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ARISTOTLE'S THREE SOULS IN MODERN SCIENCE: RE-READING *DE ANIMA*

GRZEGORZ PIOTR KARWASZ
University Nicolaus Copernicus

RESUMEN

Los recientes avances en biofísica experimental –el desarrollo de técnicas de detección química ultrasensibles, como la espectroscopia de masas por transferencia de protones, la espectroscopia fotoacústica y la detección de señalización eléctrica (es decir, como una neurona)– han mostrado que también las plantas exhiben una especie de "anima": detectan, reaccionan comunican. Los documentales elaborados sobre la vida social de los animales sensibilizaron a la opinión pública sobre las similitudes (aparentes) entre las sociedades humanas y las manadas de animales. Esto crea una seria confusión cultural: ¿los seres humanos difieren, desde el punto de vista biológico, del resto de la naturaleza "animada"? Una solución proviene de Aristóteles, quien definió los tres tipos de *anima* justo en los albores de la ciencia humana. Exploramos entre las ciencias naturales, la antropología, las neurociencias y la filosofía, incluida la ética, para mostrar cómo los *anima* humanos difieren de los demás, incluidos los prehumanos, y, por lo tanto, argumentamos que adquiere atributos únicos para ser un alma (*inmortal*).

Palabras clave: Irradiación, sacralización, modernidad, voluntarismo, subjetividad, posmodernidad.

ABSTRACT

Recent progresses in experimental biophysics – the development of ultrasensitive chemical detection techniques, like proton-transfer mass spectroscopy, photoacoustic spectroscopy, and detection of electric (i.e. neuron-like) signalling, showed that also plants exhibit a kind of „anima": they detect, react, communicate. Elaborated documentaries on social live of animals sensitized the public opinion on (apparent) similarities between human societies and animal herds. This creates a serious cultural confusion: do humans differ, from the biological point of view from the rest of "animated" nature? A solution comes from Aristotle, who defined the three types of *anima* just at the dawn of human science. We explore between natural sciences, anthropology, neurosciences and philosophy, including ethics, to show how human *anima* differs from others, including pre-humans, and thus, we argue, acquires unique attributes to be an (*immortal*) *soul.*

Keywords: soul, neuroscience, eschatology, humans.

I. INTRODUCTION. SEARLE: MOST PEOPLE AND THE WESTERN WORLD…

John Searle, one of leading philosophers of cognitivism writes in *Mind. A Brief Introduction*:

> There is an enormous difference between what people believe and what professional *experts* believe. I suppose most people and the Western world today accept some form of dualism. They believe they have both a mind, or a soul, and a body. I have even heard some people tell me they have three parts – a body, a mind and a soul. But this is definitely not the view of *professionals* in philosophy, psychology, cognitive science, neurobiology, or artificial intelligence. Almost without exception, the professional experts in the field accept some version of materialism.[1]

With modern scientism we would tend to reduce all phenomena to those measurable, the best if resembling physics. However, the methodology of physics, as developed by Galileo, finds best applications to events repeatable, isolated, simple, or reduced to simple. Physics hardly applies to humanities – even the economy fails to follow mathematical predictions. Not demanding a

1 John R. Searle, *Mind. A Brief Introduction* (New York: Oxford University Press, 2004), p.12.

special role for the philosophy[2], we discuss if it can still bring some answers to Searle's "most people" in the matter of body, mind and soul.

Philosophical thinking, from its very beginning, develops in parallel with natural sciences. In the subject of soul (or using the Italian title for the Aristotle's work: *Anima*) – the medicine, biology, neurosciences stimulate continuously new *reflection*. Does the modern science require and/or prove that *anima* is a part of matter (in the meaning of physics)? Which of Aristotle' research in *De Anima*[3] is *not* in contradiction with modern science? For sure the physical interpretation of the soul, as a source of the movement[4] ("the soul sets the body in motion, it may reasonably be supposed to impart to it the motions which it has itself" (406a 6) is not needed any more – in times of mechanics and thermodynamics. But still, the movement of *animated* bodies in not only physics.

The pathway of this paper is from a materialistic-like concept of the human thought[5] - passing through physics, humanities, philosophy and theology - to Ratzinger's eschatology[6]. We analyze writings by Aristotle, Descartes and achievements of modern sciences.

II. DESCARTES AND OTHER "DISASTERS"

John Searle in the chapter entitled "Descartes and other disasters" adds:

> Descartes' most famous doctrine is dualism, the idea that the world divides into two different kinds of *substances* or entities that can exist on their own. These are mental substances and physical substances. Descartes' form of dualism is sometimes called "substance dualism." Descartes thought that a substance has to have an essence or an essential trait that makes it the kind of substance that

2 Władysław Tatarkiewicz in his PhD dissertation wrote on Aristotle: "[…] and philosophy is for him just a science side-by-side with other, and not above particular sciences." *Die Dispositione der aristotelischen Principien*, (Marburg: PhD Dissertation, 1910) p. 19

3 Aristotle, *De Anima* (Cambridge: University Press, 1907)

4 To be more precise, Aristotle's search for the source of movement in *Physics* (Lincoln: University of Nebraska, 1961) reflects a lack of the term *momentum*, in Latin *inertia*, that was introduced only in XIIIth century by Jean Buridian, Rector of Paris University.

5 "The structure of connections and neural properties determine types of personality; it can not depend on something received", Włodzisław Duch, „Why minds cannot be received, but are created by brains", *Scientia et Fides*, 5(2) 2017: 195.

6 " […[*anima*, on one hand belongs to the material world, on the other hand, however, exceeds this world […] just by the fact that the *anima* in man reaches to God." Monika Szetela y Grzegorz Osiński, „The concept of dialogical soul by Joseph Ratzinger against latest concepts of neuroscience", *Scientia et Fides*, 5(2) 2017: 209.

> it is (all this jargon about substance and essence, by the way, comes from Aristotle).[7]

Aristotle's definition of "substance" in *Categories*[8] (2a 11-14) was quite laconic: a man or a horse (for discussion see e.g. Studtmann[9]). A part of this difficulty in defining substance originated from the fact, that at times of Aristotle, of Descartes (and still a couple of centuries later), the meaning of *matter* was quite vague. Descartes, to explain the movement of planets introduced strange vortices, the heat was believed to be a liquid (phlogiston), electromagnetic wave were supposed to propagate in an invisible ether, and so on. Therefore, Greek "earth", "air" and so on were quite good *working hypothesis* to explain both substance and essence.

Descartes worked in times when an autopsy was depicted by Rembrandt and theories of magnetism, electricity and heat were at their dawn. On Galileo, working at the same time it was said: "Physics stepped down from heavens to earth on the inclined plane of Galileo"[10]. Similarly, Descartes tried to link Aristotle's anima to a material body; hence somewhat improperly he is accused to be a founder of dualism: a soul inserted into body, like in Polish, the "anima" is the heated piece of iron inserted inside an ancient clothing iron. Attentive reading shows that Descartes recognized different natures of the mind and brain – the mind is extended and non material; Descartes in *Meditations* does not specify the mind as "positioned" in the brain; he rather uses the scholastic term "sensus communis":

> […] for there is not one of these imaginable by me which my mind cannot easily divide into parts, and which consequently I do not recognize as being divisible; this would be sufficient to teach me that the mind or soul of man is entirely different from the body, if I had not already learned it from other sources. I further notice that the mind does not receive the impressions from all parts of the body immediately, but only from the brain, or perhaps even from one of its smallest parts, to wit, from that in which the common sense (*sensus communis*) is said to reside.[11]

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7 Searle, *Mind*, 13.

