

# ANCIENT WISDOM AND NEW CYBERNETICS FOR A NEW ANTHROPOLOGY

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## **ABSTRACT**

The man of our times has been told “cybernetics man”, because of the rapid and apparently unceasing development of technologies, data transmission and artificial intelligence. The philosophical thought must reflect about the cybernetic-man’s roles and duties, to which he has to be in conformity, and also about the astonishing possibilities opened in this historical time with its own new high-speed of communication.

The human being, as *ens subsistens*, has a preferential role in relation with the machine. Starting by some recognized limits of mechanical model, we will try to imagine, understand and propose a possible direction for the anthropological progress; it means to find the way to answer to the technological system vulnerability with an anthropological model that starts and returns to the dimension of ancient Greek “wisdom”, which is still able to stimulate scientific and philosophical thought and so can be an acute answer to the nowadays’ challenge to cybernetic man.

## **Introduction**

The Western philosophical thought’s origins are in the Greek theoretical thought. In a (maybe superficial) valuation, we are used explaining the practical researches of Greek science in its last centuries like a moment (the final one) of decadence<sup>1</sup>: we are used considering two aspects – theoretical and practical – like opposite aspects of knowledge. So we have been learning to consider the importance of theorist precision and speculative intelligence against practical intelligence: and the duty to elaborate theoretical meanings and to rationalize discovers or happenings was up to men.

Nowadays things are changing: people no longer practical thought inferior to speculative one, but most normal opinion is about major utility – if not superiority – of first one on the second one. Against a time in which the man could elaborate rational conceptions of events, we are now getting used to the extreme velocity – without the possibility of a rational elaboration – of progress and results of practical knowledge and, particularly of technology of information and biology. This creates a new sort of problem: is it possible to elaborate an organic explicative frame to give answers to problems that new technologies create time after time? For example, answers to questions like what will happen to environment in 50 years if I deviate the course of a river; or what will happen to a specie after a century if I change its genetic heritage; and more questions will be about actions that produce irreversible effects, more it will be important to understand how to give answers.

Who could give these answers? Scientists, technologists, philosophers, politicians? Before trying to understand who could – if someone could – we think it is necessary to reflect about some relevant points of discussion.

### ***1. From the Cybernetics origins to development of Artificial Intelligence: the accelerated course of the world.***

The term “cybernetics” was coined by Wiener, inspired to the sense of Greek term *kybernetike* that means the act of piloting. Plato (*Resp.* I 346 B) uses the term to describe the prudence that is necessary to the art of governance<sup>2</sup>. In *Essai sur la philosophie des sciences*, Ampere (1969) uses the term *cybernetique* to indicate the science of civil government. But the English term “governor”, Latin corruption of *kybernetes*, is also the mechanism of auto-regulating valves in a vapour-motor, valve that maintains the vapour in a constant velocity behind conditions of variable load; Clerk Maxwell, studying this mechanism, understands that there is a feed-back cycle under it to lead again outputs of the system to a pre-arranged standard<sup>3</sup>.

As everyone knows, the beginnings were from the observation of voluntary actions and the oscillating circuit of muscle that contracts and relaxes<sup>4</sup> and from the problem of curvilinear prevision of flight: Bigelow, Wiener and Rosenblueth proposed to extend similar researches systematically and to give them the name of cybernetics. Around them, a lot of scientists – engineers, physiologists, mathematicians, biologists such as Pitts, Aiken, von Neumann, Goldstine, McCulloch, Lorente del Nó, Bigelow, Savage and others – started to be interested on cybernetics-problems. Psychologists, sociologists and anthropologists – like Klüver, Lewin, Bateson, Mead, ... – were also involved<sup>5</sup> in order to Understand psychological and sociological implications of these arguments.

From that moment, cybernetics is really conceived like the study of natural or artificial process of control and regulation of complex systems. More specifically, cybernetics could be now divided between a group that interprets biological and mental phenomena like physic-chemical processes and theorizes them in mathematical terms; another group of cybernetics studies informative and communication processes, and it has an important role in the information technology; a third group works on the real construction of new machines and automatons<sup>6</sup>. Recently, above all Artificial Intelligence has born and grown from cybernetic. So machines are now not only important instruments that improve our life-level, but also spectral anticipations of what the future-man will be.

The ideal behaviour would be to avoid extremes: technology in general, in every form, contains a lot of aspects that are so important for our society that it's now impossible thinking without them. For example, the advantages of having ecographies, artificial harms, household appliances, water systems, etcetera... are undeniable. But also in the field of the abstract research the use of machine – in particular computers – has given a lot of very interested results: considering Mandelbrond, who was helped by his computer to view his set when he didn't understand the extraordinary developments of his idea<sup>7</sup>. So the consideration of technological progresses as something awful and

frightening is absurd, as it's absurd look at them with eyes of the "mechanism's adorers" (Wiener (1991), pp. 56-57).

