WHAT REDUCTIONISTS BELIEVE IN

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> "We have been told by popular scientists that the floor on which we stand is not solid, as it appears to common sense, as it has been discovered that the wood consists of particles filling space so thinly that it can almost be called empty. This is liable to perplex us … Our perplexity was based on a misunderstanding; *the picture* of the thinly filled space *had been wrongly applied*." (Wittgenstein, *Blue Book*, 45.46, *emph.* CK)

1 INTRODUCTION

Ontological reductionism is normally motivated by a skeptical view on what people in ordinary life assume to be the case in their ordinary world: on things like cars, sheep and human beings having properties, being related to one another, and remaining the same even if they undergo changes. Reductionists want to protect us from taking such a naive access to reality as *ontologically* serious. Ontology should not reflect upon that what normal people mean, but what the basic structure of our world *really* is. And science – natural science of course – tells us what this basic structure really is. Thus the noblest aim of ontology is to reduce the objects in one's everyday world to the basics presented to us by natural science; respectively to reconstruct these objects from this basis. This is the only way to get a real scientific ontology in the context of a rational world-view.

In this article I try to examine ontological reductionism with a little bit more scrutiny. The question is how we could understand reductionism and its consequences. More philosophically speaking: I am going to ask what "reductionism" may refer to, look for common premises shared by the different reductionistic positions, and try to discuss them. My result will be that "scientific" ontologies stick to strong premises – believes, I am inclined to say. This is problematic, because these premises can be called into question: on the one hand by reason of ontological and on the other

hand of methodological – as I would prefer to say meta-ontological – arguments.

2 What is Reductionism?

2.1 As far as I can see there is no fixed or technical usage of the term "reductionism" in ontological contexts. Sometimes "ontological reductionism" stands for a specific ontological position. I will call this position "reductionism in the narrow sense". Sometimes "reductionism" is used to refer to a general label under which various different positions can be subsumed. That is "reductionism in the broader sense". However, I start with the latter, ontological reductionism in the broader sense.

The next question should be the following: What makes a position suitable to be subsumed under this label "reductionism"? – I think it is a claim, which can be expressed by the scheme:

E has to be replaced by *B*

"To be replaced by" could be made more precise by adding "in an ontological context" or "as commitment of an ontological theory", or such kind of phrases. It is not decidable in this phase of investigation whether "replacement" stands for a relation in a technical sense or not. Take it simply as what it sounds: something must be introduced into an ontological theory instead of something other.

"*E*" does not denote a single object, but a type of objects, like things as the before mentioned cars, sheep, or human beings. And it is accordingly asserted by reductionism that the tokens of the *E*-type are excluded from belonging to the structure of reality, to which an ontological theory commits. "*E*" stands, in an open or pre-theoretical sense for "epiphenomenon". A famous Australian philosopher recently called *E*'s as "ontological free lunch"[1]; German-speaking friends of neologisms would translate this into: "Epiphänomene existieren nicht wirklich." We will examine what these metaphorical phrases could mean.

"*B*" also does not refer to single objects, but to a type of objects. *B*, the basis of *E*, belongs to the ground structure of reality. *B* is that to what a really ontological theory commits. "*B*" is no "free lunch", and neither a cheap one. *Die Basis existiert wirklich*.

[1] Armstrong 1997, 12f.

To remain at my example: One instantiation of the reductionist scheme would be: "Things, like cars, sheep, and human beings have to be replaced in an ontological theory by something other, by real basic entities." These real basic entities should be introduced into an ontological theory instead of the mentioned things. Things have a mere epiphenomenological status. Despite their seeming to they "do not really" exist.

2.2 With the mentioned scheme we have a first clue to an understanding of the label "ontological reductionism". How to put flesh on the bones? – We can differentiate various positions within the label of ontological reductionism: first, according to the status of *E*; second, according to the strength of replacement; and third, according to the nature of *B*. I am sure that we can make the matter always more difficult, but for the beginning we can help ourselves with the following: Concerning the third way of distinguishing, the relevant literature presents us with prominent candidates for basic-categories: processes (Whitehead, 1978), atoms, thing-like simples (Van Inwagen, 1990) or quality-like tropes (Campbell, 1990), normally understood as material entities.

