

HANS JONAS ON TELEOLOGY IN BIOLOGY. THE RELEVANCE OF EXISTENTIAL PHILOSOPHY FOR BIOLOGICAL THINKING

*HANS JONAS ACERCA DE LA TELEOLOGÍA EN LA BIOLOGÍA. LA RELEVANCIA
DE LA FILOSOFÍA EXISTENCIAL PARA EL PENSAMIENTO BIOLÓGICO*

Jan Trnka*

Faculty of Medicine, Charles University in Prague.

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RESUMEN

Los conceptos teleológicos son considerados sospechosos en la biología moderna pero parecen difíciles de desterrar sin perder importantes categorías biológicas tales como “función” o “adaptación”. Este artículo revisa brevemente los diversos enfoques filosóficos para re-definir los conceptos teleológicos mediante el uso de teorías causales y después analiza un enfoque muy diferente a la filosofía de la vida, principalmente, la filosofía existencial de Hans Jonas. En su obra mayor *The Phenomenon of Life* Jonas intenta encontrar una solución a la disparidad entre la experiencia humana de la vida y los presupuestos materialistas de la ciencia moderna. Mediante el uso de un rango de argumentos históricos, ontológicos y epistemológicos él muestra lo inadecuado de la instancia materialista y en vez de eso sugiere la posibilidad de la co-existencia de los enfoques causales y teleológicos en vista de que ambos surgen de la experiencia humana.

Palabras Clave: Casualidad, Teleología, Hans Jonas, Existencia, Biología, Vida.

ABSTRACT

Teleological concepts are considered suspect in modern biology but they seem to be difficult to uproot without losing important biological categories such as “function” or “adaptation”. This paper briefly reviews the various philosophical approaches to re-defining teleological concepts using causal theories and then discusses a very different approach to the philosophy of life, namely Hans Jonas’s existential philosophy. In his major work “The Phenomenon of Life” Jonas attempts to find a solution to the disparity between the human experience of life and the materialist assumptions of modern science. Using a range of historical, ontological and epistemological arguments he shows the inadequacy of the materialist stance and instead suggests a possibility for a co-existence of the causal and teleological approaches as they both stem from our human experience.

Key Words: Causal, Teleology, Hans Jonas, Existential, Biology, Life.

1. Introduction

Teleological concepts have been used in descriptions of nature for thousands of years (Ariew, 2002; Ruse, 2002). With the backlash against scholastic philosophy in the early modern period and the removal of the need for a Designer through Darwin’s theory, teleological explanation of natural

phenomena became suspect and attempts have been made to transform the teleological language and concepts into causal theories. To date, these attempts have not yielded a consensus (Amundson & Lauder, 1994; Neander, 1991) or a universal (causal) theory of teleology in biology.

Hans Jonas in his book *The Phenomenon of Life* (1966) introduces an existential philosophy of

* MD, PhD, MPhil. Assistant Professor. Third Faculty of Medicine, Charles University in Prague, Czech Republic.
jan.trnka@lf3.cuni.cz

biology. He analyses the metaphysical background of modern biology and finds it to be incomplete with respect to the range of phenomena encountered in nature, especially regarding purposiveness or teleology. Building on Heideggerian phenomenological philosophy Jonas proposes that the privileged, disinterested point of view assumed and professed by modern science is untenable when faced with the problem of life. Jonas's philosophy of biology does not start with a pure consciousness observing from the outside events in a mechanical world (in a Cartesian sense) but with a phenomenological study of our own being alive as the part of living nature with which we are best acquainted. 'Anthropomorphic' categories such as freedom or purpose are therefore not to be purged from our view of the world but, on the contrary, they represent essential means for our understanding of life in general.