But we must be conscious that technology is the result of integration of a lot of elements, like capital, work, innovation ability and time (Giustini (1985), pp. 145-148). So we will try to view and understand limits and positive aspects of cybernetics, in order to build a positive vision of man and his unique role in a cybernetic society.

## **2. FROM CARBON REIGN TO SILICON REIGN? PROBLEMS AND LIMITS IN THE CYBERNETIC THOUGHT.**

We do not want to examine all typologies of problems linked, directly or indirectly, to cybernetic. We will try to underline three big risks in which a cybernetic mentality could fall, connected to other aspects which we will later analyze: these three risks could be resumed with the "desire to pass from the carbon reign to silicon reign".

### **2.1 The risk of materialism.**

The term "materialism" denotes, generally, the philosophical doctrines that admit only material existence while not spiritual existence: the unique cause of phenomena is matter. The term appeared for the first time in Europe during the XVII-XVIII centuries, although ancient doctrines like Democritus and Leucippus's ones were defined "materialistic". In those centuries, the progresses of Scientific Revolution and the influence of Cartesian idea of rigid distinction between *res extensa* and *res cogitans* diffused and seemed to confirm a mechanicistic model of materialism. Later, Hobbes, D'Holbac, Condillac and La Mettrie built their thought around the ideas of matter and movement: above all, the theory of "machine-man" of La Mettrie can be remembered as a tempt of man's interpretation a complex physic-physiologic mechanism, whose operation-laws can be known *a posteriori* using experiments of medicine, anatomy and physiology<sup>8</sup>.

Not all materialistic tendencies were also mechanistic: for example the last Diderot, during the XVIII century, formulated a non mechanistic materialistic doctrine. Even if only material causes and substances exist, not all matter is reducible to a collection of bodies moved by other bodies, because it has in itself sensibility and a inclined vitality<sup>9</sup>.

It is reductive resuming the complex phenomena of XVII- and XVIII- materialism in a few lines , we want to make sure that some ideas have lived on: the theory of machine-man seems to be evocated in some of today's scientists, and it is undeniable that cybernetic concepts can give force to that theory.

An example are the Somenzi's writings: physic, interested on cybernetic from its origin, he was convinced of the necessity, and not only the possibility, to integrate biology with physics and psychology «on the base of an essentially materialistic vision of life and thought phenomena»<sup>10</sup>, translating all aspects of the event considered into "information". Above all we are interested in two points that we will comment later:

1. Somenzi thinks we must move in the direction of affirming the dependence of the "form" (for example, the way in which I can perceive a colour in its formal aspects – e.g. intensity) on the "matter" of my brain-cortex. Deep connoisseur of science and its laws and cybernetics' successes and failures, he uses for example the famous law  $E = mc^2$  to underline the reducibility of energy to matter, and not *vice versa*<sup>11</sup>. This perspective is explained with abundance of details and extreme rigour. Somenzi insists on the fact that we have to forget the Platonic and neo-Platonic influences and we have to believe that, like in Aristotelian vision, matter and form are real only in the reality of the *synolon*.
2. Another problem is the identity of technique and nature. Writing on machines and of their definition after Turing's analysis, Somenzi expresses the certainty that the superiority of nature over machines is only quantitative, and writes: «the "dignity" of future technical products wouldn't be smaller than the "dignity" of natural products, and the distinction

between nature and technique, about that Descartes doubted – clearly but prematurely, would be got over definitely»<sup>12</sup>.

## **2.2. Penrose and Artificial Intelligence's limits.**

«In this book I have presented many arguments intending to show the untenability of the viewpoint – apparently rather prevalent in current philosophizing – that our thinking is basically the same as the action of some very complicated computer»<sup>13</sup>: this is the Penrose's pen that closes the monography *The Emperor's New Mind*. There are several eminent opinions in favour and against this Penrose's position about impossibility to reduce mind's process, in particular the event of the consciousness, to a computational event. Above all his colleague Hawking, that considers himself a positivist and considers Penrose a Platonist<sup>14</sup>.

We quote briefly the steps that lead Penrose to his conclusion, and later we will use some of these results for our remarks:

1. the Penrose's goal is to point the way to a grand synthesis of classical physics, quantum physics and even neuropsychology. He begins his argument by slighting computers' ability to mimic the thoughts of a mathematician. At first glance, computers might seem perfectly suited to this endeavour: after all, they were created to calculate. But also Alan M. Turing himself demonstrated that many mathematical problems are not susceptible to algorithmic analysis and resolution: the best example is the Hilbert's problem, known like *Entscheidungsproblem*, elaborated by Turing in the form of the *halting problem*. In these terms the last Fermat's problem about that “no cube can be the sum of positive cubs”<sup>15</sup>: so there are problems that can be solved by human intuitive faculties and not by computers.
2. The bounds of computability are related to Godel's theorem, it holds that any mathematical system always contains self-evident truths that can not be formally proved by the system's initial conditions. The human mind can comprehend these truths, but a rule-bound computer can not. The mathematical intuition, through which mathematicians conceive their theorems, is a non-algorithmic faculty: mathematical propositions, that no algorithmic analysis can

resolve, will always exist. If the mathematician's mind works completely as an algorithm, the whole of used algorithms would not let him judge the used system's validity and so the results' correctness<sup>16</sup>.

