FUNDAMENTALITY: STRUCTURES, POWERS, AND SUPERVENIENCE DUALISM

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To say what "fundamentality" means, we have to start by approaching what we generally see at the empty place of the predicate "____ is fundamental". We generally talk about fundamental entities and fundamental theories. At this article, I tried to make a metaphysical approach of what is for something to be fundamental, and I also tried to talk a little bit of fundamental incomplete and complete theories. To do that, I start stating the notion of "entity" and looking at the difference at perceived entities. The difference led us to talk about the entities' structures and their powers, and about the supervenience between these last two. The supervenience talk made us to see the fight between emergentism and reductionism as the difference between the irreducibility of laws and the reducibility of powers and structures to lower-order domains. Then, we conclude that "fundamentality" is a mereological relation – a relation that a whole structure has to a certain combination of its structural parts or that a power has to a certain combination of its constituent powers – of to be identical and to exist in virtue of them.

Key-Words: Mereology. Fundamentality. Reduction. Emergence. Supervenience.

Difference at the entities – structures and powers

An entity is something that must be encountered in the space and something that is manifested through its powers. A power is a potentiality of an entity that becomes effective when the right conditions are met. For example, a human being is an entity because he is something encountered in the space and something manifested through its powers – colors, textures, smells, hardness, solubility etc. When we see two different human beings, we ask ourselves about the reason of this difference. If there are similar external conditions where both human beings are, and no relevant difference at the observer perceptive apparatus, we have to think that the difference at the perceived powers come from a difference at something intrinsic to the entity. We have to think that there is something that if the perceived powers change, it also change. And this "something" is the entity's structure (because there is no other thing to be).

When we analyze an entity without paying attention to its powers, we just have its structure. To imagine it better: try to think about hydrogen as a sphere and about oxygen as a cube. So, a hydrogen is a sphere with some powers, and an oxygen is a cube with some powers. Then, structurally, or better, without attention to the powers, a molecule of H_2O is just two spheres in a certain relation (relation X) to a cube. The structure, and not the powers, is met in the space. Because the space where the powers present themselves is in the same space where the structure is, but they are different from the structure. Thus, backing to the difference subject, if something is structurally H_2O (a cube X-related to two spheres) and present the powers of to be transparent and to dissolve salt, if there is another entity that is not transparent or that does not dissolve salt, it is rational to think that there is a difference at its structure.

As the structure can be encountered in the space and the powers cannot, they are different; and, therefore, the entity must be seen in two ways: structurally and in its powers. But if it is so, we have to explain the relation between structures and powers, and the relation between an entity and its structures and powers. That is what I am going to do now.

Laws of nature, intrinsic powers, and supervenience

When we divide an entity within structure and powers, we have to explain why a certain structure manifests a certain power. For example, why the structure of a cube X-related to two spheres manifests the power of high solubility for salt? There are two answers for that: (i) there are laws of nature that make a certain kind of structure to manifest a certain kind of power, or that (ii) the kind of manifested powers are intrinsic to that kind of structure. Both approaches are problematic: they have to explain, the first, what is a law of nature, and the second, what is "intrinsic". What both answers seem to maintain is that the powers of an entity are supervenient on its structure, or on its structure together with the laws of nature. It means that there cannot be a difference within an entity powers without a difference within the entity structure or also within the laws of nature – if we use the laws of nature's approach. Of course, it does not mean the reciprocal is true: different structures can present the same powers.

I rather prefer to use the laws of nature's thesis because (a) it gets clearer what I want to say, (b) because I do not want to postulate infinite potentialities to the structures, and (c) because talking about intrinsic powers – or better, dispositions – do not explain why there are any disposition at all. If I say that structures have intrinsic powers, I would have to say that the structures have intrinsic powers for each kind of ambient they could exist in; and thus these powers would be infinite. This is not a complete justification of the preference for the laws of nature, but it will not be a problem. If through an argument someone reduces the laws of nature to intrinsic powers, the only thing we must do then is to adequate the theory I am exposing here to intrinsic powers' talk.

Thus, I must say that the powers are supervenient on the structures and on the laws of nature. Or better, two entities structure-indiscernible at alike conditions are powers-indiscernible at alike conditions. These conditions are the ambient and the laws of nature. As powers supervene on structures and are different from them, we have to pay attention to the relation between them as to discover their nature.

