

The limits of reductionism: thought, life, and reality

What is the best question reductionists would have to answer but cannot, and why exactly is there no reductionist answer to that question? To answer this question, we need to identify the relevant question. Let us call the question we are looking for the Question.

An obvious candidate for this Question is this one: *what is thought?* – Why? Well, reductionism presents itself as a *thesis* we might come to endorse (or not). If thought is irreducible, then the reductionist does not merely face a bullet that she is unwilling to bite. The reductionist project rests on endorsing a thesis; endorsing a thesis is irreducible; and so the bullet is lethal.

However, this might seem to saddle us with a dualist picture: there is this unique, irreducible part of reality – the part inhabited by beings engaged in the activity of thinking – but *for the rest* reductionism is fine. The existence of rational creatures will then be an annoying detail that spoils the reductionist fun. A reductionist, then, might be tempted to counter with an optimistic promissory note: perhaps some unforeseen future scientific discovery will enlighten us, putting us in reductionist heaven after all.

Hence, I will attempt to push the limits of reductionism further by suggesting as a candidate for our Question: *what is life?* If the reductionist faces an unresolvable problem *here*, squarely within the realm of the natural sciences, she seems to be in more serious trouble. And I will endeavor to claim that, indeed, the reductionist faces such serious trouble. This results not in a dualist picture, but rather in a pluralist one: we must grant *sui generis* status to inanimate nature, life, thought, and perhaps to other realms as well.

Now, a hard-nosed reductionist might resort to an instrumental understanding of biology. She might even adopt an eliminative stance towards life. But we can push the limits of reductionism even further, and I will do so by suggesting a third and ultimate candidate for our Question: *what is reality?*

The progression I make with these candidate questions, *thought – life – reality*, at first sight is one of expansion. We first focus on a very limited domain (the thinkers), then widen our scope towards a larger domain (life) and end up with the largest possible domain (reality). I will boldly suggest, however, that the last question, on reality is, in fact, the very same as the first question, the one on thought. Thus rounding the circle, we find ourselves not with a dualist or pluralist but rather with a monist picture (but, of course, not of a reductive variety).

Before presenting these three candidate Questions, I will briefly introduce my conception of reductionism, in §1 below. Then follow the promised three candidate Questions: in §2 *what is thought?*; in §3 *what is life?*; in §4 *what is reality?*. I conclude in §5, where I elaborate briefly on the ‘transformative’ motivation behind my choice for these three candidate Questions.

§1. Reductionism

In principle, many different kinds of view could justifiably be named reductionist. A Berkeleyan idealist reduces everything material to perceptions; a classical atomist reduces everything to indivisible atoms and their motions within the void. And there are local reductionisms as well: one might take the social realm to be reducible to interactions among individu-

als¹, and yet accept those individuals as irreducible to, say, the level of biology or physics. Or one might take life to be reducible to mere material interactions, and yet take *conscious* life to have an irreducible status of its own (being impressed, perhaps, by Chalmers's 'hard problem').²

Here, I will take issue with what is plausibly the most popular form of global reductionism: physicalism. Roughly put, physicalism is the view that (future, or idealized) physics will tell us what the fundamental elements of reality are and how they behave – and that this is all there is. “All else supervenes on that”, to borrow David Lewis's sweeping phrase.³

Difficult questions immediately emerge: how should we cash out this slogan, that “all else supervenes” on the physical facts? Different versions of physicalism are on offer in this regard, yet I will not discuss any one of them in detail. Nor will I critically question whether supervenience is the proper notion to be used here (though it is, indeed, a problematic notion).⁴ These questions I will leave to those invested in the reductionist project. I do not intend to target some specific theoretical rendering of reductionism, but rather the broader reductionist *picture* that is holding us captive.⁵ A picture, indeed, which, despite their efforts, holds captive even some of the most ardent enemies of reductionism (we will come back to this in §5).

Let me evoke a more vivid image of what this reductionist picture involves by presenting the following typical quote, taken from the introductory chapter of a book that presents an overview over the contemporary consciousness debate:

[E]verything happening in the universe is ultimately a process involving the basic forces of nuclear attraction, electromagnetism, and gravity, in various combinations. Digestion is a process by which food is broken down into usable energy for the body. This is a chemical process: complex starches, say, are converted into the glucose our cells need to power their activities. And the chemistry is explainable in terms of more basic atomic interactions: various attractions and repulsions at the atomic level make up chemical reactions. There's nothing else to them in the final analysis. (Weisberg 2014: 13).

Here it is suggested that the entities and activities one finds in animate nature – organisms, digestion, etc. – can be reduced to the “various attractions and repulsions at the atomic level”, i.e., at the level of physics. A typical reductionist claim.⁶

Now, I do not want to suggest that what Weisberg writes concerning digestion is false. Of course, the digestion of complex starches *can* be explained on the level of chemistry and even physics. We are not missing anything relevant *on those levels* once we've found a suffi-

¹ See, for instance, Bratman (2014) for an attempt to understand group agency in terms of individual agency, and Rödl (2014a) for a non-reductive stance.

