HUSSERLIAN PREGNANT WHOLES AS AN ONTOLOGICAL CRITERION FOR INDIVIDUALS AND OBJECTS*

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1. Introduction

The first part of this work intends to give a general survey of some theories current in the fields of ontology and mereology dealing with the well-known problem of whole-parts relations. Some hints about the philosophical consequences of these positions concerning the problem of identity will be given. In the conclusive part of the article I will focus on a specific identity criterion defining the Cartesian notion of substance in order to distinguish in ontological-formal terms individuals from objects. More specifically, it seems that the differents notions of pregnant whole of Husserl's "Third Logical Investigation" can single out the formal parthood structure of certain kinds of entities, typically living beings, from that of material artifacts or objects.

It is well-known that the topic of whole-parts relations is today at the centre of a lively debate about relationships between metaphysics, ontology and many applied disciplines such as medical-biological sciences, cognitive sciences, but also geography, environmental sciences or software engineering. My research aims at developing some important issues of the "Third Logical Investigation" named "On The theory of Wholes and their Parts", in view of presenting a double type articulated theory of strong integrated wholes called, respectively, *unitary pregnant wholes* and *emergent or supervenient pregnant wholes.* The former typically exemplified by living beings or individuals, the latter by complexes of individual properties called by the Australian philosopher

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Keith Campbell <abstract or dependent particulars>[1], as opposed to <concrete particulars> also known in the tradition as substances or individuals. Abstract particulars of Campbell are very close to Williams's <tropes> and Husserl's <individual moments>, but many centuries before Leibniz and Aristotle called them <individual accidents or individual properties>. Donald Williams (1953) espoused his view in the pioneering "The Elements of Being" where substances are bundles of tropes related by a relation of compresence. Campbell following Williams wrote: ***"an ordinary object, a concrete particular, is a total group of compresent tropes or abstract particulars".***[2]

I will not accept the bundle theory because the relation of compresence is too weak in order to explain how from a fusion of tropes we can move to concrete particulars as objects or living beings. Individual properties seem to be too insubstantial to give rise to substantial individuals by bundling, that remain - as Peter Simons assumes - a mere collection and not an individual.[3] In my view, bundles of tropes - not single tropes - are emergent or supervenient pregnant wholes made up by the Husserlian relation of ontological foundation binding unitarily every trope. They can be melodies, the laughing of the Mona Lisa, expressive and affective aspects of anatomical parts as faces, attributes of objects shape as the pug-nose of Theaetetus in the famous dialogue of Plato, or as in an example of Peter Simons, the way Ingrid Bergman asks Sam to play "As time goes by" in Casablanca, and so on.[4] Unitary pregnant wholes and the emergent wholes - plausibly, living beings and complexes of tropes - are radically distincts form each other and from material artifacts - ***medium-sized*** *dry goods* as in the words of J. L. Austin, the inanimate things called by Husserl ***narrow wholes.***

2. Extensional Approaches to Whole-Parts Relations

My view also differs from the formal theory of whole known as classical exstensional mereology which is usually presented in two logical guises: *"The calculus of individuals"* of H. Leonard and N. Goodman and the mereology of Lesniewski.[5] Usually in extensional mereologies no formal ontological differences have been carried out up to now between individuals and objects. These theories are subject to two major criticisms.

The first is that it asserts the existence of certain individuals - called mereological sums - for whose existence we have no evidence outside the theory itself. The second and more fundamental criticism is that they do not fit most of the objects around us.

Also in the spirit of analytic philosophy, objects and individuals have always been conceived like spatiotemporal entities with the same conditions of identity in a strict sense and across time. For Frege and Quine individuals and objects both can be in the same way the value of a logical variable in a predicate calculus. Peter Strawson applies the term *individual* to refer to all the conceivable spatiotemporal entities even if he recognises that the terms individual and object are linguistic expressions that cannot be synonymous.[6]

Recently, some theories have been proposed to favor the encounter between topological disciplines of space and mereological theories like those mentioned before. Roberto Casati & Achille Varzi in their two books published by MIT Press, *"Holes and Other Superficialities",* 1994, and *"Parts and Places",* 1999, have reformulated many mereological principles in terms of topological principles that lie behind spatial representations. Casati & Varzi apply these principles to things conceived as specific space regions clearly determined by bona fide boundaries constituted by surfaces or lines. Mereo-topological approaches together with purely logic-analytical conception of entities cannot in any case formally distinguish between individuals and objects and also between wholes like living beings and complexes or bundles of tropes.