Concerning the second way, the extremes are, on the one hand, the replacement of *E* in favour of *B* can be explained with nomological strength; on the other hand, the replacement of *E* in favour of *B* can be explained, at least in principle, but without any prospect of nomological regularity.

Concerning the first level of distinguishing positions, we can identify views which regard *E* as neglectable as well as for everyday use as for every ontological context. I would call them *eliminativist* views with respect to *E*. Then there are *E*-theoreticians who defend the relevance of *E* for everyday use, but deny its theoretical relevance for ontology at all. Such a position comes near to that what I called above "ontological *reductionism* in a narrow sense". Finally there are "reductionists in a broader sense" who defend *E* as indispensable both for the explanation of our everyday world, and, at least partially, for some theoretical contexts. *Supervenience*-theoreticians are prominent holders of the last view concerning *E*.

Thus, under the label of reductionism in a broader sense, there may be included the positions holding that our everyday objects can be replaced – without any loss for theoretical ontology and for our everyday phenomenology – with nomological stringency to – lets say – material processes. This would be nomological eliminativistic process-ontologies. In addition there may also be included under the label of reductionism positions holding that

our middle-sized things must be ultimately replaced by some kinds of atoms, simples or tropes. However, because of their indispensability in everyday life and for some theoretical contexts, as well as the a-nomological character of the putative replacement we have to take a non-eliminative and non-reductionistic (in a narrow sense) replacement view: things supervene on some kinds of atoms. These seem to be the extremes: there are, according to my scheme, a lot of possible theories between them.

2.3 At the beginning I mentioned that I primarily will not look for the differences, but for the common premises shared by reductionistic positions. What have eliminativists in common with supervenience-theoreticians, process-ontologists with tropists and other atomists? – I think, they share basically three premises – believes, as I said at the beginning polemically.

The first is the assumption of the *ontological priority of the bottom*, the basis, as I called it in my scheme above. That does not mean that they have the same understanding of how strong this priority must be interpreted, how great the difference between the prior and the posterior has to be assumed. But, if an ontologist denies the priority of the basis in comparison with the non-basic phenomena, there remains no reason for the replacement claim, which is indeed essential for reductionism.

The second premise, which is inseparable from the first, is that all reductionists must rely on the success of any *bottom up-strategy*. It must be, at least in principle, possible to reconstruct the things of our ordinary world from the assumed bottom or basis. Otherwise replacement, however considered, cannot work. It must be possible to reconstruct Susan, the sheep on the grass, from the atoms or the processes to which it is pretended that she can be reduced to.

Finally, the third premise is (according to non-idealistic reductionism and idealistic reductionism we leave aside here) that the basis must be discovered and described to the ontologists by the others, normally physicists or quantum mechanicians. Ontology is an *a posteriori-discipline*, as a prominent reductionist recently urged.[2] Ontology has to look first to that what the others say and must take their results as the preliminary findings of its own theorising. (I don't deny inner-ontological replacement-claims, for instance concerning universals, which should be replaced by concrete properties, according to "inner-ontological reductionism". But these claims should not be mixed up with reductionistic replacement-claims as they are discussed here.)

[2] Simons 1998, p.251.

I call these premises the *reductionist-triangle* which is characteristic for every reductionistic theory. With the use of this metaphor I do not only maintain that every angle, i.e., every premise, is indispensable for reductionistic ontology; but also, that if one of them can be rejected, then the triangle collapses, resulting in the refutation of the core idea of reductionism.

