Acta Biotheor (2007) 55:47–71
DOI 10.1007/s10441-007-9010-0

Philosophy of Biology: About the Fossilization of Disciplines and Other Embryonic Thoughts

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Received: 20 March 2007 / Accepted: 9 April 2007 / Published online: 7 July 2007

Abstract This paper focuses on a running dispute between Werner Callebaut's naturalistic view and Filip Kolen and Gertrudis Van de Vijver's transcendentalist view on the nature of philosophy of biology and the relation of this discipline to biological sciences. It is argued that, despite differences in opinion, both positions agree that philosophy of biology's ultimate goal is to 'move' biology or at least be 'meaningful' to it. In order to make this goal clear and effective, more is needed than a polarizing debate which hardly touches upon biology. Therefore, a redirection in discussion is suggested towards a reflection on the possibilities of incorporating philosophy in interdisciplinary research, and on finding concrete research questions which are of interest both to the philosopher and to the biologist.

Keywords Philosophy of biology · Naturalism · Transcendentalism · David Hull · Experimental philosophy · Academic discipline

1 The Debate in Context

Let me recapitulate. In 2004, in a conference at the Free University of Amsterdam, Thomas Reydon and Sabina Leonelli invited Flemish and Dutch philosophers with a main research interest in biology to present their programmatic views on the future of Philosophy of Biology as an academic discipline (cf. Leonelli and Reydon 2005). This conference was initiated because in both geographical regions philosophical research on biology increasingly is seen (i) to become fragmented and isolated, (ii) to suffer from a general discounting of the intrinsic and social relevance of

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philosophical and historical perspectives on biological knowledge, and (iii) to experience a reduction in funding, directly threatening the subsistence of a professional philosophy of biology in these regions. Hence, motivations for keeping philosophy of biology alive were asked for *and* answered in terms of (i) the specific—or even unique—'nature' of this discipline, and (ii) its relation to and value for biology as its domain of study. In the publications resulting from this event (i.e. Callebaut 2005; Van de Vijver et al. 2005), an initial disagreement about this very nature appeared. With Filip Kolen and Gertrudis Van de Vijver (Ghent University, Belgium) defending a so-called *transcendental* view on philosophy of biology and Werner Callebaut (Konrad Lorenz Institute for Evolution and Cognition Research, Austria and Hasselt University, Belgium) in arms for a *naturalistic* philosophy of biology, the depth of this disagreement is further explored in this volume (see also the contribution of Kolen and Van de Vijver, and of Callebaut in this volume).

Although being involved as members of Van de Vijver's research group at Ghent University, Dani De Waele and myself felt a similar reluctance to 'join' this disagreement simply by choosing sides. Partially, and even though I am convinced both parties would like to see it otherwise, this is because the way in which the debate is held has a somewhat negative undertone obstructing room for a "constructive dialogue" (cf. Callebaut 2005, 93, note 1).[1] Also, we believe some viable ways of thinking about the central question of what philosophy of biology is (or, is not), may lie *beyond* this discrepancy. Initially, we planned to bundle our views on the matter into one solid opinion. This exercise would lead to a cross-pollination of thoughts coming from a younger researcher in philosophy of biology with an interest in interdisciplinary projects and the experimental details of epigenetics (i.e. myself) and a molecular geneticist by training *annex* senior researcher who switched from participant observer studies on knowledge processes in molecular laboratories, via theoretical and social studies of GMOs, to experiencing the activities of philosophers of science by a career long presence at our Department of Philosophy and worming herself through tons of philosophical

[1] Callebaut's criticism claiming that Van de Vijver et al.'s review article on complexity (2003)—dubbed the 'VVV paper' by Callebaut, with the second V standing for Van Speybroeck—omits certain research trajects is well-taken, even though our paper explicitly stated not to have the pretence to be exhaustive. If the referees and editor had pointed out major gaps or faults in the review, we would have been more than willing to take the advise seriously. Also, the VVV paper 'exemplifies' only part of the workings of the research group of Gertrudis Van de Vijver at Ghent University. For a more 'naturalistic' approach, I refer to my work on the conceptual history of epigenetics and its contemporary molecular form (cf. Van Speybroeck 2000; Van Speybroeck et al. 2002). During this research, there has been a close contact with molecular biologists *and* with the biological practice. This was translated in a lab experiment on epigenetic inheritance, which was conducted by a molecular biologist and myself. The experimental setup and its preliminary results were presented by the co-promotor of my doctoral thesis, Anna Depicker (Molecular Genetics at Ghent University), at the 2001 interdisciplinary conference on epigenetics (Het Pand, Ghent). I initiated and organized this conference in cooperation with Gertrudis Van de Vijver, Dani De Waele and Denis Thieffry (UMarseille). It gave the floor to top experts in epigenetics and to philosophers of biology. Both parties were explicitly asked to take distance from too strict jargons and to find common themes of discussion in order to explore the possibility of a dialogue between philosophers and biologists (cf. Jablonka et al. 2002; Van Speybroeck 2002). This particular setup was attributed a pioneer's role in the workshop on 'Epigenetics: Historical and Conceptual Perspectives' (9–11 February 2006, Berlin), organized by the Zentrum für Literaturforschung (i.c.w. Eva Jablonka and Ohad Parnes).

literature and lectures (i.e. Dani De Waele). Due to circumstances,[2] here I present a separate paper in which reference is made to my colleague's perception of the discussion via quotes. These quotes originate from an unpublished manuscript[3] she wrote in the context of this discussion (cf. De Waele 2007, unpublished) and are added because they hint at the possible confrontation this discussion may trigger when broadening the debate with the views and opinions of biologists.

In my contribution to the debate, it is spelled out how I received the debate initiated by Callebaut and my colleagues at Ghent University on 'naturalism versus transcendentalism'; where I find some 'inspiration' in it, where not. In reference to David Hull's paper on the status of philosophy of biology in the 1960s, I further reflect on the role of philosophy of biology either *as* or *not as* a (fossilized) academic discipline.

2 Where does the Debate on Naturalism Versus Transcendentalism Take Us?

The discussion between Werner Callebaut on the one hand and Filip Kolen and Gertrudis Van de Vijver on the other hand is spelled out in terms of a debate on naturalism *versus* transcendentalism.

In line with Niklas Luhmann, Callebaut defines the transcendental viewpoint as not allowing the results of inquiry to question the conditions of knowledge (Callebaut 2005, 97). Callebaut's criticism on this viewpoint exists in arguing that a Kantian stance no longer is fashionable and that philosophical thoughts on biology at least went through some transformations going from Immanuel Kant to Charles Darwin.[4] This position is somewhat provoked by Van de Vijver et al. (2005), who explicitly link transcendentalism to Kant. In Kolen and Van de Vijver (this vloume), however, this discussion is magnified into a discussion about starting points: when

[2] Also academic philosophers now and then 'literally' breed, which explains my physical absence at our Department for a couple of months, after which time pressure hindered our initial planning to co-write a Letter to the Editor. This very time pressure also explains that this letter contains 'embryonic' thoughts, as suggested in the title.

[3] Dani De Waele presented this manuscript as a Letter to the Editor in the context of the current discussion on the role of philosophy of biology. In this manuscript, De Waele adopted a personal and autobiographical writing style, illustrating how she experiences philosophy of biology and its goals and ambitions. The paper was not accepted for publication, based on the editorial argument that the chosen style draws not enough within the lines of a 'standard' publication, being too personal in content and format. This very decision opens two interesting side debates: (i) while Kolen and Van de Vijver (this volume) acknowledge that any philosophy also takes place within a perspective, perhaps this perspective need not only be theoretically characterized, but also sociologically. It may be interesting to investigate in how far the specific and personal (academic) experience one has with, for example, philosophy *and* biology can be isolated from the role(s) one attributes to philosophy of biology. And (ii), the editorial decision also opens a discussion about publication formats in philosophy. For example, does dictating philosophical writings into the very same publication formats handled by the scientific community, possibly hinder philosophy of science from having a sufficient autonomy or allowing a domain specific creativity? With regard to the theme of 'complexity', which seems to be a hot item in both biology and philosophy, one can ask why philosophy—being less attached to experimental standards—so little allows to play with alternative formats and ways to translate or talk about this complexity. In other words, could our discipline not gain from a revaluation of diversity in image and word?

[4] Which is a point similar to the one defended in my doctoral thesis, only then, the focus was on the views of Conrad H. Waddington instead of on Darwin's.

did philosophy of biology really commence? With Kant or Darwin? Or with—as they defend—the 'now'? Surely, the choice for either starting point reflects traces of the kind of philosophy one stands for. But such a discussion may lead away the focus from what both papers really try to set out: that is, (i) a *working space* for philosophy of biology, and, (ii) if something 'transcendental' has to be added, the *conditions* under which this working space can be made possible.

In the characterization of this space and its conditions of possibility, at least some ideas on how philosophy and biology relate to each other should appear. According to De Waele (2007, unpublished), both the naturalistic and the transcendental viewpoint as presented by their respective defenders mainly fail to make this point *concrete*. On the part of Callebaut, De Waele remarks the following:

> That Werner Callebaut makes an issue about the importance of Darwin's evolution theory for biology and thus for philosophy of biology, is very plausible, even nearly evident, for a biologist. […] (I would not solely push Darwin forward if I had to say something about whatever biological thinking.) The question remains 'What does he do with this proposition? Does this add anything to biology?' or does he only want to wake up those philosophers who forgot Darwin in their philosophy of biology? […] In other words: what does Werner Callebaut say additionally or differently compared to, for instance, evolutionary psychologists?

