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SUBJECTIVITY AND OBJECTIVITY: A MATTER OF LIFE AND DEATH?

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ABSTRACT: In this paper, it is argued that the question “What is life?” time and again emerges—and within the confines of an objectivistic/subjectivistic frame of thought *has* to emerge—as a symptom, a non-deciphered, cryptic message that insists on being interpreted.

Our hypothesis is that the failure to measure up the living to the standards of objectification has been taken too frequently from an objectivistic angle, leading to a simple postponement of an objective treatment of the living, and meanwhile confining it to the domain of the subjective, the relative and the metaphorical. As a consequence, the truly important question of the co-constitutive relation between objectivity and subjectivity is thereby evaded. A critical, transcendental account can be relevant in this regard, not only because of the fact that objectivity and subjectivity are seen as co-constitutive, but also because it addresses the question of the embeddedness of objectivity and subjectivity from within the living dynamics.

This hypothesis will be articulated on the basis of Erwin Schrödinger’s famous little book on “What is life?”, in dialogue with Robert Rosen’s critical reading of it. It appears that Schrödinger considered the living as a genuine challenge for classical objectification procedures. However, it is doubtful whether this brought him to a critical reading of objectivity or to the acknowledgment of a constitutive role of subjectivity in relation to objectivity. We argue that his viewpoint has the merit of *expressing* the difficulty of the living within the field of the physical sciences, but does not really transcend the objectivism/subjectivism opposition. At this point, Rosen’s relational account takes up the challenge more radically by acknowledging the need for a new epistemology and a new metaphysics in relation to living systems, and by attributing a place to classical objectivity from within this “new science”. In conclusion, we return to Kant’s epistemological proposal, and show its potential relevance in this debate.

KEYWORDS: Life; Co-Constitution; Relationality; Structure; Function; Immanuel Kant; Erwin Schrödinger; Robert Rosen

INTRODUCTION: OBJECTIVITY AND SUBJECTIVITY

Modern science is in the first place a matter of asking questions and only in the second place a matter of finding answers, as Kant pointed out in his *Critique of Pure Reason* more than 200 years ago. With his Copernican revolution, Kant argued that the objectivity of scientific knowledge is not the result of an *object in itself* in some sense out

there in nature and as such dictating appropriate ways of apprehension. Objectivity is on the contrary the result of a very specific questioning activity that gives rise to objects that have a validity only *within* the range of that activity. Kant stated very clearly that *if* universality and necessity are to be related to scientific knowledge it is because the questioning subject succeeded in constituting the answering potentiality of nature as a point of invariance, of exactness, of necessity and universality.

Kant felt safe in approaching objective knowledge in these terms because of the contingent fact that classical mechanics was available then, and had been shown to lead to a secure knowledge of mechanical, dead, systems. However, he never lost track of the idea that objective knowledge *testified* to an intrinsically subjective bearing surface because that was, in his view, the only way in which its possibility could be explained. This is precisely what the Copernican revolution points to: as things don't dictate the way in which they are to be apprehended, what can be revealed about them is always what is allowed *within* the range of the question, and this is as revealing about the question as it is about the answer. In Kant's critical philosophy, the contingent perspective of the questioner *is* the possibility of any objectivity: it is *from within* the contingent perspective that objectivity witnesses of the possibility of a stabilized, non-contingent, necessary relation between questions and answers.¹

What is it then, and above all, what *can* it be, to ask the question "What is life?"; from within this "space of objectivity"? To Kant, it presented a genuine challenge to the conception of objectivity endorsed in terms of necessity and universality as it initiates a moment of crisis in the traditional space of questions and answers opened up by the science of mechanics, and points to a limit, an exhaustion, an impossible applicability, of classical objectification procedures. And Kant fiercely held on to this resistance, as it is only *from within* the specific context of the living that anything, including objectivity and subjectivity, ultimately can have a place or a meaning. In his view, it is precisely through their intrinsic *resistance* to objectification that living systems have the potential to question and to reveal something about the *meaning* of objectivity *in relation to* the subjective conditionality in which it is grounded. In other words, the failure to measure up the living to the standards of objectification is revealing for the co-constitutive relation between objectivity and subjectivity.²