3 Is Reductionism True?

3.1 One standard way of criticism is to attack premise one because of its *counter-intuitive* consequences. We intuitively accept the inhabitants of our ordinary world as real units, "real" in a stable sense. We especially like to regard ourselves as self-remaining entities in spite of the various changes we undergo. – This kind of criticism, whether true or false, leads to a dead-end of the debate because reductionists normally do not intend to theorize in accordance with intuition. As another important reductionist succinctly pointed out: "Unnaturalness in philosophy is all right."[3]

Another way of criticism would be to doubt the success of a premise two-strategy. I am convinced that this really refers to a hard problem for reductionism. In fact, as far as I can see, there is no widely accepted theory of reconstruction of at least some phenomena of our macro-world from the basis of a physical micro-world. – The reductionist's reply is normally immunizing. It does not matter that we, today, have no theory of the reconstruction, for instance of our sheep Susan from its subatomic basic constituents. But *in principle* we can develop one and future generations of scientists surely will provide it. – However, controversies about futurabilia cannot be resolved. This is why I am going to focus especially on the third angle of the reductionist's triangle: the premise that ontology is an a posteriori discipline which has to start with the given results of physical world-descriptions. This kind of argumentation is methodological or meta-ontological as I called it at the beginning.

The intended meta-ontological debate can and should be led from the most fundamental level: What is ontology, and what are natural sciences? With regard to reductionism: What understanding of these sciences and their relation must someone presuppose who regards ontology as an a posteriori enterprise in the sense of the third reductionistic angle? – Ontology must be considered as a kind of natural science with all of its consequences; a discussion of which would lead us too far away from our topic.

[3] Quine 1994, p.93.

Another level of the debate could be how ontological descriptions, explanations, and theories can be related to, e.g., physical ones. What is the epistemic status of the first, what of the latter? Are there differences, and how can they be explained? To what understanding of this matter does the third reductionistic angle commit? – According to reductionism, no differences in principle, for example concerning verification/falsification should be allowed between ontological and physical theories.

3.2 On this occasion I do not intend to discuss the mentioned fundamental questions. I rather want to make aware of one concrete point, which allows illustrating the methodological or meta-ontological difficulty of the reductionistic premise three. According to the third reductionistic angle, ontology has to start with the results of physics. Let us ask, what these results, in which our reductionistic colleagues are interested, actually are? – The uninterpreted bare empirical data are not interesting. No ontologist starts with a look into an electronic microscope. And even if he would, he could not understand what he sees. What philosophers need are *interpretations*. And the first level of interpretation contains *models* physicists use to come to theoretical explanations of the given data. – *Simple material elements* for instance (and it does not matter if they call them actually atoms, or electrons, quarks, or sub-sub-quarks) are such models. And it seems to be the case that successful physical theorizing relies on such models. – The problem is that our colleague-philosophers, in their effort to start with the results of physics, import such models and take them, and this is the decisive point, as ontological hard facts. To remain with the example we can state that they regard material simples (some actually call them atoms, some other simply "simples", some "tropes") as the basic units of reality and give them genuine ontological characteristics like "primitiveness", "undividability", and so on. The result is an atomistic ontology: material simples, called "atoms", "simples", or "tropes" are taken as primitive and undividable basic units of reality. They are regarded as the basic category of entities, from which all the macroscopic phenomena can be reconstructed. – The case of material simples is just one example – we also can take processes, "space-time worms", or something else – but a very interesting and influential one; because it has given rise to one mainstream of reductionistic ontology. I repeat the point: What they seem to do is to hypostasize or to ontologize physical models or "pictures". In fact there do not *exist*, in a stable sense, simple, primitive, undividable material units (however you call them).

"Atoms do not exist" seems to be a rather dangerous thesis. – And I try to be careful, and insist on the differentiation, that I, of course, do not deny the usefulness of models for interpreting the empirical data we have from the basic levels of material reality. But to repeat it, I deny that we should convert models into entities. "Atom" may be a useful concept for a model in physics, but not for an ontological entity – if it should refer to material simples.

