

## MEDIUM EMERGENCE – Part One – The Personalist Theory of Emergence

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### Abstract

Today the concept of emergence is quite popular, but its original meaning—a proper medium ontological conviction between dualism and materialist monism—has faded. An epistemological, weak understanding of emergence has arisen and the possibility of ontological emergence is called into question. With a detailed examination of the ontological consequences of the notion of reduction, I will argue, that, contrary to materialist conviction and interpretation, reduction and emergence are not each other's rivals but on the contrary, and that epistemological or weak emergence is not a kind of “metaphysically innocent” materialism, but one of the two Janus faces of one medium emergence—the other being ontological or strong emergence. These faces are inseparable, and together they form the one proper medium ontological conviction between dualism (or vitalism, creationism, etc.) and materialist monism.

**Keywords:** emergence, reduction, materialism, ontology, epistemology, ontological (strong) emergence, epistemological (weak) emergence, ontological (diachronic) reduction, epistemological (synchronic) reduction.

### 1. Preface: *The Original Meaning of Emergence*

The concept of emergence has become quite popular. Countless papers and authors speak about some kind of emergence and try to deal with the problems that arise. The notion of emergence can be found in almost every field of science, from informatics via biology to physics. However, these notions seem to be quite different across disciplines.

I believe that the most notable reason for this mottled situation is that the original meaning of emergence has faded. We are left feeling that there is a true need for the concept of emergence, but we seek back roads and rear entrances instead of the real, foundational meaning. Of course, there are valid reasons for this fading, including two main ones: first, the fast rise and *fall* of the British Emergentists (see McLaughlin 1992); second, the strong *materialist conviction* and *methods* of scientists and philosophers. The latter leads to an understanding of emergence that is “metaphysically innocent” and entirely “consistent with materialism” (Bedau 1997).

The first emergentist is often considered to be John Stuart Mill, but the term in fact stems from George Henry Lewes (1975). After the fast fall of the British Emergentists (Samuel Alexander (1920), Lloyd Morgan (1923) and C. D. Broad (1925)), there was a long silence and few weak and distant voices, most notable those of Michael Polanyi (1962; 1969) and Roger W. Sperry (1969, 1980, 1986).

Today, the concept of emergence has returned, and it seems to carry two main and differing meanings. First is the old *ontological* or strong meaning. This meaning asserts that there are multileveled objects, higher levels of which ontologically *exist* and are not material. Second is the new *epistemological* or weak meaning. This meaning asserts that the higher levels ontologically *do not exist*; they are only comprehensive phenomena of matter.

The first, ontological meaning is of course the one that was proposed by the British Emergentists. It is important to note that this was a kind of cosmological theory of emergence that started *on the level of chemistry* or even of matter on space and time (Alexander 1920); thus every higher level was ontologically emergent, and there was no place for epistemological emergence. More exactly, every higher level was also epistemologically emergent—the clear distinction of these terms came after the British Emergentists—and therefore it was not a simply contrary to current epistemological ideas of emergence, but was truly a much stronger version of the concept. This is one of the main reasons why such a concept was highly problematic. According to “Alexander’s dictum” (Kim 1992), the higher levels have to be causally effective, otherwise they cannot be ontologically real; but many philosophers think that this leads to overdetermination, downward causation and the breaking of the causal closure (Kim 1998; 2000; 2002). Thus higher levels either are ontologically not real just are epistemological descriptions, or they are real—but necessarily tied to dualism.

The second, epistemological meaning, however, is also highly problematic. Although according to Mark A. Bedau it is “consistent with materialism,” still “[w]eak emergence is not just in our minds [...] Rather, weak

emergence is an objective phenomenon that exists in nature” (Bedau 2008a: 457). What does it mean for an epistemological higher level to “exist in nature” and “not just in the mind”? Epistemological levels do not exist, ontological levels do. Heat is a comprehensive phenomenon of matter: we can experience it, we can feel it, but it does not exist. The particles exist, and heat is only the average kinetic energy of those particles. Also, what does it mean for weak emergence to be an “objective phenomenon”—or is it not the fundamental physical entities that are objective (e.g. particles)? It seems that although Bedau wants to be “metaphysically innocent,” he slips quietly into the territory of ontological emergence: “But weak emergence is still rich enough for an ontology of objective macro-level structures” (Bedau 2008b: 183).

Another problem arises if we accept that epistemologically emergent comprehensive phenomena of matter is really only “in the mind.” Then it seems that it is not “metaphysically wicked” ontological emergence—but notice that it *presupposes the existence of a mind/person* that experiences the comprehensive emergent phenomena. Of course, the existence of the person does not imply dualism, only the ontological emergence of the persons...

Perhaps these short trains of thought have clearly emphasized the serious problems with the notion of emergence. I believe that Bedau’s struggle with metaphysical innocence and emergence in nature is not accidental. Epistemological and ontological emergence *cannot be separated entirely*. If someone starts to flirt just “innocently” with the concept of emergence, she will soon be burned with the flame of the original ontological meaning of emergence.