1. Of course, it is tempting to consider objects that have been obtained as stable and reliable products of questioning practices as *real* objects, somehow out there, independently of a subjectively grounded questioning business. How else could it be explained that there *is* invariance, that there *is* objective knowledge? To Kant, however, this was not an issue. His point was not to deny the existence of things outside of our subjective engagement. It was rather to grasp the specificity of objective knowledge that initiated modernity. And in this regard, he had no doubt that things of whatever kind outside us could not explain the necessity and universality of the type of knowledge at stake in the sciences. Even if the empiricists had awakened him from his dogmatic (rationalistic) slumbers, he never agreed with the basic empiricist options in relation to the sciences. On the contrary, he stressed that the possibility of the sciences could only be grasped through an ideal moment, that he described in terms of subjective conditionality and of which he set out to articulate the structural and systematic nature in and throughout his three *Critiques*.

2. This implies, on the one hand, that it is only through the contingent fact of objective knowledge that subjectivity can be seen to have a particular constitutive status in relation to objectivity. It is the space

After Kant, the question “What is life?” continued to have an equally challenging status. Phrased in terms of self-organisation, teleology, *élan vital*, complexity, “epi”-(genetics), “systems” (biology), ... it pointed each time to a limit or an impossibility of current objectification procedures, and expressed a worry about the meaning and the possibility of a beyond, an “epi?”. However, almost no attention was paid to the aspect of the *critical* potential of the question in revealing the meaning of objectivity in its relation to subjectivity.³ This can perhaps be related to the fact that the sciences were frequently interpreted from within an objectivistic viewpoint. As a matter of fact, to the extent that objectivism considers that science deals with objects that are independent of subjective engagement, and to the extent that subjectivism, intimately accompanying objectivism, considers things outside the scope of science as subjective-relative and contingent, one can wonder how there *could* be a place for a genuine *critique* of objectivity *in relation to* subjective conditionality.⁴

In this paper, it is argued that the question “What is life?” time and again emerges—and within the confines of an objectivistic/subjectivistic frame of thought *has* to emerge—as a symptom, a non-deciphered, cryptic message that insists on being interpreted.⁵ Taking the symptomatic status of the question seriously, a critical exploration is proposed of the idea that the encounter with the living constitutes a limit and a challenge to objectivity. Our hypothesis is (i) that the failure to measure up the living to the standards of objectification has been taken too frequently from an objectivistic angle, leading to a simple postponement of an objective treatment of the living, and meanwhile confining it to the domain of the subjective, the relative, the metaphorical, (ii) that the truly important question of the co-constitutive relation between objectivity and subjectivity, and hence of the place or the meaning of objectivity in its relation to subjectivity is thereby evaded,

constituted by objective knowledge that retroactively installs subjectivity as a problem, and not the other way around. On the other hand, it is with regard to the potential failure of objectification that subjectivity has a particular function, the one namely of revealing, from within the context of a *possible*, contingently given, objectification, the meaning of objectivity *in its relation to* subjectivity. This was already made clear in Descartes’ articulation of the thinking subject. Without the availability of objective knowledge, there would have been no need to come to an explicit account of the subject. For a more detailed discussion, see, a.o., Husserl (1996 [1934]).

3. We refer in the first place to analytical philosophy of science.

4. Husserl considers that the objectivism/subjectivism opposition—excluding a critical questioning of objectivity in relation to subjectivity—is the main reason for the crisis in which the European sciences find themselves in the beginning of the 20th century. He describes this situation starting from the initiating moment of the modern sciences up to then. In our view, that picture can be maintained until now, even with regard to the most rebellious or challenging interpretations in analytical philosophy of science (cf. Kolen & Van de Vijver, 2008).

5. In Freudian theory a symptom is seen as the return of the repressed. In the context of objectivism, what is repressed is the issue of the subjectively and historically based sources of thinking. Instead of addressing the question of the meaning of objectivity in relation to subjectivity, objectivism evades it, and hence the question returns in symptomatic form, as in “What is life?”. As long as it is not explicitly taken as a symptom and deciphered as such, it presents itself with a revealing as well as a hiding character. According to Freud, the return of the repressed is a problem (not repression in itself), in as far as it disturbs the conscious (i.e. objectivistic) discourse where it appears quite ostentatiously, as something cryptic, but meaningful.