8 Aristotle, *Categories and De Interpretatione*, (Oxford: Clarendon Press, 1963), 5.

9 Paul Studtmann, *Aristotle's Categories*, in: Stanford Encyclopedia of Philosophy (2013) https://plato.stanford.edu/entries/aristotle-categories/#Sub

10 Eric M. Rogers, *Physics fir the Inquiring Mind* (Princeton: University Press, 1960), vol. II, Ch.19.

11 René Descartes, *Meditations on First Philosophy* (Cambridge: University Press, 1911) I-31. http://selfpace.uconn.edu/class/percep/DescartesMeditations.pdf

Descartes was quite cautious about the Soul[12], written with major "S". Only in the 2nd answer to comments he expressed his opinion on soul's immortality:

> But if we asked on the absolute power of God, and if by the case He has not decided that souls cease to exist in the same moment in which are destroyed bodies with which He joined them, on this only God can answer. And if he announced us that this would not happen, we have no reason to doubt on it, or just minimal.[13]

Descartes' last work, *Passions of the Soul* is dedicated to what we would call individual psychology but the book starts from "a natural heat[14]" that is the subject of biology or physics:

> Thus it has been wrongly believed that our natural heat and all our bodily movements depend on the soul; whereas we ought to hold that the dependence goes the other way—the soul leaves our body when we die only because this heat ceases and the organs that move the body decay.[15]

Descartes, before Galvani's discovery of the "electricity" in frogs, uses the term "spirits" for neuronal signals, travelling all around the body. Hence, the

12 Translations into English are somewhat clumsy. In the original Latin version (1641) Descartes uses two words different. In the preface to Paris Theological Faculty he uses "Anima": "Semper existimavi duas quaestiones, de Deo et de Anima, praecipuas esse ex iis quae Philosophiae potius quam Theologiae ope sunt demonstrandae:" In the preface to the reader he uses "human mind": "Quaestiones de Deo et mente humana jam ante paucis attigi in *Dissertatione de Methodo recte regendae rationis et veritatis in scientiis investigandae* gallice edita anno 1637." (http://www.gutenberg.org/files/23306/23306-h/23306-h.htm) The English translation is "the Soul" and "the human soul", respectively. (Internet Encyclopedia of Philosophy, 1996. This file is of the 1911vedition of *The Philosophical Works of Descartes,* Cambridge: University Press, translated by Elizabeth S. Haldane) http://selfpace.uconn.edu/class/percep/DescartesMeditations.pdf (consulted 29/01/2018)

13 Descartes, *Meditations*, Polish edition (Warszawa: PWN, 2010), p. 154.

14 For physics this heat comes via thermodynamic processes, but in biology we call them metabolism.

15 René Descartes, *Passions of the Soul* (Jonathan Bennett, 2017), Part I, art. 5 (p. I-2) http://www.earlymoderntexts.com/assets/pdfs/descartes1649part1.pdf. An alternative translation says: "The mistake is this: observing that all bodies are deprived of heat and then of movement, people imagined that the absence of the soul was the case of the absence of movement and heat. Hence they believed, without reason, that our natural heat and all the movements of our bodies depend on the soul; whereas they should have thought, on the contrary, that the soul takes leave of the body at death, purely because the heat has given out, and the organs the function of which is to move the body have become corrupted." R. Descartes, *The Passions of the Soul and Other Late Philosophical Writings*. Trans. by Michael Moriarty. (Oxford: University Press, 2015), 196. Both translations mix-up different meaning of the word "soul".

soul is indivisible. "For a perfect grasp of all this we need to recognize that the soul is really joined to the whole body, and can't properly be said to exist in any one part of the body rather than in others."[16] Here, Descartes uses the word "soul" in different meaning as in *Meditations*: he searched to place Aristotelian "anima" in the context of contemporary to him physics and physiology, not denying the existence of something/ Somebody beyond. In conclusion, attributing to Descartes a material body opposed to a non-material mind is an oversimplification.

III. A BUNCH OF ELECTRICAL WIRES?

Being or not a materialist of the mind, Descartes triggered the interest where in the brain the "anima" is placed. On such a pattern we have today discoveries where in the brain religious sentiments are placed, where laziness lies and so on.

Only in 1897 J. J. Thompson officially named (and measured properties) of the electron, Albert Einstein in 1905 determined the number of atoms in a water drop (even if he was convinced that atoms can not bee seen), Maria Skłodowska-Curie studied the structure of atomic nucleus: a modern concept of matter emerged. From that time we know that the whole matter are atoms, and we could avoid "substance" and "essence" in describing them[17].

Therefore, an easy illusion comes that thinking is just a bunch of electrical currents somewhere in the brain. With ultra-sensitive devices - superconducting magnets (SQUIDS), we can trace these signals in real time. The "electrical" activity of the brain, discovered in the 30ties of last century in a form of relatively (few Hz) slow waves, still is labelled *alpha*, *beta*, *delta*[18], like the nuclear radiation in times of Marie Curie.

But, surprisingly, not only human (and animal) brain generates electrical signals, but all contracting muscles (the heart included). Recently it was

16 *Ibidem*, p. 9.

17 This is only partially truth. Electrons seem to be elementary particles, indivisible, but protons are made of three "quarks", inseparable, much lighter than proton,(3-6 vs. 911 MeV) and elementary (?). Notions of matter and energy are mixed, the term "consisting of", from times of $E=mc2$ is not any more relevant. With Pauli's principle, we still need "an essence" in order to explain the whole chemistry of electrons, see (G. Karwasz, "Il costante progredire della frontiera tra teologia e scienza: Parte II. Metafisica", *Scientia et Fides*, 4 (1) 2016: 151.

18 Recently it was discovered (through mathematical modeling) that these waves may act like waves on a lake, pushing a single thought as a piece of wood on water the surface of water. Mojtaba Chehelcheraghi et al. "A neuronal mass model of cross frequency coupling" *PLoS ONE* 12(4) 2017: e0173776.

discovered that also plants use electrical signals for inter-body communication. These signals differ in amplitude (brain voltages are microvolts, while heart pulsing generates millivolts) and in timing, but essentially are similar, see fig. 1. Plants exchange information between specimen (on pollination, on harmful events, on ripening) using also gaseous hormones, like ethylene[19] and isoprene[20].

An additional confusion comes from behavioural observations of animals: "My dog behaves like understanding me!" (And Michael Gazzaniga adds: "There is no a bigger offence for a dog – he can do so many things that humans can not"[21]) This was already Aristotle who noticed "intelligent" animal actions, inventing what we would call today *ethology*:

> The horse and the anthus are enemies, and the horse will drive the bird out of the field where he is grazing: the bird feeds on grass, and sees too dimly to foresee an attack; it mimics the whinnying of the horse, flies at him, and tries to frighten him away; but the horse drives the bird away […]"[22]

Today we have many evidence of even more "intelligent" behaviour of animals: a forked-tail drongo (*Dicrurus adsimilis*) living in Namibia is able to mimic up to 50 voices, much better than the anthus (*Motacilla alba*), in a well-defined order, to steal food to other predators[23] Elephants accompany their dying friend, orangutangs can use a hand saw, chimpanzee make theatrical exhibitions to impress females. So, from the points of view of electricity and ethology there is no difference between plants, animals and humans? Philosophy must be called in succour.

