutski, Rudolf Klimek, Ryszard Tadeuszewicz, p. 20.

³⁰ *Ibidem*.

Actually, the ubiquity of consciousness was “observed” at the level of macro-bodies where no one would have supposed it: a stone made a dam in the water path. Now the water makes a detour around the stone. However, the examples of cinematic and dynamic detours, including the one of an animal’s course in front of an obstacle, shows that *there are physical laws and neuro-psychophysiological laws explaining them*. But in quantum mechanics in the quantum tunnelling (of particles in their wave probabilities) there is a possibility of very few particles to escape from the limits given by the potential barriers: through borrowing energy from the environment, they may tunnel the potential barriers *as if* they “would account” for the ‘energetic intrinsic legitimacy’ of the final state and integrate the ‘means’ to arrive to this state in a unitary action where time, as the space, seem to be overflowed, as in a detour consciously operated and according to calculus”³¹.

Or let mention the quantum biology phenomena: the efficiency of photosynthesis – where every photon is absorbed – is realised through waves of electron probabilities in the process of quantum coherence (that has no classical analogue), so having two separate split-beams for every electron “in order to take” every possible path to the reaction centre of cells³².

1.3.1. “Anti-matter” and cancer

More: because of the newest physical and cosmological research, we may have a more realist (materialistic) image about life and cancer. For example, there are already clear cognisance about antimatter whose antiparticles are “partners” and correspond to the “normal” particles of matter. Differing by opposite electric charges and quantum numbers, these two types of particles may collide and mutually annihilate. With great probability, antiparticles do not exist in the living matter, so to mention them in carcinogenesis is a fantasy (this is the reason I put the word antimatter in quotation marks). But we can use antimatter as metaphor – because there already are proofs that antimatter can exist on the Earth³³ – and conceive cancer as antimatter developing/multiplying on the expense of living matter: as Feynman has suggested³⁴, including in the ordinary matter the positron and electron are opposed and the coming of one of them generates the other one in a time symmetry where the coming of one particle signals the past generation and the other particle. Life is based on the same phenomenon. But if so, cancer may be viewed as a reverse process, in mirror, or – in more prosaic terms – as a parasite plant on the normal and healthy one that ends by devouring its host.

³¹ Ruyer, Raymond. (1954). *La cybernétique et l'origine de l'information*. Paris: Flammarion, p. 181. The examples of the macro-bodies are from Ruyer.

³² Al-Khalili, Jim. Johnjoe Mcfadden. (2014). *Life on the Edge: The Coming of Age of Quantum Biology*. London: Bantam Press.

³³ *Rogue Antimatter Found in Thunderclouds*, May 13, 2015, <https://www.scientificamerican.com/article/rogue-antimatter-found-in-thunderclouds/>

³⁴ Feynman, Richard. (1985). *The Character of Physical Law*. Cambridge Ma., London, England: The MIT Press, pp. 149-155 [first edition 1967].

On the other hand, since life is defined by multiplication/development – and thus exchange of matter, energy and information with the environment – why would cancer not be life too? If we do not forget the ancient significance of love as *ontological* process of gathering, bringing together, association of parts and elements (together with dissociation) as explaining factor of the identity and continuity of things, we may conceive of cancer as destroying the association of the host living system and substituting it with its own association (based on destruction/dissociation). The destruction entails matter, energy and information: the resistance of the natural system is not based only on matter and energy or on information, it is based on all of them but certainly in an uneven way, according to the stronger force embedded in matter or information; the diet with healthy food, the respect of circadian rhythm, sport and activity are as important as the complex cultural informational stimuli, from which I select one in the final chapter.

1.3.2. Information and cancer

Information means *telos*, but not every *telos* supposes awareness. The *teloi* of quanta etc. concern only the systems these elements in relations are parts of. From this standpoint, we should think that entities of different scale have their “experience” – so interactions “and” reactions – in their “spaces”³⁵ or “epistemologically different worlds”³⁶, and the *teloi* of every entity on all the scales correspond to the scale and world these entities belong to. There certainly is (at least, a relative) communication between different scales and worlds (the nutrients we eat not only arrive at the organs through a bio-chemical process [and this process is unconscious], but also until our mind generating pleasure or disgust, and this process is not only conscious but it is the first sign of awareness as more than simple *reflection* of the environment], but the information related to the inferior levels of chemical and biological reactions is subordinated to the information realised at the superior level of mind and at different storeys of this level. This means that the inferior information has a “meaning” and *telos* only in the framework of the inferior levels where this information constitutes and is transmitted through interactions, but the *telos* of the organism does not directly “translate” the inferior *teloi*, it is not their sum and is specific to the *new* world the organism is.

Just this dialectical approach – and process – makes possible the complexity of a healthy or diseased state: on the one hand, cancer occurs at the level of physical, chemical and biological interactions and worlds, for the sake of its existence, and not because of a subcellular awareness; on the other hand, the transmission of cancer to the whole organism and the metastasis take place only after a period when the

³⁵ I paraphrase Sorin Baiculescu’s mathematical theory concerning the epistemological spaces of experience (*Space of Experience*. (bilingual edition). (2013). Bucureşti: Editura Amurg sentimental).

³⁶ Vacariu, Gabriel. (2005). “Mind, Brain, and Epistemologically Different Worlds”, *Synthese* 147, pp. 515–548,

DOI 10.1007/s11229-005-8366-4. And Vacariu, Gabriel. (2016). *Illusions of Human Thinking: On Concepts of Mind, Reality, and Universe in Psychology, Neuroscience, and Physics*. Springer.

organism could no longer counteract, with its superior (because integrative) information and *telos*, the localised cancer.

The “from within” source of the organism’s healthy or ailing development is not only information: although this one is first of all not cultural but physical, chemical and biological, and many people think that it would be both the bearer of the evil and the mysterious angelus that would defend the individual’s integrity and lasting existence, information is absolutely intertwined with matter (and energy). If it’s true that *ex nihilo nihil fit*, it’s equally true that the survival of the individual as such or of its dowry of information is related only to the unity of “his” matter, energy and information in their exchange and life in their environment. As a clone of a human is not tantamount with the original human because this one is the result of his unique experience in his milieu, as a “cluster of information” naturally “remaining from” the individual is not specific to that individual and does not assure his lasting forever, but becomes information related to the inorganic matter the individual turns after his death.

By mentioning these aspects I do not intend to exclude the process of consciousness from the problems of the existence and especially of life. I think that just through the fathoming of the physical aspects – and this means, obviously, matter, energy and information – one may clarify the space for the grasping of what does consciousness mean and how does it act. “Antimatter” as well as other strange phenomena helps us to see at what extent consciousness is *not* constitutive to life. Reactivity, the answer of elements put in relation each other, and their *conatus* are not consciousness, this one is something more: *values* and the *operating with values*, so for the sake of something more than the own *conatus*. Anyway, the problem is open: but the solution is not neo-spiritualism.

However, though the deep interior phenomena – whose bearer and vector are the unity matter-energy-information – are the origin of cancer, i.e. not the exterior signs as appearance of the organism are this origin, in fact the organism has not only a genotype but also a phenotype that is the result of the experience of the organism in its milieu: briefly, an interference of the internal data and the external ones.

1.3.3. Life and cancer

Life is the process that best would allow the equality of information and consciousness. In fact, life is *metabolism* “ceaseless flow of energy through a network of biochemical processes, which allows the organism to maintain itself, to repair itself and to perpetuate itself”³⁷. This flow and *networks* of processes are from within the cells, organs and organism, and imply *structures* and *patterns* of organisation and action. Therefore: a high level of complexity that, mathematically speaking, means that the networks of life are nonlinear and generate bifurcation

³⁷ Pisani, Francis (2007). “Networks as a Unifying Pattern of Life Involving Different Processes at Different Levels: An Interview with Fritjof Capra”, *International Journal of Communication* 1, pp. 5-25 (p. 10).

points and emergence (as in consciousness whose experience/reaction to a changing environment means *ad hoc* creativity, initiative, freedom to change).

Finally, life is a process intertwined with entropy. This one is an emblem of the dialectics of existence: life means entropy (disorder, contraries, and contradictions) not only because of the above-mentioned conscious reactions but also because of the life processes as such, exchange of matter, energy and information with the environment. However, life means not only entropy, but also – and rather – negative entropy: just because the living organism is open and communicates with the environment by the exchange of matter, energy and information, it counteracts the second law of thermodynamics and, with free energy, “pumps” entropy outside it in order to maintain an internal equilibrium. Therefore, the problem is the proportion on entropy and its control by the life structures. Too much entropy that cannot be controlled by the organism is harmful, as the too less one. Cancer is just this uncontrolled disorder related to ageing, disorder in large fluctuations of opposing metabolic processes and metabolism by dissipation of mass, information, and energy in the proximity of the neoplasm³⁸, and the atrophy of the immune system: all of these in the individual’s environment. Therefore, the cancer therapy must take into account just these relationships of the natural processes of the individual with its social frame and existence.

2. METHODOLOGICAL REMARKS RELATED TO A SOCIAL TOOL AGAINST CANCER

The concept of *entelecheia* – the effort for the realisation of the *telos* of the whole thing/organism, the complete state of a thing/organism as a result of the realisation of the *telos* through and within its inner interpretations of the movements of the whole comprising the organism – explains the dialectic of the discontinuous individual and its social appurtenance or interdependence with the whole society. The social/cultural feature of the individual – and its socially/culturally forged consciousness – gives the specific of man towards other animals and living beings. Ontologically, man is a new being alongside other animals just through its social/cultural singularity.

We have to not forget that Aristotle has developed the fourth cause, the *telos*, because only the material and efficient causes, emphasised by the previous thinkers, do not explain essential aspects of the beings which have in themselves “the innate impulse to change”/ “a principle of motion or change” (Physics, II, 1). This is the reason he explained the *telos* by giving examples from the area of the living: for in the inanimate things the *telos* is given from outside, as in the statue where the *telos* is put by the sculptor.

Obviously, in the living the external conditions are integrated and processed, and the result is as if everything would be created from within alone. And the more the living species is more developed, and especially in man, the more one may grasp

³⁸ Klimek, Rudolf. (2014). “Threefold material-informational-energetic reality: $E = mc^2$ ”, *Biocosmology – Neo-Aristotelism* Vol. 4, No. 4, pp. 405–415 (411-12).

both the external material and efficient causes from without and their transformed appearance as provided from the inner remaking of these causes.

The *telos* of man as a social/cultural living organism is thus not the arithmetical sum of the *teloi* of organs and their lowest parts, nor is the *telos* of the biological organism as a whole – if one might separate the biology from the cultural – but a multilevel *telos* where the inferior levels have an efficient impulse in the transformation of the living man but where at the same time the superior levels have a big influence on the inferior one, physical-chemical and biological. The superior levels are those of the *consciousness* imbued with the social and cultural data from outside and the processing of all these data. The *levels* of consciousness concern those: of reason and logical description of the world and man's existence in the world, of feelings, of different needs, of feelings again, of recollection and memory, of anticipation, of projects and individual aspirations, of values and social ideals.

First, no level of consciousness is less important than the other ones, and all of them are interdependent in a harmonious construction. And as in the construction of a building if a piece is missing the whole becomes shaky and unstable, as the balanced man requires a level-headed existence of all the levels of consciousness.