3. Mathematical comprehension is only a part of the general human faculty of comprehension and both are not reducible to an algorithmic analysis: we can say the same thing for intuit, creativity and consciousness. Quantum theory, summing a chance component to the classical physic determinism, approves this interpretation<sup>17</sup>. At the quantum level, different alternatives can coexist. At the very beginning, a single quantum state consists of a large number of different, simultaneous activities: the human brain is not able to exploit this phenomenon. A new quantum theory is necessary to understand consciousness phenomena: Penrose thinks that this new theory can derive from a new gravitational quantum theory<sup>18</sup>.

### **2.3 The Golem literature.**

Wiener before and after Collins, Pinch and others have described technique and technology like a *Golem*, a creature of the Jewish mithology like a clayey monster, build by man and managed to live by magic and spells: the Golem is very strong and can protect his creator, but it can be dangerous, because it is stupid<sup>19</sup>. We will point out some aspects that emerge by this literature:

1. Assuming some experiences in the scientific and technological history, (e.g. Challenger's explosion<sup>20</sup>), the notion of «experimenter's regress» must be necessarily born in mind: that is, there is the objective difficulty of deciding whether an experiment provides data that fails to decide a matter, or perhaps the experiment was just not properly done; it can be difficult to be decide whether a 'crucial' experiment really proved the point. This consideration remembers Wiener's warning: «the negative consequences of prevision's mistakes, big already now, will increase so much when automation will be used completely»<sup>21</sup>.
2. We must remember that in science and technology, like in love, “from a distance everything seems more beautiful”: scientific and technological discussions seem to be easier if we look

at them from a certain distance. If we look at them closer, science and technology would appear less predetermined.

3. Like the case of Patriot missiles shows<sup>22</sup>, the concept of «proof's contest» depends on definition of success or failure we want to use: the meaning of a experimental result seems positive or negative according to the problems we want to face.

### **3. The Cybernetic Man: nevertheless an ens subsistens.**

«The intense-technology world asks for emerging an other specie, more adapt than *homo sapiens* to the new clime: *homo technologicus*, a sort of hybrid between man and machine»<sup>23</sup>: Longo proposes this new “specie” underlining that we can not think to man and machine as distinct objects, but as something that is unthinkable to divide. The use of machine modifies the men's mind: some aspects and property are increasing, and others ones are decreasing. So science and technology have a big power to influence our feelings, our world's perception and our personal history.

We would prefer to talk about *homo ciberneticus*, considering also to the aspects linked to science in general. We want to comment some aspects we need to describe this cybernetic man.

#### **3.1. Beginning from the *sinolo*: neither materialism, nor Platonism.**

We agree with Somenzi that a lot of physiological events can be explained with the material and formal interaction between object and subject. We disagree with the Somenzi's conclusion that «the knowledge-problem abandons its traditional form for the form of a biophysical or neurochemical problem, transferring information from the external environment to sense organs and from these to the material-system-brain»<sup>24</sup>. Above all, considering the Aristotelian *synolon* and his *hylomorphism*, it is impossible to reduce the knowledge-problem to a materialistic problem: were it so, it would mean reducing it to a one-dimension problem, against the complexity in which the Aristotelian (human) subject is inscribed and consequently his learning ability. We can't examine deeply the Aristotelian problem of matter and form and the gneoseology and anthropology that derive from it<sup>25</sup>, but we try to give some outlines; above all we will try to propose an alternative anthropological conception developing from the same idea of *synolon*.

Every being (*ens*), whether first substance or second substance<sup>26</sup>, is a *synolon*, made of matter and form (Arist., *Metaph.* VIII 3 1043 ss.). These two principles are irreducible and the one cannot be derived from the other. The matter is not first substance and can not subsist alone: it can not be a “metaphysic subject”. It can be instead a common substrate, by means of which some physical being exists (*id quod aliquid existit*): the common matter is not individual.

So Aristotelian philosophy is not a materialism but an hylomorphism (= *yle*, material + *morphe*, forma), in which we can't eliminate matter, but in which matter does not have any type of supremacy. So the form has not understood only as “information” that determines the structure, in order to Somenzi's interpretation. Aristotelian form has a finalistic role: the form places a limit (*peras*), a disposition, a de-termination to the instability of the matter (Arist., *Phys.* II 2 194a27-29)<sup>27</sup>; the form is the *cause* that does reach this limit, this disposition.

So the form exists in the matter as “in potency”. But “in potency” does not mean that the form is implicit in the matter, such as mathematical theorems, are implicit in the postulates: the potential existence of the form in the matter depends on the action of an agent-cause which “does exist” that form in the matter. E.g., the wood is passive power in order to a statue, and the action of an artist and his chisel is active power. So we can speak about an *educere* (as *ex-ducere*) and not *deducere* the form from the matter: this passage, this *educere* has managed by the action of another being that is the *agent cause*. Assuming this concept, the form and the matter are only the principles from which something exists (*id quo aliquid existit*), and the first substance (*id quod*) is made of both of them. S. Thomas explains this fact applying it to the man: «we say the man in a rational animal, and not that the man consists in animal and in rational... The man has told to be constituted of soul and body as a third thing constituted of two things; because the man is neither soul nor body» (*De ente et essentia* II 16).