19 Simona M. Cristescu et al. "Current methods for detecting ethylene in plants" *Annals of Botany* 111 (2012): 347

20 Mastaneh Ahrar *et al.* "Isoprene emission in the monocot Arundineae tripe in relation to functional and structural organization on the photosynthetic apparatus" *Environ. Exper. Botany*, 119 (2015): 87-95.

21 Michael Gazzaniga, *Human. The Science Behind What Makes Your Brain Unique* (New York: Harper Perennial, 2008)

22 Aristotle, *The History of Animals*, (London: John Bell, 1907) Book IX, Chap. I

23 Will Duncan, Reuters, *Liar! Liar! African birds uses elaborate ruse to steal food*, http://www.reuters.com/article/us-science-birds-idUSKBN0DH38720140502 consulted 29/01/2018

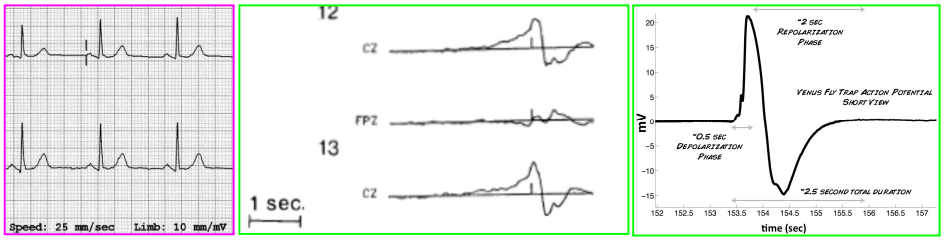

Fig. 1. Electrical signals in living organisms. (**a**) Electrocardiogram are signals of few mV order and different form, according the point of detection; specialists define P, Q, R, S, T features[24]. (**b**) Any stimulus, like a falling ball, causes an electrical impulse in brain, which includes a phase of preparation, reaction and quenching[25]. **c)** In plants electrical signals are much slower; Venus flytrap (*Dionaea muscipula*) eating insects closes the trap if in distance of not more than 20 seconds two sensors are touched, the signal generated lasts about 2 seconds[26].

IV. ARISTOTLE: THREE *ANIMA*

Aristotle is known for his extraordinary solution of the soul-body unity (hylomorphism) that has essential importance in theology (that will be discussed later); for modern popular culture more important is his distinction of living beings. The Philospher, with all his scientific interest (astronomy, physics, biology) had understood differences between forms of life, and had risen conceptual barriers between: i) plants, ii) animals and iii) man - surprisingly he did it not in his scientific treaties, but in *De Anima*.

Three types of anima: i) nutritive, ii) sensitive and iii) intellectual sum up in sequence in the three types of livings. Aristotle considered *anima* not only the organizing source of life, but a *purpose* of existence. In fact, the organizing force in all living beings, now called homeostasis, acts till the very end of the biological existence when cells are programmed to commit a suicide when their natural life ends or when external conditions trigger the *apoptosis*. This is the correct concept for Descartes' "heat leaving the body",

Descriptions of the three types are spread over the whole *De Anima*:

24 Murray Bourne, *Maths of ECG: Fourier Series*. https://www.intmath.com/blog/mathematics/math-of-ecgs-fourier-series-4281, consulted 29/01/2018

25 Giuseppe A. Chiarenza et al. 1991. Brain activity associated with skilled finger movements: Multichannel magnetic recordings, Brain Topography, 3 (1991): 433-439.

26 *Backyard Brains, Neuroscience for Everyone* https://backyardbrains.com/experiments/Plants_VenusFlytrap consulted 29/01/2018.

- Of the powers of soul above mentioned, namely, those of nutrition, appetency, sensation, locomotion and understanding, some living things, as we remarked, posses all, others again only one. Plants posses the nutritive faculty only: other things along with this have sensation; and if sensation, then also appetency: where under appetency we include desire, anger and wish. (414a, 30)

- There are two different characteristics by which the soul is principally defined: firstly, motion from place to place and, secondly, thinking and judging and perceiving. Both thought and intelligence are commonly regarded as a kind of perception, since the soul in both of these judges and recognizes something existing. (427a, 3)

- Others – that is to say, man and any other species like man or, possibly, superior to him – have also the thinking faculty and intellect. (414b, 20)

- Concerning the intellect and the potentiality for contemplation the situation is not so far clear, but it seems to be a different kind of soul, and this can exist separately, as the everlasting can from the perishable (413b, 26)

- For being able to perceive and being able to believe are different, since perceiving too is different from believing. (413b, 31)

Władysław Tatarkiewicz[27], in his monumental *History of Philosophy*[28] resumed in few words the genius of Aristotle in the matter of *anima* (and soul):

> 10. Anima (Psychology). In psychology Aristotle applied the general rules of his philosophy: he used the notions of form and matter, to resume the relation between the soul and body. Thanks to it he created the third great concept that the Greek thinking produced in this question. Following him the soul is not a substance separated from the body as Plato wanted, and is not the body like Democritus wanted. Following Aristotle, it is the f*orm*, i.e. the *energy*[29] *of an*

27 Tatarkiewicz, seventy years later after his PhD, in the preface to the Polish translation (1978) stated that what he admired as a student was the *system* that Aristotle constructed, but what he fully appreciated later was the fact that Aristotle left his system open, in a way that other generations can further build it up and exploit.

28 Władysław Tatarkiewicz, *Historia filozofii* (Warszawa: Państwowe Wydawnictwo Naukowe, 1998), t. 1

29 In Aristotle's *Metaphysics* (for ex. 1046, 1) the use of *ένέργεια* is in the meaning of act. In physics, starting from mid XIX century, "energy" means something that is a feature of the body, but can not be extracted. The energy is a *capacity* of the body to perform a work: a risen hammer can beat

> *organic body*: it means that the soul and the organic body form an *inseparable unity*; the soul can not exist without body, and the body can not perform its functions without the soul, which makes the body alive.[30]

In elementary explaining, three types of souls have three functions: nutritive, sensitive, intellectual. But from the text of *De Anima* (as given above) these functions are more numerous and mutually convoluted. Tatarkiewicz, again, is very precise in his wording:

> The consciousness was only one of the function of the soul understood in this way, that has so many functions as the organic body activities. These function Aristotle ordered in a hierarchy. As higher he considered those that can not be performed without other, lower; in this sense thinking is higher than perception, and perception higher than nutrition (as also this is the function of a widely conceived soul). He differentiated three function and, accordingly to them, three types of the soul. *Plants' soul* has only the lowest function […]. As higher abilities suppose lower, so human soul links all abilities of the soul.[31]

Summing up, in Aristotle's understanding electrical signals simply belong to all the three animas: *nutritive*, *sensitive* and *intellectual*; differences between souls come not from physical mechanisms (or structure), but from results of activities (and purposes). These activities are more various (imagination, understanding, intelligence) but come in three steps, i.e. quanta.