If we try to establish an interaction between a power and a structure, it will not make any sense. For example, the cubes and spheres that H_2O structurally are cannot interact with the power of to be a liquid substance; it can only interact with structures of the same order (atoms with atoms, molecules with molecules, and so on) and of the same mode (structure or power). But the power of to be a liquid substance can interact to the power of freezing substances that the structure of a freezer has. Structures can only interact to structures, and powers can only interact to powers; although powers are supervenient on structures together with the conditions (plus laws). And if, for example, from the interaction of the powers of the water and the powers of the freezer, the water becomes ice (it means that a combination of powers modified the entity's powers); and, in the same time, a change occurred at its structure. It is a kind of parallelism between structures and powers, and between mereological-orders (atoms do not interact to molecules, they only interact to atoms). Thus, if there cannot be interaction between structures and powers, although powers occur within an entity's structure without occupying its space, powers have a different nature of the structures. But what is the nature of a structure?

The structures as wholes, the mereological supervenience and the problem of emergents

A structure is a whole that can or cannot be made of proper parts. A proper part is a part that is not identical to the whole. For example, 10 ml of water is a structure made of lots of molecules of H_2O together in a certain relation. The molecules of H_2O and its relation are proper parts of the 10 ml of water. Also each molecule of H_2O is a structure and wholes made of proper parts. H_2O is a structure made of a certain relation between two atoms of hydrogen and one atom of oxygen. Thus, 10 ml of water is made of a certain relation between complexes of atoms.

But what does "to be made of" means? There are two senses we can understand it: (1) as the materials an entity presents itself in, and (2) as the identity between the whole and its proper parts. I understand it here as (2). So, the conjunction of the structural proper parts of a whole together with the non-structural proper part of that whole – the relation that the structural parts have to be the whole – *is* the whole. Therefore, it cannot be a change in the whole without a change in the proper parts, or better, the whole is supervenient on the conjunction of its proper parts. And as the conjunction of all the proper parts is the whole, "the conjunction of all proper parts being supervenient on the whole" is true. If this is so, the whole is reducible to the conjunction of its proper parts.

Not everybody would accept such a claim without restrictions. There are some philosophers called “emergentists” that would deny that the whole is always reducible to its parts. Nevertheless, I think that position arises from a mess between powers and structures, and from an intuition that the sum of the parts is not always equal to the whole; for example, when the powers of the whole are not any power of its structural proper parts. Some power emerges from the whole and it is not in any of its parts. This thesis is generally used to defend the existence of some powers that are claimed to be emergent, as the life or the mentality, and to defend that the reality is organized in orders of existents with its own laws. Other arguments for the emergentist position are the unpredictability argument and the argument for the impossibility of deduction. The first say that we can only predicate an emergent power to an entity if it is already instantiated at a higher-order whole, and the other say that we cannot deduce from the lower-order parts and its regulative lower-order laws the higher-order powers and laws.

My argument to counter the emergentists is to say that a sum is not a conjunction, and that the parts they are talking are only the structural proper parts, they generally do not include the relation between the proper parts. The structural proper parts without the relation are not comparable to the whole. A sum of all structural proper parts is not the conjunction of all – structural and non-structural – proper parts. It is not a conjunction because a sum of parts can only be thought as parts together side by side, and a conjunction is something more interactive.

But I agree in part with the unpredictability and the impossible-deduction arguments. Of course we can only predicate a specific x-order power to an entity of the x-order. In this sense all predicates are emergent. It only shows us that the powers emerge from a whole structure, or better, from the relation of the entity’s structural proper parts (together with the laws of nature and the ambient), and not from the sum of the structural proper parts – if those entities are made of proper parts. And this answer leads us to the impossible-deduction argument. As a law connecting molecules is in fact a law connecting complexes of atoms, we cannot understand why we cannot deduce that a relation between complexes of atoms will present some specific power based on laws of the relation of atomic complexes. The emergentist can say that although a structure can be reduced to the relation of its proper parts, the laws of wholes cannot be reduced to laws about the parts. Again, we do not understand why this impossibility is relevant to the emergentist. Laws are not reducible because they treat of x-order specific kinds of entities. All laws are emergent, in the unpredictability sense. But we can reduce the entities from those laws to a conjunction of its proper parts and think it as a law about complexes of lower-order entities. Thus, we can assume there are emergent powers and laws (all powers and laws), but not that these emergents cannot be analyzed in terms of lower-order entities and, therefore, reduced.

If we analyze only the powers we can also see that: a power, as a structure, is the conjunction of its components of lower-order. For example, the power of “to be liquid as water” that arises from 10 ml of water is a conjunction of the powers of each molecule of H_2O. Since there is a conjunction of powers and a law of nature indicating the power that will be that conjunction, a power can be analyzed in terms of a conjunction of its component

powers plus laws.