But secondly, since the superior levels arise from superior strata of relationships of man with its complex milieu – and just for this reason they have autonomy towards the inferior biological levels of the human being – it seems that the superior levels would have a bigger role than the biological and physico-chemical ones. This is because the superior levels integrate the inferior ones and the *entelecheia* of the whole corresponds to this integration: i.e. the superior levels are closer to the *entelecheia* of the whole being it is about of, than the inferior levels; more clearly, *only the superior levels give the quiddity of that being* and ultimately every level of that being is “subordinated” to the superior ones.

Therefore, just because of *entelecheia* the superior levels decisively influence the inferior ones and the functioning of the whole.

The superior levels related to the consciousness construct different *projections* within the “world 3” of ideal things (let's borrow Popper's formula). Between these projections, the stronger are those using: *values* as vectors of human action transcending the immediate needs, aspirations aiming more than the horizon of the present (so, anticipation and future), and feelings concerning a wider scope than the individual harmony with the neighbour humans and environment. These types of projections proved to be the most powerful factors of the human life: people lived longer and were happier when they had not only aspirations concerning their individual purposes but also, and rather, *ideals* concerning the collective well-being, *teloi* and actions.

The reason of this fact is that the *content* of the human thinking and action is less legitimate, in the eyes of the individual, when it concerns only individual targets and suitability with the exterior: just because man compares his/her goals with those of the others and sees that all these goals are relative, temporary and unimportant in their inexorable repetition and similarity. But man is a social being. If he/she considers society only an exterior environment from which it would be better to take

what is good and to ignore what is bad – or, concretely, as in the mainstream ideology, to privatise the gains and socialise the losing – then (and somehow paradoxically) neither he and she do really develop their inner richness (because, let's paraphrasing Francis Bacon's fable of science in *The New Organon*, I, 1620, one is not only a spider removing from its belly different products, as certainly one is not only an ant gathering from outside what it can catch, but a bee both tasting and interpreting the external world and acting within it) and nor do they have a good relation with the outside.

The social is not an added feature to man and from without, as if man would be only an individual solitary being: a "necessary evil", as in the mainstream ideology. On the contrary, the social is an *internal* constituent of man, his interior is social. Therefore, what gives the basis of all the individual goals is only their social *raison d'être*. The individual happiness – so *sine qua non*, unique and unrepeatable for the individual – is yet *not enough* to support the individual will to live and the efforts of all its inferior levels of its being.

Though every being, thus every human, wants to live – "everything naturally keeps itself in being, and resists corruptions so far as it can"³⁹ – the preservation of life does not depend only on this *conative* force but rather on the *contents* of life, i.e. human meanings of the human life according to the always *highest values* shared by a society⁴⁰. These contents are given and grasped by the human mind and its forces, reason and feelings together, and consist of the *flourishing of the human thinking and the development of man's creativity*, unique and unrepeatable of every individual: so, the contents of the human life consist also in the will *to annul the obstacles* to this flourishing and development of every individual.

In order to preserve our life as long and happy as it is possible, we depend not only on our will to live – influencing from the highest level of our conscious will even the deep biological events – but also on our social *ends*, consciously constituted. These ends are socially constructed, continuing the mutual aid as factor of evolution of the living⁴¹, and the more they concern the values of *justice and freedom for all to think and develop in a creative way* the more they are stronger influencing the biological processes of our life and the more they realise the unique contribution of the humans in the movement of *kosmos*. This contribution consists in the introduction in the kosmic mechanism of both the enlargement of the *field of the possible* and the complex *dialectics* of the *aleatory* – and what would be more aleatory than the human thoughts and deeds resulting from so many experiences and concrete relationships in concrete and changing environments? – and the strict *determinism*, put by the same human capacity of understanding and designing the *logos* of things.

³⁹ Thomas Aquinas, *Summa Theologica* (1265-1274), Secunda Secundæ Partis, Question 64. Murder, Article 5. Whether it is lawful to kill oneself?, Objection 5, <http://www.newadvent.org/summa/3064.htm#article5>.

⁴⁰ Bazac, Ana. (2016). "The philosophy of the *raison d'être*: Aristotle's *telos* and Kant's categorical imperative", *Biocosmology – Neo-Aristotelism* Vol. 6, No. 2, pp. 286-304.

⁴¹ See Kropotkin, Peter. (1902). *Mutual Aid: A Factor of Evolution*. <https://www.marxists.org/reference/archive/kropotkin-peter/1902/mutual-aid/>.

Ultimately, the efficiency of the will to live depends on the social ideal of *justice and fight for the conditions for the creative development of all and every human individual* shared by us. This efficiency is not direct, but through the *joy of life* the sharing of this social ideal produces in our conscience. Obviously, the joy of life – sign of the *élan vital* of man (Bergson) and, through emotions emerged with the human self-awareness, a new evolutionary force, if I may paraphrase Ladislav Kováč⁴² – is not generated only by the high social conscience of a person, but the more this person is older and its illness gets worse and the necessary human *pleasures* (as other signs of life, again as Bergson has pointed) decrease, the only way to prolong a joy of life is to concentrate the person's superabundance in a social direction. The *social ideal* allows this superabundance to become more spiritual and detached from the physical immediacy. Bergson showed that the *élan vital* explains the life as *resistance* of the living to the obstacles of the environment⁴³. If so, the mental resistance against injustice, oppression and social domination of all sorts, including spiritual, may help the individual's resistance against the disorder of the spontaneous order of his life.

Therefore, one of the most powerful enemies of cancer is just the *social ideal* shared by the individual and deeply internalised in his mind. The social ideal is not a panacea, but certainly it is the factor imposing not only the protraction of life and the joy of its rich contents surpassing the egotism of the individual animal in front of the biological constraints, but also a serene death: since this one is a natural event, as life is, the consciousness of the melting of the own bodily material rest in the cold abiotic material of the Universe can give the *tranquillitas* of the inexorable but continuing transformation, i.e., existence.

Man's most motivating driving force is not the anxiety towards death, but its concrete care for the others, and not only for the fellow neighbours. This care gives the contents of his life: therefore, the social ideal and concrete activism as care are not simple means to preserve health and prepare a serene death: indeed, the social ideal is not tantamount with the watchword "think positively".

Instead of conclusions

Not only through the "dead information" of the consumerist messages deforming everything, but also through the bad distribution of matter and energy worldwide and concerning every individual on the Earth, the present organisation of society is a carcinogenic factor. For a successful treatment of disorders – especially of cancer – an *integral* medicine is needed, integrating elements from both Western and Eastern medicine⁴⁴. At the same time, the prophylaxis requires complex conditions – material and informational – for a dignified life for all and every

⁴² Kováč, Ladislav (2012). "The biology of happiness: Chasing pleasure and human destiny", *EMBO Reports* Vol. 13, No. 4, March, pp. 297–302.

⁴³ Bergson, Henri (2011). *L'évolution créatrice*. Septième édition, Paris: F. Alcan, pp. 102-103. [First edition 1907].

⁴⁴ Khroutski, Konstantin (2010). "All-Embracing (Triune) Medicine of the Individual's Health: A Biocosmological Perspective," *Journal of Future Studies* Vol. 14, Issue 4, June, pp. 65–84.

individual⁴⁵. In order to realise these conditions, one has to integrate not only the collective and individualist traditions of a sustainable life⁴⁶, but rather the collectivist tradition and innovation. This conclusion is not a fanciful “ideology” but results from the entire analysis of the natural basis of the human life.

The development of the present science, though in a fragmentary manner, helps us to understand the malign consequences of the human action motivated by the quest for private profit. And though the understanding of these consequences for the Earth as a whole and for every human being is only now, after their agglomeration, it is not too late to change the course. The holistic view on both prophylaxis of illnesses and improvement of the course of life comes from Aristotle’s chief value: “the human good (that) turns out to be activity of the soul in accordance with virtues, and if there are several virtues, in accordance with the best and the most complete”⁴⁷.

References

- Al-Khalili, Jim. Johnjoe Mcfadden. (2014). *Life on the Edge: The Coming of Age of Quantum Biology*. London: Bantam Press.
- Aristotle. (1989). *Metaphysics, Aristotle in 23 Volumes*, Vols.17, 18, Translated by Hugh Tredennick. Cambridge, MA.: Harvard University Press; London: William Heinemann Ltd. [first edition of this translation 1933].
- Aristotle. (2000). *Nicomachean Ethics*, Translated and edited by Roger Crisp, Cambridge: Cambridge University Press.
- Baiculescu, Sorin. (2013). *Space of Experience*. (bilingual edition). București: Editura Amurg sentimental.
- Bazac, Ana. (2015). ”The Societal Crisis and the Human Dignity: Epistemological View”, *Wisdom 2* (5), pp. 47–60.
- Bazac, Ana. (2016). ”The philosophy of the *raison d’être*: Aristotle’s *telos* and Kant’s categorical imperative”, *Biocosmology – Neo-Aristotelism* Vol. 6, No. 2, pp. 286–304.
- Bejan, Adrian and Sylvie Lorente. (2004). “The constructal law and the thermodynamics of flow systems with configuration”, *International Journal of Heat and Mass Transfer* 47, pp. 3203–3214.
- Bejan, Adrian and Sylvie Lorente. (2011). “The constructal law and the evolution of design in nature”, *Physics of Life Reviews* 8, pp. 209–240.
- Bergson, Henri. (2011). *L’évolution créatrice*. Septième édition, Paris: F. Alcan. [First edition 1907].
- Botta, Marta. (2016). “Neo-collectivist Consciousness as a Driver of Transformative

⁴⁵ Bazac, Ana (2015). ”The Societal Crisis and the Human Dignity: Epistemological View”, *Wisdom 2* (5), pp. 47–60.

⁴⁶ Botta, Marta (2016). “Neo-collectivist Consciousness as a Driver of Transformative Sociocultural Change”, *Journal of Future Studies* Vol. 21, Issue 2, December, pp. 51–70.

⁴⁷ Aristotle (2000). *Nicomachean Ethics*, Translated and edited by Roger Crisp, Cambridge: Cambridge University Press, I, 7, 1098a 24-26, p. 12.