5. I AM HAPPY NOT TO BE A CHIMPANZEE[32]

Electrical signals alone do not bring difference between the three animae. Neuroscientists are frequently called to testify on the materialism of the brain (and of the mind). J. R. Searle states: "Consciousness is a system-level, biological feature in much the same way that digestion, or growth, or the secretion of bile are system level, biological features. As such, consciousness is a feature of the brain and thus a part of the physical world"[33]. In fact, this is *not* easy to show, via detected (and understood) electrical currents in the brain that

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the nail. The relation between the body and its energy, to some extend is therefore similar to that between the matter and the form.

30 Tatarkiewicz, *Historia*, p. 116-117

31 *Ibidem*, p. 177

32 Michael Gazzaniga, *Human. Quel che ci rende unici* (Milano: Raffaello Cortina Editore, 2009).

33 Searle, *Mind*, p. 80

higher psychical functions are performed – that the brain is not just a bunch of neurons but a *substrate* for the functioning of an *intelligent anima*.

An extensive discussion of subtle differences between humans, and Aristotle's "beasts" is given by Michael Gazzaniga in "Human. What makes us unique" (this is the title in Italian translation[34]). Gazzaniga spans over genetics, the brain, social behaviours, psychological functions, arts, ethics, intelligence - to distinguish man from animals, including primates. He stresses, in matter of our DNA similarities with monkeys (and with flies) that 1.4% of the active difference corresponds to 68kb substitutions of nucleic bases that are sufficient for expression of all functional proteins[35].

We add that majority of genes in all lived creatures are related to the same external conditions: Earth with the gravity, metabolism in aqueous solutions, presence of oxygen in atmosphere etc. Then, these is not only the sequence of 3.3 billion ribonucleic bases along the human DNA chain but infinity of combinations, in which they are read during the transcription into proteins. Quoting scientists in genetics – expression of genes is much more complex than we could imagine.

The essential (using Aristotle's adjective) difference between animals and humans Gazzaniga sees not in the biology but in behaviours, i.e. higher mental and ethic functions. Chimpanzees make hunting (of some other monkeys) dividing roles but they will never organize an appointment: they have no temporal horizon. A dog seems to be ashamed "after having chewed your best Gucci shoes"[36] but this is a simple fear of immediate consequence. Differently, a four-months old girl hides her head in mother's arm when a stranger, after her insisting smiling, answers with the same: this is not a shame but decency (Italian *pudore*).

> We humans are special. The point is that most human activity can be related to antecedents in other animals. But to be swept away by such a fact is to miss the point of human experience.
>
> ... [arguments] come through data about our brains, our minds, our social world, our feelings, our artistic endeavours, our capacity to confer agency, our consciousness, and our growing knowledge that our brain parts can be replaced with silicon. […] From this jaunt, one clear fact emerges. Although we are made up of the same chemicals, with the same physiological reactions, we are

34 Gazzaniga, *Human*, 490.
35 *Ibidem*, p. 50.
36 *Ibidem*, p. 195.

> very different from other animals. Just as gases can become liquids, which can become solids, phase shifts occur in evolution, shifts so large in their implications that it becomes almost impossible to thing of them as having the same components.[37]

But the very cultural importance of Gazzaniga's *Human* is not a mere content, but the testimony: a leading world neuro-surgeon constructs the distinction between animals and humans not on the architecture of the brain but on external, psychical "artefacts" of this brain, like arts and ethics.

Do animals show a kind of ethics? Such a question goes in parallel with the term "natural ethics", like natural is the wind and sand. Admitting existence of natural "ethics"[38], i.e. of the common origin with animals, leads immediately to the ethical relativism: if nobody over me guarantees the morality, than it is (i.e. I am) allowed to improve it. Numerous examples in the inheritance of humanistic sciences show, how it is tedious to construct ethics, that would not have a transcendental "support"[39].

VI. ETHICS, PSYCHOLOGY, PEDAGOGY

It is easy to detect, in original texts, a subtle conviction of their authors, that the world may extend *beyond now and here*, that human anima is not like a secretion of bile, and that the soul may be ever-lasting. It was Plato in *Phaedo* (LVII D) , who linked the soul to ethics (or *vice versa* – ethics to the immortality of the soul): "But forasmuch as the soul is immortal, the only way to avoid those evils and obtain salvation, is to become good and wise […]".

Texts written *without* such a clear conviction find difficulties in argumentation. In ontology this is the case of Hegel and followers who considered the religion "an opium for proletariat", as compared to Kant who notes in *Critics of pure reasoning* (B 652) that one can not prove existence of God without "some grace and external help".

But the difference stays not in declarations of materialism or not, but on the whole "outcome" of operas. Tatarkiewicz wrote on *happiness*[40] that a secure

37 *Ibidem*, p. 2-3.

38 Such postulated "natural" ethics is to be distinguished from an "innate ethics", that comes with the soul but needs a constant grace to keep it pure.

39 In spite of attributing to Kant the origin of relativistic ethics (and ontology), he permanently testifies his conviction on existence of *transcendental* categories.

40 Władysław Tatarkiewicz, *On Happiness* [O szczęściu], (Warszawa: PWN, 1962) 317.

way to reach it goes via a single, well defined path (even if he did not say openly which path). He contrasts with George E. Moore[41], also from the middle of the last century, searching thoroughly some correct actions via pragmatism – individual, extended, socially and historically approved, but at he end – undefined. Written by the same generation in Poland, but without a proper spiritual dimension "Meditations on decent life"[42] lack any final indications for the reader. Some weakness in moral argumentation exist even in Aristotle's *Ethics*, not saying about Marcus Aurelius, confessing his fear for the death: ethics without a transcendental source (in physics we say "boundary conditions") is limping.

Conviction of writers that the soul is something based not only on the individual's body (i.e. a bunch of electrical signals) but is a self-contained entity, worth respecting (and admiring) shines also in other humanities. In psychology (and pedagogy) Jean Piaget searched the *children intelligence*[43] in all possible minute nuances of individual characters. And this book was proceeded by *Le jugement moral chez l'enfant* (1932). Piaget's approach contrasts with that by the Soviet psychologist, Lev S. Vygotsky treating pupils only as part of communities and starting discussion on the mind and language[44] (1934) from comparing humans to monkeys.

In pedagogy we contrast Maria Montessori[45] (and Johann Pestalozzi, Janusz Korczak etc.) who found in weak, children's souls the reason for their personal pedagogical devotion with, say John Deway, constantly searching during his whole life different (but mainly political and social) justifications for educational actions.

So, surprisingly, this is not sociology, not behaviourism, not neuro-sciences but humanities (philosophy, ethics, pedagogy and, possibly, theology) which seem to bring back a proper ontological status to human *anima*. Before exploring theology, we come back to physics and *De Anima.*

41 George E. Moore, *Ethics* (Oxford: University Press, 1966).

42 Tadeusz Kotarbiński, *Meditations on decent life* [Medytacje o życiu godziwym] (Warszawa: Wiedza Powszechna, 1966).

43 Jean Piaget, *La naissance de l'intelligence chez l'Enfant* (Neuchâtel, Paris : Delachaux et Niestlè, 1936)

44 Lev S. Vygotsky, *Thought and Language* (Cambridge MA: MIT Press, 2012)

45 On children's education Montessori wrote (what is not frequently quoted): "The sentence «search for God and the rest will come itself» is without doubt the departure point, resulting from facts." (Maria Montessori, *Educare alla libertà*. Milano: Oscar Mondadori, p. 50)

VII. FIVE SENSES

Descartes attributed to the human mind some independent existence: "Cogito, ergo sum". In *De Anima* these are five senses that precede thinking: "Thinking is diverse from the sensation and includes from one side the imagination and from other the intellectual apprehension." [46]

Intuitions of Aristotle on human senses are surprising. In the question of the vision he noticed that objects are visible only when they are *illuminated*, and that the colour is *added* to the shapes. "The visible, then, is colour. Now colour is that with which what is visible in itself is overlaid. But colour is universally capable of exciting change in the actually transparent, that is light. Hence colour is not visible without light."[47] The modern physiology shows that with a scarce illumination we see a scale of greys as only rods work, and colours are visible thanks to cones, which require a higher illumination.