On the part of Kolen and Van de Vijver, De Waele states that:

> Their attempt or aspiration to "disturb" biology through philosophy might indeed be appreciated—for their courageous purpose—as a program point, it however does not come across as more than programmatically, and in this sense their proposition perturbs rather than disturbs: an epidermic perturbing (resting at the surface) rather than an organic disturbing (deeply penetrating). […] When transcendental philosophers, instead of naturalistic ones, look—more than for 'facts'—for 'ways of thinking' and for 'meaning', then I do not want anything better than hear which are these 'ways of thinking' and 'meanings' of/in biology. Unfortunately, I do not hear or read anything more than this program point being stressed. […] Please apply this Kantian thinking to some biological research subject, entwine this thinking with the handicraft thinking in biology. Put it to the test.

In sum, according to De Waele, in the ongoing discussion it is barely touched upon *how* philosophy of biology can become more meaningful to biology and in what this meaningfulness exists. Let us see if this is the case.

2.1 Callebaut's Naturalistic Agenda

Callebaut's naturalistic position places philosophy of biology within the context of science studies (which also include historical and social studies of biology) (cf. Callebaut 1993). The agenda is to provide "useful conceptual and methodological clarification" (Callebaut 2005, 99), and to bring "increased awareness of the social pressures that may affect scientific research and of the impact of scientific results on

individuals and society" (*ibidem*, 99). Another part of the agenda is "the enterprise of trying to understand philosophically how science works" (*ibidem*, 103). This agenda is general in that it is not specified towards whom these clarifications, awareness and understanding should be directed. But one thing Callebaut makes clear: it must be made sure that "our philosophical theories are—at least—compatible with science" (*ibidem*, 95). Even more, "philosophy (*of science*, that is) should be *shaped* by science" (*ibidem*, 95).

As a condition to this, Callebaut subscribes to the idea that philosophers should be deeply informed by the science they study. Although this argument seems common sense, it makes wonder what this 'being deeply informed' implies. Callebaut answers this question in terms of "*do*[*ing*] *justice* to the facts and theories of biological science, including the things that Darwin begun to teach us about the epistemological predicament imposed on us humans as products of biological evolution" (*ibidem*, 97, italics added). This choice of words may arouse some resistance, or at least a moment of reflection. When taking philosophy in its general interpretation of critical thinking, a call for 'a philosophy of justification' is not entirely evident. Indeed, is philosophy about doing justice to biological sciences? Or is it a reflection on what these sciences generally stand for and how they look at and think about biological phenomena in particular? Either way one answers these questions both a philosophy of justice and a philosophy of reflection can be linked to a belief in philosophy as acting more or less autonomously from the biological sciences. *In extremis*, in the former one can read the suggestion that biology somehow is 'in need' of an external justice and that philosophy can provide this. In the latter, one can read the suggestion that biology can be isolated and 'objectively' observed in a 'wet lab fashioned' way. This would make philosophy into something like the Science of Sciences. Is Callebaut hinting at any of these extremes? Surely not. His suggestion rather exists in *taking biological sciences seriously*, i.e. treating them with a genuine respect,[5] taking them as an important 'given'—as Kolen and Van de Vijver also argue—, however without neglecting how much a philosopher himself already has become to depend in his thinking on these very sciences. To a certain extent, any current philosopher already *is* informed by science, and he or she takes these sciences along in his or her reflective activities. This renders a rigid distinction between what we reflect upon and the basis or context from which this reflection departs problematic.

Callebaut recognizes this and chooses to stand close to biology in terms of a *co-operation* with biologists.[6] Unfortunately, he leaves unexplained which specific

[5] In that respect, it is advisable to interpret Callebaut's talk about biological *facts* and *data* in terms of a vocabulary on *models*. The biologists I met in the field of molecular biology and epigenetics are very much aware that their experimental data are "just" that: observations within a partially controlled setting, which do not automatically lead to strict and/or objective interpretations of what is 'really' going on (which would lead to a *fact*). As such, they prefer to call their interpretations of these data *models* (or *speculations*, depending on how much data and theoretical background can be placed within the interpretative scheme). This is contrary to the "plea for facts" that Kolen and Van de Vijver read into Callebaut's paper.

[6] Callebaut here refers to the meetings of the International Society for the History, Philosophy and Social Studies of Biology (ISHPSSB) at which biologists are welcomed. All good intentions not withstanding, it does remain unclear in how far this forum attracts not just those biologists already interested in and tolerant to philosophy in the way it currently presents itself.

tasks the philosopher can take up in such co-operations. Because of a difference in training, because of the 'fact' that philosophy and biology are considered and practically defined within academic boundaries, such co-operations are not gratuitous. They foremost rely on the possibility of a *dialogue* between both parties. One has to understand each other in writing, speech, working and gesture. Leaving aside what this implies for a biologist, the meaning and nature of such a dialogue can be altered by a philosopher depending on the readiness to step beyond disciplinary barriers. A philosopher willing to take biological courses, visit laboratories, speak with biologist during their practice, think out and conduct experiments, write papers with biologists, hence, *adopting smaller or larger pieces of the biological epistemic and practical culture* will stand in a dialogue with biologists which is *different* from the one entertained by philosophers reflecting in philosophical jargon on biological publications or on philosophical publications on biology only. This difference in itself however does not guarantee a *meaningful* dialogue that—in De Waele's terms—"touches" or "moves" biologists, while next to philosophers also biologists seem to expect this much from a discipline calling itself Philosophy of Biology. Quoting De Waele (2007, unpublished):

> My personal 'calibration' when listening to or reading such philosophical views is 'Does it touch me? Do I gain something? Can I do something with it? Does it help me in my experience and vision on biology, on science? Would my research be different with it, could it change my opinion on things and people?'. I also ask the question 'Does it help biology forward—or backward or sideways—or can it touch or influence in whatever way current biological research?'

Co-operation relies on finding a shared interest (which may be suggested by either party or by both parties). Callebaut suggests that the interests shared between philosophers and biologists are large[7] and that the 'new' philosophy of biology successfully plays in this intersection. But it remains unspecified in what this intersection currently exists and how this so-called philosophical 'success' should be interpreted.[8] A worldwide increase of active academic philosophers need not necessarily go with more philosophically inspired 'movement' in biology.

Here, Callebaut's optimism stands in contrast with his claim that the dialogue between philosophers and biologists is far less formed in molecular biology (cf. Callebaut 2005, 107, note 31), while this discipline does form a major branch in current biology. One can wonder why philosophy of biology here has relatively little or no impact, the more so when considering Callebaut's arguments that most of

[7] In his abstract, Callebaut (2005) claims that "it makes sense to define philosophy of biology more narrowly than the totality of intersecting concerns biologists and philosophers (let alone some scholars) might have". I return to this statement in section 3.5.

[8] Although Callebaut mentions that "the *reasons* for the success of the 'new' philosophy of biology remain poorly understood" (Callebaut 2005, 93, italics added), it is not clear in how far this success reaches out to Biology. Fact is that, as witnessed by the ISHPSSB, the "internal community" of Philosophers of Biology is steadily growing, even though the situation in the Dutch regions gives a somewhat different signal.

current philosophy of biology is supporting evolutionary theory *and* that movements to naturalize are dominant in most areas of contemporary philosophical research.

Perhaps we have not yet reached the core of the problem. Callebaut's paper however is inspiring for two reasons. First, despite the fact that under its general claims I am pretty much a naturalist myself, I feel some hesitation when Callebaut cites Alexander Rosenberg who argues that—next to the acknowledgement that philosophy of science is part and parcel of that science itself—"the questions philosophers deal with do not differ in kind from those scientists face. Some differ in generality and in urgency, but none is a question that scientists can ignore as irrelevant to their discipline and its agenda" (cf. Rosenberg in Callebaut 2005, 96). If disciplinary boundaries were not in between Philosophy and Science, I could still follow this line of thought. But these boundaries *do* exist and *are* heavily defended.[9] The core of the problem philosophy of biology faces may have to do with these boundaries, which urges me to readdress this theme later on (cf. section 3.3). Secondly, Callebaut's sketch of trends in philosophy of science presents the *naturalistic* version of philosophy—i.e. as standing in close cooperation with biology—as the most 'progressed' relationship between science and philosophy since the scientific revolution. Coming from *reflection* (instead of production) and *logical analysis of scientific language* (autonomous from empirical sciences), this naturalistic version is not just characterized by being informed and shaped by science's past and present activities. It also demonstrates an increased willingness to put claims literally to the test. This route appears to me as a most interesting and *concrete* route in our discussion on the role of philosophy of biology. I will elaborate on this theme under the heading of 'experimental philosophy' (cf. section 3.5). But first, let us turn to the transcendentalist stance.