A major area in philosophy of biology that has to come to terms with teleology is the analysis of natural functions and goals. In the first part of this paper I will argue that the failure of current causal theories of functions in biology lies in the discrepancy between the aim to remove all teleology from science on the one hand and intuitive notions of purpose (and derived notions of function and goal) used more or less explicitly in scientific and even in philosophical practice. The theories discussed below either implicitly work with teleological notions of purpose or by completely purifying themselves of these notions they produce theoretical concepts, which fall short of expectations and needs of everyday use and scientific practice. This fact, in my opinion, suggests that intuitive, anthropomorphic teleological concepts are far too important for our understanding of life and cannot be reduced to causal explanations.

This is the context in which in the second part of the paper I will discuss Jonas's existential philosophy of biology as an alternative to the canonical scientific view. Jonas's philosophy centres around our intuitions and experiences with our own being alive, provides epistemological and metaphysical arguments for the centrality of teleology for the study of living organisms and therefore promises to remove the *skandalon* of teleology in biology by embracing it as a essential category of our understanding of the world.

Finally, I will outline some other potential benefits of Jonas's philosophy and identify some potential problems to be studied in a future work.

2. Current debate about teleology in biology

The debate about teleology in the philosophy of biology centres around the following terms: function, adaptation, goal and purpose. In the following I will not make any distinctions between these terms as they are largely irrelevant to my further analysis (Wright, 1973). In common language the term 'function' is more appropriate for a body part, organ or organ system while 'goal' or 'purpose' is better used when talking about whole organisms but all three terms express the (common sense) fact that X does F in order to G . 'Adaptation' is uniquely used in evolutionary context and R. Amundson showed convincingly that it is only a special case of function (Amundson & Lauder, 1994). However, all these concepts contain a teleological core and in this core I will be interested in the following discussion.

The debate about teleology in the philosophy of science is, in general, characterised by an attempt to explain teleological concepts as special cases of causal explanations and thus fit them into the framework of modern science¹. Such a process is uncontroversial in physical sciences, where the use of teleological explanations was removed long time ago with the demise of Aristotelian physical theories. In biology, however, the expurgation of teleological explanations is proving much more difficult. Where does the need for teleology in biology come from?

The relevance of any metaphysical concepts of teleology, especially those positing an intelligent transcendental being as the source of purpose in nature, are more or less strongly rejected. Since there are currently no influential theories of immanent purpose in nature, the prevailing efforts aim at transforming teleological explanation to causal ones. In the following paragraphs, I will briefly summarise three influential causal theories of functions and propose a common reason for their apparent failure to yield a generally acceptable theory that fits this token of teleology comfortably and completely into the materialistic reductionist paradigm. The choice of approaches included in the following is loosely based on (Nagel, 1977, 1977b; Boorse, 2002).

2.0.1. Analytical, causal role approach

The analytical or causal role (CR) approach was developed by R. Cummins (1975) based on Bock's and von Wahlert's (Bock & Wahlert, 1965) 'teleologically neutral' (Nagel, 1977b) notion of

function. It originally stems from and caters for the needs of functional anatomy and defines function as any property of a complex of traits (Amundson & Lauder, 1994).

Cummins takes over this model and develops it further. His view of function is one that depends on a specific analytical or theoretical approach. A function of an organ is whatever effect it causes that contributes to a property of the whole system we happen to be interested in. For example, the function of the heart is to pump blood if we are studying the circulatory system and are interested in the movement of blood around the body. However, it makes perfect sense for Cummins to say that the function of the heart is to produce sounds if we are interested in the sounds produced by an organism (e.g. for communication). Any functional ascription is thus dependent on the specific theoretical framework used to explain it.

To avoid trivial and counter-intuitive ‘functions’ (such as weight as a function of the heart) he introduces criteria for the evaluation of plausible (or epistemically useful) functional explanations. These criteria require that there be a significant difference in sophistication between the explanandum and the explanantia (i.e. the latter must be significantly simpler than the former), the two must be of different type and the systems to be explained must be sufficiently sophisticated.