(iii) that a critical, transcendental account can be relevant in this regard, not only because of the fact that objectivity and subjectivity are seen as co-constitutive, but also because it addresses the question of the embeddedness of objectivity and subjectivity from within the living dynamics.

This hypothesis will be articulated on the basis of Erwin Schrödinger's famous little book on "What is life?", in dialogue with Robert Rosen's critical reading of it. It appears that Schrödinger considered the living as a genuine challenge for classical objectification procedures. However, it is doubtful whether this brought him to a critical reading of objectivity or to the acknowledgment of a constitutive role of subjectivity in relation to objectivity. We argue that his viewpoint has the merit of *expressing* the difficulty of the living within the field of the physical sciences, but does not really transcend the objectivism/subjectivism opposition. At this point, Rosen's relational account takes up the challenge more radically by acknowledging the need for a new epistemology and a new metaphysics in relation to living systems, and by attributing a place to classical objectivity from within this "new science". In conclusion, we return to Kant's epistemological proposal, and show its potential relevance in this debate.

SCHRÖDINGER'S QUESTION: "WHAT IS LIFE?"

Schrödinger is embarrassed by the question "What is life?" (Schrödinger, 1967 [1944]; Rosen, 2000). However, he feels somehow obliged "to take life on board", even if the question drives him to take the risk of entering a new and unknown domain, and could lead to imperfections or simplicities on his part.⁶ In this, he has to manage with what he's got: a physical background, which is his constraint, but also his possibility.

As a physicist, Schrödinger strives towards universality, and has a tendency to look for the smaller parts as a basis from which to start.⁷ But he readily admits that in due course this treatment might have to be amended in order to anticipate the biological facts. In this regard, he acknowledges that living organisms differ quite substantially from any other piece of matter, because the organization of the vital parts is substantially different from that of a piece of matter. "The difference in structure is of the same kind as that between an ordinary wallpaper in which the same pattern is repeated again and again in regular periodicity and a masterpiece of embroidery, say a Raphael tapestry, which shows no dull repetition, but an elaborate, coherent, *meaningful* design traced by the great master." (p. 5, italics added)⁸ Schrödinger stresses that living organisms are

6. Is the international context one of the contributing causes in this? Or the fact that Schrödinger had to flee his country? Europe clearly was in a moment of crisis, there is no doubt about that, and various authors (cf. Husserl, 1967 [1934]) have made important philosophical gestures out of this acknowledgement.

7. "We have inherited from our forefathers the keen longing for unified, all-embracing knowledge. The very name given to the highest institutions of learning reminds us, that from antiquity and throughout many centuries the *universal* aspect has been the only one to be given full credit." (p. 1, original italics).

8. Schrödinger uses the term structure to refer to the organization of the vital parts of a living system. In this paper, we follow Rosen in taking the term structure to refer to the physical, material, configuration of parts that is correlated with functional organization, and involves a flattening of dynamics or an

sensitive *selectively, from within a certain perspective or organization*, and not primarily at the level of the atom. If living organisms would be sensitive to each and every single atom, there would probably be no room for the living.⁹ In this regard, he notes: “Nevertheless, the one and only thing of paramount interest to us in ourselves is, that *we feel and think and perceive*. To the physiological process which is responsible for thought and sense all the other play an *auxiliary* part, at least from the human point of view, if not from that of pure objective biology. Moreover, it will greatly facilitate our task to choose for investigation the process which is closely accompanied by *subjective events*, even though we are ignorant of the true nature of this close parallelism. (...) We are thus faced with the following question: Why should an organ like our brain, with the sensorial system attached to it, of necessity consist of an enormous number of atoms, in order that its physically changing state should be in close and intimate correspondence with a highly developed thought?” (p. 9, italics added).

So, Schrödinger seems to express two fundamental ambitions in relation to living beings. On the one hand he holds on to the specificity of the organization of living systems, referring to the coherent, *meaningful*, interrelation between the parts, as well as to their specific sensitivity, qualified as “subjective”. On the other hand, he looks for their material basis and for law-like correspondences between matter and living form. Both ambitions are captured in the basic question formulated in the beginning of the book: “How can events in space and time which take place within the spatial boundary of a living organism be accounted for by physics and chemistry?” (p. 3), reformulated here in a teleological way: “Why should an organ like our brain (...) consist of an enormous number of atoms, *in order that its physically changing state should be in close and intimate correspondence with a highly developed thought?*” (p. 9, italics added).