If the hylomorphism does not conduce to materialism, it does send away from the Platonism: Penrose, that defines himself Platonist against Intuitionism, says that some mathematical sentences are Platonist sentences but only in moderate sense (Penrose (1989), p. 113). The central problem is

the meaning of “existence”: but if we differs *being of essence* and *being of existences* we can differentiate first and second substance without concluding in the separation of ideal reality from experimented reality (Marcacci (2004)).

### **3.2. Physical causality in living bodies: the “cybernetic” metaphor.**

With this schema, Aristotle maintains the fundamental distinction between first substance and second substance, but above all he manages to explain the second substance (= the essence) as founded on a causal model: there is not an World of Ideas, but the essences can exist in the physical beings because there are a series of causes that can do emerge the form from the matter.

In the Aristotelian ontology the physical causality that does emerge the essences is divided in four types for living bodies: here the Stagirit uses the famous “cybernetic” metaphor (*De anima* 413a) of the “soul-helmsman”, that we can read in the sense of four-causes theory with Thomas<sup>28</sup>: for what, if we compare a living organism to a vessel, we can individuate the *final component* of physical causality in the helmsman, that controls the *formal component* that is the naval engineer; this one controls the *agent component*, that is the carpenter, which takes effects directly in the *material component*, that is the vessel’s wood.

This conception of “cause”, as articulated in four parts, is far from ours, because we are used to using “cause” in the sense of the Newtonian science of mechanic cause: our science uses agent and material cause, but excludes final and formal ones. But if we consider both chaotic systems (Basti (2002) and Basti (2004)) and the feedback-concept (Wiener et al. (1943))<sup>29</sup>, it would be possible to recover final and formal cause: in fact, in this cases defining starting conditions is not enough to definite final state, such as classic physic would desire<sup>30</sup>.

We can understand how using formal and final causes only if we recall an important aspect of Aristotelian model of physical causality: these two causes can be distinguished only in intentional processes (e.g., when I want to eat an apple, I move my hart and my hand to grasp it: my desire determines my action), but they can’t be in physical processes. Indeed, we have already said before how the form can be the limit that does stable the matter (see § 4.1.). At the same time, the final

component is the not intentional *telos* of the physical process: that is to say, the form is not only an ordinate state, but also an aim that organizes the process as irreversible; the final component is not agent component, but it is linked to it because the final state exists in dependence on initial agent cause, whereas the agent cause can be formalized only when we recognize the final state at the end of the process<sup>31</sup>. Considering this formal-final cause, besides agent and material causes, direct our considerations of physical processes as *irreversible* processes.

Why does this schema seems to draw near to Wiener's idea of feed-back? First of all, a lot of times Wiener speaks about mechanisms that reproduce human behaviours and biological processes; and he admits that these processes are not reversible<sup>32</sup>, as in the Aristotelian four-components-model of physical causality.

But Wiener declares not to be interested in the problem of causality, and he uses the idea of teleology only in relation with the "aim" (and not the final cause) of a behaviour. Wiener sustains the deep similitude between some behaviours of some living bodies and some machines: there are machines that work with feedback, that is their behaviour is turned over to an aim which is obtained using feedback, giving back to the machine a part of the output-energy (e.g., a tracking-system)<sup>33</sup>. «In the past teleology has been considered as implying an aim with addition of the vague concept of "final cause". The concept of final cause has brought about opposition between teleology and determinism»<sup>34</sup> : these words do thinking at the concept of neo-Platonic final cause (Galvan (2000)), in which the efficient cause (as power to producing events) is identified with final cause (as power to order the event to the aim). But this distinction is clear in Aristotelian physical model.

And moreover: in an intentional level, where final cause seems to determine the action – e.g. when I want to bring an apple – the connection between the agent subject and his action's aim occurs only on the epistemic plain. The unique agent remains the subject, who produces the actions that altogether does pursue the aim<sup>35</sup>. A machine can imitate this epistemic consciousness remarking step by step its aim, like in the mechanism of a machine that must follow an objective and that is settled on the objective's changeable position.

### **3.3. Autodetermination-levels in the *ens subsistens*: necessity to surpass Aristotle.**

Up to this point, saying that there can be affinity between a four-causes-model and some cybernetic mechanism seems to be at least plausible. If we consider the human being as physical being, it can be reproduced also in those actions that seems to be conducted by a will. For this, it's fundamental that the elaboration and consciousness of the "aim" is possible for the machine only because the man has elaborated before that aim on the epistemological plane.