- Sociocultural Change”, *Journal of Future Studies* Vol. 21, Issue 2, December, pp. 51–70.
- Bremer, Josef, Konstantin Khroutski, Rudolf Klimek, Ryszard Tadeusiewicz. (2017). “Challenging integralism, Aristotelian *entelecheia*, *hyle* and *morphe* (form), and contemporary concepts of information, touching upon the aetiological issues of carcinogenesis,” *Biocosmology – Neo-Aristotelism* Vol. 7, No.1 (Winter 2017).
- Chapouthier, Georges. (2001). *L’homme, ce singe en mosaïque*. Paris: Odile Jacob.
- Chapouthier, Georges. (2009). *Kant et le chimpanzé. Essai sur l’être humain, la morale et l’art*. Paris: Belin.
- Chapouthier, Georges. (2012). “Mosaic structures in living beings in the light of several modern stances”, *Biocosmology – Neo-Aristotelism* Vol. 2, No. 1-2, pp. 6–14.
- de Broglie, Louis. (1941). *Continu et discontinu en physique moderne*, Paris: Albin Michel.
- Drăgănescu, Mihai. (2003). *The Fundamental Phenomenological Information of the Universe*, <http://www.racai.ro/media/Racai1.pdf>.
- Feynman, Richard. (1985). *The Character of Physical Law*. Cambridge Ma., London, England: The MIT Press [first edition 1967].
- Gould, Stephen Jay. (1977). *Ontogeny and Phylogeny*. Cambridge, Ma., London, England: The Belknap Press of Harvard University Press.
- Khroutski, Konstantin. (2010). “All-Embracing (Triune) Medicine of the Individual’s Health: A Biocosmological Perspective”, *Journal of Future Studies* Vol. 14, Issue 4, June, pp. 65–84.
- Klimek, Rudolf. (2014). “Threefold material-informational-energetic reality: $E - I mc^2$ ”, *Biocosmology – Neo-Aristotelism* Vol. 4, No. 4, pp. 405–415.
- Koutroufinis, Spyridon A. (2016). “Modern biological neo-teleologism versus Aristotle’s genuine *telos*”, *Biocosmology – Neo-Aristotelism* Vol.6, No. 3 & 4, Summer-Autumn, pp. 414–426.
- Kováč, Ladislav. (2008). “Finitics: A plea for biological realism”, *EMBO Reports*. 9, pp. 703–708.
- Kováč, Ladislav. (2012). “The biology of happiness: Chasing pleasure and human destiny”, *EMBO Reports* Vol. 13, No. 4, March, pp. 297–302.
- Kováč, Ladislav. (2016). “Life’s arrow: the Epistemic Singularity”, *EMBO reports* DOI 10.15252/embr.201642902, e201642902.
- Kropotkin, Peter. (1902). *Mutual Aid: A Factor of Evolution*. <https://www.marxists.org/reference/archive/kropotkin-peter/1902/mutual-aid/>.
- Matache, Mihaela. Elena Bogdan, Niculina Hădăde. (2014). “Selective Host Molecules Obtained by Dynamic Adaptive Chemistry”, *Chemistry – A European Journal* Volume 20, Issue 8, February, pp. 2106–2131.
- Menn, Stephen. (1994). “The Origins of Aristotle’s Concept of *ἑνέργεια*: *ἑνέργεια* and *δύναμις*”, *Ancient Philosophy* 14, pp. 73–114.
- Menn, Stephen. (1995). “Physics as a Virtue”, In: *Proceedings of the Boston Area Colloquium in Ancient Philosophy*, Vol. 11, Brill, pp. 1–34.

- Mikulecky, Donald C. *Robert Rosen: The Well Posed Question and Its Answer – Why Are Organisms Different From Machines?*, <http://www.people.vcu.edu/~mikuleck/PPRISS3.html>
- Moldoveanu, Florin. (2016). “Reconstruction of the quantum mechanics from physical principles: method and interpretation”, *Noema*. XV, pp. 135–143 [in Romanian].
- Pisani, Francis. (2007). “Networks as a Unifying Pattern of Life Involving Different Processes at Different Levels: An Interview with Fritjof Capra”, *International Journal of Communication* 1, pp. 5–25.
- Rivera-Ferre, Marta G. (2012). “Framing of Agri-food Research Affects the Analysis of Food Security: The Critical Role of the Social Sciences,” *International Journal of Sociology of Agriculture and Food* Volume 19, issue 2, pp. 162–175.
- Rogue Antimatter Found in Thunderclouds*, May 13, 2015, <https://www.scientificamerican.com/article/rogue-antimatter-found-in-thunderclouds/>.
- Ruyer, Raymond. (1954). *La cybernétique et l'origine de l'information*. Paris: Flammarion.
- Stamenov, Maxim I. and Vittorio Gallese. (Eds.) (2002). *Mirror Neurons and the Evolution of Brain and Language*. Advances in Consciousness Research, Volume 42, Amsterdam/Philadelphia: John Benjamins Publishing Company.
- Suteanu, Cristian. (2013). “The causal network of in-betweenness”, *Biocosmology – Neo-Aristotelism* Vol. 3, No.4, Autumn, pp. 608–618.
- Terekhovitch, Vladislav. *Metaphysics of the Principle of Least Action*, <http://arxiv.org/abs/1511.03429>.
- Thomas Aquinas, *Summa Theologica* (1265–1274), Secunda Secundæ Partis, Question 64. Murder, Article 5. Whether it is lawful to kill oneself?, Objection 5, <http://www.newadvent.org/summa/3064.htm#article5>.
- Vacariu, Gabriel. (2005). “Mind, Brain, and Epistemologically Different Worlds”, *Synthese* 147, pp. 515–548, DOI 10.1007/s11229-005-8366-4.
- Vacariu, Gabriel. (2016). *Illusions of Human Thinking: On Concepts of Mind, Reality, and Universe in Psychology, Neuroscience, and Physics*. Springer.
- Xu, Fei. Weihua Guo, Weihong Xu, Yinghua Wei, Renqing Wang. (2009). „Leaf morphology correlates with water and light availability: What consequences for simple and compound leaves?”, *Progress in Natural Science* 19, pp. 1789–1798.

**SEMA/SIGN, SEMASIA/MEANING AND TOYING WITH SEMANTICS
IN ARISTOTLE'S TRANSLATED TEXTS –**

**Response to the “Challenging Integralism, Aristotelian *Entelecheia*, *Hyle*, and
Morphe and Contemporary Concepts of Information”,**

by J. Bremer, K. Khroutski, R. Klimek & R. Tadeusiewicz

Anna MAKOLKIN¹

*One sign causes knowledge,
and one sign causes belief.
Aristotle, Rhetoric to Alexander*

This recent collective contribution to postmodern neo-Aristotelianism posits Aristotle and his system of knowledge into the centre of the current discourse and all interdisciplinary studies – information, methods of transmission of knowledge, its role, both constructive and deconstructive as far as human civilization is concerned. This article timely and appropriately demonstrates how the 21st- century sciences and humanities cannot dismiss the ancient thinker as antiquated and outdated, but, moreover, how relevant is his analytical system for current pursuit of knowledge and how elegantly simple and permanently useful are Aristotle's logical arguments. Aristotle could teach every modern thinker how to present one's ideas. The article creatively includes the aetiology of cancer into the information formula and the Aristotelian famed causes. However, the most crucial point of the essay is the question of translation and the resulting problematic meaning of the translated Aristotelian terminology in English, the postmodern lingua franca and authority on Meaning.

Most modern and postmodern Aristotle scholars and intellectuals now rely on translation and, primarily, on the English versions of the canonical texts since English is the current global lingua franca in all areas of knowledge, politics, economics, global communication and philosophy. Therefore, the question of meaning of the terms and, in our case, Aristotle's scientific categories is of primary significance. Prof. Khroutski, one of the co-authors of this article, a medical doctor and a philosopher, but not a linguist, should be credited with drawing scholarly attention to the linguistic problem, i.e. the problem of **mistranslation** and misinterpretation which he and his colleagues encountered in the process of rehabilitation of Aristotle and his teaching in the 21st century.

When a translator produces a rendition of the foreign text he/she exercises a significant intellectual and poetic act, relying on one's own imagination, cultural background and analytical skills in decoding the meaning/ *semasia* in any original text. Here, it is imperative to know that **none** of the translators and **none** of the

¹ University of Toronto, CANADA.

dictionaries have ever managed to provide the exact meaning – instead, it has always been and is merely **approximate**, serving as the instruments of crossing the codal boundaries, the frontiers between different languages, with differing grammatical, lexical structures and vocabularies, and purely linguistic laws. One gets to the original and presumably intended meaning by overcoming the barrier of Otherness and one's own cultural biases and peculiarities. Thus, it is imperative in the 21st century to revise, review, re-translate, re-edit and compare translations of canonical texts, particularly, if they have been authored by the intellectual human colossus such as Aristotle. By the virtue of cultural shift, English has now become **the** authority on Meaning and on Aristotle's terminology. The authors of the article in question timely challenge this status in postmodern scholarship, given the utmost relevance of Aristotle even to postmodernity.

Translation itself, in the Germanic and Romance languages, as well as in most Indo-European ones, means “movement across another heavy side”:

In Latin, for example,

TRANS = over, across

LATUS= other heavy side

Hence,

TRANS + LATUS= TRANSLATION

The prefix TRANS gave rise to the multitude of international verbal signs:

Transmission, transformation, transcription, transnational, transfiguration

Incidentally, the Russian word for “translation” “*perevod*” means literally “to lead over” and is identical in its semantics to Latin. The act and process of translation in general, from one language to the Other, is possible at all due to the single ARISTOTELIAN UNIVERSAL, human thought. “Universal is common,” concluded Aristotle in distant antiquity, humans express their thoughts in various ways and tongues but they organize them in a single mode, or Idea. This is why the Chinese can read and know Aristotle, so do the English, French, Germans, Italians, Russians, Finns, Spanish etc., despite the different linguistic external cosmetic structures.

The philosophical treatises and major parts of Aristotle's teaching first were translated into Latin, by the bilingual inhabitants of the Roman Empire, eager to transmit the best of the Greek legacy and educate its citizens. From Cicero up to the Renaissance period, the scholars wrestled with the transmission of the Greek thought. One has to mention that pre-Christian and Christian versions differed substantially since translations reflected the change in the societal ethos and the religious orientation of the translators. Some translators of Aristotle into Latin had been guided by political and patriotic considerations – hence, the Greek PSYCHE became DE ANIMA, despite the fact that the Greek original had given rise to the proper global scientific terminology, such as **psychology, psychiatry, psychometry** etc. and should have been preserved in the title of the famed Aristotle's essay. The global tradition of translations did not reject the Latin neologism – DE ANIMA – having preserved it for posterity as a more successful version. Many modern European translated editions have preserved this incorrect translation, and the global scholarly

community forgot about the Greek “psyche,” despite its longevity in other disciplines and languages. The reason is political – Latin remained the lingua franca of the educated Europeans up to the 16th century and the misnomer or the Latin name displaced the Greek original title.

The same happened with another Aristotle’s essay, *De interpretatione* which came into being with the 6th–7th-century AD translation by Isidor from Seville who chose this Latin version to the original PERI HERMENEAS, translated by some Western scholars as “Hermeneutics” while the most appropriate should have been “exegesis”. Incidentally, Russian translators of Aristotle in their 1978-edition did provide the latter. The Latinized *De interpretazione* was picked up by many neo-Platonians, including Stefan from Alexandria, his student Ioann Philipon, the Edessa Nestorian monk Probe and, during the Renaissance, by the staunch neo-Platonians and rival of Pomponazzi, Alfred Nifo (1473–1538). Thus, either “exegesis” or “hermeneutics” would have been more appropriate. Yet, the Latinized version became the **permanent sign** in discourse and scholarship who accepted the false sign. The Latin “interpretare” meant to provide oral explication during the debate, and now it exists in all Indo-European languages as a legitimate sign, implying oral translation. The second word “translate” which also means to give “written rendition,” exists both in Italian and French “traduire”.

Translation is an **arbitrary choice of verbal signs** and each sign/sema is arbitrary in itself, and different translators in different times choose different signs for transmitting the same idea, Thought, claiming to be the most precise renditions of the original, remaining, in fact, nothing but approximations. Translation is a poet who selects the most suitable descriptions in various languages. The grammatical, lexical and syntactical possibilities of languages differ, so do the skills of a translator. The phenomenon of POLYSEMY or multiplicity of meanings complicate the matters in the process of translation. English, the current lingua franca, is a very cryptic and challenging code due to its polysemy, and scholars often are not aware of its limitations and barriers. Meaning could be changed but, if it is not so important in literature and poetry, it is of crucial significance in philosophy. Philosophy of modernity thrives on ambiguity, but Aristotle’s multifaceted natural philosophy does not tolerate it. To apply his concepts and categories we need precise understanding of the key concepts and premises. Given the fact that we have not received the precise complete Aristotle’s texts but the interpretations of his students and followers even in Greek, compounded by the multilayered multiple translations into and from Latin, there is an urgent need to revisit the basic terminology under scrutiny.