² See Chalmers (1995) – I briefly return to Chalmers's 'easy' and 'hard' problems shortly.

³ See Lewis (1986: ix-x). The phrase comes from his formulation of the view he calls 'Humean supervenience'.

⁴ For instance, supervenience claims do no more than *state that* supervening properties vary with their subvening property base (very roughly). They do not explain *why* that is so. And this is considered by most to be unsatisfactory. See, e.g., Kim (1998).

⁵ I mean to be echoing Wittgenstein here, who remarks in his *Philosophical Investigations*, regarding his own earlier *Tractatus* view, that “a picture held us captive” (Wittgenstein 1953: §115).

⁶ Indeed, Weisberg expresses a disarming enthusiasm towards this claim later in his book: “For my part, I think it's super amazing that we might 'just' be a physical system. I find it incredibly inspirational to think of myself and the rest of humanity in this way.” (Weisberg 2014: 46).

ciently detailed account. There are no further, hidden, quasi-physical factors involved. And this suggests that nothing more can be said *tout court*. But compare: a full description can be given of my copy of Weisberg's book in terms of patterns of black ink on white paper. Nothing needs to be added to that description either – there are no additional hidden quasi-patterns, printed with invisible ink by means of some ghostly, intensional printer. Yet the book, in a different sense, *does* contain more: it contains an overview over the consciousness debate. Likewise, Weisberg's own quote points to what the digestion of complex starches involves beyond the mentioned attractions and repulsions at the atomic level: his quote speaks of *food*, which is to be *transformed into useable energy* for some *body*. These specifically biological, teleological, concepts get lost once we phrase the whole story in terms of attractions and repulsions. Just like the actual contents of the book get lost once we describe it in terms of ink-patterns.

The reductionist will now claim that, since *obviously* there is nothing *in addition* to the attractions and repulsions (or patterns of ink), these further observations about this instance of digestion (or about my copy of Weisberg's book) must in some way be reducible. In *some* way: contemporary physicalists typically resist committing themselves to any specific form of reduction. For perhaps it is impossible to give an exhaustive account of the contents of Weisberg's book, or of digestion as a biological process, in terms of attractions and repulsions. This is why many physicalists nowadays call their view 'non-reductive physicalism' (which, by the way, does still belong under the label of reductionism as I will understand it here).⁷

This presentation of the reductionist position already suggests the diagnosis I have in mind: by restricting our attention to just the physical level, we lose sight of the very phenomenon we were studying. It disintegrates under our very eyes. The various physico-chemical interactions that make up a given digestive process *belong together* as a process of digestion. Digestion is the reason why they are occurring *in this order and sequence*; it is even the reason why they are occurring *at all*. But digestion, here, is not an additional physical quantity or force. Similarly, the various ink patterns in my copy of Weisberg's book *belong together* as expressions of the content he intended to convey in writing it. That content is the reason why they are there. The very coherence of those chemical processes (and of these ink patterns), their unity as a process of digestion (or as a book) thus depends on something that is simply *not to be found* on the physical level. We don't realize what went thus missing, because we tacitly project that unity onto the physical level. To borrow an apt metaphor from Crawford Elder: the reductionist tacitly relies on the *shadows* that higher-level entities (an organism, a contentful book) cast onto the physical level, without realizing that those shadows are dependent on that which casts them (cf. Elder 2011).

The reductionist is likely to object. "Of course, not everything is explained by the *immediately present* physical goings-on! But that doesn't mean that there is no reductive explanation

⁷ Nonreductive physicalism is a curious phenomenon. It brings to light that, indeed, reductive physicalism is a picture holding those defending it captive: it holds them captive to such an extent that it is alright for them to grant it a self-cancelling name ('nonreductive' physicalism). – Another symptom of this situation is the following. In the face of the many difficulties that physicalists encounter in their attempts to formulate their distinctive, physicalist thesis, Alyssa Ney has come to defend physicalism as an "attitude": "physicalism is an attitude one takes to form one's ontology completely and solely according to what physics says exists" (Ney 2008: 9).

of, say, digestion, or the content that a book conveys. We just have to look at the wider context!" And the reductionist is surely right – accordingly, this essay doesn't end here.

Notice, now, that the gesture towards an adequate reductive story is so far not much more than a promise. If you are empirically minded, you might claim an easy victory at this point: "The burden of proof lies with the reductionists; let us simply wait and see how far they get with their attempts at keeping their promise!" And this is surely fair: even in the most fundamental and paradigmatic cases, reductive theses have tended to be untenable upon closer inspection.⁸

Such an attitude, however, forever leaves it open that the reductionist project might eventually be vindicated. On this route, then, one will not be able to find a suitable candidate Question – the requirement is, after all, that we show why the reductionist *cannot* answer it, not merely that she *hasn't as of yet* answered it, or is not likely to find a conclusive answer.