Aristotle's is also surprising on understanding an evanescent nature of light, which is a wave propagating in vacuum, and is visible only if it impinges an object. "Light is neither fire nor body generally nor an affluence from any body, but the presence of fire or something fiery in the transparent."[48] A visible light is emitted by bodies at temperatures above 1000ºC, so *fiery*. And further: "Some things, indeed, are not seen in daylight, though they produce sensation in the dark: as, for example, the things of fiery and glittering appearance, like fungus, horn, scales and eyes of fishes." Aristotle noticed phenomena that we call now *diffraction*, that is caused by a nanostructure of some objects, like fish scales.

Similarly attentive is Aristotle on other senses. „The medium of sound is air, that for odour has no name." Sound is a longitudinal wave propagating in air and smells are added to the air (or water). "For animals that live in water also appear to have the sense of smell. But man and other land-animals which breathe are unable to smell without inhaling breath. The reason for this, too, must be reserved for future explanation."[49]

The acoustic wave is generated by vibration of an objects, and this wave causes vibrations in our ear. "They can produce actual sound between the sonorous body and the organ of hearing. [...] for it is blow that produces it. The thing struck must be of even surface, so that the air may rebound and vibrate in

46 Aristotle, *De Anima* 427b 27
47 *Ibidem*418b 7
48 *Ibidem*, 418b 15
49 *Ibidem*, 419a 35

one mass."[50] A violin is made of an "even" box, that vibrates and moves (rebounds) the air.

All these observations of Aristotle are not falsified by modern physics neither physiology. And could still serve for teaching.

VIII. IN SEARCH OF "COMMON SENSE"

Aristotle starts Book 3 of *De Anima* with a statement that the five senses exhaust the bodily capacities, and any mixture of them into a "common sense" is not appropriate. Quite in a materialistic manner he states that senses are complementary, and that the source of sensations is a given, material object, even if he mentioned in *De Anima* what later was called internal faculties: imagination, the sensation, opinion, knowledge and intellect.[51]

Albert the Great in his *De Anima* made a significant step towards separation of internal and external mental capacities[52]:

> But the fourth and final grade is that which apprehends the quiddities of things stripped of all material attachments, and which does not receive them with sensible intentions, but rather as simple and separate from them. And that apprehension is unique to the intellect, such as the understanding of human being through that which belongs to all humans, or the understanding of substance, and, as is commonly said, the understanding of the universal quiddity of every thing, inasmuch as it is its quiddity, and not inasmuch as it belongs to this thing and not to that one. [53]

Does this "apprehension" develop step-by-step in contact with the external world (but somewhat surprisingly in the same, congruent way between single individuals) like Jean Piaget argued? Or does it rather develop like a (fully programmed) flower from a blossom? Noam Chomsky states that also human linguistic capabilities prove some *innate* "cognitive powers", differently than in animals' communication:

50 *Ibidem*, 420a 25

51 *Ibidem*, 428a 5

52 In computer nomenclature we would call this distinction input-output devices and central processor unit.

53 Albert the Great, *De Anima* (Toronto: Deborah L. Black 2009), p. 2. http://individual.utoronto.ca/dlblack/WebTranslations/albimagdeanima.pdf

> We can add another insight of seventeeth-and eighteenth-century philosophy, with roots as far back as Aristotle's analysis of what were later interpreted as mental entities: that even the most elementary concepts of human language do not relate to mind-independent objects by means of some reference-like relation between symbols and identifiable physical features of the external world, as seems to be universal in animal communication systems. Rather, they are creations of the "cognoscitive powers" that provide us with rich means to refer to the outside world from certain perspectives, but are individuated by mental operations that cannot be reduced to a "peculiar nature belonging" to the thing we are talking about, as Hume summarized a century of inquiry.[54]

What is the relation between "cogniscitive powers" of Chomsky (and "common sense" of Albert and Descartes) with other senses? May the internal mind be separated from the body? Is the soul an insert into the clothing iron? Gallagher and Zahlawi put the question "the brain in-the-vat?" and answer it in a following way:

> It just is an empirical fact that we are indeed embodied, that our perceptions and actions depend on the fact that we have bodies, and that cognition is shaped by our bodily existence. […] The brain-in-the-vat thought experiment actually shows that perception and action do require some kind of embodiment. Even the pure brain-in-the-vat requires absolutely everything that the body normally provides – for example, sensory input and life support."[55]

The body, or its fully functioning and assembled constituents (i.e. organism) are necessary for the mind. The only, terrifying reference of the separation is the artistic imagination of authors of the script and the register of "RoboCop 2" (Kershner, 1990) – a deprived brain becomes a monster if gets isolated from its (corrupted) body.

Putting again the question of Descartes: "where in the brain is the *common sense*?" Stanley Yaki responds: everywhere or nowhere.

> But dualism, as was the case with Descartes, discredits itself when it looks at the soul as something merely attached to the brain but not wholly diffused within it in a sense of being integrated with it. It would, of course, be futile to say something quantitatively specific about that kind of diffusion. It is neither

54 Noam Chomsky, *Language and Mind*. (Cambridge: University Press, 2005) p. 177.

55 Shaun Gallagher y Dan Zahavi, The Phenomenological Mind. An Introduction to Philosophy of Mind and Cognitive Science, New York: Routledge, 2008) p. 131.

> chemical nor spatial. The soul or the *mind* is everywhere in the brain yet it is nowhere within it.[56]

A nice analogy comes from holography (1947) – a 3D picture printed on a 2D foil. The physical principle of operation is diffraction, and the unusual feature of the holographic 2D print is that every part of it contains the whole 3D picture (only the intensity is lower[57]). In other words, the soul and the body are everywhere in man, mixed non on atomic, but on more primordial "earth-heavens" (using expression from *Genesis*) level. Some modern medical voices[58] also stress, that tracing presence of life processes in human body can not be reduced to the brain activity solely.

IX. NEURO-SIGNALS: HEIESENBER'S PRINCIPLE

The search for a place where *anima* is located, as explained above wrongly attributed to Descartes, brought to studies on brain functions. The early wave of research came with the 1st World War, where numerous casualties with brain injuries led to identification of zones (lobs) responsible for specific functions – vision, hearing etc. Note, however, that these studies showed not "a function is entirely placed there", but rather – "if this zone is damaged, the function fails". Newer discoveries (see for ex. Gazzaniga[59]) proved that even with heavy injuries, some functions can be overridden by other zone.

Internal structure of the brain can be studied nowadays by almost non-invasive methods, i.e. the magnetic resonance (anatomy) or positron annihilation tomography (an uptake of glucose). The first group of methods of detection are fast, the second - slow. Both are extremely useful, but some conclusions, like that a few years ago on the location of religious sentiments in a given zone are to be considered oversimplifications.