2.0.2. Cybernetic, system-property, goal-contribution approach

In the goal-contribution (GC) theory the goal/function of a subsystem is to achieve and maintain a specified state of the supersystem, which is, by definition, its goal (Nagel, 1977b; Boorse, 2002). Clearly the model comes from homeostatic systems common to all living organisms and to some man-made machines. This approach boasts with the most comprehensive breadth of all without being over-broad (Boorse, 2002). In many ways it is very similar to Cummins’s analytical approach (*vide supra*) but in an attempt to avoid the arbitrariness of function-ascription in Cummins’s theory the GC theory defines what a goal of a system may be using cybernetic principles originally used for the description of artificial systems. A goal of a system, according to this view, is a final condition of the system (in relation to its surroundings), to which the system approaches in a *plastic* and *persistent*

way. The biological examples given by Nagel and Boorse are homeostatic mechanisms involving the regulation of extracellular fluid osmolarity or glycæmia. Here the function/goal of the homeostatic system is to keep plasma osmolarity or glycæmia at (or near) a target value, which is achieved in a variety of ways. However, for these mechanisms to deserve to be called functions they must contribute to the goals of the whole organism (health, survival), which in turn must contribute to the goals of the society, ecosystem, and so on.

2.0.3. Ætiological, selected effect approach

In contrast to the previously described *ahistorical* concepts of goals/functions, the ætiological (or ‘selected effects’, SE [Amundson & Lauder, 1994]) approach works within the framework of evolutionary theory and explains functions through their natural history.

The ætiological of function was developed by L. Wright (1973). Wright claims that the central notion of all functional ascriptions is the cause of a trait’s existence: the function of a part of a watch is the reason why it was used when manufacturing the watch (Wright, 1973) (hence ætiological). In the case of natural functions, Wright sees natural selection as the causal connection (Wright, 1973): trait *i* is present in organism *O* it does *F* (which is its function), i.e. only those ancestors of *O* had *i* survived and transmitted *i* to their descendants because *i* does *F*. Or: the function of the heart is to pump blood since it pumps blood and it was selected because organisms with blood circulation were selected over ones without.

A similar model has been advocated by R. Millikan². Millikan’s notion of ‘proper function’ is based purely on the (natural) history of a trait as the cause for its existence but the trait in question need not actually perform the action purported to be its function (Millikan, 1989), thus avoiding problems with e.g. diseased organs, and the adjective ‘proper’ serves to exclude accidental functions (Millikan, 1989).

2.1. Problems with analyses of teleology

The brief and necessarily selective overview of some of the theories of function in current philosophy of biology shows that despite substantial effort devoted to the clarification of these issues

there is still no sign of a consensus or even a convergence. While the philosophical, scientific and practical backgrounds behind these attempts vary significantly, similar problems seem to crop up in all of them: these theoretical analyses either rely on intuitive concepts of function/goal and thus in effect admit a failure of explaining teleology away or reject the validity of these common-sense notions and consequently risk arbitrariness and limited practical use. In order to provide evidence for this view I will now discuss the shortcomings of the approaches mentioned in the preceding sections.

In Cummins's account, a function is portrayed as nothing more than an effect of a component contributing to an effect of a supersystem containing this component as studied with a specific analytical interest. However, Cummins uses a highly intuitive (and anthropomorphic) examples of a factory and its constituent parts and an electronic diagram to illustrate his theory (Cummins, 1975) and he imagines

(...) biologists expressing their analyses in a form analogous to the schematic diagrams of electrical engineering (...) (Cummins, 1975).