Nevertheless, this does not mean that we must return to the philosophy of the British Emergentists, as the full inseparability of ontological and epistemological emergences does not mean that these terms are as the British Emergentists treated them. The ambitious tower of British Emergentism collapsed for ever; however, it was *not* because of the original ontological meaning of emergence, but because of the reduction of chemical objects to quantum mechanics (see McLaughlin 1992). While their peculiar theory of The British Emergentists was clearly wrong this does not mean that their original intention was wrong, namely, that it is possible to conceive a proper *medium* ontological conviction *between* dualism and materialist monism. In fact, that is the true, original meaning of emergence. That there are no eternal souls or substantial minds as the dualists believe in or there are not only quarks and electrons as the materialists imagine for whom the person is only an empty word but there are real persons emerged from inanimate matter during the long course of evolution.

After the fall of British Emergentism Michael Polanyi grounded his theory of tacit and personal knowledge on this original meaning of emergence. “I shall meet this situation by re-establishing within the logic of achievement, the conception of emergence first postulated by Lloyd Morgan and Samuel Alexander.” (Polanyi 1962: 382) And then he fiercely criticized materialism and neo-Darwinism which is the materialist theory of evolution. Polanyi clearly recognized that epistemological and ontological emergence—with his words conceptual and existential emergences—cannot be separated entirely. (1962: 390-397) However, he did not deal with the problem in details and he did not have an adequate conceptual framework to do so.

In this Part One I will investigate the original meaning of emergence and its consequences. I will not investigate particular theories in detail neither the British Emergentists’ nor Polanyi’s, because it is my firm conviction that that would misdirect the focus I wish to place on this original meaning. I will investigate strong and weak emergences, but not to contrast them, because I think they are not rivals, but rather the different Janus faces of the *same* notion. Epistemological emergence on its own is not emergence at all; it is *materialism*, the nowadays popular materialist theory of emergence. Thus I believe there is no strong emergence and there is no weak emergence, *only one medium emergence between dualism and materialist monism with two faces*.

In the second section I will ask a question: how can we know that an object is material or emergent? This will lead us to the problem of reduction. In the third section the examination of reduction will help to shed light on the original meaning of emergence, and I will show that, in a sense, reduction is not the rival of emergence at all. Then in the fourth section, I will define the ontological reduction of natural sciences, explore the two Janus faces of emergence. The end of the paper will be a short conclusion and I hope this investigation on the original meaning of emergence will provide an adequate conceptual framework to better understand Polanyi’s ontological position and arguments against materialism and neo-Darwinism.

In the later Part Two I will show that Polanyi’s ontological position is exactly the same as I understand under medium emergence: this is the true personalist theory of emergence. Then I will redefine his main anti-materialist argument in this new framework which standing alone is quite weak even in the eye of the Polanyian tradition. I hope, however, that in this way it would be clear that materialism is plainly self-contradictory.

## 2. From Emergence to Reduction

According to the original meaning of emergence, there are higher levels that ontologically exist. But what does this mean? To understand, we must first understand the ontological consequences of reduction.

*Dualism* asserts that there are *two different kinds of reality*, *two fundamental substances*, generally matter and mind, which are *equal*; their relation is *symmetrical*.

*Materialist* monism asserts that there is *one kind of reality*, *one fundamental substance*: matter.

*Emergentism* asserts that there are *two different kind of reality*, but only *one* is *fundamental substance*, matter. The other is not fundamental, it is *emergent*. Thus their relation is *asymmetrical*. The emergent reality is not self-sufficient, but it necessarily exists *on* the fundamental material substance. It follows that emergent objects are necessarily multileveled and consist of at least one fundamental and one emergent level of reality.

The question is, how can we know that an object is material or emergent, or perhaps has dual substantial nature according to a vital force? In nature we see trees, houses, machines, frogs, people and many other objects. *We cannot see the kinds of reality themselves*—we cannot see matter, that is, quarks and electrons, etc., and we cannot see the emergent levels separately. We cannot see the mind itself.

Of course, a materialist would say at once that houses, trees, machines, people, etc. are composed of matter, so to see them is like seeing matter. Perhaps, but it is true necessarily only in the case if and only if we *a priori* accept materialism—only then do we start to see things. However, objects as houses, trees, frogs, machines and people are very *different* phenomena contrast with quarks and electrons. Maybe they are ontologically equal, but certainly *it has yet to be revealed*. So far, *no one* has shown that houses, trees, frogs, machines and people are composed of only matter. We can easily believe it, but *only* in the case of the chemical level was it ever revealed that these objects are ontologically equal to the fundamental level of matter. The hydrogen atom and covalent bond, etc. were reduced to the material level, and not houses, trees, frogs, machines and people.