2.2 Philosophy of Biology in Transcendental Terms

Kolen and Van de Vijver (in this volume) reject Luhmann's definition of transcendentalism as used by Callebaut. Transcendentalism, they claim, is not just about (i) what appears as meaningful to us, and the conditions under which such meaningfulness can exist. Foremost it is about (ii) how this meaningfulness and the conditions hereto are *related* to one another.

Having said that, the authors initially focus on the first claim and clarify the transcendentalist method in terms of "taking one step back". Kolen and Van de Vijver not so much elaborate on what such a philosophical stance would mean for biology. They want to work more fundamental and "take one step back" from the request itself to find a working space proper to philosophy of biology. They argue

[9] It is interesting to note that philosophers *as well as* biologists published articles on biology in Philosophy of Science journals. "Professional" philosophers displaced these biologists as soon as Philosophy of Science began to establish itself within disciplinary boundaries (cf. Byron, forthcoming). In combination with Callebaut's review of "great biologists [who] have doubled as philosophers reflecting on the epistemological or, more often, on the ethical aspects of their discipline" (Callebaut 2005, 98), it surely makes wonder if philosophers *tout court* have been too busy with establishing their disciplinary boundaries, in the meantime missing the interdisciplinary boat and now being forced to make up for this lost time.

that the *aim itself* to demarcate philosophy from science is already bound to a perspective on the matter, to a choice already made. For example, Callebaut's demarcation of philosophy in terms of naturalism from the very start *intends* to be meaningful to the sciences. Because of this intention, the authors claim, it cannot but inscribe itself into the scientific agenda of facts, progress, and objectivity. Any other philosophy—the so-called "serious alternatives"—is necessarily considered as "non-serious thinking" and as "superfluous". Naturalistic philosophy, so it is argued, goes together with "dogmatism", with the impossibility of critically reflecting on the perspective within which science establishes itself. This makes philosophy into nothing but a servant of science, leaving science undisturbed, and calling only for a "justification" of the philosophical practice against scientific standards.

In contrast, a transcendentalist stance is said to escape these philosophical dead ends. Elaborating on the second claim about the nature of a transcendentalist philosophy, a transcendental "analysis" even is said to uncover philosophy and science as necessarily making each other possible. That is, "scientific knowledge is the objective witness (as well as the factual condition of possibility) of a subjective perspective […], and *vice versa*, the subjective perspective is the necessary condition of possibility of the meaning of scientific knowledge". According to the authors, this uncovering has a destabilizing or disturbing potential. Also, as "in biological research, a multiplicity of perspectives are involved, at various levels and in various degrees of detail, and the biologist is quite subtle in dealing with them", it is "beyond doubt that the biologist might gain from a detailed [philosophical] analysis of those perspectives". In sum, in this transcendentalism, a strong ambition and optimism shines through: it is not dogmatic and more philosophical than naturalism, yet it can disturb science and be of interest (thus also of meaning!) to the scientist.

Let us try to grasp what this implies. Foremost, the message seems somewhat troubled because the coherence in Kolen and Van de Vijver's transcendentalist agenda is not entirely spelled out. On the one hand, philosophy of science and science are stressed as "co-determinative and co-constitutive". But on the other hand, the authors cling on to a philosophical autonomy by *not* questioning the possibility of philosophy (of biology) as a separate discipline, *and* by appropriating the freedom to reflect "without *a priori* strings attached".[10] One can wonder in how far this *überhaupt* is possible. In how far can a philosopher shed off the entrenchment with the kind of scientific thinking so abundantly present in Western society? Also, the authors take that the question itself of what philosophy of biology is only evokes a biased (i.e. scientific) justification. But at the same time, their viewpoint likewise *answers* this question in terms of an alternative *better* than naturalism because of its being *more true* to the philosophical nature or "the restless wandering of reason". Finally, the naturalistic intention of being meaningful to the sciences is interpreted in terms of a servantship to science, while a transcendentalist

[10] Kolen and Van de Vijver claim that it is "worthwhile to pursue the search for conditionality, and this without *a priori* strings attached. It is philosophically speaking a missed opportunity, to say the least, to cut off research in an arbitrary and *a priori* way, as seems to happen in the naturalistic approach". This sounds like a metaphysical ideal, lying much closer to the God-like and objective stance they claim no longer to be engaged in.

philosophy itself aims to be of meaning—in a "destabilizing" or "disturbing" manner—to the sciences. This pushes the so-called philosophical alternatives to naturalism in the corner of negative criticism, i.e. if science somehow is not negatively criticised, corrected, urged to leave the present routes, philosophy is not doing its job well.[11] As such, philosophy can be but the antipode of science, the so-called counterweight to keep science sound. Still, philosophy here is as much determined by science as the transcendentalists blame the naturalists, because it is about what science is 'negating' or neglecting. The philosophical agenda thus also evolves in parallel with the scientific agenda. Measurements for 'success' here become easy. If the scientist declares transcendental philosophical thoughts as nonsense, it probably is suggested that he is defensive and that philosophy does indeed disturb (even though the scientist may still be considered 'unwilling' or 'incapable' to revert this disturbance into something constructive). If the scientist agrees with the transcendentalist, he must recognize his superior in philosophy.

Of course, these confusions may be entirely due to my misunderstanding. So let us assume that a reflection without *a priori* strings attached is possible after all. What then is the upshot of a transcendental view on science? Basically, and next to its method of taking steps back, it exists in ("nothing else—and nothing more than") the acknowledgement that science finds its meaning within a specific (metaphysical) perspective. The transcendentalist agenda then aims to investigate how science—as it is, as a "given"—can be possible. I.e. it aims to uncover the conditions within which scientific knowledge or specific scientific questions gain meaning. Under these general headings, I have no argument against it. Still, it remains unanswered in how far such a research agenda is possible or can be made concrete, and in what the accompanied "disturbing potential" exists. The debate thus goes further.

2.3 The Lure of Giving Controversy a Hand

Although the implications for philosophy of biology's practice indeed remain vague, so far it has been argued that the *general* core of Callebaut's and Kolen and Van de Vijver's paper is not entirely different and contains 'common' and 'sense' elements. Yet in Kolen and Van de Vijver's paper, the initial disagreement with Callebaut seems to have changed into an insurmountable dichotomy. Perhaps this is due to what can be called 'the lure of giving controversy a hand'.[12] Although this

[11] From its inception onwards, scientists have considered philosophy of science as an arrogant, if not irrelevant, discipline. Hull (2000) stressed this by claiming that philosophers put themselves on a *meta-level*, i.e. the so-called *critical* level from which the object of study is dissected, screened and evaluated. This 'allowed' philosophers to abstract away the details of any scientific endeavour and to define *what* science is. In search for the so-called *demarcation criterion*, they hoped not only to distinguish the scientific from the non-scientific by studying its methods and theories, but also to *redirect* inconsistencies and to *steer* the scientific course without much dictate or interference from the scientist himself.

[12] This expression is adaptated from John Dupré's paper entitled "The lure of the simplistic", in which the quest for a simple and unified worldview is attacked because it distorts an understanding of complex phenomena. It refers to evolutionary theory as a fundamental *perspective* present in the scientific world view, and argues how evolution needs to be complemented with other perspectives for an understanding of biology in general, and human behaviour in particular. Dupré pays attention to a shift in views of science from universal laws to models locally suited to specific phenomena (Dupré 2002).

may sometimes help in uncovering the essence of a debate, it also can make a dialogue less easy. For example, in order to make sure that the alleged difference with Callebaut's stance exists, Kolen and Van de Vijver (at times provoked by Callebaut) seem to push both naturalism and transcendentalism to their most extreme form. By doing so, the danger lurks of creating a dichotomy that does little for the discussion at stake. In order to 'see' this—and under penalty of making philosophy into a *regressum ad infinitum* of reflections on reflections—let us do the transcendental exercise and take one step back from some of the remaining claims (i) in favour of a transcendental philosophy of biology and against a naturalistic philosophy, (ii) about how science is portrayed, or (iii) about what a questioning of philosophy of biology is about.

For example, what to think about Kolen and Van de Vijver's claim that the question of what philosophy of biology can or should be is not "innocent" because it defines the practice of a philosopher within "*a priori*, straightforwardly defined barriers that are, once adopted, beyond discussion"? The current discussion indeed need not be about finding a universal definition or a Central Dogma of philosophy of biology. If the many studies of the gene-concept (to name but one thing) taught us something, it is that definitions hardly ever are rigid. Rather, they are temporarily stable expressions reflecting the way we look at the world (or our own discipline) at that time.[13] This 'change of definition'[14] can be witnessed in evolving disciplines such as the sciences, but also in philosophy of biology. One thus can assume that philosophy of biology has not been entirely fossilized; otherwise it would not be able to look for a reorientation of its own activities. The question about where to go with philosophy of biology would not even emerge. As such, the question itself need not be interpreted in negative terms, as Kolen and Van de Vijver choose to do.