A squarely philosophical approach, on the other hand, will attempt to investigate the very viability of such a reductionist project. Is life, or contentfulness, amenable to reductionist treatment *at all*? It is in this latter spirit that I will be discussing the very ideas of thought, life, and reality in what follows.

§2. What is thought?

Nowadays, the opinion is widespread that, while qualitative or phenomenal consciousness constitutes a serious or 'hard' problem, thought doesn't. Indeed, Chalmers famously grouped many of the issues related to thought together under the label "easy problems", which "seem directly susceptible to the standard methods of cognitive science, whereby a phenomenon is explained in terms of computational or neural mechanisms" (Chalmers 1995: 201).

Under the heading of "easy problems", Chalmers here summarizes a mechanistic conception of the rational mind, which Gödel has sought to refute until the end of his days. Gödel saw in his own incompleteness theorem a first step towards that refutation, yet, with typical caution, he usually did not venture beyond the following disjunctive conclusion:

My incompleteness theorem makes it likely that mind is not mechanical, or else mind cannot understand its own mechanism. (Gödel, as quoted in Wang 1997: 186).

Although Gödel did, in addition, express allegiance to Hilbert's "rationalistic optimism", which would eliminate the second option, he did not want to rest content with such a mere conviction.⁹

If Chalmers's quote captures the received view, the prospects for Gödel's project may look dim. Yet if we read Sebastian Rödl's following claim, this pessimistic estimate, and Chalmers's labeling of thought as an "easy problem", looks to be entirely misplaced:

Perhaps it is sensible to dream of some development of natural science by which sensory consciousness comes to be within its reach. However, this dream is *obviously* incoherent in the case of [thought]." (Rödl 2014b: 492).

⁸ Color is a nice example; see Stroud (2000) for an excellent in-depth discussion. The issue whether classical genetics reduces to molecular biology is another fine instance – see, for an overview, Brigandt and Love (2017), and see also §3 below.

⁹ See Wang (1997: 185f).

Why does Rödl think it so obvious that thought will never come within the reach of natural science? And how could this be of help to Gödel?

We can unpack Rödl's bold claim by going back to the simple observation that Lewis Carroll famously captured in his parable of Achilles and the tortoise over a century ago (Carroll 1895). Suppose you (validly) infer C from A and B . What does this involve? You think A and B , and then you think C . But that is not enough: just *adding* the judgment C is no inference. Rather, in making this inference, you are aware *that C follows from A and B* . So perhaps what is missing is this extra premise: $A \& B \rightarrow C$. However, the addition doesn't help: now we imagine that you judge A , B , and $A \& B \rightarrow C$. And then you proceed to judge C . This juxtaposition of judgments again does not amount to seeing that C follows from the previous three. – The lesson to draw is that *no* addition will do the job.

Now suppose that through some “computational or neural mechanism” I add a judgment, C , to given judgments A and B . This isn't inference, since my arrival at C doesn't rest on a recognition that C follows from A and B . To be sure: the mechanism might be logically sound, i.e., such that it only produces representations that *in fact* follow from the given ones. That still doesn't make it inference, for this is not reflected in the representations themselves. Being asked why I judge C , I can only say: “I don't know.” If my judgments spring from a mechanism of the mentioned kind, I will simply find myself saddled with them, in utter incomprehension.

An alternative suggestion springs to mind. Let us say that the mechanism is more sophisticated, in that it provides me with an additional judgment *about* those three: “I judge C because it follows from my judgments A and B ”. This suggestion also misfires, and it is instructive to see why: it separates my awareness of the validity of my inference from that very inference. It attempts to portray my (first-order) inference as something that is independent of my (second-order) awareness of its validity. However, if the inference itself doesn't involve that very validity, it simply isn't inference – and no amount of *additional* representations, be they second-order or not, will turn something that isn't an inference into an inference. (This was Carroll's insight.)

We can make another interesting observation here: the proposed second-order judgment, taken at face value, *already includes the entire inference*. That is to say, not if it is something I find myself saddled with, in utter incomprehension. But if it is taken to signify my coming to see that, indeed, C follows from A and B , then this simply *is* my concluding C on the basis of A and B (given that I have already judged A and B).¹⁰

In short, then, making an inference is not something *separate* from being conscious of making it.¹¹ The unity of judgments in my inference *is* my consciousness of that unity. Rödl puts

¹⁰ Is it really? What if I have reason to doubt C , won't I then rather reject A or B , or suspend my judgment? – Sure. This is, however, no objection to the point under consideration; it rather illustrates that point. My judgments aren't separate elements lying around in my awareness, unconnected. They are united, and their union is precisely my consciousness of their union.