3.3 I would be ready to defend this view, not only because of meta-ontological reasons, but also because of ontological arguments. I briefly sketch two of them. The first one: considered ontologically, the concept of a material simple is – I say it cautiously – gravely defective. Materiality necessarily implies extension, and something extended cannot be simple in the sense atomistic ontologists suppose. The second: identity. According to his reductionistic bottom-up postulate, the reductionist must be able to reconstruct the identity of middle-sized objects from the identity of the basic entities. That presupposes that he must be able to say in what the identity of the latter consists. He must provide *informative* conditions of their identity. How should we reconstruct our middle-sized objects and their identity without positive knowledge about the identity of the bottom items? – But: as we can learn from John Locke, Jonathan Lowe, and other important philosophers in between, informative conditions of identity always refer to the *constituents* of the entities in question.[4] (Heaps of sand are identical iff their grains are; organisms are identical iff their life-functions are …) Simples have no constituents. That is why we cannot give informative conditions for their identity. Thus, they are no plausible basic-elements for the reconstruction of cars, sheep, humans, and their identity. (Therefore perhaps, Locke, Lowe, and some other philosophers are no reductionists.)

If it is not possible to reconstruct the identity of middle-sized objects from the identity of material simples (however you call them), or if these simples are no entities at all, ontological reductionism pretending that they are the only entities of a real scientific world-description is definitively false. Beginning with premise three of the reductionistic triangle we can knock the bottom out of premise one, and in consequence that of premise two. – What can we do now? Are there alternatives to reductionism? – Yes, I think, there is one, and this is:

[4] Locke 1975, book II, chapter XXVII, §3. Lowe 1989, chapter VII.

4 THE ALTERNATIVE: STRICT NON-REDUCTIONISM

Finally I will try to give an outline of some core-assumptions of a non-reductionistic ontology. In contrast to the premise one of reductionism, a non-reductionistic ontology asserts the ontological *priority of the units of our ordinary world*: macro-things like cars, sheep, and human beings. It does not matter whether you add also the properties of these units and their changes to your ontology or not; neither whether you are ready to make ontological differentiations within the thing-world (artefacts – living beings) or not – the prior beings are the units of our macro-world. One possibility of being non-reductionistic in this sense would be to stick to an Aristotelean-like substance-ontology.[5]

But what is with the reductionist's basis, the micro-world, what is its place in a non-reductionistic theory? – The non-reductionistic strategy to analyse macro-things in comparison to the micro-world is not, as the reductionistic premise two indicates, bottom up, but *top down*. And, in contrast to the reductionist premise three, as non-reductionists we are obliged to differentiate between the *ontological* top-down program and the procedures of the different natural sciences. Of course, there are several possible genuinely ontological top-down strategies. One of them is the Aristotelean-like analysis of the inner constitution of our complex macro-things; holding that this complexity is constituted by an individual material-aspect and an individual form-aspect: *What* a thing is made of and *how* the components are built into a complex unity. Both, the what-, and the how-aspect are irreducible to each other in their functions for the constitution of the whole complex thing.

In contrast to ontological top-down analysis there may be a wide range of other methods of top-down investigations into a complex macro-thing. One of them, of course a rather interesting and important one, is a physical investigation into the material aspect of such a thing. And the results of such a physical investigation may be very informative physical theories, making use of illustrative models, like the above-mentioned atoms, protons, quarks, and – if you want – sub-sub-quarks.

What is with the ontology of the micro-world, the reductionist may critically throw in? – Non-reductionistic ontology is open for every kind of investigation into the material aspect of our basic units – that is the proper

[5] For some new approaches to "substance", but also for new critical arguments against substance-ontologies, see Trettin 2005; for a historical summary of the substance-debate see Gutschmidt (ed.) 2008.

task of natural sciences – and for efforts to integrate the results of natural sciences *as such* into a philosophical theory of the basic structures of reality – that would be the aim of philosophy of nature. Non-reductionistic ontology gratefully receives the results of philosophy of sciences reflecting on the differences between the methods in natural science and in ontology, and examining seriously the relevance of physical models for an understanding of the material aspect of our basic units of reality.

Non-reductionistic ontology does not the job of the others. It is an open project. As non-reductionistic ontologists we are open for the results of the others, but we let them be the others and strictly refuse to ontologize their conceptualized metaphors or to "apply wrongly" their "pictures", as Wittgenstein once exposed one of the methodological premises of the reductionistic fallacy in his *Blue Book*.

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