Although Callebaut does delimit the philosophical activity (but so do Kolen and Van de Vijver), there is no argument to claim that his position is all about shattering the possibility of self-reflection in philosophy and about putting the entire debate beyond discussion. This is illustrated in Callebaut's section on the history of philosophy. Callebaut seems not to be looking for 'the' philosophy of biology (although he suggests this much in the title of his 2005 paper), but for a form of philosophy of biology that somehow succeeds in doing something for current (evolutionary) biology. In this, accountancy need not be necessarily given to the sciences alone, but perhaps also to society at large. Philosophy does not stand outside society. The request to reflect on the kind of activities present or possible in philosophy of biology thus is legitimate in order to defend a continued academic attention and the obtainment of future grants. If philosophy of biology is portraying itself as an academic discipline, it necessarily is some form of—what Kolen and Van de Vijver pejoratively call—"fieldwork". It is the (kind of) quality of this fieldwork that is at stake here.

Self-reflection should be possible. However, how far should one take it ? If it is not about finding a Central Dogma of philosophy of biology, perhaps it is about "an

[13] Definitions often result from a reflective activity singling out regularities in a dynamic situation (cf. Van Speybroeck et al. 2007).

[14] Regarding changes in definitions, see Jablonka and Lamb (2002) on the concept of epigenetics.

ongoing questioning of its own definition"? Kolen and Van de Vijver, who make this activity the heart of philosophy and claim it as an important criterion to distinguish philosophy from the sciences, suggest this much. However, does "an ongoing questioning of its own definition" leave room to look at anything or anywhere else but the 'own tower'? Under this condition, is it possible for philosophy of biology to be about biology at all? Let alone about critically destabilizing or inspiring biology, instead of merely annoying biologists (cf. De Waele, earlier quotes)? In this regard, the interpretation of science as 'factual' instead of 'model-like' may be indicative. It may be worthwhile for Kolen and Van de Vijver to remake their case not by interpreting Darwinism as a 'fact', like they currently stress, but as a historically originated and currently still fertile perspective, as most biologists—and also many philosophers like Callebaut—see it. This just to say that the transcendental exercise of taking biology as 'a given' in itself already is highly problematic, and practically impossible if philosophy holds on too much to its autonomy or sovereignty.

In sum, both Callebaut and Kolen and Van de Vijver do not question that philosophy and science are distinguished disciplines. It is the form of the relationship these disciplines can entertain that is interpreted differently. Callebaut manoeuvres between philosophy as 'reaching out to the sciences' and 'being in line with science'. Kolen and Van de Vijver want a philosophy of ongoing questioning, of uncovering implicit perspectives, assuming that these will free science from the dogmas it is entrapped in. In the end, both parties want to 'move' biology. But what is the result? In the current discussion, transcendentalists claim naturalists will not succeed because they only affirm the dogma scientists are already engaged in. And *vice versa*, naturalists claim transcendentalists will not succeed because their philosophy is not about science, rather *against* science or about a self-contained philosophy in a language strange to the scientist. Seen like this, the discussion is anything but fertile.

2.4 Cooling Down the Debate

Kolen and Van de Vijver invite the naturalistic philosopher to enter the transcendental perspective and to acknowledge that naturalism (just as transcendentalism, for that matter) is a perspective, a point of view. It is hard to imagine that Callebaut was not already aware of this. But then, if naturalism does acknowledge itself as a viewpoint on philosophy and on biology, it surely cannot be as dogmatic as portrayed by our transcendentalists. The naturalistic stance *does* leave aspects of biological theory unquestioned, *but* with reason. Callebaut, for example, goes with the flow of biological evolution as described by Darwin. This however does not say that naturalism accepts just any kind of formulation of evolutionary theory. Within the confines of evolutionary thinking, there is 'room' left on how to fill in such a theory and which shades in thinking about life can be involved. Personally, I go with the flow of molecular biology (which today is interwoven with other biosciences such as genetics and biochemistry; with the advent of Systems Biology, also a growing attention for bioinformatics and the integration of the currently existing -omics is explored, cf. Kitano 2001; Ge et al. 2003). I consider the study of

molecular processes and networks present 'in, around and in between' living organisms an interesting and workable (i.e. experimentally feasible) input to the epistemic model of biological life. However, does this say that I do not realize that talking in terms of 'the molecular level'—which often is the case—already suggests a particular view which co-determines any 'model of life', or that explanations at one level may not necessarily *be* or *feel as* sufficient explanations at another level (take f. ex. the mind-body problem), or that also at this molecular level one can move in between a gene-centred and a complex view of life? The idea of 'dogmatism' thus rather is relative than absolute. In the long run, dogmas also prove to be *means* to explore, even to exhaust, a specific view on life.[15] Perhaps here it is sound to talk in terms of *trade-offs* or *intercessions* instead of *dogma*.[16] We want to say something about biological life and the way it is studied; hence we (more or less considerably, more or less arbitrary in relation to the grand picture of life) choose a starting-point or a perspective in which to work. As history thought us on several occasions, if these starting-points are not well chosen (leading to too many 'aberrant' phenomena) or somehow get exhausted, redirections take place. Remember Crick himself, talking about his Central Dogma: "It may be complete nonsense, or it may be the heart of the matter. Only time will show" (Crick 1958, 160).[17]

[15] Dogmas focus one's thinking. They allow economizing our time and efforts in not constantly reinventing the wheel. They also act to eliminate or suppress alternative habits of thought (cf. Steele et al. 1998). For example, the past decades, Francis Crick's original stress on "the central biochemical importance of proteins" (Crick 1958: 152) was kept down in favour of "the dominating biological role of genes (…) and the genetic linearity within the functional gene" (Crick 1958: 152). The focus on the causal direction from DNA to protein long prevented speculations on passages from RNA to DNA, from protein to DNA, etc. According to Morange (1998), this had not much to do with the biochemical data that were available to Crick and his contemporaries, but with the traditions inherited from genetics and neo-Darwinism. Here, the Central Dogma found its place as a principle of evolutionary theory and was placed in the context of natural selection, random genetic mutations and the impossibility to cross the Weismannian Barrier between soma and germ. This created a climate almost in advance disinterested in ideas on environments changing proteins, and proteins influencing DNA. Such ideas also have been called *neo-Lamarckian* (Steele et al. 1998), but they can also be seen as originally embryological (cf. Gilbert 1996), a theme which today—in the context of molecular epigenetics—has regained attention from within biology itself (cf. Van Speybroeck 2000).

[16] Crick reports in Judson's *The Eight Day of Creation* (1979) that, in retrospect, the term 'dogma' appeared not well chosen because it made forget the intention to let it serve as a heuristic tool in order to develop new hypotheses on gene expression.

[17] It is illuminating to consult Crick's original paper, describing both the Sequence Hypothesis and the Central Dogma as speculative and as "an instructive exercise to attempt to build a useful theory without using them" (Crick 1958: 152). Crick saw both speculations as tools in "getting to grips with these very complex problems [i.e. of protein synthesis and gene action, which was at that time under rapid development]" (*ibidem*). The original intention of the Dogma was to present a general explanatory framework ascribing a functional role to DNA in terms of an agent controlling (and Crick adds, "not necessarily directly") the synthesis of amino acid sequences. It was not about diminishing the role of proteins in biological systems or about extrapolating the 'control' of DNA to the whole of an organismic being. Crick also realized that he *presupposed* the possibility to separate protein synthesis (in terms of a polypeptide chain) from protein folding (which is considered as a self-organisational function of the order of the amino acids). The Dogma thus modeled a link between nucleotide *sequences* and amino acid *sequences*, without explicitly reducing protein characteristics to DNA. Neither was the Dogma about the isolation of DNA function or protein synthesis from their cellular context. Crick openly discussed that there was no known case in nature in which protein synthesis proper occurs outside cells. He even

In the next decades, for example, it will be fascinating to see how biologists deal with the 'new world' of proteomics and other -omics and what this will have in store for the current still very present way of thinking in terms of 'genes'. This just to say that not just philosophers, but surely biologists, are aware of how different perspectives make different stories, that perspectives may change, and that from time to time it is useful to 'take a step back' and ask if the chosen perspective is not hindering our thinking too much (this, for example, is happening in the transition from genetic to epigenetic thinking). This awareness need not stand in the way of exploring the possible models in a given perspective, nor of changing directions. We thus end up with an intercession between 'being beware of dogmatism so that also non-standard questions can arise' and 'sticking to starting points so that at least some questions can be answered'. This can be interpreted as a trade-off, i.e. the ideal or principle of totally excluding biases and dogma is traded in favour of a concrete choice (although temporal, and balancing between accidentalness and consideration) of starting points that at least allow to ask 'some' questions and answer some of them in terms of models. Realizing this however is not exclusive to philosophy; it is also part of science. So, besides spelling out this known message, what can philosophy offer? In what kind of activity can it exist?