Schrödinger’s concern for correspondence has frequently been interpreted in purely reductionist, physicalistic terms, which contributed to view him as a major source of inspiration for the reductionist movement in molecular biology (Rosen, 1991; Moss, 2003; Dronamjuru, 1999). His point would have been to reduce living organisms to impoverishment of genericity. To Rosen (1991), organization is a concept that is intrinsically functional and that as such does not allow for a flattening in structural terms. It is precisely the resistance of living systems to such kind of flattening that brought him to hold on to their organisational nature. From there on, he criticizes all attempts to understand them in structural terms, e.g. to try to recover the whole on the basis of the parts (part-whole reductionism). As will be shown further on, Schrödinger acknowledges that there must be a structural difference between physical and living systems, but he does not articulate the concept of organization as qualitatively different from structure. Apparently, the meaningfulness of structure to him refers to the fact that there is something in between an endless repetition of the same pattern (a total symmetry) and a total randomness, something that allows for meaningful variation. It is however doubtful whether this conception can be addressed in purely informational terms (see a.o. Collier 2004; Salthe 2008 - submitted).

9. The idea that seems to be involved here, is that the organization of the living intrinsically implies the active negation of certain aspects of the stimulus. It is actually this type of robustness—understood as the capacity to selectively negate certain aspects of the stimulus—that is one of the most central conditions of possibility of the living organization. For a philosophical analysis of this idea in relation to the constitution of the distinction between inside and outside in the context of the neurosciences, see, a.o., Van de Vijver & Noé (2008); Bazan & Van de Vijver (2008, in press).

their basic constituent parts and to develop appropriate, new (physical) laws to account for their behaviour. Now, it is true that Schrödinger proposes to discover new physical laws and is looking for thermodynamic principles in that regard. It is also true that he advances a Morse-like viewpoint on the code, which can be seen as indicative of a materialism, in as far as the code purports to materialize the living organization on the basis of a one-to-one correspondence between material and functional processes. The ambition of a code-like description is indeed to find a material fixity of some kind, and even if Schrödinger stresses the importance of the aperiodic crystal in this regard, it is doubtful whether he will ever succeed in accounting for the specific organization of living systems on this basis. However, we believe that this interpretation neglects the fact that Schrödinger was *also* driven by the question “What is life?”. This question minimally *expresses* that there is something “overruling” all material issues, something going beyond, something “epi” with regard to issues of material implementation.

Perhaps it is precisely this paradoxical situation, provoked by the tensed combination of on the one hand a specific question, “What is life?”, and on the other hand a physical research tradition, that contains the most valuable aspect of Schrödinger’s text. Clearly, Schrödinger endeavours to understand living systems on the basis of their basic constituent parts, while he also underlines that their *essence*, their *specificity*, lies elsewhere, at the level of their organizational interrelatedness, that leads, amongst other things, to a difference of relevant access. Indeed, from the moment certain components are connected in a dynamically organized way, things can have, or lack, meaning *for* the system, depending on the level and the modes of access it allows for.¹⁰ In this regard, Rosen points out that the question “What is life?”, is with Schrödinger a question about a noun, not about a predicate (2001, p. 6). It suggests that there is something in life that is qualitatively, formally, different from matter, namely its organization. Through the formulation of his question, Schrödinger shows himself to be attached to the *ideal* moment that is required to understand living systems—they can only be understood through their essence, their specific (formal) organization, which is an idea or a questioning perspective within which certain answers, certain material processes, can have a place. As such, Schrödinger introduces a new questioning perspective with regard to the physical sciences, and allows for a critical note with regard to the reductionist view according to which the starting point ought to be in any case the independently identifiable material constituents and the laws that govern them. So, with Rosen, we would be tempted to inverse, or at least nuance, a reductionistic interpretation of Schrödinger’s viewpoint. We suggest an interpretation of Schrödinger’s concern for a correspondence with a material basis, his struggle to establish a “new” physics, from within his attention to the ideal moment related to the living, and not the other way around.