These examples assume that we already know the purpose of the system (factory, electronic device) and we explain the functions of its components in relation to it. However, Cummins does not admit to need such external knowledge of purpose, which leads him to dismiss the relevance of his 'counter-example' with the function of the heart being the production of a 'circulatory noise' (Cummins, 1975) as potentially valid under the right analytical viewpoint (footnote 23) without specifying what would make us choose such a viewpoint. I would, however, argue that this example is indeed a genuine intuitive counter-example and the reason is that we can see no purpose in producing a 'circulatory noise' (but if we did see such a purpose this wouldn't be a counter-example). It is unclear whether Cummins tacitly assumes that we choose our analytical interests based on some external criteria (such as our notions of purpose) or we choose them arbitrarily (or only with respect to their epistemic values [Cummins, 1975]). If the former an explanation or definition of these criteria would be in order. If the latter then we can have infinitely many functional ascriptions for an individual trait/organ (Amundson & Lauder, 1994). Not only does the 'arbitrary version' of Cummins's theory of function map incompletely

to our everyday and scientific notions but we can easily imagine the difficulty of applying it to an alien entity with no structural similarity to terrestrial organism—that is unless we allow for using necessarily anthropomorphic notions of purpose.

The goal-contribution theory appears to be philosophically the most naive one. While its reliance on the functions' contribution to goals of the organism helps it avoid many problems of the competing theories, the *definition* of such goals is, at this point, rather unhelpful. It is easy to see how this theory was inspired by cybernetics. The function of a servomechanism in a torpedo is to adjust its course, which contributes to the goal of the torpedo—hitting an enemy vessel. It is trivial to point out that the goal the torpedo is striving to achieve is not its but ours. If, in the cybernetic and by extension GC theory's view, we (as living organisms) are all kinds of 'torpedoes', there cannot be any goals inherent in us (or other organisms) but they must always be sought outside, in a higher level system. Where does this regress end? In the goal of the universe? This discussion may be a little unfair to Boorse as he acknowledges this problem without offering a solution (Boorse, 2002), while believing that his analysis is not dependent on a specific definition of a goal. However, as it stands now this theory does nothing to remove the intuitive, pre-scientific, teleological notions of goals and functions³.

Wright's *aetiological* starts as unabashedly teleological. The sweep-second hand is in a watch because it makes it easier to read off seconds and the epiglottis is where it is in order to keep food out of the windpipe (Wright, 1973). If we assume that the object of our interest was designed by an intelligent being, this theory works without a hitch. Things become more complicated if we posit that no such purposeful designer is needed and blind natural selection can fill his/her shoes. First of all, as noted by Wright himself (1973) and later more forcefully by Cummins (Cummins, 1975), natural selection *does not* provide a causal explanation of a trait—current evolutionary theory posits that trait variation arises as a result of random mutations. Natural selection tends to increase the prevalence of individuals with a more advantageous form of a trait but that is hardly as strong as Wright's wish for an *aetiological*. Even if we give up on *aetiology*, we can easily imagine selected effects, which would not be considered as having a function: some coniferous trees evolved a defense mechanism involving a resin,

which solidifies in contact with air. This is accomplished by using a volatile solvent, turpentine. We can smell this mixture of terpenes as ‘pine’ odour and it may be said that these conifers were selected to produce this odour. However, we cannot therefore say that the function of turpentine is to make the trees smell nice because, in fact, the odour is just a side effect of the mentioned defense mechanism. Purely from the natural historical record we cannot say what the function of turpentine is. However, when we look at those coniferous trees as having a purpose (e.g. defend themselves from insects) we will clearly see the real function of the resin.

Millikan’s account of function is susceptible to the same criticism but adds another problem. Millikan states explicitly that

(...) being preceded by the right kind of history is sufficient to set the norms that determine purposiveness (Millikan, 1989).

This assertion may work well for functions of organs or animal behaviour, however, how are we to understand it in the context of human behaviour and artifacts? Millikan addresses this problem by stating that currently we do not have a theory of what makes our behaviour purposeful and therefore the historical basis of purpose may well be adequate (Millikan, 1989). This, however, does not explain how many times we need to use a screwdriver to open a can in order for the screwdriver to acquire can opening as its function.

In this section I tried to show that all three theories of function are (more or less admittedly) built on intuitive, anthropomorphic notions of purpose. It is such notions that allow these theories to map onto the use of functional ascriptions in everyday life and scientific practice. The price paid for a complete removal of these notions is a theory, which lacks any useful attributes and dissolves in arbitrariness.