The most unsuccessful so far is the translation destiny of Aristotle’s ENTELECHY/ ENTELECHEIA whose etymology through the ages was simply disfigured during the transfers from Greek into Latin, from Latin into numerous other tongues, and currently from English into the multiple modern languages. The English failed to have captured the rich polysemy of the Greek original and produced the simplified meaning “actuality,” depriving the Aristotelian concept of its original philosophical meaning BEING or EXISTENTIAL REALITY, or THE EXISTENTIAL GIVEN. Will Durant whom the authors quote obviously was not

well trained in languages and failed to provide a proper morphological analysis. He wrongly separates the term's first two letters "en" and starts his dissection of the term at the incorrect point and produces the imaginary sense that is far removed from the original. Had Durant known that ENTE means Being, Entity, Order and Society in Italian, and that in Greek ENTELL'IA means "perfection", he would have arrived at a better version. The French appropriated from Latin the term in an unchanged form and they translate this Greek sign as "complete" or "perfect". The French translators kept the original authentic meaning and origin: ENTELECHEIA AS "PERFECTION" "while the English reduced it to the toothless and ambiguous "actuality" or "potentiality". The English 1603-meaning was "a hypothetical agency non-demonstrable by science", clearly influenced by theology (New Webster's Dictionary, 1987:415). The Russian 1976-edition of Aristotle's *Metaphysics* added another interesting meaning – GIVENNESS OF GIVEN ENTITY, originally provided by A.Kubitsky in 1934 (1976:478). This translator claims that ENTELECHY could mean also UNIFIED AND BEING. The treatise "On Generation and Corruption" translated into Russian by T.Miller also looks somewhat different from the one produced by H.Joachim. The Greek title PERI GESEOS KAI PHTORAS is again replaced by the Latin one.

MORPHE, now reduced in the English to a singular form, is also polysemic. It may signify EIDOS, LOGOS, BEAUTY, SHAPE, STRUCTURE. Given that the god of Dreams was called Morpheus in Greek mythology, one may imagine that Morphe could mean ILLUSIONARY OR ILLUSION, not related to reality. Translation cannot be literal and mono-signatory, it has to take into account context which may affect the meaning. The same happens with HYLE that could, depending upon the context mean:

1. Material
2. Matter
3. Infinite
4. Nature
5. Cause
6. Primary substratum
7. Relationship category

The Greeks who obtained literacy, cities, philosophy and other sciences from the Phoenicians do not like to mention that HYLE having the root EL, alluding to the name of the Phoenician God of Creation, is originally a Semitic term (Phoenician was a West-Semitic language, the lingua franca of the ancient pre-Greek Mediterranean).

Conclusions

The collective work of four different postmodern scholars from different linguistic traditions emphasizes the need of re-translating Aristotle's major texts and inspires the idea of creating the Int'l Aristotle Translation Centre which could embark on this historic mission. It could provide the synthesis and terminology-compromise, the closest to the ancient Greek original and enriching the postmodern Aristotle

studies and their applicability to all sciences and humanities.

References

- Aristotle. *Complete Works* 2vol.ed by J.Barnes. Princeton, NJ: Princeton University Press, 1984.
- Aristotle. *Complete works. (in Russian)* 4th vol. Ed. by A.Dovatur, Moscow: Mysl, 1983.
- ,----- 3rd vol. ed by M.Kozhansky. Moscow: Mysl, 1981.
- ,----- 2nd vol ed. by Z Mikeladze. Moscow: Mysl, 1978.
- ,----- 1st vol. Ed by V.Asmus. Moscow: Mysl: 1976.
- Dizionario Italiano-Russo*.ed N.Skvortsova, V.Maisel. Moscow: Gos. Iz. Foreign Dictionaries, 1963.
- Divry, *New English/Greek and Greek English Dictionary*. New York, 1950s
- Canadian French/English Dictionary*. Editor-in-Chief Jean-Paul Vinay. Montreal, Quebec: McClelland & Stewart Ltd., 1962.
- Makolkin, Anna. *Phoenician Roots of European Civilization*. Toronto: Anik Press, 2016
- Webster's Ninth New Collegiate Dictionary*. Markham, Ont.: Thomas Allen & Sons Ltd, 1987.
- New Shorter French English Dictionary*. N.p.:n.p.

“CHALLENGING INTEGRALISM, ARISTOTELIAN ENTELECHEIA, HYLE AND MORPHE (FORM), AND CONTEMPORARY CONCEPTS OF INFORMATION” – SOME ADDITIONAL REFLECTIONS

Leonardo CHIATTI¹

This is a very brief note about the paper of colleagues Bremer, Khroutski, Klimek and Tadeusiewicz recently circulated in preparation of the Cracow meeting. It is a very interesting and extensive article which covers many different topics ranging from philology of Aristotelian texts (and Platonic) to modern information theory, from biological evolution to biosemantics until Chalmers' reflections. Even though I'm not expert in these fields, I resonate with many of the discussed topics.

Here I will limit myself to add some considerations related to my specific research area, that of physics. Considerations stimulated by the reading of this paper and I'd like to share with colleagues from the BCA (I thank Konstantin for his encouragement); in particular they relate to the nature of the substance and the theory of causation.

About the theory of causation I believe that Aristotle remains a firm point of reference, but I also believe that his vision requires modernization. For example, I do not press the hands too strongly on the ubiquity of the *telos* in relation with traditional four causation modes because the finalism is (in my opinion rightly) severely discredited in the natural sciences these days. In my view the concept of “aim” to which a natural action tends is defensible only if the action is approved by a subject endowed with reflective consciousness. As is elucidated in the article, this subject can then internally represent the world, simulate it through this representation, and make a decision based on this simulation, then translating it into action. Outside of this context, we cannot, today, talk of an “aim” in natural phenomena and hope to be understood.

Let me explain with an example. Aristotle was perfectly logical and consequent to talk about a *telos* in the fall of a stone, because in his physics the fundamental notion of natural places was contemplated, and the fall of a stone was the natural (local) motion that led back the stone to its natural place. Since in the composition of the stone dominates the Earth element whose place is down, the stone naturally tends to go down and doing this realizes its *telos*. Now, this view is completely erased from the current Archimedean (not Platonic!) concept of the mathematized space as a set of equivalent points, which established itself in the seventeenth century to replace the doctrine of natural places. So today no longer makes sense to talk about a *telos* in a phenomenon like the fall of a stone. In other words, the local motion (according to the terminology of Aristotle) is no longer a movement *in se* or *internal*, but an *external* (changeable) *relation* between bodies. And this on one hand makes possible

¹ ASL VT Medical Physics Laboratory, Viterbo, ITALY.

the mathematical representation of space in a form compatible with the principle of inertia (and therefore with the infinite [1]), on the other excludes the possibility of a *telos* in the events of mechanics. This exclusion appears at such a basic level in the formulation of the science of motion (the mechanics) that subsequent attempts to reintroduce the finality in this science (for example through the variational formulation of its principles) have remained unsuccessful [2].

As it is easy to understand, the question of the *telos* becomes particularly delicate, even from a political point of view, when instead of a falling stone we consider – for example – the evolution of living forms on Earth. The precision in the expression of concepts is important not to be misunderstood and mixed up with the creationists with religious roots. In Italy, where the Catholic Church is very powerful and secular reaction to its hegemony is very strong, I must be careful in the choice of words to avoid being incorrectly classified by my interlocutors. Certainly, the Aristotelian *telos* has nothing to do with an *external* biological teleology that is with the design of an external intention to Nature and overordinate to it. On the contrary, the concept indicates something intrinsic to Nature which can be possibly investigated through the methods of empirical sciences.

But it tells us something more than terms such as: adaptation, optimization, symbiosis, and synergy? If we remove the feedback effects, the effects derived from the multiplicity of organization levels and their mutual influence, and so on, what remains of *telos*? When we describe the organic unity of the living by adopting not only efficient causality (the only form of causation now recognized by most of our colleagues as “scientific”), but all modes of causation introduced by Aristotle, does it remain something of *telos*? Or *telos* is a name for anything other than the relationship between local and global (cell-tissue, organ-organism, individual-environment and so on) specifically expressed by these modes? In this case it would certainly be ubiquitous and transversal to the modes of causation, as the authors’ state.

Even the *morphé-hyle* dualism requests, in my opinion, a clarification and an updating. If the *hyle* is the substance (that is, if we identify it with *ousia*) which remains the same in the various configurations determined by a certain essence or process (*morphé* or *entelecheia*), then we reproduce a separation that modern physics no longer considers fundamental. It is certainly meaningful and true in the description of natural phenomena we encounter in everyday life, as correctly noted by Aristotle that raised it in principle. But the nuclear phenomena remind us that mass and energy (process and substance) are two sides of the same coin.

Classical physics, which to some extent inherited the Aristotelian idea of substance, considers the bodies as finite portions of substance endowed with certain attributes. One of these is the mass. The energy of the body is instead a property of its state of motion (we are speaking here of kinetic energy, although there are other forms of energy definable from it), therefore a process. This distinction, however, becomes very fuzzy in phenomena that classical physics does not describe as, for example, the sub-nuclear phenomena. For example, when ultra-high-energy cosmic rays from outer space impacting the atoms of Earth's atmosphere, a considerable part of their energy is spent to create new particles [3]. In these very violent collisions,

their energy becomes the mass of new particles that before the impact did not exist. Thus, not only mass and energy are mutually convertible, but we are faced with something that is incomprehensible in Aristotelian terms: the creation of a previously non-existent substance.

The point is that a correct interpretation of the micro-world most likely requires the adoption of a *process* philosophy. In relativistic theories the time becomes an additional spatial coordinate. A body at rest is still in motion with respect to this coordinate, for the simple fact that it exists. In this description, therefore, the body is a process rather than a substance; and it is therefore possible to speak about the kinetic energy that this process possesses at rest (the one that is related to the motion of the body over *time*). It appears that this energy is the mass of the body.

Of course, the meaning of “kinetic energy” remains the same: it is the work that needs to be done on the body to start its motion (or, if it is already in motion, to reduce it to the rest). If we refer only to the motion in time, it is the work that needs to be done to create the body (or to annihilate it). These possibilities of creation (set in motion over time) and annihilation (stop motion over time) of a body are those that we see at work in the impact of cosmic rays. Thus, the widespread feeling today is that the “substance” is a macroscopic concept and that at the level of elementary constituents of matter exist only processes.

But what are the new particles created by the impact of cosmic rays before the collision occurs and “starts their motion in time”? We should conclude on logical bases that they are in a motionless condition of timelessness and aspatiality. Also the analysis of quantum phenomena (non-locality, delocalization and so on) converges on this conclusion, as the authors of the article rightly point out. But then: how can the timeless and aspatial become “material” and thus enter into the phenomenal “reality”? I think it is around this question that rotates the very possibility of a philosophy of Nature.

In my opinion, we begin talking about the Nature philosophy when we accept to consider the possibility that Nature is *manifestation*, thus dismissing the conception of substance as an absolute. It is at this level that the meeting between Aristotle and Plato, the disciple and the teacher, can renew itself; and this is probably the starting point for a renewed understanding of categories as *Entelecheia*, *Morphé* and *Energeia* adequate to the present day.