But a human being is not only a physical being: it is also a living beings. In Aristotelian thought, what does a living body characterized itself for? A living body is a body "that lives"; and it is characterized by its (= of the living body, totality of soul and body<sup>36</sup>) ability to auto-determine itself (*De anima* II 2<sup>37</sup>). In particular, human being has the rational faculty: so he can give to his behaviour new aims, not only biological ones. This ability resides mainly in the culture and collective traditions (*Politica* 1281a): upon this point Thomas corrects Aristotle. The former had recognized that the man, as first substance, is an *ens subsistens*; but he managed to found on a strong causal model only the essences, as second substances: this problem has caused in the philosophy's history the confusions between hylomorphism and materialism<sup>38</sup>.

Thomas gives a strong causal foundation to the first substance, too; and in particular to human being and to his individual existence. If Aristotle applied the relation act-power to form-matter, Thomas extends this application at being-essence: being and essence are the actual and the potential principle of the absolute-being (*Summa contra Gentiles* II 54 1295)<sup>39</sup>. So, Thomas pones the necessity of a First Cause, that is not-caused and that is an *Ipsum ens subsistens*.

Here we interest on the consequences for the intellect and rational faculty of a single man: so Aristotle seems to remit to a collective intellect the possibility of organizing the aims of human actions<sup>40</sup>, as Avicenna theorized an unique intellect. Thomas (*De Unitate Intellectus*) answers that if it were so, Aristotle itself would betray his own anthropology: if the soul is the "form of the body" (*De anima* II 1 412a19-22), according to the hylomorphism, the soul is a intelligible principle that structures the body and makes it what it must be. Thomas deepens this conception and

considers the soul act and form of the body but also in its ontological consistence. In Thomas's thought, the soul is not a material form, that exists because of the *synolon*: «anima autem humana, quia secundum suum esse est, cui aliquantulum communicat materia non totaliter comprehendens ipsam, eo quod maior est dignitas huius forme quam capacitas materie: *nichil prohibet quin habeat aliquam operationem uel uirtutem ad quam materia non attingit*» (*De unitate intellectus* III 81). The human being is connected to the other beings, but he understands he belongs to the world of spiritual beings. The soul's ability to have *aliquam operationem* that has not in common with the matter indicates the not-reducibility of the men to the machines.

#### **4. From Ancient Wisdom, towards a New Humanism.**

We can resume in three points the observations elaborated up to this point:

1. body and mind, matter and spirit are so joined up that they influence (and often determine) themselves in turn and often very deeply, like biology and neurology show us; this fact has led Somenzi to speak of hylomorphism;
2. there are a lot of events that show irreducibility of mind to body, like Penrose has revealed;
3. this irreducibility does not conclude in a Platonist world, where spirit and matter are separated and one is superior in compared to the other one. This irreducibility is implied just from the hylomorphism and consequent interpretation of reality. Exactly in the logic order of hylomorphism – where every beings is made of matter and form, where “form” is not only “information” – the human being has an unique role that never machines will able to reproduce.

The question, that now becomes necessary, is: what kind of science for the cybernetic man? We love return to quote Wiener: «as technique becomes always more able on achieving man's purposes, always more it must get used to formulate man's aims»<sup>41</sup>. Wiener are referring to “aims” which are not the specific purpose of a specific research – e.g. improving a specific technology. Wiener are referring to aims that belong to the man as human being between human beings; as part of a history that is bigger than him and that is not composed by only him. Here Wiener seems to be

closer to the idea of final cause than he seemed to exclude: we have seen as a human being can elaborate an aim that lead his actions (in epistemological sense, and not efficient sense).

Just Aristotle and Greek culture in general propose an idea of “science” that respects this ideal: the science as “*sophia*”, *sophia* that is more than science. Aristotle writes *sophia* is a science that researches first causes and principles (*Metaph.* I 1 981b28-29, 982a1-3): between these causes there is also final cause. These Aristotle’s words feel the Greek cultural climate: the ideal of Greek *paideia* induced the Greek man to search a cultural training for all his life, in all cultural aspects – political, philosophical, social, religious, mathematical, ... (see Plato, *Resp.* ). There would have not been in Greece a scientist that had considered his science independently on other aspect of culture and independently the fact that he was a man before than a scientist. Moreover, since its origins Greek culture had given attention as to the body than to the soul – e.g. thinking on role of gymnastic; this fact produced in the V sec. a.C. a particular consideration of medical science, as not artesian technique<sup>42</sup>. Nevertheless no one in Greece could think to consider the man in the unique medical dimension.

According to this perspective of the *sophia* De Giorgi, eminent Italian mathematic, wrote a lot, promoting an ideal of science as product of scientific and humanistic research together (De Giorgi (2001))<sup>43</sup>. But also the “*technologicus* man” of Longo can agree with the Greek idea of *sophia*: his man of technique want to be a man that lives not only in a technical dimension, but also in an aesthetic, an ethic, an emotional and an expressive dimensions (Longo (2002)).