However, this successful reduction of the chemical level was the reason of the fall of the British Emergentists, whose peculiar theory was build upon the conviction that the typical instance of emergence is the emergence of the chemical level. This successful reduction was also the reason that the original meaning of emergence has faded and that we can easily believe in the successful reduction of higher levels, trees, frogs, people, etc. But a while successful reduction has *never* in fact come, and emergence is once again at issue.

The answer, then, to our question of how we can know for certain that an object is material is *the successful reduction* of the higher level(s) of that object. At the same time, the goal of reduction is not necessarily the fundamental material level. It is possible to reduce between two higher levels and go no further, or even to reduce higher levels to a non-material substance, for example human notions and acts to mind. However, in practice these possibilities do not appear, because the notion of reduction is tightly connected to materialism.

There are two main reasons for this. First, materialists have to reduce the higher levels to show that materialism is true. Second, if someone is a reductionist, why would she stop at a higher level? In principle, what can stop reductions of levels? The answer is the fundamental level of material substance. This is the level that per definitionem is the last one. In principle, every other level can be reduced. But, as we have seen, the end of reduction can be another fundamental level, too. Even so, dualists fight the notion of reduction, because in practice the question is not the possibility of reduction of higher levels to the mind, but the reduction of the mind and qualias to matter, according to the viewpoint of materialism and the tight connection of reductionism to materialism.

The notion of reduction, however, is *not* materialist. Moreover, it cannot be materialist because it is not an ontological conviction, it is only an *epistemological tool*, useful, for instance, to show the truth or untruth of materialism, or to show that dualism is wrong, and there are no minds, qualias, social levels, etc. But no one uses this latter method, so perhaps a kind of “social Cartesianism” is true? (see Collins 2010).

Thus, reduction is an *epistemological tool* while materialism (and, of course, emergentism and dualism) is an *ontological conviction*. It is for this reason I use the term materialism and not the now-popular “physicalism,” which suggests that materialism is like and inseparable from physics. But again, physics is an epistemological tool and not an ontological conviction; they are not in the same category. If emergentism is true, physics operates without problems with higher-level emergent objects; as a matter of fact, physics originally dealt only with emergent objects for centuries, as the presupposed fundamental material level of quarks and electrons was discovered only in the first half of the 20th century. Physics is *fundamental* for an emergentist, for example, to answer the biophysical cause of sickle-cell anemia in the ontologically emergent human body. René Descartes, the father of dualism, also used mechanical physics without any trouble; moreover, he was one of the first who

worked out a purely mechanical physics, long before Isaac Newton. Moreover, in recent years some eminent physicists argue that physics and emergence cannot be separated, for example, Robert B. Laughlin (2005) or Lee Smolin (2013).

Multiple fields provide examples of reduction. In philosophy, the two classic, normative examples are Ernest Nagel's and Jaegwon Kim's models (Nagel 1962; Kim 1999). However, there are many others, and we can find different reduction methods in several scientific fields, such as biology, mathematics, or even technology and informatics, considering Bedau's reduction by "simulation" (Bedau 1997). However, I will not deal with these different methods here, because for this paper it is the *consequences* of reduction and not the exact methods that are of interest. It is the consequences of successful reduction of the chemical level to quantum mechanics, and not the concrete method and quantum mechanics itself that makes the fall of the British Emergentists. No one is interested in specific quantum mechanical equations.

Moreover, if we define reduction by a concrete method, for example, by Kim's functional reduction model, many other reduction methods would fall necessarily outside the definition. It is a materialist notion to think that there is one true method of reduction with the goal, of course, of fundamental material substance. But why would the same method necessarily work for a reduction between two higher levels and between a lower level and the fundamental level? Or, even more, that the same method would work for a dualist reduction of human notions and acts to the mind and for the reduction of the chemical level to matter? I do not believe that human notions and social levels can be reduced to the mind, because I am not a dualist; but if I am wrong, and dualism stands, I am pretty sure that the reduction of human notions and social levels to the mind would be something highly different from the reduction of the chemical level to matter.

So, for the ontological consequences of reduction, to answer our question of whether an object is material or not, it is entirely inessential which particular reduction method we use. What is essential is the *success* of the reduction, as in the case of the reduction of the chemical level to quantum mechanics. Of course, this does not mean that the success is independent from the particular method—the proper method is the precondition of success—but the ontological consequences still lie in the outcomes of the success and not in the particular method, which is "only" an epistemological condition. To understand the original meaning of emergence, we must first understand the ontological consequences of reduction.

Thus I do not look here for the proper epistemological tools; I believe *scientists* are responsible for this, as it was done by the reduction of chemical levels, and I presuppose that if a reduction is possible, a scientist will find the proper epistemological tool at the end. The question for me is the ontological consequence, the task I as a philosopher am responsible for, the question of whether every object is material, whether every object can be reduced to matter—even trees, frogs and people.