Recent advanced studies show that even the most simple operation, like hearing a word, triggers a whole series of signals, of strictly defined length,

56 Stanley L. Yaki, *The Brain-Mind Unity: The Strangers Difference*. (Pinckney: Real View Books, 2004) 21.

57 To some extent also the eye pupil works in a similar way: with contracted aperture (due to higher illumination) we see still the same picture.

58 Norkowski, Jacek, Norkowski, Jacek M., "Brain based criteria for death in the light of the Aristotelian-Scholastic anthropology", *Scientia et Fides*, 6/1 (2018): 153-188.

59 Gazzaniga, *Human.*

sequence and delays[60] in different regions of the brain, see fig.2. Physics, or more precisely quantum mechanics, teaches that even a path of such a well defined material object like a point-like electron can not be determined: how such faint phenomena like a thought can be traced with certainty?

Our understanding of complexity in neuronal connectivity stops merely on the case of *Drosophila* larvae (see e.g. Karsai[61]) and of simple mathematical models of few clustering cells (see e.g. Bulllmore[62]). Quantum Chemistry quite a long time ago surrendered in front of ten electrons of neon - more cells in computer memory are needed to predict movement of electrons than the number of atoms in the universe. So, Quantum Chemistry changed the methodology from Schrödinger equation to some simplified (and phenomenological) Kohn-Sham method: we do not know positions of single electrons but only the *overall*, optimized energy of the atom. Recalling worlds of Copernicus from *De Revolutionibus* on the dimensions of Universe[63]: "complexity of the human brain? - we do not know and, maybe, we even can not know".

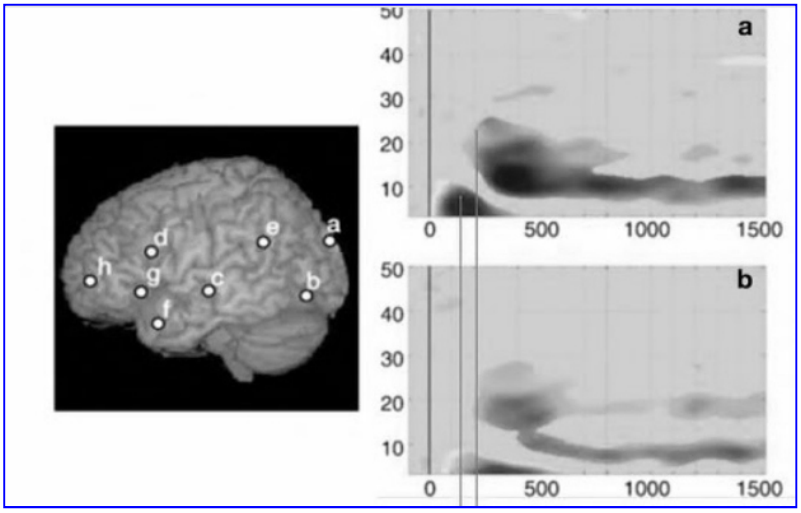
60 It seems, that some anomalies, like dyslexia, are not caused by dysfunction of "processing units" in the brain, but by a too fast transmission of data between these units. The therapy (for ex. so-called Crispiani's method) stays in teaching rhythmic sequences in mental functions (hearing, singing, clasping, walking etc.)

61 Gergely Karsai *et al.* "Diverse in- and output polarities and high complexity of local synaptic and non-synaptic signaling within a chemically defined class of peptidergic Drosophila neurons", *Frontiers in Neural Circuits,* 7 (2013): 127

62 Ed Bullmore y Olaf Sporns "Complex brain networks: graph theoretical analysis of structural and functional systems" *Nature Reviews Neuroscience* 10 (2009): 186-198

63 "Earth, great without any doubt, nothing is as compared to the Universe, dimensions of which we do not, or even we can not know" (*De Revolutionibus orbium ceolestium*). In fact, a constant velocity of light, as discovered by Albert Einstein, limits our exploring and forbids us to know the "real" size of the Universe.

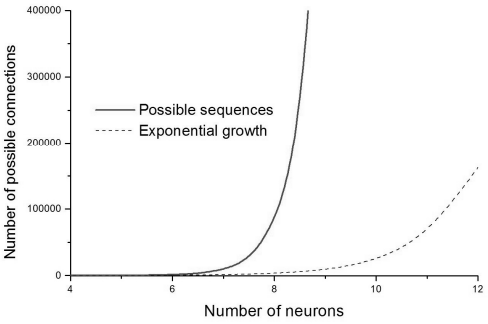
Fig. 2. Sequence and location of signals in reading a word: "In addition, the time course of these signals was interesting, in that the first signal at approximately 150 ms was a gamma (35-40 Hz) signal, the second, at approximately 200 ms, an alpha signal, and the next signal at about 300 ms, again a gamma signal. The cortical networks involved in reading are highly complex, requiring a sophisticated interplay of temporally and spatially dynamic interactions."[64]



X. MORE PHYSICS: CRITICAL MASS

Construction of the atomic bomb (1945) introduced a new concept in chemical/physical reactions. As in one fission process of uranium 235 two or three neutrons are produced, and each neutron can induce next fission if properly absorbed by uranium, a certain amount of uranium 235, above a minimum limit, becomes a self-sustained reactor. The concept of the critical mass, understood in physics with a great difficulty, is tricky: nothing happens below the critical amount, and the pile reacts without termination, bringing to an atomic explosion, once this limit is exceeded.

64 Kristen Pammer, "Temporal sampling in vision and the implications for dyslexia" *Frontiers in Human Neuroscience*, 7 (2014): 933



As a mere hypothesis, the concept of a critical mass could be applied to understanding neuro-networks. The very early computer – Turing's machine demonstrated, that the result of operations depends on the order in which bits are read from memory cells. So, the number of possible operations, if all cells are interconnected, changes with the number n of these cells as the factorial (n!). We visualize in fig. 3 this function together with an exponential growth (which is characteristic to the total number of neutrons emitted from a pile of uranium). Even if only n=8 is shown, a vertical-like onset is seen for a number of possible sequences in reading the memory cells. A possible complexity of alive neuronal networks, that continue to adapt continuously to changing conditions (see for ex. Porter [65]) lacks any mathematical measure.

Noam Chomsky underlines not only the complexity of the human brain (in the context of language capacities) but also the difficulty of explaining these capacities by a mere biological evolution:

> We know very little about what happens when 10^{10} neurons are crammed into something the size of a basketball, with further conditions imposed by the specific manner in which this system developed over time. It would be a serious error to suppose that all properties, or the interesting properties of the structures that have evolved, can be 'explained" in terms of natural selection. Surely there is no warrant for such an assumption in the case of physical structures.[66]

From analogy with computers we attain another example. Any computer – small or big, contains billions of connections, but it does not work, until a single, on/off switch is activated. We illustrate this concept by a nice mosaic from Cappella Pallatina in Palermo, fig. 4.

65 Susan Porter *et al* . "Changes in brain-behavior relationships following a 3-month pilot cognitive intervention program for adults with traumatic brain injury", *Heliyon* 3 (2017): e00373.