3 Embryonic Steps Beyond Naturalism *Versus* Transcendentalism

3.1 Philosophy as a Kind of Activity

A common philosophical exercise exists in digging up ancient authors, squeeze them into a modern timeframe that these authors never experienced or at most vaguely anticipated, and see if somehow they can help resolve current problems. As long as the author's ideas somehow can be 'translated' into a modern terminology, such historical escapades may inspire to tackle the debate, or at least to highlight either historically marginal-but-important or dominant-thus-important ways of

Footnote 17 continued
specified the question of *context* by asking whether protein synthesis occurs in the nucleus, the cytoplasm, or in both. He also considered experimental support for the idea that RNA synthesis is in need of a combination of nucleotides *and* amino acids, allowing speculations on RNA-RNA interactions, RNA-DNA interactions and translations of proteins directly from DNA (Thieffry 1998). Crick even argued that "an essential feature of [his] argument [is that] in biology proteins are uniquely important" and that "once the central and unique role of proteins is admitted there seems little point in genes doing anything else" (Crick 1958: 138–139). In sum, Crick's Dogma appears rather flexible. Still, despite Crick's continued urge for caution when interpreting the Dogma (Crick 1970, 561–563), a "symbol" of gene-centrism and a touchstone for biology was distilled out of it (cf. Torres 1999). Crick *did* visually present the Dogma in an explicit "oversimplified" (Crick 1958: 154) form. This had to do with the paper being written "for the biologist rather than the biochemist, the general reader rather than the specialist" (Crick 1958: 138). It also demonstrates Crick's personal conviction that protein synthesis—based on a combination of "the magic twenty amino acids found universally in proteins" (Crick 1958: 140)—was a rather uniform and simple process, which led him to conclude that "in the protein molecule Nature has devised a unique instrument in which an underlying simplicity is used to express great subtlety and versatility" (Crick 1958: 139).

thinking in order to gain one's point.[18] For what it is worth, let us call in Aristotle as old-time favourite because he came up with a typology of activities [*energeíai*] (cf. Aristotle 1905). Perhaps this can inspire to figure out what kind of activity philosophy is or can be about.

Aristotle's typology is linked to respective natural potentialities of the soul [*dynámeis*]. Roughly speaking, it consists of three types. First, there is *theoria* or *theorein* with its potential *sophia* (or wisdom, i.e. the virtuous combination of *noûs* or intuitive intellect and *epistémé* or logically demonstrative knowledge of things that have unvarying originative causes). *Theoria* stands for a contemplative comprehension of the eternal truth uninfluenced by practical purposes or interests. It leads to knowledge of universal, unvarying and necessary, natural things. As a result, deliberations are superfluous because they cannot lead to changes. And one can only speak in terms of true or false. Secondly, there is *praxis* with its potential *phrónésis* (prudence, practical wisdom or moral action). It denotes intentional actions involving people and finding their ends in themselves. *Praxis* relies on *doxa*, judgements or choices that combine right desire with right reason. Last, and according to Aristotle definitely least, there is *poiésis* (making) with its potential *téchné* (production). It refers to activities leading to things, i.e. external products or effects. In *poiésis*, the ends served by the product are typically those of the producer. Knowledge objects of both *praxis* and *poiésis* are temporal, contingent, contextual, thus arising uniquely from temporally varying causes. Here, deliberations are in order, and different courses of action can be taken under consideration.

This Aristotelian typology equally reflects a value hierarchy, with *theoria* on top. In terms of human representatives, philosophers carry more status than politician or technologists and poets. Aristotle attributed *praxis* a servant role in making possible the performance of *theoria*. *Poiésis* was given even less importance.[19] *Theoria* was what mattered, literally thriving on luxury, on the support of a wealthy society. There was no necessity to take this society into account, as this would turn philosophy too much into a servant of society and bring in external ends. This would stand in contradiction with the 'pure' status of philosophy. A perfect validation thus for the existence *and* maintenance of 'ivory tower' philosophy.

Could it be that traces of this old scheme shine through in the current discussion on the role of Philosophy of Biology? It is interesting to note that Kant insisted on the distinction between theoretical and practical reason, and thus somehow preserved the concept of Aristotelian *theoria*. Perhaps here the gap between Western philosophy and science finds it origin. That is, leaving aside the idea of

[18] Although they are present, such historical detours less 'live' in the biological community. While in biology new technologies, data, hypotheses, models and insights push themselves into a prominent role, one may wonder if this 'neo-neo-classicism' or 'keeping alive' of historical predecessors in philosophy of biology is not already a sign on the wall. A sign not so much of identity, but a lack of identity, a lack of novel insights, a living by virtue of what others have claimed, a leaning on authorities. In this regard, the current 'identity crisis' may plays less regionally than the original set-up of Reydon and Leonelli's conference suggests. It also makes one wonder if the relation between philosophy and history as academic disciplines is as much troubled as the relation between philosophy and biology.

[19] Which has much to do with the presence of slavery in the Greek society Aristotle described and defended (cf. Aristotle 1981).

eternal or objective truth, is philosophy not often about contemplation without attention for practical purposes or challenges, for technological possibilities and limitations? With regard to biology, is it not about the belief that a living system (be it a cell, an organism, a population…) *can* be grasped without all the detailed biochemical, molecular, physiological… stuff; that a conceptual comprehension of living systems *is* possible in abstraction of its materiality? That complexity somehow has a simple core? Perhaps philosophers have focused too exclusively on the conceptual stuff, underestimating how also perspectives and concepts are partly shaped by the practices they make possible. Perhaps philosophers are taking too much for granted that what it has to say—often in abstraction of much in biology—is of relevance. I quote De Waele:

> I remain surprised how much philosophers are mesmerized ('biofascinated') by science; how some are opposed to (react against) science, how they look down on the (other?) way of thinking of scientists as being inexistent, insufficiently reflective, too much embedded into practice.

And:

> [Philosophers of biology] their critique has an air (or gives the impression) of omniscience, knowing better, condescension, arrogance, haughtiness, vanity: as if biology and science are burdened with all the sins of the world, as if biology and science are Evil, not of 'human nature'. As if only (this kind of) philosophy represents the True Thinking and, moreover, is harmless, does not dirty its hands. What would this philosophy be without biology, without science, without its criticism thereupon?

Science, in general, and biology, in particular, has moved beyond Aristotle's typology. Somewhat like Aristotelian philosophers, today's scientists still devote their lives (or careers) to acquiring knowledge (and yes, to impressive publication lists, management of research groups and funding resources), but they do so by stimulating dynamic and specific ties between conceptual schemes, theoretical research, experimental methods and technological means (cf. Keitsch 2006). In other words, the space between the Aristotelian activities no longer is vacuum. Aristotle somehow must have realized the importance of this. For example, his *De Generatione Animalium* (Aristotle 1943), describing his views on embryology of animals, is one large illustration of how his own observations and manipulations of the workings of nature are interwoven with his view on the 'matter'. Here, Aristotle's 'natural philosophy' comes of age: contemplative, but also experimental, questioning nature in mind and matter. In such a scheme, it is much harder for philosophy to remain inside the own tower and stand isolated from a request to reflect on how it sees itself situated in society in general and the academic world in particular.

3.2 Revisiting David Hull's "What Philosophy of Biology is not"

There are more recent routes leading to a discussion on what philosophy can be about. The title of Callebaut's 2005 paper, for example, refers to the devastating

criticism on philosophy of biology made by David Hull.[20] In 1969,[21] Hull formulated a charge against the kind of philosophical research done and against the attitude with which philosophers of biology profiled themselves at that time. Hull not only described how philosophy of biology and its activities "irritate" biologists (cf. Hull 1969, 255), as today equally is illustrated in De Waele's manuscript (see quotes above). He also charged philosophers of taking the biological sciences and their respective experimental and epistemic cultures too light. He claimed them to have only a superficial understanding of biology, not caring for 'details'. Hull summarised this—in reference to philosophy of physics—in the quick-witted sentence that "the differences between mesons and pions are important. The differences between moths and butterflies apparently are not" (Hull 1969, 244). But the criticism goes deeper. Philosophers neglected that scientific theories are "under constant revision and reexamination" (Hull 1969, 255). They neglected the existence of more or less (un)orthodox views in biology (cf. Hull 1969, 257, note 38). They mistook workable models for dogmatism. Hence, the easiness with which philosophers could present their 'proper' views as innovating and critical.

In the context of the current debate, it is striking to experience how contemporary this paper still is and how familiar the criticism sounds. This makes wonder in how far the philosophical community has taken Hull's message at heart in the past 38 years. Another actual point is that it is still the philosopher who decides which philosophical themes are significant or insignificant in biology, often by *omitting* or *abstracting*. The notion of *abstraction* surely plays a role in current philosophy of biology. While accusing biologists of being reductionist (either in terms of gene-centrism or molecular reductionism), philosophers seem to continue their search for the 'true essence' of causality, laws, and natural selection. They do so by 'cutting to the core', 'abstracting away' the details, and 'uncovering' the essence in all the muddy biological complexity. In the meantime, biology is moving on from a strong gene-centred thinking to a more complex and epigenetic view on living organisms, taking the complexity of biological systems as seriously as currently is possible. Perhaps it is time for philosophers to do so as well. Also in philosophical *analyses*, these supposed 'details' might very well be 'essential' in making the difference, in thinking about living organisms (we might try talk about philosophical *synthesis*, integrating some complexity in our own jargon). In a similar vein, also 'matter does matter', and is an 'essential' part of modern biology. The challenge to deal in creative terms with this material complexity thus also counts for a philosophy of biology.

Hull argued that the hidden agenda of many philosophers is to defend human's special position in evolution. Hence, the stubborn presence in philosophical literature of topics such as *emergence* and *consciousness* and the accompanying

[20] For a review and comments on Hull's work, see the special issue of *Biology and Philosophy* (cf. Griffiths 2000a, b) in dedication of Hull's retirement as Dressler Professor of the Humanities at Northwesters University in July 2000. See also Hull (1974, 1998).