References

- [1] Koyré A. Etudes galiléennes. Hermann, Paris 1966
- [2] Mach E. Die Mechanik in ihrer Entwicklung historisch-kritisch dargestellt. Ed. 1933.
- [3] https://en.wikipedia.org/wiki/Cosmic_ray

BIOCOSMOLOGY AND THE “SOCRATIC PROBLEM”

IN PHILOSOPHY – Remarks on the article:

“Challenging integralism, Aristotelian entelecheia, hyle and morphe (form), and contemporary concepts of information, touching upon the aetiological issues of carcinogenesis”,

by Josef Bremer, Konstantin Khroutski, Rudolf Klimek, Ryszard Tadeusiewicz

Milan TASIĆ¹

ABSTRACT. We call here the “Socratic problem” the problem of definition of things and beings, phenomena, and processes ... so that the knowledge based on them to be necessarily and general one. Socrates, it is said, has “obligated any future thinking” by postulating it must be realized in the way of notions. But how define “forever” something that is alive and always changeable, and in the sphere of sentient beings contains the objective to which it strives, its entelechy? It would be a biocosmological problem of a primordial importance, which should be certainly solved by making “Socratic” definition of a notion containing these or those marks as essential, first, to be complemented by a degree (size, quantity, intensity, ...) in which they appear in them. And, after it, by using different types of so-called “fuzzy logics”, which would contain among a “pure” truth and a “pure” lie an infinite number of degrees of certainty (truthfulness, veracity, probability, ...) etc.

KEYWORDS: definition, notion, mark, degree, fuzzy, logic

Can we bring, and how, in a consistent relation terms of “hyle”, “morphe”, “entelechy”, “information”, “integralism” etc., from the title of this article and can they all be comprised within a consistent set of concepts, where to each of them would belong a specific (and necessary) place in the series, and all of which, in their sum, would build a clearly defined model in the human consciousness? Bearing in mind equally what the authors state, citing, for example, Francis Bacon: “Truth is rightly called the daughter of time and not of authority” [Bacon, p. 69] etc. Our answer would be more or less positive both times. In this sense, we are going to sketch such a possibility, by attaching a number of arguments for this choice.

Just in the sense of Bacon's claiming, say, let's rely, first, on the heritage of Kant from his *Critique of Pure Reason*, in connection with his three “pure concepts of reason”: “soul”, “freedom”, and “God”, for which he finds they do not create objects of knowledge, as categories of understanding, but achieve a greater unity of knowledge, having a practical and heuristic character. After that, these three central concepts in the sciences of psychology, cosmology, and rational theology, do not have a constitutive but only regulative character, because they do not extend our

¹ University of Niš, SERBIA.

knowledge beyond the experience, since, as we have said, they are *sine qua non* of any knowledge in these sciences. Therefore, when it is to create a system of concepts within the cosmological organicism, in terms of BCA program (*Biocosmological Association*), we can legitimately do it – if not by the force of authority – (at least) in the same Kantian sense of a regulatory principle, which would secure a greater unity to our knowledge, having also a practical and heuristic, or the axiological character.

Kant, therefore, deterred from pretending to create a “precise concept” of soul, of world and of God, which would have a necessary and general validity, because they would lead to the “antinomies of pure reason”, where it can be proven with an equal certainty the assertions and their negations. According to him, these entities can be imagined, but cannot be objects of knowledge, what he designates as “transcendental illusion”. The “soul” would be the unity of subject of thought, the “world” – the unity of phenomena in the experience, and “God” – the unity of all objects of knowledge etc.

Second, the stance of the cosmological organicism can be justified in the light of arguments offered by the so-called “anthropological principle”, which is formulated in its strong form as: “The universe (and hence the fundamental parameters on which it depends) must be such as to admit the creation of observers within it at some stage” [Carter, 1974]. So this principle postulates a necessary condition for the emergence of organic matter, of living being, intellect, and consciousness. For it was realized that the relationship between the basic constants in nature: of the gravity, of the speed of light in a vacuum, or of the elementary charge, etc., are such that it necessarily caused the emergence of carbon and heavy elements, as conditions for the origin of life on Earth. So, in an evolutionary sense, it could be matter about a lawful, predetermined, and not about an accidental emergence of life on our planet. What would mean again that “the vector of evolution” may be hides in itself a (permanent) tendency to realize not other than an organic matter, and that the stance of the cosmological organicism is a legitimate starting point for the interpretation of all that exists.

In [Tasić, 2016] we carried out the principle we designated by the words “anthropoid principle”, as also a regulatory principle in the knowledge, and whose point is to show that the anthropic principle is not only a necessary, but also a sufficient condition for the genesis of the universe. It is expressed by the words: “In what is coming to be, the nature (including man himself) tries to create entities with anthropoid characteristics”. In this way, our anthropoid principle eliminates the possibility of (any essentially) different organization of matter from the existing one, which led to the creation of brain, to the consciousness. It would be the expression of a particular point of view of the universe, as no different than a homoid one, where would find expression each of concepts of matter, of form, of entelechy, of information ... In support of our thesis, we brought out arguments from inorganic nature, from vegetative and animal world, as well as on the side of what are products of human hands: machines, habitat, cities ... Although if it's only about the traces of what essentially defines a man: striving to protect himself, to feed, to reproduce, or to communicate, to remember and the like, that large evolutionary arc from the inanimate nature to man's conscious activity, is one of at least (possible) heuristic key

in our view of nature, on its micro and macro level. This in turn dictates the need for an insight into the structure equally animate and inanimate nature, that is, into the way in which changes occur in their organization.

We find that it can be described in mathematical terms of elements and sets of elements, whereby, for their part, the elements can be found in the role of sets and sets in the role of elements. The atom is, for example, an element, for it is a constituent of things, but also a set of so called “elementary particles”. And as for the manner of their presentation, them as objects, phenomena, processes ... one proves to be suitable as “fuzzy sets” in mathematics.

What is a fuzzy set? [Zadeh, 1965]. Unlike traditional concept of set [Cantor], which (only) “lists”: all elements with some property, a fuzzy set brings different degrees – from the lowest 0, to the highest 1 – of the presence of those properties in the elements. And as to the very nature of these properties, it can be the most diverse one, while the mentioned degree of their presence is expressed by a proper fraction, or percentage. In other words, if X is an arbitrary set of elements x (we write: $X = \{x\}$), to every $x \in X$ it would correspond a function $f: x \rightarrow [0, 1]$ (called “membership function”), as a “degree of presence” of x in X . Let us denote the set of all degrees of all elements by A . Then A is the required fuzzy set on X , or $A = \{f(x) \mid x \in X\}$. So these sets include magnitudes, quantitatively measurable, which, in certain conditions, attain a minimum value 0 and a maximum value 1, including a variety of inter-degrees. And what is the case everywhere in nature with physical magnitudes, in the society with social impacts, or in the theory of knowledge with degrees of probability and truthfulness of assertions, or in informatics with degrees of reliability of information etc. As well as in medicine, in pharmacology, etc.

After, of one or two fuzzy sets, we can build a new fuzzy set, or new sets, by an application of operations: complement, sum, difference, union, intersection etc. For example, if A and B are two fuzzy sets, defined by membership functions $f_A(x)$ and $f_B(x)$, as follows, in that case new fuzzy sets A' (complement), $A \sim B$ (union) and $A \cap B$ (intersection) would be determined by membership functions $1 - f_A(x)$, $\max[f_A(x), f_B(x)]$, and $\min[f_A(x), f_B(x)]$, as follows. This “set structure” follows to a maximum degree the structure of micro and macro world: from unicellular organisms to the structure of the universe. So it is in animated, lively world, where we see everywhere parts like cells, as organs that perform a function peculiar to them, but at the same time as submitted to demands of higher wholes to which they belong.

In parallel with it, on the epistemological level, this ontological reality is followed by construction of complex concepts, starting with simpler ones, as well as by appropriate logical operations, when it is about the truth value (probability) of complex propositions, and the same values of simpler propositions are known. For example, let p and q be two such objects, and $\tau(p)$ and $\tau(q)$ some value labels: of their degrees of truth, or of probability, or of quantity of information they contain and the like. We take all these values to be from the set $[0, 1]$. In this case, the appropriate degrees of complex propositions of negation, conjunction and disjunction, for example, would be counted as follows:

$$\begin{aligned}\tau(\sim p) &= 1 - \tau(p), \\ \tau(p \text{ C } q) &= \min[\tau(p), \tau(q)], \\ \tau(p \text{ E } q) &= \max[\tau(p), \tau(q)]\end{aligned}$$

as might be postulated the appropriate rules of inference *modus ponens* too.

Then how find a place for terms “hylemorphism”, “potential”, “actual”, “entelechy”, “information”, “choice”, etc., in such an ontological – epistemological “hinterland” we have just sketched? And in what would consist the main problem in this way? In our opinion, it would be the very basic problem in philosophy, the one with the very beginnings of it as a science, and that is the problem of defining terms, or “Socratic problem”. In fact, we have a thing or a being, a phenomenon, a process, ... for which we use certain terms (names), although all of them as individuals – no matter how insignificant it could be – are new and different ones. How determine what belongs to all of them as unchanging and the same one, and by which they differ from each other things, beings, phenomena, processes...?

As is known, unlike the Sophists, who claimed that “everything is as it seems to me to be” (“Man is the measure of all things” – Protagoras), Socrates thought that it can be achieved through definition of terms, when the realized knowledge would be, according to him, necessary and general one. But if his method of “irony” (what a thing is not) and “midwifery skill” (what a thing is), as well as Plato’s method of “dichotomy” (division into two parts) are not historically confirmed, Aristotle’s method of “nearest higher genus and *differentia specifica*” in fact has been stabilized over centuries in the science to date, but here it is until the end ignored the role of the subject – what of course is not true. For our every understanding of a concept, of a meaning of word ... is yet different. In fact, if we would exactly know in what is the essence of things or beings, we would know to us – in terms of Aristotle – their form, what is as potentially contained in them, or their entelechy, as their final, “completed form”. Then we would know, for example, what enables the health of an organ, of organism, and what harms them and to what extent and due to which factors emerge one, or another of them, and what would be only a regular “treatment of information” on their part and an analogous action in terms of what is most appropriate – their entelechy.

If we would exactly know in what consists the essence of human being, we would know all his predispositions, but also the essence of the community, what is that helps their persistence to a maximum measure etc., and where all information concerning the preservation of life and of survival in the community would be measurable and thus enabling optimal choices, according to a chosen purpose one has in mind. And since the quantity of information that comes to us from a source is computable one – using, say, Shannon's formula $q = N \log_2 N$ formula (N – number of messages from a source) – so it is just a matter of our choice, which of them will be approved and which rejected. And for what can serve different “methods of optimization” in the natural sciences, etc.

In conclusion, we are left to repeat that the biocosmological problem is closely related to the order of values which an individual and a community chose for

themselves, and which “grow up” on the generic essence of man, of community, which they contain “by nature”. Then it would be formulated in these terms concepts of entelechy, of an individual, of a social group, or their whole “world view” to community, to history, to science, to creativity.