66 Noam Chomsky, *Reflections of Language*, in: Pragmatics, Critical Concepts, Vol. V. ed. A. Kasher, (London: Routledge, 1998) p. 24

"Gli soffió nelle narici e l'uomo divenne creatura vivente" (*Genesis*)

The idea of critical mass suggests, that exceeding certain complexity, the brain (and functions that it support) acquire new quality. The mind, possibly, can be then called "soul", yet with a minor "s". Aristotle deduced it via philosophical reasoning.

XI. ST. THOMAS: *MINOR MUNDUS*

A critical step towards the third anima, i.e. human soul, is the intellect. It comprises several functions, and more - it has no corporal settlement, so becomes immaterial[67]. Aristotle[68] says:

- There are two distinguishing characteristics by which people mainly define the soul: motion in respect of place; and thinking, understanding, and perceiving. (427a 17)

- That perceiving and understanding, therefore, are not the same is clear. For all animals have the former, but few the latter. (427b 7-9)

- That part of the soul, then, called intellect (and I speak of as intellect that by which the soul thinks and supposes) is actually none of existing things before it thinks. Hence too, it is reasonable that it should not be mixed with the body. […] Those who say, then, that the soul is a place of forms speak well, except that it is not the whole soul but that which can think, and it is not actually but potentially the forms. (429a 22-29)

Tracing electrical currents signals in the brain is very elusive: sometimes for quite long periods the signals seem to disappear. Other studies (Tang, 2015)

67 "For Aristotle the intellect has no bodily place and is in reality distinct from lower faculties being immaterial" (Giancarlo Movia, *Aristotele. L'Anima*. Introduzione, traduzione, note e aparati. Milano: Bompiani, 2014) p.282, comment to 429a 10)

68 Aristotle, *De Anima*

show that the same discrete neuronal "circuits" belong to two different functional sub-systems[69]. In analogy with computers and using Aristotle's terminology: thinking (logical operations) needs a material substrate (protein brain or silicon circuits), but itself can not be considered a part of the matter.

St. Thomas relates the immateriality of the intellect to a special status of humans: "For the nobility of the human soul transcends the scope and limits of bodily matter."[70] Carlo Leget resuming Aquinas' idea of the soul writes:

> A human being, in Aquinas' view, is a unity of body and soul. Men and women are not intellects that are accidentally wrapped up in a bunch of muscles and bones. Corporeality is a necessary element for speaking of a human being. Contrary to common sense experience—according to which the soul seems to be a function of the body—Aquinas follows Aristotle in stating that metaphysically the soul contains the body rather than the reverse. 3 The body is held together by the soul. The soul is regarded as the form (forma), motor, and goal of the body (matter). Thus, metaphysically the soul is the stronger of the two. 4 From a theological perspective, human beings hold a unique central position in creation. They are the bridge between the material and the spiritual world. This central position is a privileged one. Consequently, Aquinas calls a human being "a little world" (*minor mundus*).[71]

In the latter consideration, we add that the very shape of the human skull (Italian "calottta cranica") has a shape of a lens, focusing all external world inside our brain: memories, pictures, sentiments are amassed together and do not follow temporal or spatial orders. Conciliating Arisotle's insisting that sensorial experience corresponds to physical objects with Chomsky's "cognisciitive powers": the mind is an immaterial projection of the material world – a whole Universe above us is focused inside a small hemisphere.

69 "Discrete cortical sites extracted intonational information in real time from the speech signal. These sites were overlapping with, but functionally independent from, sites that encode other critical aspects of speech, such as the phonemes and information about the speaker." Tang, C., Hamilton, L. S., Chang, E. F. "Intonational speech prosody encoding in the human auditory cortex", *Science* 357 (2015) Issue 6353: 797-801.

70 Thomas Aquinas, *Commentary on Aristotle's De Anima*. New Haven: Yale University, 1951) §699

71 Carlo Leget, *Eschatology*, in: *The theology of Thomas Aquinas*. Van Nieuwnhove R. y Wawrykow J., eds. (Indianapolis: University of Notre Dame, 2005) p. 365

XII. ANIMA IS SOMEWHAT DIVINE

The highest, third anima, intellectual, is to be considered immaterial. But more: in Aristotle's wording[72] it has somewhat divine.

- "But intellect would seem to be a substituting essence implanted in the soul, and not to corrupt. [...] Understanding and thinking, then, decay with the decay of something else within. Understanding itself can not be affected. (408b, 20)

- But perhaps intellect is something more **godlike** (θειότερόν) and unalterable. " (408b, 30)

The editor and interpreter of the recent Italian edition of *De Anima*, Giancarlo Movia (2014) deduces as follows: "As we read without prejudices this text, and we keep present the chapters 4 e 5 of the III Book, one can not negate that essentially the doctrine professed by Aristotle in published works, is the immortality of the soul."[73]

Tatarkiewicz in his *History* states that Greek ancient philosophers reached at certain moment the limit of their fertility, and only Christian religion broke the dead-point. St. Thomas in *Commentary* makes the immortality explicit:

> This is what he has said in Book II, namely that this 'kind' of soul was separable from others as the perpetual from the mortal,—perpetual in the sense that it survives for ever, not in the sense that it always has existed; for as he shows in Book XII of the *Metaphysics*, forms cannot exist before their matter. The soul, then (not all of it, but only its intellectual part) will survive its matter.[74]

Aquinas did not complete eschatology in *Summa Theologiae*; in *Commentaries* he uses a gnosis argument on the immortal human soul: "Hence, after the body's death the soul no longer knows anything in the same way as before. But how it does know anything then is not part of our present enquiry."[75] Aristotle in *De Anima* stated, that productive intelligent anima survives the death and only later acquires its real nature:

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72 Aristotle, *De Anima*

73 "Se si legge il testo senza pregiudizi, e si tengono presenti i cc. 4 e 5 del III libro, non si può negare, che esso concordi sostanzialmente con la dottrina professata da Aristotele nelle opere pubblicate, dell'immortalità dell'anima umana." (Movia, *De Anima*, 262-263)

74 Thomas Aquinas, *Commentary*, §743.

75 *Ibidem*, §745.

> And there is an intellect which is of this kind by becoming all things, and there is another which is so by producing all things […]. And this intellect is distinct, unaffected, and unmixed, being in essence activity. […] In separation it is just what it is, and this alone is immortal and eternal.[76]

So, immortality maybe the main determinant of the human anima (i.e. Soul)?

XIII. RATZINGER: DUALITY, NOT DUALISM

The question on immortality of the human soul, initially included into Plato's ethics, now is the subject of theology. But this question needs first solving the problem of "Cartesian" duality: is the soul an insert into a body? is it a *form* of the living organism? is it somewhat divine?

A document "Some Current Questions in Eschatology"[77] (Ratzinger, 1992) explains the position of the of International Theological Commission[78] that differs from plain dualism (see also Fletcher[79]):

> "Since this Christian anthropology includes a *duality* of elements (the 'body-soul' schema) which can be so separated that one of them ('the spiritual and immortal soul') subsists and endures separately, an accusation is sometimes made of a Platonic dualism. The word 'dualism' can be understood in many ways. For this reason, when we speak of Christian anthropology, it is better to use the word 'duality.'(5.1) […] Moreover, Christian anthropology cannot be confused with Platonic dualism inasmuch as in the former, person is not a mere soul such that the body ought to be abhorred as a prison. (5.2)"

76 Aristotle. *Anima*, 430a 12-24.

77 Joseph Ratzinger, *Some Current Questions In Eschatology* (Vatican: International Theological Commission, 1992)

78 "This document of the International Theological Commission, under the leadership of Rev. Candido Pozo, S.J., was prepared by a subcommission made up of Professors J. Ambaum, G. Gnilka, J. Ibanez Langlois, M. Ledwith, S. Nagy, C. Peter (+), as well as the Most Reverends B. Kloppenburg, J. Medina Estevez and C. Schönborn. After it was submitted to debate in the plenary session of December 1991 it was fully approved by written vote *in forma specifica*. According to the statutes of the International Theological Commission it is now published with the approval of His Eminence Joseph Cardinal Ratzinger, President of the Commission."