[21] Hull was about 34 at the time, the same age I currently have. Perhaps, such papers mirror a crisis some researchers in philosophy of biology bear down upon in their early postdoctoral careers. Of course, Hull's paper may also reflect the '1960s', which in both the US and Europe stood for strong criticism on society and authorities.

claims that biology fails to fully explain these concepts. This 'religious' flair seems less present in current philosophy, but the argument that philosophers put little effort in explaining why their core topics or newly introduced concepts matter so much to them or to biological theory or practice may still ring a bell. A more thorough reflection on the usefulness or importance of philosophical research projects—beforehand *and* while projects are running—may help to provide more transparency and a better interpretation of what philosophers are doing or are engaged in, and how this is supposed to relate to biology.

3.3 What's in a Discipline?

Remarkably, also in Hull's paper, one thing remains unquestioned. That is the relevance of philosophy of biology as a *separate academic discipline*. Nonetheless, this relevance comes under discussion when Hull describes how biologists themselves succeed in solving philosophical questions.[22] The fact that, *when necessary*, biologists themselves *do* ask philosophical question and *are* capable of solving them jeopardizes the whole idea that philosophy only comes with philosophical training and knowledge of the accompanied 'thinking tools'. It is all the more striking then that, in the current discussion on naturalism *versus* transcendentalism, philosophy continues to be interpreted as Philosophy with capital 'P'. This, of course, reflects a historically grown situation wherein most universities present philosophy as a self-contained discipline with an own study curriculum, jargon, research projects, more or less isolated research groups and publications in more or less widespread journals. However, is such a context appropriate if philosophy wants to connect to biology?

Currently, much seems to depend on the personal initiatives and research projects of the philosopher and the readiness of the biologists to take an interest in these projects. In a later paper (Hull 2000), Hull's reference to the growing degree of philosophers collaborating and publishing with biologists or starting off on interdisciplinary projects, at least indicates that via an orientation of philosophical parlance towards biology and a focus across disciplinary boundaries a connection *can* become possible. Here, philosophy may find itself in the role of opening interdisciplinary spaces, i.e. with philosophy as glue between diverse research topics and research groups that do not easily find one another under the current academic circumstances.[23] Whether this eventually will lead from multidisciplinarity (in which disciplinary perspectives are juxtaposed) to interdisciplinarity (in which

[22] See Hull (1969, 260) on how biologists themselves worked out the differences between individuals, classes, etc.

[23] Currently, at Ghent University, an interdisciplinary oriented project is running on postgenomic complexity and how this plays in philosophy, molecular biology (Systems Biology), agricultural biology and communication sciences. The project has been initiated by Dani De Waele and myself, and stands under promotorship of Gertrudis Van de Vijver. It consists of four 'classical' doctoral researches in the respective domains. But it also engages itself to explore research topics 'shared' between several doctorandi. The exercise is difficult, but also challenging. As a result of the combination of these various disciplinary viewpoints and accents, the first interdisciplinary results begin to emerge (cf. Van Speybroeck et al. 2005; Devos et al. 2006; Devos et al. forthcoming). These may not be the most spectacular results, but at least they reflect a shared basis of interest in topics and research questions.

specific disciplinary data, methods, tools, concepts and/or theories are integrated in order to obtain a common understanding) or to transdisciplinarity (in which the limited scope of disciplinary world views is transcended) remains to be seen.

One could also ask how strictly the disciplinary boundary between philosophy of biology and biology should be supported. Today, biology goes through major disciplinary changes, slowly but steadily shifting towards a situation in which biological researchers are not just trained in biological sciences, but also in bioinformatics and mathematical modelling, and on a daily basis work in interdisciplinary teams; a situation also in which future biologists often are directed—via options in the master's curricula—towards either education or experimental research. First, perhaps now we can stand up for a more intense anchoring of philosophy in biological research departments, with philosophers and (senior) scientists working together (i) to integrate current views in reference to past periods (which could run in co-operation with historians of science), (ii) to present their findings to scientific and non-scientific publics (for example, in co-operation with researchers in communication and social sciences),[24] (iii) to make pertinent and updated states of the art of existing challenges or hypotheses within or still out of reach, and the conceptual, theoretical, experimental, technological,… reasons hereto (in co-operation with the involved biological subdisciplines), or (iv) to contribute to the construction of new hypotheses or new research angles by asking questions[25] that are broad enough to link different research domains and specific enough to make sense to the experimental practice of the biologist (in co-operation with a specific research team). And second, philosophy of biology could be more present in the bachelor training of biologists. Not as a curiosum or a course to score some easy points, but as a course that pays specific and explicit attention to (i) how philosophy and biology are intertwined, (ii) how models function as means to deal with biological complexity, (iii) how and which conceptual schemes are used in biology, (iv) the way in which some of these schemes are interpreted or misinterpreted or even abused by non-biologists, etc. In the long run, these options

[24] Acknowledging biological complexity is one thing, talking about it without either bringing the message too simple or too detailed (so that one loses the message) appears difficult. As I witnessed at a recent conference on 'chromatin dynamics and epigenetics' in Liège (Belgian Society for Developmental and Cell Biology), this difficulty plays in the biosciences: f. ex. 'plant epigeneticist' could not easily follow 'animal epigeneticist', research on chromatin dynamics is related to methylation, but is different from research on (trans)gene silencing, etc. which made the possibility of a fluent dialogue a real challenge. Perhaps here, research on the possibilities and feasibility of 'story telling in science' is of interest, i.e. the didactic weighing against each other of what one wants to communicate, to which audience it is addressed, in which general framework the message is introduced, to which depth the message can be explored, etc., so that the message presents itself as a story which can be followed more easily.

[25] Cf. "A system of philosophical concepts is not (…) a ready-made set of pigeonholes. (…) it is something much more important, namely a way of thought. One of the best known half truths about science is that asking the questions is more difficult than answering them. Whether this is an exaggeration or not, *asking questions is at least one of the essential phases of scientific activity*. It is in this connection with this function that philosophy is most important. A new question implies a new context, that is to say, the attempt to fit a phenomenon into a system which has not previously been applied to it" (Waddington 1947: 147, italics added). Do mind that Waddington stresses asking questions as *part of scientific activity*, a part that is often learned by trade.

may enhance chances for philosophy to lose the loaded connotations it currently has in biology, to better understand what is happening in biology, and to fulfil its own ambition of meaning something to biology in terms of what also biologists find interesting.

In line with this view on philosophy outside traditional academic boundaries, one could also interpret philosophical thinking as a *process*, or as the *attitude* of critical thinking, i.e. not taking everything for granted, putting things in perspective, being aware of the perspective used, hinting at implicit assumptions and hidden agenda, etc. As such, philosophy forms a key attitude in modern society, a form of education that already can be integrated as a basic thinking process in infant and primary school (in this regard, Matthew Lipmann's project of philosophy with children is a highly underestimated cultural trajectory). This view allows welcoming biologists as philosophers, with views and ideas that are not in advance considered as showing less philosophical penetrance or rigour in comparison with the views of their 'trained colleagues', the academic philosophers.[26] As such, the biological community and biological sciences can be seen as a source of inspiration to the philosophical community in figuring out what the post genomic era and the concept of complexity brings along.

3.4 From Demolition to Construction

Academic structures are old and stubborn; hence one can expect that philosophy of biology will defend its boundaries. In the meantime, we can at least try to make the best of it.

Today, as the ISHPSSB meetings demonstrate, philosophy of biology certainly is full of activity. It begins to widen its scope from evolutionary biology to molecular, developmental and even ecological biology. And although the study of conceptual issues (e.g. the use of metaphors in biological discourse, analysis of concepts such as *gene* and *information*) and theoretical frameworks (e.g. the debate on gene-centrism versus complexity) still stands central, also experimental issues (e.g. the limits of using specific model organisms), social issues (research group interactions, the impact of industrial funding), and feminist analyses of socio-biology have been placed on the agenda. The philosophical agenda today thus exhibits a flexibility

[26] This view is well spread in philosophical literature. Griffiths (2000b: 301, italics added), for example, interprets the attempt to explain basic philosophy to biologists as useful, "not because philosophy has all the answers, but because *scientists must think about how to do science*, that is doing philosophy of science, and scientists frequently reinvent philosophical views with known flaws". This implicitly invokes the idea of a scientist as a non-reflective being driven by unspoken biases, a failure the philosopher escapes from. Likewise Auyang states that philosophy as a critical instrument can "interpret *properly* the meaning of regional theoretical models and […] delineate their limits" (Auyang 2000: 75, italics added)—as if only one 'correct' interpretation exists which is in reach of philosophers only. Or, as De Waele (2007, unpublished) writes: "As if only (this kind of) philosophy represents the True Thinking and, moreover, is harmless, does not dirty its hands". Hull (2002) claims that biologists do stand open to philosophy, but that philosophers are unwilling to accept philosophical reasoning by biologists because they are considered to lack the necessary philosophical baggage and concepts to express what biology is really about. On the other hand, philosophers usually *do* lack a biological training, leading more or less to an incompetence which may not be pleasant to admit, but which cannot be set aside either.