3. Hans Jonas’s existential philosophy of biology

In the book *The Phenomenon of Life* (1966) Hans Jonas describes his existential philosophy of biology. His explicit motivation for such an endeavour is

...to break through the anthropocentric confines of idealist and existential philosophy as well

as through the materialist confines of natural science. [p. xxiii]

While recognising and building on the crucial insights of Heidegger’s existential ontology Jonas criticises existential philosophy for creating an impenetrable divide between man and the rest of nature. Modern science, on the other hand, programmatically discards any possibility of ontologically separate characteristics of living beings and relies on purely mechanistic explanations. Jonas attempts to show that purely mechanistic science is principally bound to miss some essential properties of living organisms and therefore he advocates an extension of existential insights first developed in relation to humans to all living organisms.

As mentioned previously, Jonas comes to the study of living organisms from a philosophical tradition radically different from the tradition in which modern science was developed. While the heritage of post-Cartesian natural philosophy allows (and prescribes) a disinterested, objective stance as a prerequisite for the understanding of the world and rejects any ‘subjective’ influences, Heidegger’s existential philosophy posits that our own being (Dasein) is an essential key for understanding the modes of being of everything else in the world: we understand the world by living and acting in it.

In the following paragraphs I will summarise Jonas’s arguments for the inadequacy of the reductionist materialistic viewpoint of modern biology for the appropriate understanding of living organisms. I will divide his arguments into three groups: historical argument, ontological argument and epistemological argument. This division is necessarily artificial as all three groups of arguments are interrelated but it may prove helpful for a better understanding of Jonas’s central theses.

3.1. The historical argument

In the historical argument Jonas attempts to relativise the exclusive standing of materialistic ontology in modern science by analysing its origins.

According to Jonas, the primary ontology of the human race was that of panvitalism—everything in nature was alive. This (pre-)philosophical stance most likely stemmed from the fact that

[o]n the terrestrial scene, where experience is reared and contained, life abounds and occupies the whole foreground exposed to man’s immediate view [p. 7].

Signs and echoes of this understanding of nature can be found in the teachings of pre-Socratic philosophers or even in the panpsychism of the creation myth in Plato's *Timaeus* (e.g. 30b–d) (Plato, 1997). At this stage of philosophical development of the human race the problem to wrestle with was not life but *death*. Death contradicted the fundamental experiential fabric of the world and had to be explained (away) or tackled in some other way. Jonas points to the 'obsession' of ancient civilisations with death as a supporting evidence for this view. One of the early attempts for reconciliation of this dichotomy (living cosmos vs. death) was the separation of the 'primitive' unified ontology into two parts—the world and the soul. The arrival of dualism (in Orphic mysteries) showed death as an appearance only while the life of the immortal soul continues [pp. 7–9].

Such dualism originally focussed primarily on the human side of things (i.e. soul) but at the same time it opened the possibility of inanimate nature [p. 15]. It was further elaborated on in the following centuries (via Gnosis and Christianity) while gradually stripping away attributes of life from the non-human world. Finally, dualism found its paradigmatic expression in Descartes' philosophy. Descartes divided reality into a purely mechanical world describable by causal principles and mathematics and the human mind, which was outside this world and was not governed by its rules (Descartes, 1968). From here one needs only a small step to arrive at the philosophical worldview of modern science—materialistic monism.

In this historical narrative, Jonas shows how the original, 'primitive' experience of the world as a living being was gradually overcome by metaphysical developments resulting in an 'ontology of death' [p. 12]. Was this a necessary development resulting in a better understanding of the world around us? The split between inanimate matter and spirit as the sole bearer of (human) life attributes irrevocably separated, according to Jonas, two aspects of the world. The choice of one (materialism) or the other (idealism) does not solve the problem, merely denies its existence [p. 16].