10. In a sense, this little book might be said to witness most exquisitely of life itself, in as far as it expresses the obstinate capacity to build and to entertain a specific organisational cohesion, that is embedded and grounded in a material context, but that has nevertheless also a formal autonomy or irreducibility and as such a determinative impact on that material context by providing a specific place and meaning for its parts.

In this regard, let us consider, for example, Schrödinger's way of formulating the question of the gene. Rosen (2001, p. 14) points out that Delbrück's project of providing for the material basis of a gene, can be summarized as: "What is the matter that makes up the gene?". Delbrück's answer is: a molecule (see Timofeef-Ressovsky, *et al.* 1935). Schrödinger is influenced by Delbrück and acknowledges that overtly, but he reverts the question into: "When can a molecule be a gene?". This reversal is similar to the one noted earlier in relation to the huge number of atoms in the brain ("Why and when is a physical brain state to be called a thought?"). Rosen insists on this reversal, because he takes it to illustrate that Schrödinger, instead of simply subscribing to a materialistic reductionism, actually fundamentally questions it. If Delbrück had succeeded in proving that a gene *has to be* a molecule, then indeed biology would have found a solid basis and would become "solid rock knowledge", solid and dead, as a rock. Life based in dead matter.¹¹ Rosen, and also Schrödinger, consider that, in addition to Delbrück's suggestion, a reversal of the question is needed to adequately deal with life, pointing to a reversal in priority: it is not dead matter that *can* serve as a basis for apprehending life, it is life itself, its specific type of organization, its specific sensitivity, that is prior and that provides for the context within which the parts can have a meaning. That is *new physics!*

Schrödinger has the merit to have expressed "What is life?" as a symptom and to have opened as such a new possibility in regard to the physical sciences. His concern to establish a "new" physics from within the ideal moment related to the living, can however hardly be called an *explicit account* of a new perspective on the living. In particular, it seems that he evades the *metaphysical*, as well as the *epistemological* consequences of the priority he overtly wishes to give to the living organization. The main reason is perhaps that he implicitly continues to subscribe to the idea that "what there is", is ultimately dependent on an independently identifiable material givenness of some sort. The "life-question" precisely puts this idea under pressure. Not taking that into account, however, leads to the fact that the life-question has only a metaphorical status.¹²

11. That this reductionistic viewpoint implies a conflation between structure and function, has been pointed out by many authors (for a discussion see Van Poucke & Van de Vijver 2008 in press). Gene-reductionism subscribes to a one to one correspondence between structure and function (information), and implies that there is actually no longer a difference, no longer a possible relation, between the two. A one to one correspondence in the sense of Schrödinger involves a fixity strictly binding together information in the form of a code and matter. Gene reductionism has long been concentrating on the analysis of structure (sequence), and it is as such that it encountered in various ways points of impossibility, of limitation (cf. epi-genetics, systems biology, complexity, ...). It is precisely the (possibility of a) relation between structure and function that Rosen wishes to account for.

12. As a consequence, the opposition between objectivism and subjectivism stays completely intact. What Schrödinger writes in the epilogue about the I, as a conscious mind, is in that regard indicative: "There are, of course, elaborate ghost-stories fixed in our minds to hamper our acceptance of such simple recognition. E.g. it has been said that there is a tree there outside my window but I do not really see the tree. By some cunning device of which only the initial, relatively simple steps are itself explored, the real tree throws an image of itself into my physical consciousness, and that is what I perceive. If you stand by my side and look at the same tree, the latter manages to throw an image into your soul as well. I see my tree and you see

It is on this point that Rosen's account can be seen to make a difference. His work on living systems is indeed focused on articulating the metaphysical and epistemological implications of a viewpoint in which the idea of an independent material basis that would be relevant to account for living processes, is no longer accepted. If there is life, it means that there is context, perspective, from within which material particles can acquire a meaning.

In what follows, we propose to see whether and how Rosen's viewpoint opens the perspective of "What is Life" more radically, whether and how he is successful in articulating a metaphysics and an epistemology that genuinely reflect a Copernican reversal of perspective.

ROSEN'S QUESTION "WHAT IS LIFE?"