This necessity to extend the concept of man on more directions agrees with the words: «the scientific-technical rationality, with its own language, has dilated on a planetary level and constitutes a strong unification element, cultural and not only of development one. But because of its internal characteristics, it can’t originate a real form of culture and society: for its own methodological planning, the scientific-technical rationality leaves out of consideration of moral good and evil, and more deeply, of the sense and the destiny of man and universe...»<sup>44</sup>.

Now we can see as Cybernetics, the concept of *sophia* and an hylomorphism can agree:

1. about the relation between the man and the natural beings: the cybernetic idea of reproduction of human body and mechanisms by machines is founded on consideration of the material body of the man. By hylomorphism's point of view, the man is one between a lot of other natural beings: their physical structure is equivalent. The model of *sophia* respects this perspective: Greek wisdom views a deep continuity between the Nature and the human being.

2. although this, we think we must speak about "dignity" of technical and scientific products not like Somenzi speaks (*supra*). The difference between technique and nature is not on the plane of "dignity": not in the future, but already now some technical products have a big dignity, different but analogue to the dignity of a natural product – e.g. a computer system that helps a blind man to transmit information and to communicate has a different dignity of his stick but always deep and "true"; so as the dignity of his stick is different but "true" like that of a human assistance. The difference between technical products and natural products is on the plane of their ontological structure, that lets them in a different interpretative horizon. Above all we speak of dignity of the human nature: an ontology based on the concept of hylomorphism has shown us like there is not only the dimension of human body, that places continuity between human beings and natural beings. We have also viewed that the consideration of the "aim" in an epistemological point of view can be used also in a cybernetic technology. And this agrees with ancient *sophia* that affirmed real *sophia* was causes' knowledge.

3. But there would be some more passage to do: the concept of Thomistic "person" studies in depth the Aristotelian human-being concept. The human being is opened to a spiritual dimension, to a metaphysical dimension that can't be forgotten. In this sense we can recuperate the thought of Maritain (1973a, 1973b, 1974) about necessity to distinguish and integrate two different ways of doing science: modern science can not (always) work *per causas*, like ancient science; but modern science must be integrated with another way to do science, that is *cognoscere per causas*. A scientist can not renounce to consider reality in an ontological perspective, and this is a

philosophy's perspective; finally, the theology will remember the existence of unobservable, even if only moral philosophy will be able to give practical guides (Giustini (1985), p. 151).

We want to conclude confirming the necessity of making an effort to understand what would mean "science" for the man of Cybernetic: this former lives in a time of science and technology that modifies his being. The question about a "new anthropology" and a "new humanism" for the *homo cyberneticus* can not be omitted.

## Essential Bibliography

- Ampere, A. (1969). *Saggio sulla filosofia delle scienze*. In M. Bertolini (ed.), *Opere*. Torino: UTET.
- Bacciotti, A. (2005). Stabilità e controllo: il contributo di Maxwell. *Bollettino U.M.I. La matematica nella Società e nella Cultura, VIII Vol. VIII-A*, 23-36.
- Basti, G. (2002). *Filosofia della natura e della scienza*. Roma: Lateran University Press.
- Basti, G. (2004). Dall'informazione allo spirito: abbozzo di una nuova antropologia. In Possenti V. (ed.), *L'anima*. Milano: Mondadori, pp. 41-66.
- Bigelow J. & Rosenblueth A. & Wiener N., (1991). *Comportamento, fine e teleologia*. In *Dio & Golem s.p.a*. Torino: Boringhieri, pp. 89-105.
- Cagliozzi, R. (2005). *L'aspirazione ad un dialogo tra matematici e studiosi delle discipline scientifiche ed umanistiche, nel pensiero di Ennio De Giorgi*. In *Economia politica* 3 2005 pp. 325-364.
- Collins H. & Pinch T. (1995). *The Golem. What Everyone should know about Science*. Cambridge: Cambridge University Press.
- Collins H. & Pinch T. (2000). *Il golem tecnologico. Dalla nube di Chernobyl ai missili Patriot*. Torino: Edizioni di Comunità. (Original title: *The Golem at large. What You Should know about Technology*. Cambridge: Cambridge University Press 1998).
- Diderot, D. (1769). *Le rêve de D'Alambert*. In *Oeuvres complètes de Diderot*. Paris: Éd. Assézat
- Tourneux, - Garnier Frères (1875), tome 2, pp. 122-181. And in

[http://classiques.uqac.ca/classiques/Diderot\\_denis/d\\_Alembert/d\\_alembert\\_2\\_reve/d\\_alembert\\_2\\_reve.rtf](http://classiques.uqac.ca/classiques/Diderot_denis/d_Alembert/d_alembert_2_reve/d_alembert_2_reve.rtf).

Galvan, S. (2000). *Sul finalismo*. In Arecchi F. T. (ed.), *Determinismo e complessità*. Roma: Armando.

Giustini, P. A. (1979). *L'elaboratore elettronico: storia, tecnologia, logica, economia*. In *Metodi quantitativi per decidere. A cura della Scuola di Aggiornamento e Perfezionamento per il personale della Difesa*. Roma: Panzironi, pp. 9-20.