3.2. The ontological argument

Having asserted that the purely materialist ontology of modern science is an incomplete descendant of dualism, Jonas further argues that living organisms have a kind of being distinct from

non-living things. This argument is primarily based on the fact that metabolism—material exchange—is a defining feature of any living entity.

In metabolism, the material constituents of an organism are constantly being exchanged with its surroundings and, in principle, could be entirely replaced throughout its lifetime. On the materialistic account, an organism is a merely contingent assortment of material particles, whose phenomenal unity is given purely by their being in a specific place at a specific time. As Jonas puts it:

The life process will then present itself as a series, or a web of many series, of consecutive events concerning these single, persisting units of general substance: they are the real performers, moving in and out of configurations, each for causal reasons of its own [pp. 77f].

This means that according to this view there is no independent reality of a living organism.

Jonas uses an analogy with a wave. A wave on the water can be fully described by the causal relations of molecules of water in a pond—there is nothing more to a wave than this. Similarly, we could say that living organisms are like ripples on the surface of matter and can be analysed accordingly. Jonas, however, strongly disagrees with this view and his reasons lie, as expected, in our own experience. We as living organisms have a fundamental sense of self-identity and delimitation from our surroundings and this sense is not purely phenomenal, i.e. a synthetic result of observation, but ontological [p. 79]. A mathematical/mechanistic analysis misses, according to Jonas, this fundamental characteristic of life.

One consequence of the idea that an organism's identity does not lie in its material composition but in the 'living form' is the possibility of freedom. Through metabolism

...form becomes the essence, matter the accident [p. 80].

This, according to Jonas, is the first emergence of freedom in nature. The identity of a living organism (i.e. its life) is at the same time dependent on matter as its substrate and independent of it in the sense of not being identical with any particular bit of matter. This dialectical freedom is the basis of outward interest of the living organism: the world is

the source of matter for its metabolic needs. From such a basic outwardness Jonas develops such concepts as perception, reactivity, agency [pp. 83-92].

3.3. The epistemological argument

I have previously discussed Jonas's emphasis on the primacy of the experience of life. Using the phenomenological method, he centres his epistemological argument on our experience and understanding of the world being mediated through our experience of ourselves, of our actions and limitations. In this vein Jonas argues that the concept of causality is understood primarily through the causal power of our own actions and the concept of force would be incomprehensible (or indeed would have never arisen) were it not for our sensations of forces acting on our body [pp. 22f, 26-33]. To state his thesis even more strongly: causality and force cannot be found in the outside, purely material world, or, as Kant would have it, in pure consciousness—they are the result of our bodily experience involving both sides of the dualistic divide:

Causality is thus not an a priori basis of experience, but itself a basic experience [p. 23].

In the same way, Jonas argues, the concepts of freedom, agency and goals are central to our self-understanding and have enabled us throughout history to understand the world around us. This process is pre-eminently exemplified in *teleological explanations*. Jonas first explains how the rejection of final causes from any respectable science was not motivated by a failure to detect them empirically in nature—quite the contrary: teleology was rejected a priori because it was too 'natural' for humans to see it everywhere [pp. 34f]. From Bacon onwards, the following maxim was unquestioningly accepted:

...no inference must be drawn from [the nature of man] to [the nature of the universe] [p. 35].

This assumption was further fueled by the ascending primacy of sight as the mediator of knowledge about the world, which allowed for a further detachment of the subject from the extended reality [p. 35 and pp. 26-33]. But as we have discussed previously, Jonas believes that such a programmatic rejection of anthropomorphism is a

mistake: it leaves us without an understanding even of the extended world [p. 37].

Finally, Jonas asserts that without our experience as a living being we would not be able to distinguish life from non-living matter. On the basis of the ontological argument discussed above, he argues that a mechanistic analysis of nature would remove life as an intelligible category—everything, including ourselves, would be just assortments of elementary particles linked by laws of physics.