Unfortunately, these two different sides of reduction are often blurred; that is, the investigation of the ontological consequences on the one hand and the investigation of the particular epistemological tools on the other. Moreover, the debate typically follows materialist intentions and interpretations around the peculiar possibility of reducing important higher-level objects, e.g. qualia, mind, etc., or it takes place in a priori materialist frameworks, as in biology. Thus the question of ontological consequences does not truly arise. For example, the classic Paul Oppenheim and Hilary Putnam paper deals with the possibility of reductions of different higher levels in an a priori materialist framework, so the particular reduction methods are either successful or not, they cannot have any ontological consequences. Trees, machines, frogs and people can be or cannot be reduced—it does not matter, reduction has no real importance or meaning (Oppenheim and Putnam, 1958; see a critique of this deficiency e.g. in Reuger and McGivern, 2010).

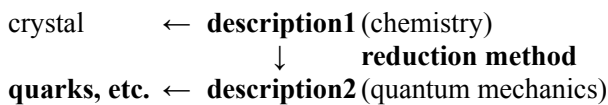
Our use of language reflects this duality and also can hide the two different sides. We often say that we reduced an object or say that we reduced a higher-level description of an object (to a lower-level description of the same). The former reflects the ontological consequences, no matter how we have successfully shown that the true nature of the object is material. The latter reflects the epistemological tools, by which peculiar method we have connected the higher and lower-level descriptions of the object. In the following, I will clearly separate these two sides to understand the original meaning of emergence.

### **3. From Reduction to Emergence**

Now, the question is: what is reduction? On one side, what is the ontological consequence of a successful reduction? On the other, what we are doing when we use the epistemological tool of reduction?

The answer to the latter is the following: *we create an asymmetrical epistemological connection between two*

descriptions that refer to different objects, for example:



Thus, the reduction has three conditions.

First, it presupposes at least *two different objects*. One of them is high-level, the other one is low-level (at the end, to answer our question, it is the fundamental material substance).

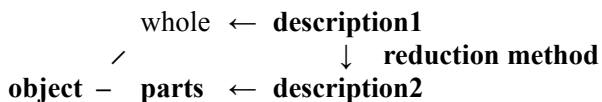
Second, it presupposes *two descriptions*. One of them refers to the higher-level object, the other to the lower-level one.

Third, it presupposes the *reduction method* itself, and we have to perform this successfully.

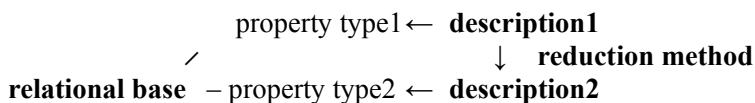
So, then, reduction has *two sides or faces*, just like emergence. One of them, that of the objects, is the *ontological side*. The other, that of the descriptions and reduction method, is the *epistemological one*.

It is important to note that the descriptions and the reduction method are *human (personal) knowledge*, and as such they are not only meaningful epistemic references to the objects, but they are *ontological objects* themselves. (In my figures, boldface type means ontological objects.) Consequently, the possibility of reducing them as objects must also be questioned. To think that human knowledge as an object does not have ontological nature but only epistemic meaning is the *a priori* presumption of materialism, that is, the blind believe in materialism before the act that they would be reduced and materialism would be confirmed.

It is a typical mistake in the case of the first condition of reduction to speak about only two levels and not about two different ontological objects, for example to speak about the higher level of the whole and the lower of the parts as was done by Oppenheim and Putnam (1958). Of course, the source of the mistake is that one of the objects is high-level and the other one is low-level. But to speak about only the two levels of a part-whole relationship and not about a high-level and another, different low-level object a priori presupposes that there is only one object, that is, there cannot be ontological consequences for reduction; it is again the a priori presupposition of materialism before the act of successful reduction.



It is a similar mistake to speak about only different types of properties, usually high-level and low-level properties, and to call the only one real ontological object e.g. relational base or something similar, which casts a shadow on its ontological meaning. (On the margin, the British Emergentists typically also spoke about only properties, but for them every whole-part relationship and every higher level were necessarily (and wrongly) ontologically emergent phenomena.)

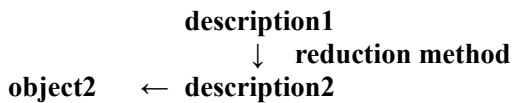


This camouflage can be deepened by identifying the relational base with the aggregation of lower-level properties, thus making the higher-level properties only necessary consequences of specific arrangements of lower-level properties. Reduction, then, is simply a necessity; the remaining question is only that of the proper reduction method. If it cannot be found, though, never mind; there would be no ontological consequences, anyway.

However, in fact, before the successful reduction it is not grounded that heat is only a comprehensive phenomenon of matter and not the consequence of an enigmatic “fire-object” or another substance, e.g. some kind of form. From Francis Bacon via Galileo Galilei to James Clerk Maxwell and Ludwig Boltzmann, several excellent scientists worked very hard to establish that heat is only a comprehensive phenomenon of matter—should there be no real stake, importance or meaning in their works?