Famously, Kripke (1982) presented a reading of Wittgenstein on following a rule ('Kripkenstein') that does take note of problems such as the one concerning inference briefly outlined here. Kripke, however, fails to realize that the solution lies in the recognition of the self-consciousness of thought. That is why he ends up with his 'skeptical solution' (Kripke 1982: 66ff).

¹¹ Perhaps there are such things as unconscious inferences. That is no objection to what I say here. At most, it is the mere observation that an account of such unconscious inferences is still lacking. See also Nagel (2012, esp. ch. 4), and Kitcher (2011, esp. ch. 15, §4).

this as follows: inference is *self-conscious*, where the term “self-consciousness” signifies not a consciousness of some object, a ‘self’, but rather this peculiar phenomenon of something being its own comprehension.¹² In every inference, I know that I am inferring. Put differently: inference knows itself to be inference.

It requires only a little reflection to see that the same holds for the unity comprehended *within* one judgment: that of predication. Within the framework of the present essay, this brief gesture towards a generalization of our conclusions with regard to inference will have to suffice to introduce the claim that thought, as such, is self-conscious (in Rödl’s sense). Thought knows itself to be thought.

Now, science in general is concerned with comprehending empirically given phenomena.¹³ So the phenomena science studies are *by definition* independent from the comprehension sought. And cognitive science indeed attempts to approach cognition in this way: there is this empirically given phenomenon, cognition, and we are now trying to understand it, preferably by identifying the relevant “computational or neuronal mechanisms” underlying it. It thus seeks to *add* an understanding to something that does not by itself already include its own understanding. And this fundamentally misrepresents the object of study.

This should suffice to see the point of Rödl’s remark, quoted above, that the sort of understanding cognitive science seems to be after is “obviously incoherent”: its object is a self-conscious phenomenon, i.e., a phenomenon that includes its own comprehension, yet it strives to provide an account of that phenomenon from the outside.¹⁴

The following objection is bound to arise: cannot these two projects peacefully coexist? There is the *first-personal* comprehension of thought, which may very well be ‘self-conscious’ in Rödl’s sense, *and* there is a scientific, *third-personal* comprehension of thought, which grounds it in something that is *not* first-personally comprehended as its ground.

However, as Rödl observes elsewhere (2018: §4.3), this suggestion treats the two types of comprehension of thought as two “perspectives” on thought. And this presupposes that that on which they are perspectives is as it is independently of being comprehended from either perspective. And this, as we saw, is not the case. The self-consciousness of thought is not something *additional*: it *is* thought.

The self-consciousness of thought is an insight that meshes rather interestingly with Gödel’s above-mentioned search for a satisfactory argument against a mechanical conception of mind. Consider, again, his statement:

My incompleteness theorem makes it likely that mind is not mechanical, or else mind cannot understand its own mechanism. (Gödel, as quoted in Wang 1997: 186).

¹² See, e.g., Rödl (2018: ch. 1). The Anscombean tradition in contemporary philosophy of action makes the same point with regard to intentional action: my intentional action is not something *independent* of my knowledge of it. Anscombe expresses this, for instance, by saying that this knowledge, practical knowledge, is “the cause of what it understands”. See Anscombe (1957: §48), and also Rödl (2007, ch. 2).

¹³ How do we know this to be the case, concerning science? Have we discovered it by empirical investigation? Obviously not. (Compare Rödl 2018: 16.) The statement that science is concerned with comprehending given phenomena merely conveys the comprehension that is included in science. Science is self-conscious as well. – We will return to this in §4.

¹⁴ Notice that I do not thereby claim that cognitive science is a doomed project in its entirety. There might be very many processes that can be described using the ‘automatic’ sort of ‘cognitive systems’ one finds in cognitive science (early visual processing is a good example). But not thought.

The self-consciousness of thought provides what Gödel was looking for in his search for a sufficient ground to exclude the second option mentioned in this quote. For, the notion of a (rational) mind that cannot understand itself (or “its own mechanism”) *just is* the impossible notion of a non-self-conscious yet thinking mind.¹⁵

To conclude, then, the answer to the question *What is thought?* at least involves the insight that thought is self-conscious. The reductionist insists that everything in the end reduces to physical goings-on. Physical goings-on, however, are not self-conscious: physical goings-on do not include their own comprehension. Hence, there can be no answer to the question *What is thought?* that will be satisfactory for the reductionist. Moreover, since the reductionist must accept that there is such a thing as science, she must accept that there is such a thing as thought. In other words: this question is a fine candidate for our Question.

§3. What is life?