- (1984). *Scienza ed etica*. In E. Berti (eds.), *Il valore. La filosofia pratica fra metafisica scienza e politica*. Padova: Libreria Gregoriana Editrice.

- (1985). *Programma scientifico e "scommesse" sulla fede*. In G. Santinello (eds.), *Progetto scientifico e speranza religiosa*. Padova: Libreria Gregoriana Editrice.

- (1991a). *Norbert Wiener e la retroazione*. In *Esercito e Scienza. Storia, applicazioni e ricadute della ricerca militare*. Firenze: Alinari, pp. 191-194.

Hawking S. & Penrose R. (1996). *The Nature of Space and Time*. Princeton (New Jersey): Princeton University Press.

Jaeger, W. (2003). *Paideia. La formazione dell'uomo greco*. Milano: Bompiani.

La Mettrie, J. O. (1974). *L'uomo macchina*. In La Mettrie, *Opere filosofiche*. Roma-Bari: Laterza, pp. 162-236.

Lloyd, G. R. (1978). *La scienza dei Greci*. Bari: Laterza.

Longo, G. O. (2002). *Homo technologicus*. In Corso dei Simposi rosminiani (ed.), *La fine della persona?* Stresa: Centro Interdisciplinare Studi Rosminiani, Edizioni Rosminiane Sodalitas.

- (2005). *Homo technologicus*. Roma: Meltemi.

Mandelbrot, B. B. (1988). *La bellezza dei frattali*. Torino: Bollati-Boringhieri.

Marcacci, F. (2004). *Matematica e realtà: è ancora possibile tornare a parlare di "qualcosa"?* In *Aquinas XLVII 1* pp. 43-66.

Maritain, J. (1973a). *Scienza e saggezza*. Torino: Borla.

- (1973b). *La filosofia della natura*. Brescia: Morcelliana.

- (1974). *I gradi del sapere*. Brescia: Morcelliana.

Maxwell, J. C. (1868). On governors. *Proceedings of the Royal Society*, 16, 270-283.

Penrose, R. (1989). *The Emperor's New Mind concerning computers, minds, and the laws of Physics*. New York: Oxford University Press.

- (2005). *La strada che porta alla realtà*. Rizzoli: Milano.

Reale, G. (1997). *Storia della filosofia antica*. 5 voll. Milano: Vita e Pensiero.

Reys, A. (1939). *La maturità de la pensée scientifique en Grèce*. Paris: Édition Albin Michel.

Ruini, C. (2005). *Nuovi segni dei tempi*. Milano: Mondadori.

Russo, L. (1996). *La rivoluzione dimenticata*. Milano: Feltrinelli.

Somenzi (ed.), V. (1965). *Filosofia degli automi*. Torino: Boringhieri.

- (1991). *La materia pensante*. Milano: Clup CittàStudi.

Wiener, N. (1966). *Introduzione alla cibernetica. L'uso umano degli esseri umani*. Torino: Boringhieri.

- (1968). *La cibernetica. Controllo e comunicazione nell'animale e nella macchina*. Milano: Mondadori.

- (1991). *Dio & Golem s.p.a. Cibernetica e religione*. Torino: Bollati Boringhieri.

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## FOOTNOTES

<sup>1</sup> So e.g. in the interpretation of Lloyd (1978), pp. 305-306 or Rey (1939), pp. 522-524. On the opposite Russo (1996).

<sup>2</sup> Also Plat. *Phaed.* 247 c, *Alc.*1. 119 d, *Pol.* 299 b, *Clit.* 408, *Rep.* 488; Aristot. *De Anima* 413a and *Pol.* 1282a 10 ss.

<sup>3</sup> See Maxwell (1868); Bacciotti (2005).

<sup>4</sup> Wiener (1968), pp. 29-31; above all Bigelow *et al.* (1991).

<sup>5</sup> Wiener (1968), pp. 35 ss.

<sup>6</sup> Cybernetics has after developed in the science of complexity, going to compare itself with sciences like sociology and psychology too: cf. Kölher, Ashby, Luhmann, Bateson, Piaget, Lorenz, Thom and others.

<sup>7</sup> See Penrose (1989), pp. 170-175 and Penrose (2005), pp. 83-85.

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<sup>8</sup> The conclusive words of the *Machine Man*: “Let us then conclude boldly that man is a machine, and that in the whole universe there is but a single substance differently modified. This is no hypothesis set forth by dint of a number of postulates and assumptions; it is not the work of prejudice, nor even of my reason alone; I should have disdained a guide which I think to be so untrustworthy, had not my senses, bearing a torch, so to speak, induced me to follow reason by lighting the way themselves. Experience has thus spoken to me in behalf of reason; and in this way I have combined the two”, La Mettrie (1974), p. 236.

<sup>9</sup> See D. Diderot (1769).

<sup>10</sup> Somenzi (1991), p. 74.

<sup>11</sup> Somenzi (1991), pp. 76-77.

<sup>12</sup> Somenzi (1991), p. 131.

<sup>13</sup> Penrose (1989), p. 447.