Such internal identity [of a living organism], transcending the collective one of the present and vanishing substratum,...is implicit in the adventure of form and is spontaneously assumed on its external, morphological evidence, which alone is open to inspection [p. 82].

However, this inference can only be made by an observer that has a first hand experience with life—without it, living organisms would be seen as nothing more than a contingent collection of material such as a waterfall or a wave.

4. The relevance of Jonas's philosophy to biological thinking

In the first part of this paper I showed that current philosophy of biology cannot extricate itself from teleological concepts of purpose despite focussed efforts. The pre-scientific notions of *causae finales* appear to be refractory to incorporation into the mechanically causal framework perceive as a necessary fundament of scientific knowledge.

Jonas's philosophy of biology refuses to accept the posited necessity of materialistic metaphysics for biology and not only it does not reject anthropomorphic concepts such as teleology but puts them in the centre of the philosophical building. Can Jonas's philosophy remove the problem of teleology in biology and what are its possible pitfalls?

One of the central points of Jonas's view of nature is the idea that the origin of life was at the same time the origin of freedom. As briefly described in the 'ontological argument', Jonas sees the fact of metabolism as an expression of essential freedom of even the simplest unicellular organism. The organism acquires freedom through its independence from any particular bits of matter and their causal relationships. This freedom is, however, essentially linked with necessity, necessity

to carry on metabolising and to go out into the world and find essential nutrients, light, warmth, etc. This dialectical unity of freedom and necessity is the basis for will (initially a rudimentary will to survive) and choice. While both these terms will sound strange to some people when talking about an amoeba, that is at least partly due to the fact that scientific biology has conditioned us to see everything in nature as mechanical automata. When we observe a *Paramecium* under a microscope swimming towards a clump of yeast cells, using its cilia to sweep them into its mouth and reacting to prod with a micropipette by a rapid exocytosis of trichocysts it is hard *not* to see the possibility of rudimentary will and choice. Such a view is even easier for higher animals. Once we accept the possibility of freedom, will and choice in a unicellular organism we must also accept the existence of purpose. What is a willful choice but an expression of purpose? Interestingly, Jonas not only sees human freedom and will prefigured in simpler organisms but he actually proposes that the *potency* for purposiveness be present in the matter itself [pp. 3f].

Such a metaphysics inevitably clashes with the scientific view and the question I want to address now is whether these two views should co-exist as complementary or whether only one should be adopted and the other discarded. The latter possibility is the one chosen by science,

which only allows causal relationships. Jonas, on the other hand, does not suggest exchanging causality for teleology. His phenomenological analysis shows that both *teleology* and *causality* are grounded in our fundamental experience of the world and are therefore adequate and necessary for our understanding of it.

This leaves us with the former possibility: one could allow the use of teleological concepts in biology while keeping causal explanations elsewhere in the sciences. However, from Jonas's point of view, this would not be a simple 'as if' compromise. His philosophy advocates an *ontologically* separate status for living beings not just pretending they are different for heuristic purposes.

5. Conclusion

Following this brief, preliminary study of the relevance of existential philosophy to biology many questions remain to be answered. Does Jonas really advocate a new version of dualism (life vs. matter or biology vs. physical sciences) or does he envisage a new, unified metaphysics covering both aspects of the world? Would the acceptance of Jonasian dualism in any way affect current scientific practice? What would happen at the boundaries between the two modes of explanation, e.g. in psychopharmacology? Such interesting questions are beyond the scope of this paper and I hope to deal with them in a later work.

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Notas

- ¹ In my paper I will not discuss conceptual analyses of biological functions, however interesting they may be.
- ² And also by K. Neander but from the point of view of conceptual analysis (Neander, 1991).
- ³ Hans Jonas deals with the cybernetic model of life in the fifth essay (Jonas, 1966). Here he provides a very good counter-argument to the cybernetic definition of a goal. If a goal of a system/organism is some final state approached plastically and persistently then one must see *death* as the goal of any living being.