Schrödinger's thermodynamical hypothesis states that life is a form of order based in order, by which he means that it has the capacity to transform a material structure (an aperiodic crystal) into a functional organisation (a phenotype), a capacity that evades the decay to equilibrium. That two different types of order are at stake, is not really addressed by Schrödinger. In this regard, Rosen points out that such a process of transformation can only take place in *open systems*, which living systems intrinsically are. Beyond Schrödinger, who considered only the flow of energy and matter, Rosen wishes to focus on the influences from the environment that *cannot* be relevantly dealt with in terms of exchange of matter and energy. His main point is that, in order to deal with an open system, you need to step outside of it: "Openness means that even a complete understanding of internal parts of subsystems cannot, of itself, account for what happens when a system is open" (Rosen 2000, p. 18). A *context* is required to account for open systems, *not* just a return to smaller parts, as Schrödinger, and with him many others, continued to believe. To look for smaller parts in relation to living systems inevitably means to close them, which leads to an infinite regress that only stops with the ultimate, closed, context of the universe.¹³

The choice in favor of the context rather than parts in defining living systems, is for Rosen a matter of principle and has a sufficient justification in the simple

yours (remarkably like mine), and what the tree in itself is we do not know. For this extravagance Kant is responsible. In the order of ideas which regards consciousness as a *singulare tantum* it is conveniently replaced by the statement that there is obviously only one tree and all the image business is a ghost-story."

13. It is not our intention to suggest that the return to the smaller parts involves no context at all. The idea is rather that the context is fixed in an objectivistic or physicalistic way. There is one and only one context correlated with the physical particles: the universe, in which there is no life, no function, no meaning. In opposition to this, Rosen's idea is that function only has meaning in the context of an organisational inter-relatedness between parts that simply disappears from the moment it is considered as decomposable into a set of basic constituent components. Organisation is in this sense a *formal* or abstract concept that indicates an arbitrariness in the relation between the whole and the components: nothing in the components mandates a particular organization, and nothing in the organization mandates particular components. To Rosen, structure, or matter, are "closed" concepts (Rosen, 2001, p. 25). For an interdisciplinary discussion on closure, see Chandler & Van de Vijver (2000).

phenomenological observation that “there is life”. However, to give priority to context in dealing with living systems, requires, in respect of the Newtonian paradigm, a new idea of science, a new metaphysics and a new epistemology. Rosen is well aware of that fact and develops to that end his relational systems theory (cf. Rosen, 1978).¹⁴ Fundamental is the idea that a living, functional, organization cannot be accounted for in accordance with a Newtonian scheme. Instead of starting from objective parts and describing the behavior of systems in terms of recursive state sequences, organisms require a kind of decomposition that is basically the opposite: *first* focus on the organization, that is, throw away the idea of objectified and separable parts from which to start, and just stick to the organization. If you don’t give up the idea of an identifiable, intrinsically non-functional material basis, not only will you not be able to recover organization afterwards, you will have lost it in an irretrievable way.¹⁵

The point is indeed not to deny the possibility of arriving at identifiable or objectified parts—you can saw any tree into pieces—it is to look for the most adequate or relevant way of looking at parts and wholes in relation to the living. Rosen stresses here that there are *many* ways to decompose a system and that decomposition is a matter of choice and interest; a matter of perspective.¹⁶

A minimal thing to be expected from an epistemology then, is that it contributes to articulate the *conditionality* of the possible choices. In this regard, Rosen makes it clear, firstly, that the questioning activity of the “new” science has to be thought of in purely *differential* terms.¹⁷ It would indeed be contrary to the nature of living systems to consider that an answer can in itself be made to unambiguously correspond to a question, as a response to a stimulus.¹⁸ On the contrary, of the essence is the evolving relationality between questions and answers: questions and answers have a place in the context of a relational network, never in isolation. Secondly, Rosen consequently interprets the idea of conditionality in terms of *participant activity*. To ask a question, is to make an engaged

14. In this regard, Rosen was inspired by his mentor Nicolas Rashevsky who coined the term ‘relational biology’ for his mathematical biology. Rashevsky came to believe that an investigation of the parts of an organism (for instance, you can investigate how the heart works or how diffusion is involved in cell division) can never result in an idea of life as such. In a way, Robert Rosen extended the idea of a relational biology to the whole of science and in this he has given the notion of function, excluded in a Newtonian framework as being unscientific, a proper place (Rashevsky, 1954; Rosen, 1958, 1959, 1978, 1985, 1991).