So, then, what is reduction, and what is the ontological consequence of a successful reduction? The answer is

the following: *there is only one object, namely the low-level one.*



If reduction is successful, it creates an *asymmetrical epistemological connection* between the two descriptions and reveals that in truth the object of the references of the two descriptions is just *the same*.

However, this does not mean that the two descriptions equally and in the same way refer to the one existing object, and it also does not mean that the presupposed two objects are identical—not in the least. Since reduction is per definitionem *asymmetric*, it reveals us that on its own the reference of the higher-level description is simply void, and has no meaning; there is no fire-object or other immaterial substance. But reduction per definitionem reveals too that via and only via the reduction method, the higher-level description refers to the same object as the lower-level one refers to; that is, heat is only the average kinetic energy of particles, referring only to the lower level object(s) and to nothing else. After successful reduction, the higher-level description *only via* the reduction method and *via* the lower-level description keeps its reference and real meaning but via that it *keeps*.

Therefore we *cannot* say that by successful reduction, the higher-level object will be identical with the lower-level one; but unfortunately we often do say that. The phrase “we reduced an object” suggests this and it is highly misleading. In truth, *we did not reduce the higher-level object, but only the higher-level description*. The higher-level object was simply *eliminated*. In Nagel’s words, reduction is only the “logical relation between certain statements” (Nagel 1962). There is no heat as an independent object. It is only a description—of natural human experiences—that via a successful reduction method refers to the average kinetic energy of the really-existing particles. The former is the *ontological consequence*; the latter is the *epistemic structure* of a successful reduction.

So, by a successful reduction only one object remains, which, in accordance with the asymmetric relationship, is the lower-level one, at the end the material substance. This and nothing else could confirm materialism, as it has done in the case of heat or the chemical levels. But there is plenty of work yet for materialists with such objects as trees, frogs, persons, etc. Without this ontological relevance, this work cannot be done, and materialism remains an attractive or repulsive presumption. Many materialists still do not bother themselves with the ontological consequences of reduction.

It is important to note that the fact that there remains only one object on the ontological side does *not* mean that the two descriptions can be identified on the epistemological side. The two descriptions *still* contain different conceptions, laws, etc. as well as the reduction method itself, which connects them. Thus, on the epistemological side, we have to still speak about more and different epistemological tools, that is, about different human (personal) knowledge. In this sense, heat still exists as a higher-level, physical (thermodynamical) concept and as natural human experience.

So, to sum up, successful reduction is an ontological statement, namely the statement that only *one object exists*: the lower-level one.

Now, the question is: what is the ontological consequence of a *failed*, unsuccessful reduction?

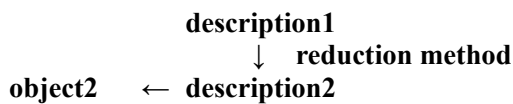
The answer is the following: the ontological consequence of a failed, unsuccessful reduction is an ontological statement, namely, that *two objects exist*.

On the epistemological side of a reduction, the gap between the two descriptions *remains*. *Only a successful reduction can bridge that*; and without this bridge and the “bridge laws” of a successful reduction method, the two descriptions *remain equal, both of them keeping* their original reference and meaning. This is a kind of epistemological dualism. (The situation of the other, ontological side will be discussed in the next section.)

**object1 ← description1**

**object2 ← description2**

Contrary to this, the structure of a successful reduction, as we have seen, is this:

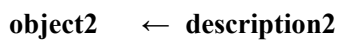


Now, my conclusion is the following: *this asymmetric relationship on the epistemological side corresponds to the notion of emergence*. With the essential difference, of course, that this is not emergence between ontological levels but “only” emergence between epistemic descriptions. Therefore, *this is a kind of epistemological emergence*.

It also follows that reduction and emergence are not each other’s enemies but, on the contrary, *they presuppose each other*. A successful reduction *reveals* the emergent relationship, and this hidden relationship *makes possible* the successful, revealing reduction.

This can be counterintuitive if (but only if) we do not clearly distinguish ontological emergence from epistemological, as the British Emergentists or materialists were inclined to do. Then it is obviously not emergence, because on the ontological side there is only one object, one level that in accordance with meaning cannot be emergent to itself.

For the sake of completeness, epistemological materialism would be this:



Here there are no real higher-level descriptions. However, this is not the situation we have to deal with; clearly there *are* higher level descriptions. Therefore, we have to deal with epistemological emergence and ontological materialism, which are just *the same*.

Mark A. Bedau says that epistemological emergence is “consistent with materialism,” but at the same time, “[w]eak emergence is not just in our minds. [...] Rather, weak emergence is an objective phenomenon that exists in nature” (Bedau 2008a: 457). Now we can understand this paradox.

To say it is “consistent with materialism” means that on the ontological side, there is *only one* (material) object, which is the case only after a successful reduction. Otherwise, there are two different objects, and then the situation cannot be consistent with materialism.