<sup>14</sup> Hawking – Penrose (1996), pp. 3-4 e pp. 134-135.

<sup>15</sup> As  $(x+1)^{w+3} + (y+1)^{w+3} = (z+1)^{w+3}$ , where  $w, x, y, z, w \in \mathbb{N}$ . Cf. Penrose (1989), pp. 58-59 and pp. 103-105.

<sup>16</sup> Penrose (1989), pp. 416-418.

<sup>17</sup> Such as the famous two-slit experiment, that leaves open the possibility that a photon can be in two places at once. Briefly, when photons pass through a double slit, they can be regarded as waves that interfere with themselves: an interference pattern emerges on a screen behind the slits unless one places a detector at either slit. The act of observation forces the photon to decide, in effect, which hole it will pass through! The phenomenon is called a *state vector collapse*: Penrose (1992), pp. 231-242. At what point in the continuum of scales, from the atomic to the galactic, does a quantum-mechanical system become a classical one? The dilemma is illustrated by Schrodinger's famous cat: Penrose (1989), pp. 290-293.

<sup>18</sup> Penrose (1992), pp. 348-367.

<sup>19</sup> Collins & Pinch (1995): science and technology in process, and at the frontier, are far more certain than they are, or are seen to be by scientists and technologists themselves. When the science or technology become important matters in a public, political or policy debate this has unfortunate consequences.

<sup>20</sup> Collins & Pinch (2000), pp. 41-74. This second Golem volume is about technology and tries to apply the concepts studied in the first volume, considering the cases of the Patriot anti-missile missile in the Gulf War, the Challenger space shuttle explosion, tests of nuclear fuel flasks and of anti-misting kerosene as a fuel for airplanes, economic modelling, the question of the origins of oil, analysis of the Chernobyl nuclear disaster, and the contribution of lay expertise to the analysis of treatments for AIDS.

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- <sup>21</sup> Wiener (1991), p. 65.
- <sup>22</sup> Collins & Pinch (2000), pp. 11-40.
- <sup>23</sup> Longo (2002), p. 173.
- <sup>24</sup> Somenzi (1991), p. 105. See pp. 103-105.
- <sup>25</sup> We refer to Basti (2002), cap. 5 for the details of the passages about Aristotelian theory of physical beings and of matter and form.
- <sup>26</sup> Aristotle corrects Plato on this specific point: the distinction between “first substances” and “second substances”. The “first substance” is the individual substance, managed to sustain *in se et per se*, an ontological individual substrate, a *tode ti, hoc aliquid*. The “second substance” or “essence” is common to a lot of individuals : it is the *nature* of these individuals, and for this it doesn’t exist *in se et per se*, but only in the variety of individuals whose they are the nature. E.g.: “to be a man” is the essence of a specific man like “Roberto”, who is first substance (Arist., *Cat.* V).
- <sup>27</sup> See Basti (2002), p. 348.
- <sup>28</sup> Basti (2004), p. 11-12.
- <sup>29</sup> See Giustini (1991).
- <sup>30</sup> In particular Basti (2002), pp. 142-174.
- <sup>31</sup> See Basti (2002), pp. 440-446.
- <sup>32</sup> *Tempo newtoniano e tempo bergsoniano* in Wiener (1968), pp. 56-72.
- <sup>33</sup> Not all machines function in this way: for example, a gun can be used for a specific aim, but this use is not intrinsic at the gun’s operations.
- <sup>34</sup> Bigelow *et al.* (1991), pp. 103-104.
- <sup>35</sup> See Basti (2002), pp. 452-457.
- <sup>36</sup> In a Platonist framework the soul directs the body.
- <sup>37</sup> In particular, *De an.* II 2 413a21-25: « We resume our inquiry from a fresh starting-point by calling attention to the fact that what has soul in it differs from what has not, in that the former displays life. Now this word has more than one sense, and provided any one alone of these is found in a thing we say that thing is living. Living, that is, may mean thinking or perception or local movement and rest, or movement in the sense of nutrition, decay and growth».
- <sup>38</sup> See Basti (2002), pp. 354-356 for a detailed analysis of the question.
- <sup>39</sup> The causal relation act-power applied to being-essence explains what Thomas called “participation” to the being. See Basti (2002), p. 364.
- <sup>40</sup> Aristotelian intuitions on the *intellectus* constitute maybe one among more original moments of his thought. His concept of soul as “form of the body” seems not to finish in an absolute immanent concept (Reale (1997), II, pp. 466-

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469). The more serious problem is if the soul embraces the intellect: upon this point his students has separated: Teophrastus thinks that the intellect is a soul's faculty, while Alexander of Aphrodisia thinks those are separated. Thomas opposes the former interpretation because it does not agree with Aristotelian and Christian demands of unity of the human person.

<sup>41</sup> Wiener (1991), p. 66.

<sup>42</sup> Jaeger (2003), p. 1339-1412.

<sup>43</sup> See also Marcacci (2004), Cagliozi (2005).

<sup>44</sup> Ruini (2005), p. 53.