Thought, then, poses a problem for the reductionist. But, she might say, isn't the presence of thinking beings just a contingency? And do not thinking beings make up only a tiny portion of the universe? A humbler reductionist victory might still be possible with respect to the vast realm of non-thinking things. And perhaps, then, the irreducibility of thought, its self-consciousness, can be considered an anomaly of sorts, a local fluke in the cosmic reductive order of things.

A more thorough rejection of the reductionist program, then, will have to show even this humbler reductionist victory to be impossible. We can arrive at such a more thorough rejection by reflecting on the idea of *life* – inspired by Michael Thompson's masterful discussion thereof.¹⁶

What is life? Unlike thought, living beings are natural, given, non-self-conscious objects, and thus objects fit for scientific inquiry in the sense mentioned above. Hence it is natural to start answering the question what life is by composing a list of features that distinguishes life from non-life. One feature frequently associated with life is organization, or complexity. Entropy would be a suitable, physical measure of complexity.¹⁷ And living things are indeed physical systems displaying remarkably low entropy values. But, even if in fact *all and only* living things display entropy values below a certain determinate threshold, this doesn't tell us much: it is not physically *impossible* that arbitrarily low entropy states are occasionally reached by non-living systems. And given that the entropy scale is continuous, what makes *this* specific entropy value so special? Does the difference between a certain living cow at

¹⁵ The question what Gödel's incompleteness theorems imply with regard to the philosophy of mind is, of course, a vexed one. See, for instance, the two essays by Putnam and Penrose on the topic in Baaz *et al.* (2011: Chs. 15 and 16). For what it is worth: I do not think there is any route *from* Gödel's incompleteness theorems to conclusions about thought. For one thing (and I owe this observation to Albert Visser), the tendency to traverse that route often results in a dispute over the claim whether the human mind is 'more powerful' than anything a mechanism could do (see the mentioned essays by Putnam and Penrose), where the notion of 'power' involved equivocates between the very abstract, theoretical concept of what lies within the 'power' of a given formal system on the one hand, and concrete mental abilities on the other.

Instead, as I suggested here, the interesting project would be to try to comprehend the significance of Gödel's results in the light of a proper understanding of thought, and that is, in the light of thought's self-consciousness.

¹⁶ See especially Thompson (2008: Part I). For a much more detailed exposition and extension of the views Thompson puts forward, see Mulder (2016).

¹⁷ I ignore the fascinating question whether entropy itself can be reductively accounted for in terms of statistical mechanics. See, for a classical treatment, Sklar (1993: ch. 9).

one time and its fresh corpse a second later really consist in just the insignificant increase in entropy (if there even is such an increase)?

The situation is different if, instead of entropy, a thicker notion of complexity is invoked: living things are organized in the sense that they are composed of *organs*: ‘organ-ized’ (cf. Thompson 2008: 38). This makes sense; living things are indeed composed of parts in a rather idiosyncratic sense. Living parts, organs, are, for instance, not detachable: as Aristotle was wont to say, a detached hand is a hand only ‘homonymously’.¹⁸ Another way of putting this is to say that in living things, the whole comes before the parts. Indeed, the whole *makes* its parts – which is beautifully illustrated by our detailed knowledge of embryological development. Compare, say, a car: cars can be assembled by putting together prefabricated parts, so that the whole comes after the parts. – In any case, once we ask what exactly distinguishes organs from non-living parts, it becomes clear that we have gone round in a circle: organs are parts of, specifically, *living* things.

It is observations such as these that prompt Thompson to conclude that “every candidate list-occupant must strike the sub-metaphysical Scylla of [‘entropy’] or else sink into the tautological Charybdis of ‘organs’.” (Thompson 2008: 39).¹⁹

Isn’t Thompson jumping to conclusions here? Perhaps organization *by itself* is insufficient to define life, but would not the situation be different if *more* features were added? In biology textbooks, one typically finds mentioned in this context such features as metabolism, growth, adaptation, response to stimuli, etc. Shouldn’t we focus on cases in which *all* of these are present?

Now, to be sure, Thompson does consider several of those, but the point is not merely to question whether these features, individually or jointly, single out all and only the living things. Instead, reflections of the kind just rehearsed are meant to illustrate that when it comes to life, we should not be interested in a list of features that happens to be extensionally adequate; what we should want to comprehend are rather the typical categories in terms of which we understand living things – the ‘vital categories’, *organ* for instance. And *these* categories turn out to resist being captured in merely physico-chemical terms. That is why, for each and every ‘list-occupant’ we find two options: either we understand that list-occupant in a merely physical way, in which case we can always ask what *that* has to do with life (this is what Thompson calls ‘sub-metaphysical’), or we understand it (implicitly or explicitly) in a way that presupposes the very concept of life (what Thompson calls ‘tautological’).