At the same time, there are *two* different *descriptions* on the epistemological side, the necessary preconditions of any reduction, but now connected *asymmetrically* by a successful reduction. Without this successful reduction there is no connection at all, just two different, equal descriptions with their own independent references and meanings, that is, epistemological dualism.

Nevertheless these descriptions are “only” human knowledge, so are these only in our minds? *No*, because the reduced higher-level description, as we have seen, has not lost its reference and meaning, *it has only been channelled in the reduction method* to refer to the one real object. We reduced but did *not* eliminate the higher-level description; it has still meaning and relevance for us. We eliminated only the higher-level object. The higher-level description tells us something about the one real object that cannot be done only by the lower level description. *This* is the reason “[w]eak emergence is not just in our minds. [...] Rather, weak emergence [...] exists in nature.” Exactly as electrons and quarks are not just in our minds.

However, this does not mean ontological existence for higher levels, contrary to Bedau’s interpretation, there is no any kind of “ontology of objective macro-level structures” (Bedau 2008b: 183). On the ontological side there is only *one* object, one material level, which cannot be emergent to itself. This means that there is only one object but *two asymmetrically connected descriptions refer to it* and tell us something meaningful and different. So, in this sense and only in this sense that the epistemologically emergent descriptions can tell us something about the one and only ontological object, epistemological emergence is not just in our minds but exists in nature.

Heat, as we have seen, is a higher-level physical concept and natural human experience on the epistemological side. But it has reference and original meaning, and this is the reason we can say that a material object has a comprehensive phenomenon. It is as true as saying every particle of a material object has a well-defined kinetic energy or mass by its fundamental description. Without our natural experience and scientific observations of heat, without the higher-level concepts, laws, etc. and the proper reduction methods, the fundamental description cannot say anything about heat or other, similar comprehensive phenomena or any other order of matter (Polanyi 1959: 48-49). Therefore, according to its fundamental description, heat is a novel and in an epistemological

sense autonomous emergent human natural experience and higher-level knowledge. Fortunately, however, physics deals perfectly with emergent phenomena. If we do not accept that heat is a reduced but still epistemologically emergent phenomenon that could lead even to the questioning of the successful reduction of heat; see this arguing here: Needham 2009.

It seems to me that Bedau wants to defend weak emergence from reduction, contrasting “standard” reduction to simulation, but it cannot be done and there is no need. Reduced higher-level comprehensive phenomena of matter (or of a simulated logical world) is really very interesting—just ask chemists. Weak emergence on its own is a materialist notion, and to make a distinction in an ontologically materialist framework between emergent and reduced higher-level descriptions of phenomena is highly problematic. It leads to a reduction-emergence dichotomy, to rivalry on the epistemological side, calling one kind of reduced descriptions emergent and another kind of *also* reduced descriptions non-emergent. It can be even worse to call non-reduced descriptions emergent. In this way we call higher-level descriptions epistemologically emergent even when they have no epistemic connection to material descriptions, and such higher-level descriptions that *have* that clear epistemic connection to the material level, we do not call emergent. The foundation of this epistemic reduction-emergence rivalry is the *a priori* materialist ontological conviction at the other side, which ignores the ontological consequences and concentrates only on the concrete reduction methods. However, for emergence the actual reduction method does not matter; what is important is the success or the failure of the reduction.

So, to sum up again, we can say that *epistemological emergentism* asserts that *there are two (or more) different kinds of epistemic levels*. However, there is *only one fundamental* description: fundamental physics, e.g. quantum mechanics or string theory. The other(s) is *emergent*. Thus their relation is *asymmetrical*. The emergent level(s) is not self-sufficient, but necessarily *relies on* the fundamental level.

This solution, although consistent, still can suggest that emergence as reduction is not an ontological conviction; moreover, it is not the opposite of reduction but rather they together lead us to materialism. Nevertheless, this has been only one Janus face of emergence. The other one lies where Bedau, as a materialist, does not go. Remember the three conditions of reduction named at the beginning of this section: the objects on the ontological side, the descriptions on the epistemological side and the reduction method. These latter factors, as we have seen, are not just epistemological tools as we have interpreted them here, but they as human knowledge are ontologically existing objects too. The mind/person is a *necessary precondition* for epistemological emergence.

#### 4. The Two Janus Faces of Emergence

We have seen in the previous section that the ontological consequence of a failed, unsuccessful reduction is an ontological statement, namely, that two objects exist.

**object1 ← description1**

**object2 ← description2**

This might suggest that then we must accept dualism. But that is not the case at all, because the two objects can be connected by an emergent relation.

Ontological emergentism asserts that there are at least two different kind of reality, but contrary to dualism, only one is fundamental substance. The other(s) is/are emergent. This means that the other kind of reality is not independent, eternal or created, but evolved from matter and although it exists, it cannot exist without its material fundament. That is, more precisely, there are no two independent objects, just one multileveled one that consists of one fundamental and at least one emergent level(s) of reality. Contrary to heat, this higher-level description has its own independent reference and meaning.