15. This is what Bergson’s metaphor of the tree suggests: if you reduce a tree into sawdust, don’t hope to reconstruct it afterwards from these, well identified, material parts... This is the idea of the whole being more than the sum of the parts.

16. As a consequence, a model is never neutral but needs to be argued for in each context. Moreover, the question of choice does not seem to be simply settled in pragmatic terms, as the idea is to do justice to what is encountered at a certain phenomenal level, within certain contexts of experience.

17. Schrödinger (1967, p. 30) touches upon this idea when he discusses the chromosome as the seat of difference: “Difference of property, to my view, is really the fundamental concept rather than property itself, notwithstanding the apparent linguistic and logical contradiction of this statement.”

18. Merleau-Ponty (1942) discusses a similar issue when he points out that dynamically structured systems (biological, psychological, social), cannot be grasped in terms of simple stimulus-response relations.

movement at a certain level. To receive an answer, is to be moved and to be receptive to a possible change. Living systems continuously and endlessly explore this dialectics of questions and answers at various levels of organization. They can reach points of stability in this regard, but these are always indicative of the question as much as of the answer. *Neither* stability as frozen detachability, *nor* complete randomness in movement, is the appropriate conditionality for living systems. With Rosen, complexity is more than simply an informational issue, it refers in the first place to a particular type of conditionality!

That Rosen starts from this neither/nor space of conditionality can be illustrated on the basis of his theory of *components* (functional parts). The identification of components starts from a wilful, active intervention, which perturbs or mutilates an original system by taking away a part of it, leading to the creation of a new system (Rosen, 1991, p. 116). After the intervention, the behaviours of the two systems, the original one and the new one with some original part ablated, can be compared. "Any discrepancy between these behaviours defines the *function* of the removed part. Indeed, (...) *it provides us with another way of describing that part*, a new way of encoding that part into a formalism." (Ibidem, p. 116, italics original). Rosen will call any part of a system that can be assigned a function in the above sense a *component*.

Important here is that the function of a part can only be defined in a negative way. Or perhaps more correctly, it cannot be positively identified, in the sense that there is no possibility to define the function of a part by taking a system apart and attributing a certain role to the part, then called its function. Functions are not to be attributed to parts, they are the result of a comparison between two types of global behaviour of a system, one in which the part is present, the other in which the part is absent. The function of a component remains undefined by a single system. As a consequence, the definition of functional parts says as much about the parts as about the whole. More correctly it expresses a *difference*, based in the comparison between two behaviours, the meaning of which is ultimately decided about in terms of stabilisation within a global network.¹⁹ Moreover, this viewpoint on function implies that reduction becomes relative to the adequacy of fractionations, and is no longer conceived of in terms of a solid and independently defined material basis, that is then to be made convergent with a functional organization at the top (or vice versa).²⁰ The adequacy will depend, a.o., on the *idea* of a natural system, that comprises, according to Rosen (1985, p. 45, italics added), "*some aspect of the external world which we wish to study*". Science consists in selectively pulling aspects of the external world into the internal world, where it *constitutes*

19. Rosen (1991, p. 116) states the latter explicitly: "From a formal point of view, the concept of *function*, and its embodiment in terms of *components*, is a part of stability theory. Namely, we are comparing two different situations: an original unperturbed one, and a second one, arising as the perturbation of the first. The discrepancy defines the concept of *component*; the discrepancy between the two *behaviors* defines the *function* of the component."

20. Rosen exemplifies this idea through his viewpoint on modelling (1985, pp. 89-220; 1991, pp. 57-63). For a discussion, see a.o. Van Poucke & Van de Vijver (2008, in press).

a model. In this, there is no absolute guiding principle of how the ambient world is to be divided in systems.²¹

Rosen in this way offers a basically Kantian, or more generally transcendental viewpoint, subscribing to the idea that a (natural) thing is only knowable to the extent that a question is asked, obliging an as yet undetermined x to answer, and leading to a determination of something that is made to fit within the range of the question. Accordingly, he allows us to see that a change in perspective primarily consists in a *change of ideal moment*. Instead of looking for an independently defined, solid material basis that could as such explain the functionality of the living (reductionism), instead of looking for functionality at a top level and to consider material identification of the living as belonging to another domain (holism), the idea(l) is to explore and to entertain the “in between” of these two options. This basically amounts to acknowledge the neither/nor conditionality within which living systems are operating and to consider the interactive dynamics as the starting point on the basis of which all fixity (including objective knowledge) is to be negotiated. Seen from this angle, what a thing is, what a part is and what a whole, what is subjective and what objective, becomes fundamentally question-begging, and asks for an articulation of the conditionality related to possible choices and interests.