Organ is, thus, the specifically ‘vital’ version of the abstract notion of *parthood*. Likewise, one can find ‘vital’ analogues of other basic categories. An instructive further example is the vital analogue of *process*, which Thompson calls “life-process”. Consider the following illustrative quote:

In a description of photosynthesis, for example, we read of one chemical process ... followed by another, and then another. Having read along a bit with mounting enthusiasm, we can ask: “And what happens next?” If we are stuck with chemical and physical categories, the only answer will be: “Well, it depends on whether an H-bomb

¹⁸ See, e.g., Aristotle (1998: 1036b30–32).

¹⁹ In this quotation, Thompson originally has ‘DNA’ instead of ‘entropy’. The point is in the end the same; considering the hypothetical situation in which all and only living things turn out to contain DNA, Thompson writes: “The judgment about DNA, if it were true, would only show how resource-poor the physical world really is. It could make no contribution to the exposition of the concept of life” (Thompson 2008: 37).

goes off, or the temperature plummets toward absolute zero, or it all falls into a vat of sulfuric acid...” That a certain enzyme will appear and split the latest chemical product into two is just one among many possibilities. Physics and chemistry, adequately developed, can tell you what happens in any of these circumstances – in *any* circumstance – but it seems that they cannot attach any sense to a question “What happens next?” *sans phrase*. (Thompson 2008: 41)

But there *are* answers to such ‘what happens next’-questions – biology is full of examples. This illustrates that life-processes, processes for which Thompson’s ‘what happens next’-question makes sense, exist for a *reason*, a reason that is not to be found by looking at their merely physico-chemical components or phases (recall Weisberg’s observation, quoted in §1 above, that digestion consists in the conversion of ingested food, such as “complex starches”, in order to power the activities of “our cells”).

To see what this ‘reason’ really consists in, first note that even the very notion of *existence* takes on a specific shape in the case of life – “to be, for living things, is to live” (Thompson 2008: 27). And indeed, as philosopher of biology John Dupré never tires to point out: “a static cell is a dead cell” (Dupré 2013: 30).²⁰ To live is to be actively engaged in life-processes that mutually sustain and enable each other. Life-processes are always embedded in, and thus unified by, the whole life cycle of which they form part. This life cycle is the full expression of the *life form* – the ‘vital’ counterpart of the more generic category of a *natural kind*. The life form, then, is the ‘reason’ to which life-processes inevitably point. In traditional vocabulary: life is everywhere teleological, not in the external sense of serving some *further* purpose or aim, but in the internal sense of being its own end. Living beings differentiate themselves into mutually supporting parts, and their life cycle differentiates into mutually supporting life-processes, and these differentiations everywhere serve the purpose of realizing the life form in question.²¹

In any case, we have again merely scratched the surface of a huge topic; much more needs to be said on these vital categories and their relation to contemporary issues in (the philosophy of) biology, such as the status of biological species, evolutionary theory, etc.²² Nevertheless, I hope I have said enough to motivate my proposal to put up the question *What is life?* as a candidate Question. If the above is roughly correct, that question cannot be answered

²⁰ Dupré’s work is full of examples that illustrate the distinctiveness of life. He doesn’t take these observations all the way to a decidedly philosophical articulation of their ground – and therefore he ends with a rather generic insistence that we should shift to a ‘process metaphysics’ across the metaphysical board. See Dupré (2012, 2013, 2018).

²¹ It is interesting, in this light, to read in one of Gödel’s recently transcribed notebooks the following ‘philosophical remark’ on life:

Life is obviously an imperfect structure, which therefore attracts matter from outside (...) and takes it up into its structure. The new structure obviously acts upon itself with a “destructive force”, resulting in the emission of urea and carbonic acid. Does this entire process result in a perfection of the original structure? (Our body only deteriorates over time and only our minds get better.) All of this shows, that life, continuously perfecting itself, comes from something that has no perfection. (Crocco *et al.* 2017: 7, my translation)

It does not seem to occur to Gödel here that destruction may be an integral and crucial part of what it is to live. In any case, Gödel obviously granted life a *sui generis* position within his philosophical thought – as is also evident from this quote: “Life force is a primitive element of the universe and it obeys certain laws of action.” (Wang 1996: 193). See also Kovač (2018: §2.2.6) for discussion.

²² For discussion of these and related issues see Mulder (2016).

without using the vital categories, which is precisely what the reductionist would have to do. It is, thus, another fine candidate for our Question.

Now, the reductionist might resort to an instrumentalist understanding of life, such as the one advocated by Alexander Rosenberg.²³ In brief, this comes down to claiming that even though the vital categories are indispensable, they are merely useful instruments that do not capture what is really “out there”. Metaphysically speaking, this amounts to an *elimination* of life. We only think there is life because *for us* the vital categories are indispensable. (Although one might wonder *for whom* these categories are precisely indispensable – aren’t we ourselves alive, too?)

This indicates that we might try to push the limits of reductionism even further. Let us proceed to our final attempt.

§4. What is reality?