**object, higher level ← description1**

↑

**object, lower level ← description2**

Nevertheless, we have seen in the previous section that at the epistemological side reduction and emergence presuppose each other; otherwise, we have to speak about dualism. Here the situation is the *same*, but not in the



same *sense*; this is not the epistemological side. Epistemological emergence and reduction exclude ontological emergence because they means that the object is material and has only one fundamental level.

Therefore I assert that ontological emergence and ontological reduction presuppose each other as well as epistemological emergence and epistemological reduction do. Here, a successful reduction also reveals the emergent relationship, and this hidden relationship makes possible the successful, revealing reduction, for otherwise we have to speak about dualism. That is, an emergentist has to be a (kind of ontological) reductionist otherwise he would not be an emergentist at all. To my knowledge the first person who recognized this was Michael Polanyi (1962: 393-294).

The situation is the following: emergent levels do not exist from the beginning. Once only matter existed; emergent levels evolve from matter. Why it is surprising, then, that they can be traced back? It is not. It is surprising to call this process reduction. Because the concept of reduction is strongly connected to materialism. But materialism is an ontological conviction and reduction is “only” an epistemological tool. They are not in the same category. Materialism presupposes one kind of reality on the ontological side; therefore it allows *only* epistemological reduction on the epistemological side. This epistemological reduction corresponds to materialism; and ontological reduction to emergentism. (Thus, and it is important to note, my understanding of ontological reduction is not in the least the same as several other author using the term nowadays, e.g. Moulines, 2006 or McIntyre, 2007.)

<b>No reduction</b>	<b>Ontological reduction</b>	<b>Epistemological reduction</b>
<b>Dualism</b>	<b>Emergence</b>	<b>Materialism</b>

It follows that materialism has to deny the possibility of ontological reduction, and so it does. But emergentism has to resist the influential dogmas of materialism and *has to call* ontological reduction as it is: ontological reduction—and then there remains nothing “mysterious” or “magical” in ontological emergence.

Earlier, I called this kind of reduction *diachronic reduction* because of its necessary *evolutionary* nature (Paksi 2011), but not in the same sense as several other authors, e.g. Reuger (2000).

It follows that there is indeed a severe conflict between emergence and reduction. However, this conflict is not between epistemological emergence and epistemological reduction, as we are inclined to think according to materialism, and not between ontological emergence and reduction, but *between the reduction and emergence concepts of the different sides*. Epistemological reduction excludes ontological emergence just as ontological reduction excludes epistemological emergence.

Now, the question is: what is the essential difference between epistemological and ontological reduction?

	<b>object, higher level</b>	←	<b>description1</b>
<b>process of emergence</b>	↑	←	↓ <b>reduction method</b>
<b>beginnings</b>	↑ → <b>object, lower level</b>	←	<b>description2</b>

First, the reference and meaning of the higher-level description has been channeled in the reduction method only partially, and *partially it keeps its reference and meaning*. There is a higher level(s) at the ontological side, therefore a higher-level description(s) has to keep its own reference and meaning. But at the same time, there are important *lower-level conditions* for emergent levels, without which there is no emergence at all—and this partially reduces the reference and meaning of the higher-level description(s), as we have seen in the case of heat, with the essential difference that here the reduction is not complete.

Second, the reduction cannot be completed because on the ontological side there exist not just ontological levels but also the *process of emergence itself* (the up arrow of the figure), by which the higher level(s) has evolved. Thus ontological reduction cannot deal synchronically with a higher-level description and the lower-level one at the same time. Emergent levels do not and cannot evolve from their actual material foundations (as heat is the actual comprehensive phenomenon of its fundamental material conditions) but from the material conditions of the beginnings. Therefore, ontological reduction *has to deal* not just synchronically with actual material conditions, but *diachronically with the long evolution of the emergent object and its all, different material conditions of the whole process*. This is not an easy task and means *the involving of description(s) of the evolutionary process of emergence from the present to the beginnings into the reduction method*.

Third, successful ontological reduction asserts that the higher level(s) *did not exist at the beginning* of the

process of emergence but *at the end it does*. This corresponds to ontological reduction's diachronic nature, which is missing from epistemological reduction.

Fourth, emergent evolution by definition of ontological emergence *cannot be formalized exactly* (This is contrary to Nagel's first condition for reduction (Nagel, 1962)). It is *indefinable* and leads to *novelty*. Emergent objects are *individual*; they cannot be described as exactly as heat and particles. Naturally, they can be similar (as a frog is similar to another frog), they can be and have to be categorized, but they cannot be identical, because all of them have individual experiences, skills and (personal) knowledge. (Polanyi 1962) Accordingly, they all are connected to one another at different emergent levels that determine their behaviour, relations and existence; because in fact there are no independent, different processes of emergent evolutions, there is just one single but highly diversified emergent evolution on Earth.

