Recensione

N. D. Cilia, L. Tonetti (eds.), *Wired Bodies. New Perspectives on the Machine-Organism Analogy*

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Wired Bodies. New Perspectives on the Machine-Organism Analogy is a collective work, grounded on the long-standing experience of the reading group "Eco-evolution and cognition" (ECOEVOCOG) based since 2012 at Sapienza University of Rome and stimulated in particular by a series of meetings on "Machine and organism" organised in 2016.

As suggested in the *Introduction*, the fundamental idea enlivening the work is that the Machine-Organism Analogy (for the sake of brevity: MOA) had played a pivotal role into both philosophy and science, inasmuch as it implies - and even *disguises* - «complex epistemological issues» linked to the nature of the interaction between organism and machinic representations (p. 14). The underlying idea is that the explicative fruitfulness of the analogy has a *dynamical core*, since the terms tied up through the analogy are prone to be conceptualised in very different and variable ways over time. It is almost self-evident indeed that the term 'analogy' itself expresses only a specific kind of relationship, but it does not force the terms of the relationship into any firm and once-and-for-all identity. Analogously and therefore, to inquire into the history and the conceptual nature of MOA implies to deal with an outstanding rate of «plasticity» (p. 15). *Wired Bodies* is precisely a conveyor of such a plasticity. In fact, as the Editors suggest, this collective work aims at providing the reader not so much with a historical reconstruction of the MOA, but rather with a useful insight on the most fruitful areas for an interdisciplinary view of the issues raised on by the MOA, with particular concern to its multiple adaptation in contemporary frameworks of cognitive sciences.

The body of the work consists of three main sections. The first one provides a reconstruction of the role and the development of the MOA targeted on medical and philosophical thought. The second one focuses on the idea of *simulation*, as

it is closely related to the structure of the MOA itself. The third one investigates what kind of *extension* the machine would provide the body with, according to various contemporary traditions of the epistemological thought.

For what concerns the aims of the first section, the interesting and mind-provoking attempt of the work is that it does not deal directly, as one might expect, with the most distinguished and acknowledged modern version of the MOA, i.e. that of Descartes. On the contrary, the work aims at retracing «forms of mechanisms alternative to Descartes' celebrated and well-known model» (p. 17). With respect to such an original and challenging theoretical attempt, the essay of Simone Guidi depicts and maps the complex «plexus» of the prehistorical ground of mechanistic perspectives, which is neither uniform nor linear in itself. The inner crisis of Aristotelian physical framework, even in the Dominican thought, poses the conditions for the development of a form of deterministic hylomorphism that seems to be surprisingly «closer to the rising "analogical" mechanism of Descartes, Hobbes and Gassendi.» (p. 32). In such a tangled context, the case of Cureau de La Chambre's 'updated' hylomorphism dismisses its seeming strangeness to acquire a significant exemplariness.

With an analogous intent, Luca Tonetti illustrates the mechanistic physiopathology of Giorgio Baglivi, a leading representative of 17th-century Italian iatromechanics. According to Tonetti's analysis, Baglivi's model has to face and conglomerate two issues which are apparently at odds: on the one hand, the idea that the parts of the body are pretty similar to physical and mechanical devices, on the other hand, the intuition that the disease of the body is neither coextensive nor reducible to the malfunctioning of the machine.

Such a curious deviation from mechanistic 'expectations' allows an analytical transition to the epistemological views that work against mechanistic explanation and, where applicable, reduction. At this regard, Alessandra Passariello analyses von Bertalanffy's organicistic arguments (and the concerned empirical piece of evidence) against the suitability of the MOA «to describe and interpret development» in organic life (p. 50), with particular concern to those claims which – according to von Bertalanffy – support mechanistic methodology and epistemology (especially the 'analytical-summative' one and the 'machine-theoretical' one). Even though von Bertalanffy's notion of «organization» had been surprisingly accommodated by Information Theory «in terms of the concepts of transmission, elaboration and control of a finite amount of information», nevertheless, nowadays organicist arguments has to «take the informational/cybernetic/computational shift seriously», inasmuch as both organisms and machines (after that shift) are «organized systems with properties that cannot be explained through the application of purely physical-chemical laws» (p. 51).

In the wake of the computational revolution, Mattia Della Rocca examines the notion of simulation lying at the core of neuroscientific research projects and protocols, as the Human Brain Project, focusing on the influence of some historical propulsive factors such as neuromorphism and reverse engineering.

This contribution bridges the first section of the volume and the second one, which is significantly cognitive sciences-driven and closely inquires the issues raised on by the nature of simulation in the light of technological turn into scientific research on mind and behaviour. Within such a redesigned way of configuring new possibilities in theoretical and experimental scientific practice – as attested by the thriving development of research programs in informatics, robotics, cybernetics and AI – the machine plays a fundamental role in carrying out the investigation into cognitive functioning. More precisely, according to the so-called *synthetic method*, it shares with the phenomenon that the machine has to simulate some relevant features. This is because the machine is set up *according to the functional organization* of the phenomenon itself and its task is to test «the 'mechanisms' by which machines are built», rather than to reproduce «cognitive functioning» (p. 62).