CONCLUSION

We started from the Kantian viewpoint on objectivity, on the basis of which it was argued that the impossibility to know the thing in itself leads to the acknowledgement that objectivity is a matter of negotiation between questions and answers. In the case of mechanical systems, this negotiation can be called successful in as far as the answering capacity of nature is reduced to a point of exactness, of universality and necessity. In the case of living systems, however, this space appears to be endlessly negotiable, obliging the questioning subject to continuously revisit the status and the conditioning capacity of his questioning activity. The confrontation with living systems pushes the knowing subject to see that processes of reflection are always also processes of self-reflection. In this regard, living systems, more than mechanical systems, lead to an awareness of the subjective conditionality as constitutive for objectivity.

This brought Kant in his third *Critique* to the consideration that living systems intrinsically require a “subjective supplement”, an “as if”, that consists in the idea that living beings are intrinsically purposive, expressing the fact that they acquire their

21. There is of course much more to say about Rosen’s account of functionality, but it is impossible to give it full credit in this limited space. Actually, the whole discussion on relational biology and models in *Life Itself* (2001) addresses the question of how to render the study of functionality possible. In order to do this, the right kind of organization and a proper graphical language need to be devised which are rich enough to express the necessary relations. Rosen, inspired by the four causes by Aristotle, considers finality in a general way as *what something entails*, and the function of a component is precisely what it entails. There are a lot of corollaries involved in this account, but we refer the interested reader specifically to chapter 5 of *Life Itself* (Rosen, 1991).

regularity from within, never from without, never from an external rule or law. The ideal moment out of which the living is “pulled” to comprehension, is to Kant the moment of its intrinsic purposive nature. Beyond this, however, the living brought Kant to a further awareness of the fact that *all* objectivity is “pulled” from within a subjective moment of idealization. In the case of mechanical systems, this aspect is often lost sight of, in as far as the fixity of the stabilisation is equated with the thing in itself. This leads to debates on objectivism versus subjectivism, or realism versus relativism, that are senseless from within a transcendental account of objectivity.

As Kant, Rosen acknowledges that living systems require a certain type of subjective conditionality that is radically different from the one required in the context of mechanical systems. To him also, the consideration that living systems are intrinsically different from mechanical systems, brought him to the acknowledgement of perspective as intrinsic in any kind of scientific knowledge. Moreover, Rosen makes it quite explicit that the subjective supplement has to be seen as a point of *exteriority*, of *otherness* with regard to the living dynamics. On the one hand, this indicates that an account in terms of objectified smaller parts is not sufficient and *cannot* be sufficient. On the other hand, it indicates a shift in focus: the basis of sufficiency lies now in the *experience* of the living—“*that there is life*”. The basis of necessity then lies in the capacities of interpretation and reflection, leading to a loss of immediacy, and to a mediated, contextual access to “*what is life*”. As could become clear with Kant and throughout the phenomenological tradition, there is indeed no way of unambiguously translating a sufficient experience into a necessary knowledge. At this point, Rosen correctly shows that open systems require a “supplement”, an addendum in relation to all possibility of objectified parts, that contains the tensed conditionality within which decisions are taken in terms of life and death, subjectivity and objectivity. From there on, the choice can be to develop an epistemology and a metaphysics that entertains the very specific tension related to this neither/nor conditionality: neither succumbing to the temptation of fixing the living dynamics through an objectivism, nor making it intrinsically relative to the contingent encounters to which it is subjected. Life as a form of suspension, continuously navigating in between objectivism and subjectivism. In this sense, the living might not just awaken an awareness of the meaning of objectivity in relation to subjectivity, it might also awaken an awareness of the precarious, abyssal, living and escaping status of subjectivity in its effort to constitute objectivity.

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