The topological attitude does not also offer a well outlined position on the problem of identity, as to say that this problem is still open to different solutions. On the contrary, in extensional mereology the identity of things is given by the strict algebric sum of their actual proper parts. In classical extensional mereology things are pure aggregates of parts. The crucial notion of identity of extensional mereology is the claim that entities with the same parts are identical. This is a thesis developed by analogy with the extensionality of sets, whereby sets with the same members are not only identical but also possible. But in spite of the theory of sets, the notion of identity that we find in mereology is not abstract or ideal identity - as the identity between two numbers - or the one of qualitative-material similarity between two things, but it is rather the

notion of the ***thisness*** of a thing as numerical sameness that is at play. The notion of identity of mereology is not so far from that of tropes theories. We can trace the philosophical origins of identity notion of the mereological approach to the philosophy of Leibniz, more precisely in his super-essentialism where the identity of a thing is given by all its individual intrinsic non relational properties. This situation is exactly formulated in his Principle of the Identity of Indiscernibles.

If the thesis of mereological essentialism is accepted then two ***prima facie*** big problems need to be accounted for. (1) The first is that certain things like living beings have clearly different parts at different times, they are mereologically variable or in flux. We easily see how an entity with different parts or properties at different times cannot be identical with the sum of its parts at any time, for then it would be different from itself across time. (2) The second problem is that some entities in the world would have had some parts other than those they actually have, and still be the same entities. In other words, they are not modally rigid in their parts. If we accept exstensional mereology then no objects could have had parts other than those they actually have. This claim is called mereological essentialism and it is usually associated with Chisholm.[7]

It must be clear that in every essentialist approach and accordingly to exstensional merelogy, an individual in two different times because of natural changes in the compositional structure of his parts, could not be considered the same individual. For instance, if at a certain time t_1 the individual A is composed of the sum of the parts <a + b + c + d + e>, and at the time t_2 the individual A_1, temporally continuous with A, is composed of the parts <a + b + c + d>, we say that the individual designated by the term A_1 cannot be the same as the individual designated by A. Mereologically they cannot be identical because they have different parts, and we have then to exclude a relation of identity through time.

2.1 Modal Approaches

The modal approaches try to avoid the many problems of strong essentialist theories by using a form of weaker essentialism. For example, this table could have been painted with another colour and it seems plausible to think that it would be the same table. In the same way, a person could have undertaken different careers or experiences and still

be identified as the same individual. However, the crucial problem with modal approaches is that they do not offer a well defined criterion to establish when an individual is still the same individual. How far can we push ourselves in imagining possible worlds populated by individuals with counterfactual properties? Modal theories are not able to determine what are the essential properties that an entity could not lose without becoming another entity with a different individual identity or a specific identity. We find here the express acknowledgement that the problem of identity through time is one to which we cannot offer really satisfying solutions, as in these claims by Saul Kripke, which do not seem to encourage to solve identity problems: ***"in reality adequate conditions, necessary and sufficient, for the identity that is not a matter of principle are in any case rare. To tell the truth, mathematics is the only case that I know in which such conditions are even given in a possible world. I don't know conditions of this kind for the identity of material objects in time, or for people. Everybody knows what kind of problem we are dealing with. But let's drop the subject".***[8]

In modal approaches the identity across time of an individual must satisfy the more general conditions expressed by the properties of his genus or species. The general attitude of modal theories about identity seem to be trapped in what we could call the *vicious analytical circle* in as much as they continually refer to the species of the individual to define what an individual is permanently across time at the level of its individual identity. To achieve this they usually use a form of mereological essentialism less restrictive than of extensional mereology to make up for the lack of theory of individual identity. They start off with a definition of the individual coinciding with the definition of his natural species or natural kind establishing his general existential conditions, then they deduce that his individual identity may persist across time and change if and only if it continues to satisfy the defining conditions of the species to which it belongs, if it continues to exist as an exemplification of its species. But what seems to be defined in reality is nothig but certain conceptual notions in use in the linguistic community, or rather, certain scientific notions that are applied to kinds of individual but that cannot describe the infinitely richer and more complex individual reality. It seems implausible to think that individual identity could be established simply

by the fact that an individual was born by the sexual union of a couple of individuals as in the Kripke's theory. We are clearly dealing here with conditions that have some value for the specific identity of an individual but not for his individual identity.