79 Partick J. Fletcher, *Resurrection and Platonic Dualism: Joseph Ratzinger's Augustinianism* PhD Dissertation (Washington: Faculty of the School of Theology and Religious Studies of the Catholic University of America, 2011), p. 159

Searching analogy in modern physics, one would refer to matter-wave duality: it is not that electron *possesses* two natures. It rather *shows up* as a point-like matter exclusively-or as a wave of matter extended in space, according to the experiment into which it is subject. The same with man: if we want to contact the body of the cousin, we visit her; in order to understand her mood, it is enough to make a telephone call. Duality is also the feature of the coin, which is not *made-of* the head and tail but is a single piece of metal, not separable into one-in-another.

God, in Church's teaching (and in Thomas' *Summa*) is the creator of individual souls – He is also the guarantee for their immortality. We quote the PhD dissertation of P. Fletcher from Washington Catholic University (2011, p. 152):

> Ratzinger's new view that the idea of the immortality of the soul which had developed in the early Church owed more to the Jewish tradition than to Greek philosophy […] Ratzinger also considers the classical Christian idea of the soul to be unique to Christianity and not a simple borrowing from Greek thought:. […] He thereby rejects the idea that the notion of "soul" current in theology was a foreign concept introduced via Hellenism.

Divine character of the human soul propagates also on the body (constituted of atoms - would say a physicist - that are eternal). Referring to "Eschatology" of Pope J. Ratzinger, as P. J. Fletcher resumes (2011, p. 342):

> As regards the question of the dispersion of matter after death, we can here make use of Ratzinger's concept of dialogical immortality. If the soul is the basis relationship to God, then we must say (as Ratzinger does) that "the truth which is love, which we call God, gives man eternity, and because matter is integrated into the human spirit, into the human soul, in him this matter thereby attains perfectibility in the resurrection." In other words, dialogical immortality touches not only the soul, but the matter of one's body. Through the soul, the body (and its matter) is related directly to God, inscribed in his memory, and can therefore never be lost […]"

Finally, in §367 of the Catechism of Catholic Church, or more precisely, in the letter of St. Paul (*1 Ts* 5,23) where the original statement appeared, we find "soul, anima and body" that was the concern of John Searle: "Sometimes the soul is distinguished from the spirit: St. Paul for instance prays that God may sanctify his people 'wholly', with 'spirit and soul and body' kept sound and

blameless at the Lord's coming. The Church teaches that this distinction does not introduce a duality into the soul."[80]

XIV. CONCLUSIONS

1. Examples of Aristotle, Descartes, and modern writers show that any current philosophy is integrally linked to the current progress in sciences.

2. Contemporary confusions on intelligent (and emotional) behaviours of animals seem to weaken ontological borders between 'beast' and man. Also the physiology (neurology) diffuse these borders. So we need to come back to Aristotle's distinction of three anima: vegetative, sensual and intelligent.

2. Aristotle's hylomorphism – a statue as unity of the wax and form, with the conceptual help of modern technique may be modified. Using the concepts usually attributed to Descartes of the body and soul, we may compare them to computer's hardware and software. They absolutely corresponds in the most tiny details one to another, and can not function separately.

3. Analogy with computers helps also to visualize the biblical worlds of a "*soffio*" (God's breath) . Computers' construction contain billion of connections inside, but without pushing the last, i.e. "ON" button, any laptop remains mute.

Aristotle, in spite of being pre-christian, in *De Anima* attributed unique features to the human soul, suggesting even its immortality and acquiring its real nature only in eternity.

4. From modern physics we borrow the concept of critical mass, over which an inactive pile of uranium become self-exploding bomb. This somewhat extends the understanding of St. Thomas, who saw in a growing embryo the passages from (i) nutritive to (ii) sensitive and (iii) intellectual anima and the cancelling lower forms by the higher[81]. With rising complexity, completely new functions are acquired. In the same way - even in the materialistic, Searle's vision - plants, animals and humans are separated by *qualitative* and not only *quantitative* barriers.

80 Catechism of the Catholic Church (Vatican, 1992) §367 http://www.vatican.va/archive/ENG0015/__P1B.HTM (29/01/2018)

81 "We conclude therefore that the intellectual soul is created by God at the end of human generation, and this soul is at the same time sensitive and nutritive, the pre-existing forms being corrupted." (Thomas, *Summa Theologiae*, I, q. 118, a2. respondeo)

5. The soul is the reason for existence of the body: like a detailed design of the computer organizes, atom by atom, a shovel of sand (silicon oxide) into a wonderful device. So, the term "hylomorphism" does not exhaust the whole treasury of ideas, still somewhat to be decipher from *ΠΕΡΙ ΨΥΧΗΣ* .

Where in man is the soul? We answer like Stanley Yaki (and Plato) – everywhere[82] and nowhere. Human soul is not a bunch of wires: it belongs to a non-material ("celestial") world. Heisenberg's problem with his undetermined cat (and electron) is only an elementary hint that the question of hylomorphism is still open.

6. The PhD of Władysław Tatarkiewicz (1911) was entitled "Die Disposition der aristotelischen Prinzipen": Aristotle's principles formed *a system*, in which physics, human physiology, perception, psychology and "something divine" contributed to an interlinked entity. Descartes, to great extent made a similar system, starting from *his* physics, optics, analytical geometry and concluding on the soul (almost certainly immortal) and almighty God.

7. To make a final judgment on Aristotle we cite Julien de La Mettrie (1747), who with the provocative title of "Man-machine" is considered to be the father-founder of materialism: "Ancient philosophy will always hold its own among those who are worthy to judge it, because it forms (at least in relation to the subject of which I am treating) a *system* that is solid and well articulated like the body, whereas all these scattered members of modern philosophy form no system."[83]

Aristotle's distinction of the three *anima* (unfortunately no language gives corrects expressions) into metabolism, perception and thinking is the "*chiave di volta*" (i.e. the key that opens the musical score, *partiture*) or an "diffraction grid" (using the term from physics), needed for correct reading of modern neuro-science, psychology, anthropology.

P.S. Answering John Searle: yes! majority of people in Western World would respond that they have anima, body and soul. They probably pick-up this conviction from Faith. And some "experts" agree.

82 See also discussion by Jacek M. Norkowski, "Brain based criteria ofr death in the light of the Aristotelian-Scholastic anthropology: can the classical philosophy help us to understand the functioning of human brain and its interconnection with the body", *Scientia et Fides,* 2018, in print http://apcz.umk.pl/czasopisma/index.php/SetF/article/view/SetF.2018.002/13987

83 Julien O. de La Mettrie, *Man a Machine*. (Chicago: Court Publishing, 1911) p. 161.

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