References

- Bacon, Francis. (2000). *The New Organon*. Edited by Lisa Jardine and Michael Silverthorne.
- Bremer, Josef; Khroutski, Konstantin; Klimek, Rudolf and Tadeuszewicz, Ryszard. (2017). “Challenging integralism, Aristotelian *entelecheia*, *hyle* and *morphe* (form), and contemporary concepts of information, touching upon the aetiological issues of carcinogenesis,” *Biocosmology – Neo-Aristotelism* Vol. 7, No. 1 (Winter 2017).
- Carter, B. (1974). *Large Number Coincidences and the Anthropic Principle in Cosmology*. IAU Symposium 63: Confrontation of Cosmological Theories with Observational data. D. Reidel, Dordrecht, pp. 29–298.
- Tasić, Milan. (2016). *From the anthropic to the anthropoid principle*. 11th International Symposium on Biocosmology (11 ISBC), “Philosophy of Nature in the light of neo– Aristotelism (teleological naturalism)”. Vienna.
- Zadeh, L. (1965). *Fuzzy sets. Information and Control*, p. 338–353.

EPIGENETIC PHENOMENOLOGY OF ENTIRETY: GENERAL COMMENTS AND OBSERVATIONS ON EPIGENETIC INFORMATION

(induced by the article on “Challenging integralism, Aristotelian *Entelecheia*,
Hyle and Morphe (Form), and Contemporary Concepts of Information;
Touching upon the Aetiological Issues of Carcinogenesis”,
by J. Bremer , K. Khroutski, R. Klimek and R. Tadeusiewicz)”

Dariusz A. SZKUTNIK¹

ABSTRACT. *This work, critically reflecting on the joint article of J. Bremer , K. Khroutski, R. Klimek and R. Tadeusiewicz (2017) – presents the methodological development of scientific research in the field of the specificity of processes occurring in living organisms. Author begins with the analysis of historical scientific approaches that clearly show the development of particular scientific positions (Aristotle, Wilhelm Roux, Hans Driesch, and Hans Spemann). Further, author focuses his attention on the clear distinction between epigenetic theory and the theory of preformation which, in the historical development of embryological research – have sought to dominate in the adequate explanation of the peculiarities of organic phenomena. Both the theory of preformation and the theory of epigenesis were based on their own types of rationality, and on their own cosmological bases, therefore striving to explain the problematics associated with biological development. In this work, indirectly, the category (methodological notion) of information also has been included as one of the basic developmental factors for the all physicochemical structures. This fundamental category was lacked directly in the research of above-mentioned authors, but which, in turn, forces modern researches to modify and improve historical and contemporary scientific approaches.²*

KEYWORDS: *Aristotle’s Bio-philosophy, Driesch’s Entelechy, embryology, phenomenology, reductionism, organizer, experiment, information*

¹ Member of the Biocosmological Association, Łańcut, POLAND.

² Cf. Bremer J, Khroutski K, Klimek R, Tadeusiewicz R., “Challenging integralism, Aristotelian *Entelecheia*, *Hyle and Morphe* (Form), and Contemporary Concepts of Information, Touching upon the Aetiological Issues of Carcinogenesis,” *Biocosmology – Neo-Aristotelism* Vol. 7, No. 1 (Winter 2017); in its referring, further in the text, the abbreviation “*Challenging Integralism*” likewise is used.

Contents

Introduction

1. Necessity for a conceptual delimitation of the aspect of entirety and purpose in Aristotle's Bio-philosophy
2. On the margin of errors of the theory of "Preformationism" – from the standpoint of Aristotelian epigenetic concept
3. Hans Driesch's Entelechy = information in epigenetic aspect
4. Hans Spemann's "organizer" as a "pool" of epigenetic developmental information

Discussion of results

Instead of conclusion

Introduction

Since the times of antiquity, Aristotle clearly perceived the epigenetic nature of organic processes, running in a holistic way. In this clue, the philosopher raised the fundamental issues, on which science is seeking answers until today. Undoubtedly, since the time of Aristotle – the epistemological mystery is the problem of cause in explaining the entirety of epigenetic processes taking place in every living organism. From the perspective of developmental biology, it can be said that inability to generate the relevant methodological bases, thus substantiating the factors of integrative developmental processes – is certainly the critical weakness of contemporary developmental biology, as well as (broadly understood) methodology of science³.

Although, in the history of embryology, science has evolved through methodological violations and errors⁴, often stumbling on a vicious circle. Eventually, however, modern science made a shift to the level of increasingly clear understanding of development processes in the aspect of broadly understood biological phenomenon. This particular, evocative example is the evolution of views in the field of causative development of epigenetic theory, wherein basic principles were advanced yet by Stagirite. In general, the history of developmental biology and its epigenetic constituent requires a special consideration of the whole topic. Researchers who used the metaphysical explanations (e.g. Hans Driesch's entelechy) attributed the cognitive meaning to this category, but, from the perspective of today's science, which is unacceptable.

³ Cf. Hans Driesch – entelechy as a metaphysical factor integrating epigenetic processes.

⁴ Methodological errors in conducting experiments led in turn to misleading scientific and philosophical generalizations.

The group of scientists⁵ associated with BCA and its journal “Biocosmology – neo-Aristotelism”, and which is acting within the general Triadological perspective – is striving to rehabilitate Aristotle’s genuine Entelechial Biocosmology (*OrganonKosmology*) that is independent from another great cosmology (of all-encompassing essence) – of Plato’s Dualist mathematical physicalism (mechanicism), and, integrating them both – through the genuine (synthesizing) Integralist approaches – aiming to approach the real understanding of the complex causal relationships that occur in every living organism. In their Organicist approach, the telic “*entelecheia, hyle, morphe and information*” (instead of usual “matter, energy and information”) [*Challenging Integralism*, p. 48] is essential for every living organism and the subject for scientific research, thus calling into existence the new cognitive dimensions and approaches, firstly the development of information concepts taken in various (including the cybernetic) approaches.

1. Necessity for a conceptual delimitation of the aspect of entirety and purpose in Aristotle’s Bio-philosophy

The first foundational researcher and thinker who systematically approached the problematics of the process of formation of the organism is Aristotle of Stagira (IV BC). Aristotle’s position on biological research is based on the postulate of “the vegetative soul” (that is the autonomic, inherently independent soul), and which he adopts in order to systematize, clarify and explain causally the data from direct observation of life. Aristotle postulated, as a matter of fact –the existence of the so-called “the vegetative soul”, which is an incompatible, non-quantized factor capable of forming the tangible “elements” (air, water, fire and earth) organized in the “perfect” form that is corresponding to our reproductive one. According to Aristotle, all living organisms are capable of biological development, including plants, animals and humans, and they would have the vegetative (autonomic) soul. In case of plants, this soul would be independent, but in animals and humans it is likewise a part of a dynamically richer (non-quantitative, non-spatial) component that explains the formation of sensory and sensory-intellectual phenomena. Therefore the vegetative soul of Aristotle is not a kind of a perfect (created) machine, crafted from chaotic and relatively homogenous elements of matter [Lenartowicz, 1982, p.144]; but which is an internal factor that drives the process of forming the Organic ‘machinery’ (that is autonomic in actualizing the specific function).

Making independent observations of the development of animals, Aristotle clearly noticed the epigenetic nature of these phenomena: complex organs are formed one after another (*De gen. An.*, II, 1, 734 A, PP. 25-30). He also noticed the distinct psychological analogy of these processes, i.e. their structural similarity to human activities. On the other hand Aristotle clearly saw the epigenetic context of developing organisms.

In fact, the purposefulness of Aristotle’s essence, i.e. which is telic and refers to the totality of action – it leads to the emergence of a complex set (system, organ) of

⁵ I.e. Joseph Bremer, Konstantin Khroutski, Rudolf Klimek, Ryszard Tadeusiewicz.

human activities that are designed to produce an effective functional structure. Anyway, still in the contemporary scholarly milieu – “totality of his concepts (i.e. used by Aristotle) concerning the life cycle is not a subject of discussion” [Szkutnik, Kupczak, 2015, p. 187-188]. In this, author finds the similarity with the approach held by BCA and the authors of “Challenging Integralism”.

The postulate of the vegetative (autonomic) soul is an attempt to explain the entirety of internally complex, epigenetic developmental processes, and, simultaneously – to explain why significant damages of material, spatial structures of forming organism are unable to lead to the division of this process into parts. The vegetative soul had nothing in common with consciousness and cognition, even sensual, although its actual action could be perceived (as a whole) only by the intellect of man. [Lenartowicz, 1982, p. 166].

The Aristotle’s concept of the vegetative (autonomic) soul, as well as his concept of biological life, in general – turned out to be extremely durable expression in the history of philosophy and science even for decades. Unfortunately, “the time works” – replacing, in their turn, the theoretical-scientific ideas that constitute the world cultural evolution. In the course of a very long duration there were various “simplifications”, which sometimes led to standpoints that were opposed to the original dispositions. Indeed, the epigenetic concept of Aristotle is a bright example in this line. The inevitable blurring of consciousness of the facts caused the drying out and stagnation of the abstract explanatory speculations once based on empirical evidence. Finally came the period dominated by unilateral and exclusive fascination with the last stage of the life cycle. This led to the identification of the organism with reproductive form and to the ignorance of data that lie at the base of the Aristotelian concept of the vegetative soul. The organism was considered to be completed machinery made up of prefabricated parts while epigenetic and totipotentiality remained unknown or forgotten concepts. In the history of embryology this approach (called Preformationism, and which belongs to the Age of Enlightenment) is characterized by the fashionable blindness to the foundational scholarly principles of Stagirite. Only few scholars, in this period, could resist and oppose to the prevalent and dominant demands of the new era.

Such “dialectic of opposites” in the development of the theoretical and philosophical knowledge is natural. On the contrary, any unification of knowledge is the unnatural, but which has become a fact lasting for many centuries. In opposition to Wilhelm Roux’s mechanistic theory (based on preformistic assumptions)⁶ the neo-vitalistic concept of Hans Driesch was born.

⁶ The theory of preformation grew from oversimplification of the epigenetic concept, derived from Aristotle, and which also inspired Hans Driesch to realize his epigenetic progress.

2. On the margin of errors of the theory of “Preformationism”⁷ – from the standpoint of Aristotelian epigenetic concept

Aristotle generalized his observations on the developmental processes of different species, stating that the development of organisms that is called procreation, occurs in two stages. In the first of „the elements” are formed “homogenous” parts which from today’s perspective can be called tissues and in the second part from the “homogenous” are created heterogeneous parts which are now called organs (De part., II, I, 643 b. 5-8). Aristotle clearly noticed the epigenetic development of the organism, wherein the complex organs of the organism do not arise one after another but gradually one after another. (De. Gen. An., II. I, 734 a 25-30). Hence, Aristotle was aware of quantitative and qualitative changes during organism’s (ontogenetic) development, especially during organogenesis processes.

To describe the methodological aspects and results of research conducted from the perspective of preformistic theory, we will refer to Wilhelm Roux’s experimental research, which are a consequence of this simplified cognitive thinking. While verifying August Weismann’s hypothesis, Roux carried out his experiments on frog eggs (*Rana esculenta*), because this material suited best, in his opinion, to this kind of research. Notably, frog eggs were large, easily accessible and well tolerated by physical maltreatment. Although some similarities can be noticed at the very starting point between Weismann and Roux, however, it falls in both cases to the area of biological research of a different nature.