So, there are two relations of supervenience: a whole is supervenient on its proper parts and the powers are supervenient on its structure. It means there cannot be a change in entity's powers without a change in its structure. It is saying that there cannot be two objects indiscernible at their structures and discernible at their powers, if they are at same conditions. The whole/proper-parts supervenience is wider than a mere covariance. The whole is identical to its proper parts, or components, whether we talk about structures, or we talk about powers. The laws are the only ones we could not reduce as the emergentist would like it, but it is not an argument against reductionism, because the intrinsic nature of a law is to be a law that rule over certain kinds of variables. It is not an argument against reductionism because if we reduce the variables the laws are ruling to proper parts variables, we will achieve a law of the lowest-order entities; although it is a law about complexes of such lower-order entity. A complete theory of our lowest-order entities – of its structure and powers – would have laws about all fundamental entities and about their complexes.

Fundamentality as reducibility and identity between the whole and its parts

I hope our reductionist talk helps us to understand what fundamentality is. When we say "is fundamental", we generally apply such predicate to entities (structures and powers) and theories. Theories are methodic descriptions of structures, powers and laws from the reality. To apply such a predicate to one of these things is to say that they are fundamental. But what means "to be fundamental"?

Fundamentality is a certain relation that a whole has to its proper parts of to be reducible to them. And to be reducible to its proper parts, here, is to be identical and to exist in virtue of its proper parts. The powers of a molecule exist in virtue of the conjunction of the powers of its proper parts (together with the ambient and the laws of nature), and they are identical to the conjunction of the proper parts' powers. It is similar for powers, structures, and theories. If we can talk about the entities of a theory in terms of these entities' proper parts, we are reducing such a theory to a more fundamental theory. A higher-order theory would be only a part of the lowest-order theory, and a higher-order theory would have identical constituents to some part of the lowest-order theory: the possibility of the existence of a higher-order theory can only occur in virtue of the possibility of the existence of the lowest-order theory. Every time we reduce something, we reduce it to something more fundamental. We will talk a little later about theories.

Let's talk now about this "more fundamental". Reducibility, as supervenience, that is a demand of reducibility, is a transitive relation. It means that if A is reducible to B, and B is reducible to C, then A is reducible to C. If we see the organization of the entities of reality in levels of reducible entities, we would be allowed to talk about *more* fundamental entities. And we are allowed to do that since there are reducible complexes of entities and non-reducible

laws – at emergentist sense of "non-reducible". They are not reducible because they have to talk about the variable they talk; but they are reducible if we think them as laws of the *most* fundamental complete theory. To be the most fundamental theory, structure, or power is to be an irreducible theory, structure, or power.

Complete and incomplete theories

A fundamental theory is a theory about fundamental powers, structures and laws. A complete theory is a theory that talks about all powers, structures and laws. The complete most fundamental theory would be a theory that talks about all most fundamental powers, structures and laws. Such a theory would contain all the fundamental structures and powers, and their complexes, and all laws for their relations and manifestations. Such a theory would be a mirror of the most fundamental level of reality.

But when emergentists say, for example, that sociology cannot be reduced to physics, they are not referring to the complete most fundamental theory. They are talking about the incomplete theories we have at present days. The emergentist is seeing the present physics as the most fundamental science – because it tries to talk about the most fundamental entities – and saying that from the laws and entities of present physics, we cannot achieve a deduction of higher-order powers and laws. We can agree with that. Present physics is not a complete theory about the most fundamental entities. Until now, it never discovered which entities are the fundamental ones. The emergentist argument should target complete physics, and not the incomplete one. But if complete physics has all the fundamental entities, its complexes, and its laws, all other theories would be deduced from physics. In fact, complete sociology for example would be only a branch of complete physics, because it would be a talk about how some kind of complexes of fundamental entities socio-relate to each other. So, the complete physics would be the most fundamental theory, or better, the irreducible theory.

Present physics cannot be the target of emergentists, because it does not intend to give an approach of all laws, and all complexes of structures and of powers. The specialization of sciences makes our present scientific practice in levels – each present science studies certain complexes of fundamental entities in a certain manner – and it makes that for achieve complete physics we would have to unite all complete sciences, taking into account they are sciences of complexes of the most fundamental particles. But if we accept that there are emergents that would be ruled by laws outside the complete physics, or better, to accept ontological emergence, it would be to deny that the causal physical determinism obtains; problem that my theory does not have. All I have said is compatible with determinism. We can only think emergence as compatible with determinism if we say things like "powers emerge from structures and laws" not in the sense that they are not in complete physics, but thinking "emerge" as "arise from". Thus, causality and determinism got preserved, and all powers become emergents. Or, by thinking "an emergent" as an irreducible law, making all laws emergents; what also preserves causality and determinism. So, the few theses the emergentist

can sustain are consistent with our reductionist approach.