For the endgame, let us return to the quote from Weisberg provided in §1. Ultimately, Weisberg says, everything boils down to physical interactions involving the basic forces of electromagnetism, gravity, and the nuclear forces. (Or, as my father-in-law likes to say: ultimately, life is nothing but moving stuff around.) So, a reductionist could say, ultimately, our conclusions concerning thought and life do not matter. Perhaps there is no way of understanding those phenomena in a satisfactorily reductive manner. Perhaps utter confusion and incomprehension is somehow inevitable when it comes to such complex matters. Still, the fundamental insight (says the reductionist) that it all boils down to those physical interactions stands.

Here we must enter the lion’s den and challenge the reductionist on the very level she takes to constitute the fundament of reality. At first sight, this may seem to be an absurd strategy. Surely, we cannot point to any reductionistically troublesome concepts, or phenomena, *on the physical level* – isn’t the reductionist supposed to *accept* precisely all and only those physical concepts as being, so to speak, metaphysically serious?

That is surely right, but there is another way of challenging the reductionist on this level. The reductionist assumes as a matter of course that these physical concepts (or the perfected versions thereof a future completed physics will discover) can be *isolated* from the concepts and forms of explanation discussed earlier. It is quite obvious, so the reductionist thinks, that reality might just as well have harbored *only* physical stuff, and no life or thought *at all*. After all, the occurrence of life, and of thought, are contingent happenings, which might just as well not have happened.

My aim in pointing this out is not to challenge the possibility of a physical world without living or thinking beings. Rather, I want to point out that that possibility does not in itself suffice to underwrite the sort of isolation of the physical sphere that the reductionist presupposes.

There are various ways in which we could challenge that isolation. One way would be to argue that the physical is *as such* already also material for the living, so that the very idea of life must be accounted for anyway – whether life ‘materializes’ or not. That, however, would

²³ See Rosenberg (1994).

yield only a deepening of the candidate Question posed in the previous section, and hence no new candidate Question.

Instead, consider again Weisberg's claim that "it all boils down to physical interactions". What does the "all" there signify? It stands for *everything*, or for *reality*. Reality is exhausted by those physical interactions. Is this concept, the concept of reality, a physical concept? No. It isn't even an empirical concept. We didn't discover, empirically, that there is this thing, "reality". Rather, the very act of discovering something, the very idea of empirical science, rests on that concept. The concept of reality is an *a priori* concept.

If this is right, the reductionist cannot point to anything physical in order to answer the question "*what is reality?*". One way in which this has been recognized in the literature is as follows. Summing up all the physical happenings, we sum up all of reality, according to the physicalist. But having summed up all of those happenings, it is still open whether or not there are *more* physical facts than those mentioned, and thus we need to add an extra, non-physical fact: "That's all".²⁴

However, here the "that's all" component is still conceived as an addition, something disjoint from the physical facts themselves. Yet with every physical statement we make, we assert that what we say to be the case *is so*; we put it within the domain that is supposed to be circumscribed by the "that's all" addition. In Wittgenstein's words: "When we say, and *mean*, that such-and-such is the case, we – and our meaning – do not stop anywhere short of the fact; but we mean: *this—is—so*." (Wittgenstein, PI §95). McDowell famously paraphrased Wittgenstein's thought as follows: "When one thinks truly, what one thinks *is* what is the case." (McDowell 1996: 27). And this idea, Wittgenstein's *this-is-so*, McDowell's being-the-case, already is the idea of reality as a whole. Rödl writes:

"[T]he concept of what is, the concept of a fact, the concept of something real, does not signify a part, an aspect, a limited region of – of what? yes: of – what is, the facts, reality. The concept of what is is not a concept of anything limited It is not contained in anything larger than it." (Rödl 2018: 56)

What the reductionist must accept as fundamental – a conception of reality in physical terms – everywhere rests on this concept of reality, of being the case, of "what is" (the Greeks discussed it under the heading of *being*). How do we account for this idea? Not by means of physics, we saw. Nor can we account for it by means of *any* form of empirical science. Especially, we cannot redirect the question to cognitive scientists, expecting that they come up with a psychological, evolutionary, or otherwise empirical explanation of the idea of reality.

This brings us back to our topic in §2: there, I claimed that thought, because of its self-consciousness, cannot be the topic of *any* empirical science. Now we see that the same holds for reality. And this is no coincidence, for reality is just another name for the self-consciousness of thought.²⁵ Whenever we say (or think), and *mean*, that something is the case, we know ourselves to mean just that. Thought knows that its ultimate object is reality; reality is the ultimate object of thought. This we know in every particular thought that we have, just as we know ourselves to be thinking in every particular thought that we have.

²⁴ Chalmers includes such "totality truths" as facts of a separate kind in his Carnap-inspired *Constructing the World* (Chalmers 2012).