With respect to this account, Nicole Dalia Cilia's essay explores the methodological differences between two fundamental kinds of simulation – *model-oriented simulation* whose purpose is to «discover the mechanism underlying a particular behaviour» trough modelling machines embodying the hypotheses of research, and *data-oriented simulation* which, since it is a molecular-level simulation, aims «to obtain fine-grained descriptions […] on the behaviour of a system which is hard or impossible to observe through more conventional technique» (p. 64) – suggesting that a «"horizontal" integration» (p. 66) is desirable.

Within a similar line of reasoning, the essay of Giuseppe Boccignone explores the field of the affective neuroscience as it represents a crucial and promising ground for integrating the gap between the technological advancements and the philosophical stance on «the nature of intelligence». In the absence of an accurate methodological inclusion of the role of emotion, any complete account of mind and cognition could be achieved by either a philosophical or a technical-scientific point of view.

Valentina Trombetta analyses – within an enactive perspective – decision-making processes (both in humans and in robots) in the light of emotions and of the role of both extrinsic and intrinsic motivations. Indeed, these elements, as the experimental literature suggests, seem to be fundamental in order to any well-adapted response of living or artificial beings and as well as for a genuine comparison between their features.

Finally, Francesco Bianchini's contribution suggests that the evolutionary perspective and methods are quite different from the biological concerns of cognitive sciences and AI. Furthermore, it claims that the idea by which synthetic approach represents a universally valid and suitable approach for AI and cognitive sciences has to be challenged.

As previously anticipated, the third section reflects on the significance, the extent and the limits of the «symbiosis between human organisms and machine» and it largely devotes attention to the technological issue as it emerges in contemporary epistemologies.

Fiorenza Lupi explores Canguilhem's philosophy of technique. Canguilhem's perspective reverses the common idea by which living organs are assimilated to machines: on the contrary, there is continuity between the functioning of organisms and the production of technical objects and such continuity proceeds from the living organism to the technical act. As Lupi clarifies, this inversion is aimed «to shield the organism from the biological determinism» implied by the mechanical assimilation, and not to give an anthropomorphic configuration of the technical realm. In this framework, the MOA – insofar as it is an analogy – has a «normative» feature and not a «normalizing» one, inasmuch as it is «able to create new rules» and not «to control and predict the behaviour of living beings» (p. 107).

Elisa Binda focuses on another philosophy of technique: that of Simondon. Within this theoretical framework, human individuation is an endless process of interplay between *inside* and *outside*, which produces «the appearance of the individual» from a «pre-individual natural asset» and the «associated environment» (p. 111). In this approach, the technical object displays a peculiar mode of existence, characterized by openness and a sort of sensitivity to the environmental information. Furthermore, according to Simondon, human evolution is carried out only through the technical gesture, which modifies the perceptual pattern and broadens the «schemes of intelligibility» (p. 113). As Binda suggests, this framework significantly echoes the fundamental issues of the Extended Mind Theory, especially in Clark's version.

Francesco Restuccia's essay articulates a possible "encounter" and comparison between Wiener' and Benjamin's perspectives on the relationship between humans and machines. Even though these authors blatantly belong to different conceptual milieux, as the author specifies, their perspectives on technology are significant both for an interdisciplinary insight on these issues and for their converging on some relevant points. Despite their different education and theoretical goals, they surprisingly share the idea that the humankind historically developed two forms of technology: a first technology (clockwork-like, closed to the environment, « accomplished once and for all» implying a high rate of human labor and control) grounded on «mastery», a second technology (self-regulated, «more autonomous», adaptable and provisional, implying a reduced use of human labor) grounded on the «interplay» (p. 118), which opens at the possibility of «systems of a mixed nature, involving both human and mechanical parts» (p. 122) as in the case of less or more sophisticated forms of prostheses.

At the conclusion of the section and of the volume, Francesco De Bei's article develops the issue of a machine-organ symbiosis in the light of situated cognition approaches and in particular along with Tomasello's evolutionary perspective. Indeed, such an approach – providing for example the distinction between individual intentionality and shared intentionality – is able to account for the softening of boundaries between internal state and external environment – phenomenon that by means of the increasing technological saturation of life significantly affects and marks the last decades – as well as to provide an in-

depth analysis of the meaning and the consequences of this phenomenon on cognition.

In conclusion, the volume offers a very large array of issues at stake along with MOA's configuration, considering its evolution during the time and according to a different variety of epistemological frameworks. The authentic force of the work probably lies in both the *novelty of the collected perspectives* and in the very *act of the collection itself.* By means of the combination of these factors, the volume gains the power of setting the stage for a vast and broad-based interdisciplinary insight, without relinquishing neither an up-dated fashion nor the historical-theoretical depth. Reflecting on the origins, the meaning, the extent and the development of the MOA, or even on its adequacy to contemporary scientific challenges, is nowadays an inescapable task for both philosophy and science. *Wired Bodies* is an invaluable tool on this path.