In the course of his experiments, Roux expected that the fertilized egg of the green frog (*Rana esculenta*) would divide into two cells. Then he experimentally damaged one these cells with a heated needle. Unfortunately, as Roux wrote – most of these eggs either did not develop at all or developed normally, in spite of the large amounts of organic material being released from the perforated cell. Roux emphasized that even after several puncturing with a thin needle and despite significant evisceration, the cell developed normally. Next, the experiment consisted of heating the needle and making a single puncture, holding the needle until the egg was brown in its vicinity. Part of this brown material stucked to the needle and was pulled out with it. Roux wrote that with such an approach – better results were obtained because in about 20 percent of cases of operated eggs, a second undamaged cell was able to survive the operation. Most of the cells were completely destroyed. Only in some cases the cells have developed normally because the needle may had been too warm [Roux, 1888, p. 114].

As it turned out, from the remaining cell grew half frog embryo⁸. Apparently it seemed that Weismann was right. In this situation, Roux, among others, and basing

⁷ Supporters of Preformationism were divided on those who “saw” a completely formed, though miniature body of the organism in the female egg (ovulist); and on those who saw it in the spermatozoon. Such observation led to important research consequences. Miniature bodies had to follow the logic of preformism theory including eggs (sperm) with similarly formed characters of future offspring.

⁸ Roux’s biological experiment failed, as was stated later because the burned, dead cell remained stuck to the live and slowed its development.

on the results of his experimental research – founded a journal called “Entwicklungsmechanik” (Development Mechanism). Roux’s experimental result was compatible with his earlier theoretical observation from 1883, claiming that a fertilized egg cell would be genetically divided into unequal developmental parts. In this, with each scraping, a developmental quality was expected to decrease: the first division of the embryonic cells to be divided into right and left quality; the second – to the front and rear; the third – to the upper and lower; after that the development process was to be conducted continually farther in the lower structures of vegetable and animal embryo, and farther in the lower structures of vegetable and animal embryo [Mocek, 1998, p. 190].

Roux understood such development in a mechanistic sense, identifying it by the term “mosaic”. In Roux’s preformistic purpose, the development of the embryo would go ahead by developing through the differentiation processes “spontaneously” only on the basis of correct organism conditions and depending on other factors in the course of the predominant irregular development of cell differentiation.

Although Wilhelm Roux’s experiment was performed with an impeccable logic, it was however wrongly considered and had the misleading significance. Roux was fully convinced that the course of cell differentiation is completely dependent on existing, identical parts contained in the body. In other words, he thought that the egg was “a mosaic” of spatial parts, each of which is irreversibly determined to be developed into a strictly defined part of the adult body. Laboratorial destruction or removal of any part crossed out the further blastomer’s ability to redifferentiate [Roux, 1974, p. 37].

In his studies, Roux did not find a specific relation of the “position” of one part of the organism during organic regeneration. His experimental method (based on preformistic assumptions) also prevented him from seeing the informative epigenetic relations that take place between individual cells at the time of holistic development⁹.

3. Hans Driesch’s Entelechy = information in epigenetic aspect

Following Aristotle’s teaching, Hans Driesch used the epigenetic approach in studying the development of a living organism. He considered living bodies as typically arranged forms, meaning that they arise from simpler ones, but bearing a different character and arranging in a special way in mutual references. All these parts in turn have their own typical forms and may be the combinations of simpler parts. Moreover, living bodies do not always have the same typical forms throughout their lives; they become more complicated, the older they become; they all have their beginning at the starting point which is only formed to a small extent: i.e. from the egg. Hence, in such a view, we can refer to a living form as an epigenetic form or as a

⁹ The hundred years of the theory of Preformation falling on the Age of Enlightenment is a sort of epistemological puzzle. Neither in the preceding period nor in the European period of Preformation itself, there was no shortage of research and publications that proved the epigenetic developmental processes. One can point to contributions in this field by Ulises Aldrovanda, the treaty by Volcher Coiter on the development of the hen’s egg, studies of Hieronim Fabrycusz and the work of William Harvey.

form that constitutes the process and therefore the most appropriate term for such a science that deals in general with the laws of organic forms is morphogenesis [Driesch, 1921, p. 13].

The main developmental phase of Driesch's research was the demonstration of the essential insufficiency and the eventual uselessness of the mechanistic interpretation of conceptual instruments of physicochemical, morphogenesis studies that did not allow for understanding the overall and dynamic-teleological nature of these particular organic phenomena, but which are to be grasped on the phenomenological level.

After biological experiments (done from the epigenetic perspective) have been carried out, Driesch has derived analytically the mathematical equation that was supposed to refer to the development of an organic form. The equation, defined by Driesch – $B(X) = f(S, I, E)$ ¹⁰ – is related, as he pointed out, to all those factors which

¹⁰ Driesch came to the expressly vitalistic conclusions asking the following question: Under which circumstances might be made conditional the prospective meaning (prospektive Bedeutung – prospective Meaning) – B – in all cases of an experimental influence (e.g. shaking, separating) on the element X? Driesch has presented following factors in question (shortly but strictly according to Driesch's meaning).

First of all, the prospective meaning of every element of the living system depends undoubtedly on and is a definite function of, the absolute size of the part of the system in question appearing in it in a given case. Let "S" symbolizes the absolute size of a system in any case of a process of morphogenesis. Then we can state symbolically the appropriate function a prospective meaning of an element of the living system: $B(X) = f(S...)$. As it appears, however, we should assign additionally other quantities to the symbol S. One might say that the prospective meaning of an element of a germ depends on the absolute (total) size of a system, insofar as it is taken in its state just before its morphogenetic change. Constituents of the system have substance (as if to "know", in a way, of how much), which is shaping organs or tissues, and which should be produced in order to guarantee the complete outcome of the organic development. Referring to Driesch's meaning: from the analytical point of view, one can say that the destiny of every constituent of the developing germ is changing in dependence on the actual place of real border-lines between parts a^1 , b^1 or a^2 , b^2 , with respect to the fundamental direction-lines or sides of a rectangle a, b under investigation. Let us designate this location by means of the symbol I as meaning that a distance of one actual border-line of the given organic part as determined with relation a to b. Then we could introduce the following, more developed formula of the function in question: $B(X) = f(S, I...)$. The point is that constituents of a germ should be located in any living organism with respect to appropriate constant points of the system. That is why they can come into being, in effect, the definite organic form, since the peripheral cells are behaving in a different way in comparison to those appearing in the center of the system. Then, one of the most important of Driesch's conclusions has been developed (while accentuating its essential methodological meaning) in the following way: the prospective power of the system in question, or rather of every of its constituents, is the sum of that what may be carried out in the system by every of these constituents. Yet, the fact that in every possible case there happens a typical proportional development is the actual proof that this sum is not only the simple one but it is presenting a kind of an order. We may call this order a "dependence of location in the absolutely normal case". But since we ought to remember that a "prospective power" or, as it can be otherwise expressed, a relative proportion which is determining foundations of the harmonious character of the living system, always should co-determinate this state of affairs, then we may be authorized to apply this expression without any ado or explanations to the designation of some

were dependent on the prospectiveness of the actual element of the system under consideration. It was meant to be a short and concise expression covering all the relationships that take place in morphogenesis. S and I were meant to be the absolute magnitude of the system and the relative position of the element (part) in relations to some certain fixed points which are independent variables. Hence, in Driesch's opinion, Entelechy was to be a sign of a certain, fixed prospective power with particular emphasis on the proportionality of the epigenetic phenomena [Driesch, 1898, p. 97, 69].

Driesch published his results before Einstein's theory of relativity. At present, we could develop Driesch's equation into the following form: $B(X) = f(S, I, E, I)^{11}$. In author's view, if this modification had been done – Driesch's research in the field of integrating factor (E – later called the Entelechy) would not have been related to metaphysical considerations that were harshly criticized by the majority of modern scientific community. Whereas the symbol E should denote energy and the symbol I – information, thus replacing (E) the entelechy as understood by Driesch.

However, from today's perspective the appropriate view would be a modified equation of Albert Einstein and Rudolf Klimek: $E = mc^2$ or the innovative and approach of Ryszard Tadeusiewicz $T = C^{12}$. The author's proposal to modify Driesch's mathematical equation aims at showing the position that the study of the organic form can be understood in physicochemical terms, taking into consideration the flow of energy in the living organism, and including the informational parameters that have the fundamental influence on the development of organic events.

Information, at the same time, as one of the main parameters of the organic world – should also interact with what is inorganic, and in this relationship there must be something that is comparable and comprehensible (in its general logical sense) in the terms of reference to inorganic causality. The whole development of organic events should be understood both in the terms of Organic and Inorganic causality – in their mutual interaction of the countless various components of the body. Herein, Information has a special significance, indeed – if factor A interacts with factor B, not only factor B is under its informational influence, but also factor A, as well.

constant factor on which there depends the prospective meaning of every element and constituent of the living system. If we designate the order embracing the prospective power of an organism by a symbol E (entelechy), then we might be able to complete finally the above stated symbolic expression to the form: $B(X) = f(S, I, E)$ [Driesch 1908, pp. 114-124].

¹¹ Such a modified approach of Hans Driesch's mathematical equation is purely symbolic in nature. Driesch knowingly gave up the approach, in his equation – energy (not to mention information). In his opinion, entelechy was not energy, but permanently reacting on the living organism temporarily suspended the flow of energy in relations to the molecules of matter, thus regulating the development of organic events (e.g. enzymatic catalysis). Cf. H. Driesch, *Philosophie des Organischen*, Leipzig 1921, p. 482.

¹² Both equations are discussed in details in: Bremer J, Khroutski K, Klimek R, Tadeusiewicz R., "Challenging integralism, Aristotelian *Entelecheia*, *Hyle* and *Morphe* (Form), and Contemporary Concepts of Information, Touching upon the Aetiological Issues of Carcinogenesis," *Biocosmology – Neo-Aristotelism* Vol. 7, No. 1 (Winter 2017).

It is important to take into consideration the principle of the growth of entropy, which is different in relations to living bodies. Essentially, living organisms as the opened thermodynamic systems – all exchange matter and energy with the environment and can locally reverse the process of the growth of entropy. As a result, these “islands” with low entropy – living organisms – are embedded in the “sea” of high entropy of their environment. In the case of living organisms, the inanimate world is composed from isolated systems that are incapable of exchanging matter and energy [Choraży, 2011, p. 89–112].

Such a distinction should be taken into consideration because the identification and comparison of strictly physical phenomena to processes in the living organisms can lead to cognitive errors in the course of explaining life processes. The above, additional view of informational factor, in my opinion, can help to understand eventually the quantitative and qualitative changes occurring in totipotent systems during the development of organism, especially the processes organic regeneration. By contrast, the full understanding of the processes of regeneration and carcinogenesis can contribute to the cure of various diseases and physiological dysfunctions in the human body¹³ [Klimek, Madej, Sieroń, 2006, p. 123–125].

On the other hand, the introduction of *informational factor* to biological research can also comprise an alternative in explaining Aristotle's ontogenetic changes (μεταβολή και κίνηση) in the organism development that are realized at the individual's developmental levels. Yet in Antiquity, Stagirite noticed that in the living organism, in the first place – “homogenous” parts (at present, called tissues) are generated from particular “elements”; and, in the second stage – heterogeneous systems are formed from the “homogenous” parts (called today as organs). (De part. An., II, I, 643 b 5-8)

Crucially, the significance of Aristotle's scientific principles does not refer only to Antiquity, and which is not lost due to the great course of historic (evolutionary) time. In addressing multi-dimensional contemporary scholarly challenges – Aristotle's (teleological) science nowadays not less (but more) is needed.