(hence, a possibility for reorientation!) that may come in handy. Let me quote De Waele (2007, unpublished) in this context:

> I also think a discussion among philosophers is necessary on the sense and nonsense of philosophy *tout court*. More than filling in what a philosophy of biology can be, I would like to listen to something about the own contribution of philosophy, of philosophies in these times. [...] Should philosophers not also question how or how different they relate to anthropology, sociology and history of the sciences, to Technology Assessment (in the social debate on genetically modified organisms, ethicists and but seldom philosophers—like Isabelle Stengers—had the floor), and to ethics of science?

Why further smother what is left of the interest biologists have in philosophy of biology with bold claims such as that biologists cannot critically think because they lack the appropriate tools or because they are too engaged in their discipline or because an experimental practice does not include any type of reflection, except for a local, isolated and rather short-minded concern for the choice of materials and methods? Why should one claim that the only way philosophy can leave a trace in biology is in terms of 'correcting' biology?

Thus far, biologists who made the effort to keep track of the debates in today's philosophy of biology have remained sceptical regarding the importance of all these activities. Lewontin, for example, argued: "we are constantly being urged to see the world of living phenomena in a different and better way, using new organizing principles: the organism as a computer program, the organism as a Boolean network, the organism as a self-organizing machine (…) The biological philosopher only interprets the world; the point, however, is to change it" (Lewontin 2001: 55). While philosophers have defended themselves that interpretation *does make a change*, apparently the changes they suggested so far are not much felt in the scientific practice. Perhaps this is not so surprising. As a consequence of the estrangement between philosophy and its 'object of study', so far *philosophers* have been pointing out *which* problems are to be solved in biology and *how* these are to be solved. This invites to ask if philosophers by any chance—or bias—may have picked inappropriate problems or inappropriate tools to answers them. It has been argued above that Hull already claimed this in his 1969 paper.

Hull answered negatively on the question if philosophical analyses of biology provided "any insights into biological phenomena, any clarity which biologists themselves have been unable to provide, a deeper understanding of biological theories" (Hull 1969, 249). Even though this answer demolished an entire generation of philosophical research, Hull continued to believe in a philosophy of biology that contributes to biology. This is described in terms of (i) not working on answers, but creating the possibility to ask questions (cf. Hull 1969, 256), and (ii) the challenge of the philosopher to "uncover, explicate, and possibly solve problems in biological theory and methodology. A philosopher might even go on to communicate these results to other philosophers, to scientists, and especially to biologists. He might show what consequences biological phenomena and theories have for other sciences and for philosophy or to show what consequences other sciences and even philosophy have for biology" (Hull 1969, 268). In the current

discussion, this very belief still plays, so perhaps it is time to construct some concrete routes to walk on.

Hull's paper provides some tools for construction in terms of 'focus questions' which need to be addressed. One should investigate (i) in how far philosophers have been motivated in their choice of topics "by any concern with issues currently of interest to biologists" (Hull 1969, 249). One needs to consider that the philosophical exercises biology is engaged in have a space and time frame. Not every philosophical question or answer is interesting endlessly and in all situations. The exploitation of the value of long dead philosophers is limited. It must be possible to say for example that the philosophical ideas on epigenetics by the late Wolfgang Pauli have their historical value, but do not much for us today.[27] Which brings us to Hull's other questions, i.e. (ii) are philosophers willing to acknowledge that their own work sometimes is "irrelevant to the issues raised by these biologists" (Hull 1969, 261)? (iii) In how far have philosophers given common issues a similar interpretation as biologists and have they worried by the same aspects of the problem (cf. *ibidem*, 251)? (iv) Is the attitude of philosophers towards biology open enough? Hull frankly claimed that "philosophers tend to exhibit what can only be described as *disdain* for the issues and distinctions which biologists find important" (Hull 1969, 260, italics added), hence some reflection on how to approach biologists may come in handy as well. And last, but not least, (v) has the language in which philosophers express themselves been under enough attention? Although the cryptic logico-mathematical language at the time of Hull's paper more or less has vanished, philosophical papers still may exhibit reader-unfriendly characteristics that hinder communication and dialogue.[28] Some research could be done on how and where the many neologisms suggested by philosophers survive (or perish), or what biologists 'take home' after a philosophical lecture or reading. Instead of building on an increasingly dense disciplinary jargon, which is an open invitation to ivory tower philosophy, one could also work on the translation or the expression of ideas in a more accessible language, breaking philosophy open to larger society.

3.5 X-Phi: Towards Experimental Philosophy?

Hull's focus questions, as described above, today can serve as a basis to welcome some *experimental philosophy*[29] to the debate. Indeed, if current philosophers are as much concerned as biologists with the question of *what biology is*, and of *how 'to think' living organisms and/or biological organisation*, and if they want to hold on

[27] I refer to Pauli, because Gertrudis Van de Vijver and myself have been invited to speak at Harald Atmanspacher's conference on the role of Pauli's ideas for contemporary science (cf. Atmanspacher 2006, for an interesting review of Pauli's philosophical ideas, which only marginally are about epigenetics).

[28] In this regard, De Waele's letter and my own experience stands in contradiction with the "paradox" Callebaut points out, i.e. "whereas scientifically minded philosophers might think that they are likely to get a better hearing from scientists than their 'woolly-minded' colleagues (*dixit* Alex Rosenberg), the reverse may be true: many working scientists seem to expect philosophy to offer them some kind of (highbrow) diversion from the greyness of their lab work" (Callebaut 2005, note 10).

[29] With thanks to Karola Stotz for introducing me to this concept. See also Sosa (forthcoming) for an introduction to this 'new philosophy'.

to the original ambition of touching biology, *without* reducing the biological reality to a mere terminological level, some empirical input on which kind of research domains are of interest can be of help. If philosophers do not want to become biologists themselves, and opt for a specific immersion in the details of a chosen 'philosophical-biological' or 'biosophical' problem, then it becomes important to first find out if the problem is worth the fuss.

Callebaut argued to define philosophy of biology "*more narrowly* than *the totality of intersecting concerns* that biologists and philosophers (let alone other scholars) might have" (Callebaut 2005, 93, italics added). But in which direction or how much should one narrow down? And why not first uncover more precisely what this intersection today consists of, instead of leaving it to our intuition? In this, especially biologists play their part. Why not let them bring some guidance (which is not the same as dictation or obligation) in which issues they have an interest? Why not literally test our ideas at biological conferences and find out where a dialogue emerges? If not, what then will function as a touchstone for comparison and evaluation of what is or is not 'interesting' philosophy of biology? Indeed, how critical or influential can one be when safely remaining inside the intricate web of an internal discourse and not seeking to meet biologists at different levels of their practice? Why not let an open dialogue emerge beyond what disciplinary standards normally require and let biology *and* philosophy benefit from interdisciplinary interactions, making them into aspects of a modern Natural Philosophy?

Via well-conducted enquiries and interviews with both philosophers *and* biologists, one could empirically investigate what the common ground questions and interests of philosophers and biologists are or can be. What are biologists actually thinking about philosophy and the philosophical research they currently get to read or meet? In a same movement, it could be investigated (i) which implicit and/or explicit goals and ambitions currently live in the philosophical community, (ii) how philosophers aim to live up to these expectations, (iii) which kinds of interdisciplinary activities today are considered fruitful or inspiring by either philosophers, biologists, or both, (iv) what biologists consider as philosophical issues and what they expect from philosophers, etc.

Such an empirical study will not 'solve' any crisis philosophy of biology regionally or internationally experiences, but it may bring some structure to the debate and flesh out virtual beliefs. It may help to orientate into less frustrating directions. Which reminds me of Seneca, I believe it was, who said, "If one does not know to which port one is sailing, no wind is favourable". Perhaps some philosophers will choose never to reach port and sail on endlessly in an air of idle universality without ever bringing their goods at the quay. Personally, I find the undertaking of the suggested empirical research more attractive. This undertaking need not be considered as something 'after which the true work of a philosopher can commence', but as part of the work (or responsibility?) of a philosopher, as something that may help to decide which research questions can be considered as important or as virtual for either philosophy itself, and/or the biological sciences, and/or society. This in turn may help to make clear the pertinence and importance of the research projects involving these questions, the kind of research results that may be expected and their eventual fields of application that can be addressed. In

practice, it may provide a tool to better situate philosophical research projects and their outcome in order to convince moneylenders of further support of philosophical research. At best, it may allow different kinds of philosophy (of biology) to find their specific place in a broad, but less free-from-accountability based research spectrum. In this context, it contributes to the view of not 'just' *criticising* the biological perspective or pointing out its limits, but also of uncovering its advantages. This in turn may help to establish a more balanced view on biology in which also biologists may finally recognize themselves and the challenges they face.

4 In Conclusion: Towards a Shift in Philosophy of Biology?

In the midst of 'taking steps back', this very discussion definitely acknowledges that philosophy of biology is liable to different opinions, trends, or even 'philosophies', in the sense of 'perspectives from within which something is thought'. To further distil the view which currently is most attractive to and/or appropriate for the philosophical (and/or biological) community or to see if philosophy of biology is up for a more or less 'extreme make-over', the discussion will benefit from the inclusion of *more* opinions and *more* discussion[30]—also coming from all kinds of biologists and, why not, non-academics.