²⁵ This insight, that the idea of reality is nothing other than the self-consciousness of thought, is central to Rödl's (2018) *Self-Consciousness and Objectivity* – its title can be read accordingly.

McDowell added to the above quote: “So since the world is everything that is the case (...) there is no gap between thought, as such, and the world.” (McDowell 1996: 27)

Perhaps we can read Gödel’s following ‘Philosophical Remark’ in the light of the coincidence of the idea of reality with the limitlessness of thought:

Aristotle’s proof that the intellect is not corporeal and has no bodily organ at all ... is after all the antinomial character of the ‘all’.*

* Or better, the possibility to make ‘all’ in turn an object and to transcend beyond that (the unboundedness [*Uferlosigkeit*]).²⁶

In any case, it is no coincidence that both Rödl and Gödel find inspiration in Aristotle’s fascinating argument to the effect that thought (the intellect) is immaterial.²⁷

§5. Concluding remarks on the Question

It was not my aim to argue at full length for the challenge that each of the three candidate Questions poses for reductionism. That would require much more space and focus than I have allowed myself in this essay. I chose to discuss three different questions, and hence had to make do with a rather sketchy treatment of each of them, for two reasons. First, I wanted to indicate the radically different levels at which one might fundamentally challenge the reductionist. Thus understood, the three candidate Questions are relatively independent from each other. But secondly, and more importantly, the order in which I presented the candidate questions, the progression from the one to the other, was meant to bring out three consecutive layers at which one might free oneself from the prevailing reductionist picture. By way of conclusion, I will attempt to explicate this ‘transformative’ aim.

For those with anti-reductionist leanings, our self-understanding as human beings often provides a good entry point for an argument against reductionism. The attitude here is one of retreat: reductionism has conquered realm after realm – the starry skies, the realm of the living, etc. – but luckily there remains this final anti-reductionist stronghold: the human being, ourselves. This is reflected in the traditional opposition between the sciences and the humanities.²⁸ The first question thus centered on thought, conceived as the center of this stronghold.

As I indicated, this stance does constitute an effective resistance to reductionism, but it simply buys into the whole reductionist world view outside of the realm of human affairs. It is, in essence, a dualist picture. We can overcome this dualism by resisting the reductionism not only when it concerns us, human beings, but also within its own realm. To this end, I turned to *life* as the topic of my second candidate Question. Here we resist the temptation to retreat that defines the first stance. We squarely oppose the reductive assimilation of the realm of the living; we discover that the dualist position we were faced with was forced upon us merely because of the aggressive reductionist expansion.

²⁶ This remark can be found in Gödel’s unpublished manuscript Max Phil VI, 404. I take the quote from Engelen (2016: 172), who also provided this English translation. (The Aristotelian proof Gödel here alludes to can be found in his *De Anima* III (Aristotle 1984: 429a18–29).) Of course, as the *-footnote to this remark indicates, Gödel connects this Aristotelian insight with issues in set theory he was thinking about – Russell’s antinomy, the unlimited expansion of the set universe, the idea of proper classes. See Engelen (2016) for discussion.

²⁷ In his (2014b: §2), Rödl discusses this argument extensively with the help of Plato’s version thereof in his *Theaetetus*.

²⁸ Here, the traditional opposition between *Erklären* and *Verstehen* of course comes to mind.

From this second stance, then, we do not end up with a dualist picture, but rather with a pluralist one. Animate nature does not reduce to inanimate nature; thought does not reduce to life; and perhaps there are more levels to be discerned.²⁹ Yet, an asymmetry remains that continues to support reductive thinking: physics still appears to be *fundamental*. Life depends on matter, even though thought appears to require a healthy brain. The various levels thus strike us as optional extras that the physical realm could also do without. Hence my final candidate Question: *what is reality?* Reflection on this question may disarm the reductive spell that makes it seem obvious that the physical level is fundamental. We come to see that this is a mistake: rather, the notion of reality is fundamental. This notion is involved in all of the various levels, so that we may say that this third stance constitutes a progression from pluralism to a non-reductive monism. Reductive monism isolates one level, typically the physical one, to the exclusion of others. It distorts our comprehension of reality. Non-reductive monism, by contrast, does not seek to ground its monism empirically, in a specific, favored *part* or *aspect* of reality. It grounds itself, rather, in the self-consciousness of thought. On the face of it, this is a formulation of what Rödl calls, following Hegel, *absolute idealism*: “reason is the certainty of consciousness of being all reality” (Rödl 2018: 15).

Freeing ourselves stepwise from the reductive picture that held us captive, we thus find ourselves with absolute idealism. Traversing this transformative path, we recognize that the three candidate Questions are really one.

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²⁹ This form of pluralism can be found in the work of philosophers belonging to the so-called ‘Stanford School’ in philosophy of science. See, e.g., Dupré (1993, 2018), and Galison and Stump (1996).

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