Dualism: structures and the power of mentality

A real emergentist seems to try to preserve the distinct nature of some powers from a structure, such as mentality. But since we have an ontology that says to us that entities are structures and powers, and that powers have a different nature from structures – only these last ones are met in the space, while the former are not – we cannot find a substantial difference, for example, between the power of being yellow and the power of being a mind. Both have not spatial location; both supervene on some physical structure and arise from it. They both seem powers that arise from structures. They both have the same mystery of the power emergence. This happens also with other powers, as "to be alive", and maybe with all the others. Remembering that the mystery we have to solve is how a structure presents powers at all.

As we had saw, dualism about brain and mind can be defended naturalistically if we accept a dualism about structures and powers. Thus, the mind would seem a power that arises from a brain-structure. But, at least, this supervenience dualism about entities seems more reasonable then a strong monism about them, and it is still part of a naturalistic project that intends to place the mind, and all other structures' powers, as variables of the complete naturalistic physical theory.

Conclusion

The intent of this article was to explain what fundamentality is within concrete objects. I called the concrete objects "entities". As the difference within perceived powers of an entity alike in conditions led us to a difference at the entity's spatial part, we have to postulate that entities are structures and powers.

As we saw, structures and powers organize themselves at levels of existents and can only relate themselves with structures and powers of the same level (or order), although powers only relate to powers and structures only relate to structures. It is a kind of parallelism between structures and powers. The parallelism also obtains in the case of the levels of existents (mereological-orders). It happens the same thing at the whole made of molecules and at the complex made of atoms that occupy the same space of whole made of molecules. It is also true for the powers and for the relation of its constituent powers.

If this is so, the whole is the conjunction of its proper parts, and "fundamentality" is the relation of "to be reducible". That is the relation that a whole has to its proper parts of to be identical and of to exist in virtue of its proper parts. Thus, "the absolute fundamentality" –

to be the most fundamental – would be "irreducibility". And this is true for spatial (structural) and non-spatial (powers) parts from the concrete entities.

As I said, the entity dualism here asserted propitiate the dualism at the mind-brain problem, but at least explain what fundamentality is, and makes all powers, that are all non-spatial, to become physical and natural objects of study; what is a physicalist and a naturalist approach of the concrete entities. Nevertheless, I cannot explain here what a law of nature is. But it is not an insoluble problem, since we can modify the supervenience dualism to accept a clearer notion than a law of nature. Since we still do not have that clear notion, and since I still do not know where to place the law of nature or whether there is any law of nature at all, I cannot talk about fundamental categories here. However, putting the laws aside, the fundamental categories within physical objects – and there are only physical objects – would be to be a structure and to be a power.

References

BATTERMAN, Robert. 2008, "Intertheory Relations in Physics". *Stanford Encyclopedia of Philosophy*. Edward N. Zalta, ed., URL = http://plato.stanford.edu/archives/fall2008/entries/physics-interrelate/

BRIGANDT, Ingo and LOVE, Alan. 2008, "Reductionism in Biology". *The Stanford Encyclopedia of Philosophy*, Edward N. Zalta, ed., URL = http://plato.stanford.edu/archives/fall2008/entries/reduction-biology/

HELLMAN, Geoffrey and THOMPSON, Frank. 2006, "Physicalism: Ontology, Determination, and Reduction", in: KIM, Jaegwon and SOSA, Ernst. *Metaphysics*: *an anthology*. 8ª ed. Malden: Blackwell, pp. 531-539.

KIM, Jaegwon. 2006, "Multiple Realization and the Metaphsycis of Reduction". In: KIM, Jaegwon and SOSA, Ernst. *Metaphysics*: *an anthology*. 8ª ed. Malden: Blackwell, pp. 515-530.

_____. 2006, "Supervenience as a Philosophical Concept". In: KIM, Jaegwon and SOSA, Ernst. *Metaphysics*: *an anthology*. 8ª ed. Malden: Blackwell, pp. 540-556.

MCLAUGHLIN, Brian and BENNETT, Karen. 2008, "Supervenience". *The Stanford Encyclopedia of Philosophy*, Edward N. Zalta, ed., URL = http://plato.stanford.edu/archives/fall2008/entries/supervenience/

SCHAFFER, Jonathan. 2008, "Monism". *The Stanford Encyclopedia of Philosophy*, Edward N. Zalta, ed., URL = http://plato.stanford.edu/archives/fall2008/entries/monism/

STEPHAN, Achim. 2007, "Emergentism, irreducibility, and downward causation". *Grazer Philosophische Studien*: vol. 65, pp. 77-93.

STOLJAR, Daniel. 2008, “Physicalism”. *The Stanford Encyclopedia of Philosophy*, Edward N. Zalta, ed., URL = http://plato.stanford.edu/archives/fall2008/entries/physicalism/

VARZI, Achille. 2008, “Mereology”. *The Stanford Encyclopedia of Philosophy*, Edward N. Zalta, ed., URL = http://plato.stanford.edu/archives/fall2008/entries/mereology/