4. Hans Spemann's “organizer” as a “pool” of epigenetic developmental information

Hans Spemann repeated the experiment of Lewis clearly introducing a methodological distinction between transplanted embryonic material and host cells. The investigator chose three differently colored Newt species, i.e. Great Crested Newt (*Triturus cristatus*), Alpine Newt (*Triturus taeniatus*, *Triturus alpestris*). In 1917 he began his experiments with the above-mentioned organisms transferring various embryonic parts from the so-called donor to different areas of bright and dark embryos.

His initial critical findings from the conducted experiments were published in 1921. Therein Spemann introduced the notion of “organizer”, thus defining the part

¹³ The main problem that physicians and scientists should focus on is to disclose and redirect the development of pathogenic cells (e.g. cancer).

of transplants of the dorsal lip of the blastopore. These results were based on a single experimental attempt that was obtained by Hilde Mangold [Spemann, 1921, p. 533–570]. Spemann has commissioned a repeat of this critical experiment with embryos. Amongst several hundred chimeric embryos (experimentally manipulated by him) only five survived and remained alive on the experimental basis, the results of these experiments were published in 1924 [Spemann and Mangold, 1924, p. 599–638].

Notably, their research methodology of the embryonic experiment itself was very simple. The dorsal lip of the blastopore was taken from one type of organism and further transplanted to different embryonic sites of other organisms (i.e. organisms-recipients). In the case when the dorsal lip of the blastopore was taken from *Titurus cristatus* and implanted to a darker variety – *Triturus alpestris*, the result was that from 83 organisms only 1 survived. Most of the embryos died in early developmental stages and only one survived and developed during further embryonic stages.

Experimental studies provoked Spemann to make a clear histological distinction of an embryonic donor and the implanted element into the recipient organism. The results of this approach came quickly. The main finding was that in all cases, in respect to the examined organisms – the transplant (that was implanted) mainly contributed to the development of axial mesodermal organs of the embryo (notochord and parts of somite), and marginally to the development of the neural coil (only to a specific piece on its abdominal side). The entire mass of neural tissue was derived from the parental organism. This experiment has shown that the dorsal lip of the blastopore possess the “organizing” abilities (which contain some developmental information. – **D.S.**) and can influence the adjoining host cells. These processes can take place by their induction from the non-neuronal prospective potency (epidermis) to future nervous state.

It can be said, therefore, that the above observations have proven that the “organizer’s” interaction with the host organism demonstrates the informational capabilities in the form of neural inductive signals. In the light of the conducted experiments, Spemann stated that the processes associated with embryogenesis are composed of the two basic processes: biochemical formation of the embryo; and morphogenetic mechanical movements that are responsible for the spatial-geometric shape of the embryo. Embryonic organization which is the process of allocation or differentiation to different areas of the embryo is formed basing on its main characteristics, i.e. either on the polarity of an egg, or through the interaction of factors derived from mentioned egg polarity, sometimes after fertilization. Anyhow, the organization of the developmental “plan” depends on many epigenetic events occurring in the course of further embryonic development; however, the leading role belongs to the category of information that is one of the main components of the “organizer” itself.

Experiments have proven that the activity of an “organizer” is realized directly or indirectly, thus initiating (inducing) many differentiation processes in other areas of the embryo under study. Notably, these processes are sometimes initiated in its own area, in a certain pool of differentiation processes, therefore leading to the

formation of the basic parts of the axial embryonic system. Eventually, the outcome of the “organizer” was supposed to be the stimulation of the particular embryo in the way that it could consequently go from the one sort of differentiation to another without acquiring earlier differential abilities.

Therefore, it may be stated that the embryonic induction process, disclosed by Spemann, is composed of the interaction between the informational developmental stimulus and the dynamic response of the tissue, which, in turn, causes changes in its developmental path. However, it should be kept in mind that the event under consideration has always (primarily) the intrinsic (genetic) origin¹⁴: both inductive – of a donor-“organizer”, and responsive – of the recipient tissue; and that the whole event is possible only under certain conditions, mainly in the early stages of development or in close contact between stimulation and responsive tissue. The cell which is activated by a single stimulating impulse, changes to a new differential course, regardless of further embryonic stimulation.

In the spirit of the so-defined action of “organizer”, it can be pointed out on its main functions – to be fulfilled in the body of a recipient, at that leading to the formation and growth of the embryonic organization. The role of the dorsal lip of the blastopore in the developmental program of the new embryo concerned two important aspects:

1. Formation of axial structures and formation of bilateral plane of symmetry;
2. Redetermination of a destiny for a specific number of cells, by implanting the transplant structures.

Hence, the „organizer”, in the light of the given experimental evidence – is certainly related to a metaphysical category (and scholarly notion) of information which is at least the dynamic constituent of the real processes.

Discussion of results

The developmental destiny of cells is not predetermined, as Wilhelm Roux predicted but their fate can be experimentally redirected from the normal developmental pathway to different developmental forms. In this area, cells within the body (which are in the embryonic state) need an informational stimulus to express their developmental potential.

Both the theory of preformation and the theory of epigenesis were based on their own types of rationality and on their own cosmological bases, therefore striving to explain the problematics associated with a biological development. Although the fact that Roux's¹⁵ reductionist approach to explain the dynamics of biological phenomena was inadequate, nevertheless it constitutes a peculiar basis¹⁶ for other researchers to verify the accuracy of morphogenetic processes. This methodological scientific approach contributed to the neo-vitalistic attitude in biological knowledge. This approach, in author's view, is appropriate and valid as in respect to epigenetic

¹⁴ Thus directly referring to Aristotle's (of Entelechial naturalism) Type of rationality.

¹⁵ Roux's mechanistic approach was indirectly based on assumptions of the theory of Preformation.

¹⁶ It is about the choice and methodology of carrying out the biological experiment itself.

specificity, as in relation to global-dynamic concepts¹⁷. However, from the point of view of Thomas Nagel – such type of research analyzes that refers to non-spatial factors as an explanatory basis for regulatory processes does not fit the scope of any science; and all this, in general, cannot be an effective cognitive method in the area of broadly understood methodology of science [Nagel, 1970, p. 369].

Hans Driesch fought against the theory of Preformationism, firstly by developing his epigenetic vision of morphogenetic development in terms of the specificity of living organisms. In turn, Hans Spemann's experimental attempts are another evidence that the theory of Preformationism is based on the incorrect methodological assumptions and false experimental data which consequently resulted in an inadequate understanding of the developmental process and, in general, in the study of the nature of living organisms.

In the age of modern science, the fundamental challenge to a precise investigation and explanation is how a cell adapts to the entire multicellular organism at the molecular level, and how it expresses its genetic information in a strictly controlled time and place.

Apparently, however, a cell has to send and receive two basic informational signals:

1. At the organ level, each cell senses its (natural) position and reacts respectively (functionally) in relation to the whole organism's needs;
2. At the level of tissues and cells, in achieving the required functional (Entelechial) efficient performance – each cell has to realize an effective information exchange (generating and receiving stimuli) with other associated cells (morphogenesis).

Instead of conclusion

In author's view, a systematic participation and contribution to the endeavors realized within the activities of BCA may benefit significantly to the development of contemporary theory of Information, including the resolution of a cognitive puzzle in the area of epigenetic dynamic purposefulness. BCA researchers are increasingly committed towards the rehabilitation and proper understanding of Aristotle's Entelechial naturalism, but which is taken equally (within the Triadological approach) with the Platonic Dualism (and its mathematical physicalism) – firstly for construction the autonomic (in general, and for sectoral studies) Integralist approach (that synthesizes both Aristotle's and Plato's types of rational knowledge), primarily including the development of the contemporary concepts of Information. Therefore, moving from the study of biological phenomena – we need to realize the further critical reflection and constructive development of the innovative knowledge, including the basic principles and proposals that were advanced the author's joint work [Bremer, Khroutski, Klimek, Tadeusiewicz, 2017, p. 8–55].

¹⁷ On the basis of Wilhelm Roux's experiments, Hans Driesch built his autonomic Vitalistic theory (which ought to be considered as a prominent Integralist contribution).

As concerns experimental research, it is still essential to work on determining the exact course of the collisions of processes that refer to matter, information and energy – within the entire developing and regenerating living organism. Profound exploration and identification of developmental and regenerative reasons would lead us to understanding the pathological developmental changes within correct (natural) developmental pathways (e.g. carcinogenesis). Knowledge of the spectrum of potential capabilities of physicochemical structures of the organism along with its energetic-informational relations – would help to solve many practical problems, such as the planning of optimally effective therapeutic methods and the most efficient breeding procedures. [Szkutnik, 2016, p. 453–464]

References

- Aristotle. *Opera*, Vol. III, *Aristoteles latine interpretibus variis*. Academia Regia Borussica, Berlin 1831.
- Bremer J, Khroutski K, Klimek R, Tadeusiewicz R., “Challenging integralism, Aristotelian *Entelecheia*, *Hyle* and *Morphe* (Form), and Contemporary Concepts of Information, Touching upon the Aetiological Issues of Carcinogenesis,” *Biocosmology-Neo-Aristotelism* Vol. 7, No. 1 (Winter 2017).
- Chorąży M., “Złożoność i hierarchia organizmów żywych,” *Nauka* 3/2011.
- Driesch H., *Philosophie des Organischen*, Leipzig, 1921.
- Driesch H., *The Science and Philosophy of the Organism*, London, 1908.
- Driesch H., *Die Lokalisation morphogenetischer Vorgänge. Ein Beweis vitalistischen Geschehens*, Mit 3 Figuren im Text, Eingegangen am 22 November 1898.
- Klimek R., Madej J. M., Sieroń A., *Rak – nowotwory a choroby nowotworowe*, Kraków 2006.
- Mocek R., *Die werdende Form, Eine Geschichte der Kausalen Morphologie*, Marburg an der Lahn 1998.
- Nagel E., *Struktura nauki*, Warszawa 1970.
- Roux W., “Beiträge zu Entwicklungsmechanik des Embryo. V. Über die künstliche Hervorbringung „halber“ Embryonen durch Zerstörung einer der beiden ersten Furchungszellen, sowie über die Nachentwicklung (Postgeneration) der fehlenden Körperhälfte.” *Virchow's Arch.*, 1888.
- Roux W., “Contributions to the Developmental Mechanics of the Embryo. On the Artificial Production of Half-Embryos by Destruction of/one of the First Two Blastomeres, and the Later Development (Postgeneration) of the Missing Half of the Body,” trans. Hans Laufer, in *Foundations of Experimental Embryology* 2d ed., eds. Jane M. Oppenheimer and Benjamin H. Willer (New York: Hafner Press, Macmillan Publishing Co., 1974).
- Spemann H., *Die Erzeugung tierischer Chimären durch heteroblastische embryonale Transplantation zwischen Triton cristatus und taeniatus*. Wilhelm Roux Archive für Entwicklungsmechanik der Organismen, 1921, 48.

- Spemann H. and Mangold H., *Über Induktion von embryonal anlagen durch Implantation arfrämder organisatoren*, Archive für Entwicklungsmechanik. der Organismen, 1924, 100.
- Szkutnik D., "In Search of the Specific Parameter of Life, General Methodological Comments," *Biocosmology – Neo-Aristotelism*, Vol. 6, Nos. 3&4, Summer/Autumn 2016.
- Szkutnik D, Kupczak R., "The Aristotelian Concept of Psyche Trophica and Contemporary Attempts to Conceptualize the Functioning of Plants Holistically," *Biocosmology – Neo- Aristotelism*, Vol. 5, No. 2, Spring, 2015.