In this paper, it has been argued that if philosophy of biology wants to maintain its disciplinary autonomy *and* reach out to biology, it will have to make interdisciplinarity work. Some empirical input from 'experimental philosophy' can be welcomed to the debate in order to uncover which kind of problems are of interest to both philosophers and biologists, and which kind of questions and approaches towards these problems can be expected.

An alternative route is to keep the philosophical tool of conceptual analysis intact in order to work out a "careful redescription of the picture of the world that science seems to be delivering" (Godfrey-Smith 2001: 285). Taking into account that also here a 'meeting' with the biologist and his practice must not be eschewed, the philosopher can profile himself as a critical thinker-in-between-biologist-and-layman gifted with the ability to make a message clear. Although not being a biologist, a philosopher of biology *can* uncover and already has uncovered (cf. the array of gene-concepts used in biology) some of the conceptual knots that form obstacles in getting a better grip on what biology is telling us. Even though these obstacles do not present themselves necessarily to the biologists, they can be seen as obstacles for a non-biologist public. Indeed, if philosophers already are overwhelmed by gene-talk, how then should the general public ever get to terms with it? Philosophy of biology thus can also redirect its attention from 'guiding biology' to 'making a difference for the layman or general reader'. Especially as this general reader—be it a non-biologist or a biologist from another subdiscipline—appears to

[30] It will be interesting to see what the octavian session on the role of philosophy of biology in the 21st century—as proposed for the 2007 ISHPSSB meeting—will bring in. With the exception of a lone philosopher, the content and setup of this session has been welcomed enthusiastically. The correspondence with potential speakers and discussants also illustrated that this topic is not limited to the Dutch speaking regions alone. Hence, an extensive discussion is more than welcome.

be often forgotten in the specialized scientific literature (cf. Lawrence 2003), here an important contribution can be made by philosophers of biology. However, in the current academic situation this implies a shift in how philosophical activities are evaluated (not only high standard publications then must be taken into account). Also, it demands the attitude to go beyond the Aristotelian prejudice that being concerned with the general public is a denigrating task for philosophers and that 'popular' literature is an abusive term, referring to literature for the plebs, the crowd, the so-called uncritical mass.

Acknowledgments I thank FWO-Flanders and UGent (BOF-GOA Project 01GA0105) for financially supporting my research in Philosophy of Biology and for permitting routes towards interdisciplinarity. I thank the members of the GOA project and my colleagues at UGent, especially Dani De Waele, for motivating discussions on the role of Philosophy of Biology. I am indebted to Thomas Reydon for providing room for discussion, and to the many philosophical and biological researchers who until this very day continue to be inspiring to further shape my ideas on the subject.

References

Aristotle. (1905) Nicomachean ethics. Translated by Ross WD. Clarendon Press, Oxford

Aristotle. (1943) Generation of animals. Translated by Peck AL, MA. PhD. Fellow of Christ's College, Cambridge, and University Lecturer in Classics. William Heinemann - Harvard University Press, Cambridge

Aristotle. (1981) Politica—the politics. Translated from Greek by Sinclair TA and Saunders TJ. Penguin Books, London

Atmanspacher H (2006) Pauli's ideas on mind and matter in the context of contemporary science. J Conscious Stud 13(3):5–50

Auyang SY (2000) Bucking the system. Review of Foundations of complex-system theories in economics, evolutionary biology, and statistical physics, by Auyang SY (1998, Cambridge University Press, New York). MetaScience 9 (1):39–44 & 73–75

Byron JM (forthcoming). Whence philosophy of biology? Br J Philos Sci

Callebaut W (1993) Taking the naturalistic turn, or, how real philosophy of science is done: conversations with William Bechtel … [et al.]. University of Chicago Press, Chicago-London

Callebaut W (2005) Again, what the philosophy of biology is not. Acta Biotheor 53:93–121

Crick FHC (1958) On protein synthesis. Symp Soc Exp Biol XII:138–163

Crick FHC (1970) Central dogma of molecular biology. Nature 227:561–563

Devos Y, Reheul D, De Waele D, Van Speybroeck L (2006) The interplay between societal concerns and the regulatory frame on GM crops in the European Union. Environm Biosafety Res 5:127–149

Devos Y, Maeseele P, Reheul D, Van Speybroeck L*, De Waele D* (*Shared Senior Authorship). (forthcoming). Ethics in the societal debate on genetically modified organisms: A re(quest) for Sense and Sensibility. J Agric Environm Ethics 20(6)

De Waele D (2007, unpublished)What a biologist as I have to say in a nutshell—and in its postscript germinations—about philosophy of biology: Beyond sense and nonsense

Dupre J (2002) The lure of the simplistic. Philos Sci 69:S284–S293

Ge H, Walhout AJ, Vidal M (2003) Integrating 'omic' information: a bridge between genomics and systems biology. Trends Genet 19:551–560

Gilbert SF (1996) Enzymatic adaptation and the entrance of molecular biology into embryology. In: Sarkar S (ed), the philosophy and history of molecular biology: new perspectives. Kluwer Academic Press, Dordrecht 101–123

Godfrey-Smith P (2001) On the status and explanatory structure of developmental systems theory. In: Oyama S, Griffiths PE, Gray RD (eds), Cycles of contingency. Developmental systems and evolution. The MIT Press, Cambridge, pp 283–298

Griffiths PE, (ed) (2000a) Special issue: essays in honor of David L. Hull. Biol Philos 15(3):299–473

Griffiths PE (2000b) David Hull's natural philosophy of science. In: Griffiths PE (ed). Special issue: essays in honor of David L. Hull. Biol Philos 15(3):301–310

Hull DL (1969) What philosophy of biology is not. J Hist Biol 2(1):241–268
Hull DL (1974) Philosophy of biological science. Prentice-Hall Inc, New Jersey
Hull DL (1998) A clash of paradigms or the sound of one hand clapping. Biol Philos 13:587–598
Hull DL (2000) The professionalization of science studies: cutting some slack. Biol Philos 15:61–91
Hull DL (2002) Recent philosophy of biology: a review. Acta Biotheor 50:117–158
Jablonka E, Lamb MJ (2002) The changing concept of epigenetics. In: Van Speybroeck L, Van de Vijver G, De Waele D (eds), From epigenesis to epigenetics: the genome in context, Ann N Y Acad Sci, vol 981. pp 82–96
Jablonka E, Matzke M, Thieffry D, Van Speybroeck L (2002) The genome in context: biologists and philosophers on epigenetics. BioEssays 24:392–394
Judson HF (1979) The eight day of creation: makers of the revolution in biology. Simon & Schuster, New York
Keitsch MM (2006) Changing technology perceptions. Prog Ind Ecol—An International Journal 3(1/2):41–58
Kitano H (2001) Systems biology: towards system-level understanding of biological systems. In: Kitano H (eds), Foundations of systems biology, MIT Press, Cambridge, xiii–xv, 1–38
Lawrence P (2003) The politics of publication. Nature 422:259–261
Leonelli S, Reydon T (2005) Editorial. symposium issue: philosophy of biology in Flanders and The Netherlands. Acta Biotheor 53:55–56
Lewontin RC (2001) Gene, organism and environment: a new introduction. In: Oyama, S, Griffiths, PE, Gray, RD (eds), Cycles of contingency. Developmental systems and evolution. The MIT Press, Cambridge, pp55–58
Morange M (1998) (1994) A history of molecular biology. Translated by Matthew Cobb. Harvard University Press, Cambridge
Sosa E (forthcoming). Experimental philosophy and philosophical intuition. Philoso Stud
Steele EJ, Lindley RA, Blanden RV (1998) Lamarck's signature. How retrogenes are changing darwin's natural selection paradigm. Perseus Books, Reading-Massachusetts
Thieffry D (1998) Forty years under the central dogma. Trends Biochem Sci 23:312–316
Torres JM (1999) On the falsification of the *Central Dogma* and the *De novo* synthesis of molecular species. Philos nat 36(1):1–18
Van De Vijver G, Van Speybroeck L, De Waele D, Kolen F, De Preester H (2005) Philosophy of biology: outline of a transcendental project. Acta Biotheor 53:57–75
Van De Vijver G, Van Speybroeck L, Vandevyvere W (2003) Reflections on complexity in biological systems: Kant and beyond. Acta Biotheor 51(2):101–140
Van Speybroeck L (2000) The organism: a crucial genomic context in molecular epigenetics? Theory Biosci 119:1–22
Van Speybroeck L (2002) Philosophers and biologists exploring epigenetics. Philos Biol 17(5):743–746
Van Speybroeck L, Van De Vijver G, De Waele D, (eds) (2002) From epigenesis to epigenetics. The genome in context. Ann N Y Acad Sci, vol. 981. ISBN 1-57331-425-0
Van Speybroeck L, De Backer PH, Van Poucke J, De Waele D (2005) The conceptual challenge of systems biology. BioEssays 27(12):1305–1307
Van Speybroeck L, Van De Vijver G, De Waele D (2007) 'Epi-geneticization': where biological and philosophical thinking meet. In: The Influence of Genetics in Scientific and Philosophical Thinking, Fagot-Largeault A, Rahman S, Torres JM (eds), Springer (in press)
Waddington CH (1947) Organisers and genes. Cambridge University Press, Cambridge