Therefore, ontological reduction is not an exact science and cannot be—it is “only” *natural science*. Ontological reduction is, rather, more an *exhaustive description* than a formalized reduction method. It has to deal with different levels of billions of years of an emergent evolutionary process, and each of these levels has its own actual “material” conditions and the emergent principles according to which they will be successful and live or fail and die. And even before all of this, the different emergent levels must be identified. In the end, though, every emergent being and level can be traced back to one fundamental level, to the primordial material substance and its comprehensive features in the beginning. *This is the real reason we do not believe in dualism and vitalism or creationism* and not at the least the successful epistemological reduction of the chemical level.

So in fact there are *several* examples of ontological reduction—several weak examples. They are weak because natural scientists want to reduce the higher levels of life according to the concepts and conviction of materialism, meaning the use of epistemological reduction methods and concepts of materialism to explain everything by (and only by) material conditions. Even those who want to break with materialism have typically only materialist epistemic tools to do it, because all contemporary science stands on firm materialist grounds. Nevertheless, this seems to have started slowly to change. As in practice, the reduction (called explanation) of life has always used evolutionary descriptions and models that are diachronic in nature, determine higher levels, understand their principle, and describe their workings, success and failure, etc.—just open, for example, *The Origin of Species by Means of Natural Selection*. One of the best examples of ontological reduction is Lynn Margulis' explanation of the origin of eukaryotic cells (Margulis 1970), and one of my favorite attempts at ontologically reducing the human mind is Merlin Donald's *Origin of the Modern Mind* (1991). Only the “official” interpretations say that there is nothing more than materialism and the “right method” of science allow but epistemological reduction has *never* showed that. If epistemological reduction would fail also in the future, and materialism would go on denying ontological reduction, this would only strengthen dualism and anti-scientific creationism. However, materialists have to deny ontological reduction and try to reach epistemological reduction. Fortunately biologists resist this—but nevertheless do not dare to think that they are not materialist. Still, I believe it would be very useful to interpret and create these models, descriptions and explanations on their own natural grounds and to call the existing practice of fractional ontological reduction to ontological reduction and build it up—to use emergent interpretations, suppose and seek real emergent principles and handle material conditions in their rightful places. If materialism wrong this could really inspire biology and, I believe, social sciences on evolutionary grounds.

At first glance, epistemological emergentism as an independent and “metaphysically innocent” theory seems to be richer because it assumes higher-level, comprehensive, epistemologically emergent phenomena; but, as we have seen, without the existence of human knowledge, which is the precondition of any higher level, comprehensive phenomena, it is only controversial materialism. *Epistemological emergence has to be one Janus faces of emergence. The other is ontological emergence. Together they are the one proper medium ontological conviction between dualism and materialist monism.*

Now we see that the ontological reduction of higher levels can reveal that a higher-level object has neither dual substantial nor vital nature. Disbelief in dualism and vitalism comes not because of the successful epistemological reduction of the chemical level or heat *but because of successful evolutionary explanations, that is, ontological reductions of life*. Charles Darwin shook dualism and creationism, not Bacon, Maxwell or quantum mechanics.

Nonetheless, the ontological reduction of biological and cultural life is not complete, and by exact criteria it never will be because it is not exact science. Therefore, the belief in dualism will remain with us for a long time, if not forever. As we demand exact criteria for completeness, we also see that such *materialist notions* as the

denying of ontological reductions oddly enough *can really strengthen the belief in dualism*. The reason for this is the wrong materialism-dualism dichotomy, which can only be transcended by the original notion of emergentism.

## 5. Conclusion

At the beginning of the 20th century, British Emergentism rose and fell over a very short period of time, and the original meaning of emergence faded away. Today, the concept of emergence is here again, but it is severely influenced by materialist concepts and methods. A weak or epistemological understanding of emergence has arisen and the possibility of an ontological or strong emergence is questioned.

In this paper I have argued that, in contrast to materialist interpretations, reduction is not at all the opposite of emergence and that the ontological consequence of a successful standard, epistemological reduction of the exact sciences is the elimination of the higher-level object of the reduced description. At the same time, very few descriptions of higher-level objects have been reduced in this way so far; this is not the reason why we believe in materialism but the false materialism-dualism dichotomy, we do not want to choose the latter.

However, the fact that we cannot reduce everything in this way does not lead us back to dualism, because reduction is not the opposite of emergence, and there is an emergentist notion of reduction too, namely the ontological or diachronic reduction of natural sciences. Ontological reduction is not exact but rather natural science; it can trace back diachronically the emergent levels of life to the primordial material substance and its comprehensive, epistemologically emergent features at the beginning. There is no some kind of universal emergence as the British Emergentists had thought, just an Earth-centered one, which we call evolution. Thus, emergence necessarily has two faces: one epistemological, looking into the material world, and one ontological, which is the emergent levels of life and evolution itself. I believe this is the proper medium ontological conviction between dualism (or vitalism, creationism, etc.) and materialist monism.

## Acknowledges

I would like to thanks to my grants OTKA PD 83589, and OTKA K 84145.

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