As soon as the individual identity of a human being is presented as the same as having a head, a heart, a DNA, etc., it seems necessary then that the loss of one of these parts invariably provokes the loss of the individual identity. Following an old mental experiment by Hilary Putnam we can think instead that an individual could preserve his individual identity constituted by his physical external features, his character, personality, memories or abilities, and at the same time this individual may radically change his specific identity - constituted by his organic internal structure - into an artificial one. What we usually intend - in a Lockean sense - as individual or personal identity - memories and personality, would be maintained even if the specific identity of a human being would be modified into another one. The paradoxical situation is that meanwhile extensional mereology shows a too strong theory of the individual identity and, at the same time, it lacks a theory about conditions for the specific identity, for the modal theories the situation is exactly the opposite, where with solely a theory concerning specific conditions they try to construct a theory for individual identity across time. The unsolved questions are in what way does an individual remain related to the peculiar characteristics of his individuality? What exactly are individual identity and specfic identity, and what from an ontological standpoint differentiates them from any other identity of a material artifact like an object?

The second objection to modal theories concerns the fact that it is unclear how to establish what properties could objectively be different from those in existence. In the modal approach there are no limits for up to what point we can imagine counterfactuals situations compatible with the enduring individual identity. This is because a too broad use of counterfactual situations prevents us from reaching a positive definition of the individual identity. This difficulty in the modal approach is determined by the fact that it cannot answer positively to the question on what is individual identity. At the heart of these theories it is possible to think that Napoleon would continue to be Napoleon even if he had won the battle of Waterloo or if he had had a different face, body or another

personality. This attitude clearly seems to lack an ontological theory of the parthood structure of an individual as a whole conceivable independently of its material origins.

2.2 Alternative Approaches

In the contemporary ontological debate we also have theories as Van Inwagen's (his main essays are *"The Doctrine of Arbitrary Undetached Parts"*, 1981, and *"Material Beings",* 1991) that do not recognize ontological object's status to material artifacts as tables or houses. Van Inwagen believes that material artifacts are only a way to rearrange the furniture of the earth without adding to it. From this point of view objects are virtual objects having virtual parts bound to each other by a manifold set of physical forces. There are therefore no tables no chairs and there are no other artifacts. Artisans do not create, not at least in the sense causing things to exist. They rearrange objects in space and make binding relations to begin to hold or to cease between portion of matter as in the case of the sculptor who chips away at a block of marble. An example of Van Inwagen's is the following: ***"Imagine a desert and imagine that a regiment of the foreign legion arrives at a certain location with orders to secure the local caravan. The first thing the legionnaires do is build a fort. They have brought bulldozers and they push the sand about with these machines up to building an aggregate of sand. Have they brought anything - a fort say - into existence? The reply of Van Inwagen is that they have not brought even one object into existence, therefore, the fort is in this sense a virtual object".***[9]

However, Van Inwagen's hypothesis seems to be too strong a solution to the problem of the nature of objects and does not offer new elements to understand the relationships between the parts of an object and the object as a whole. From this point of view, a classical dilemma or puzzle like the one of Theseus' boat seems to find an apparent solution. Theseus' mythical boat, that each year took young people to the island of Crete to be sacrificed to the Minotaur, was protected by the Athenians as they from time to time removed any damaged or old pieces and replaced them with new parts. Let's suppose that things went on as Thomas Hobbes told, that is, the damaged planks were being removed and collected to be

reassembled in the original way. If we imagine that Theseus' boat have had every plank substituted, the boat so reconstructed with the old original planks would appear very similar to the boat at the start of the story. Which is Theseus' real boat? The one that plank by plank was put together and renovated or the one composed only from the old planks taken off the original boat? The principle of identity based on spatial temporal continuity suggests that Theseus' boat is the first - the one that was renovated plank by plank - but the material and qualitative identity principle suggests that Theseus' boat is the second. How do we decide? Van Inwagen's solution is that there are no boats and hence there is no puzzle about the identity of the boats. All that happens in the story is that the planks are rearranged, brought into contact and separated. But at no time two or more of these planks compose anything, and no plank is ever an essential part of anything.

According to the ontological standpoint of Van Inwagen the puzzle of Theseus' boat seems to disappear as soon as we stop to think of the objects as endowed with an intrinsic individual and specific identity. In other words, a table or a boat are not essentially a table or a boat. They do not possess a specific ontological structure in the sense that material artifacts do not properly have parts or essential parts. Only living beings have truly undetached parts, more precisely, according to Van Inwagen: "*I think that the cells of living beings are made of […]* ***are unitary things having an entelechy; in this respect they are like men, women, and dog of which they are parts*****".**[10]

As we will see later this position is incompatible with any coherent mereological counting policy. Van Inwagen is willing to have men, women and dogs along with their cells and that violates whatever non-redundancy ontological constraint. I share Van Inwagen's denial in ascribing an essential identity to material artifacts but not for his peculiar reasons. The motivation of this denial should be found, in my view, in the failing by the objects to satisfy a specific structure of relationships of dependence between their undetached parts that I will call ***structure of unitary foundation determined by mutual relations of existential dependence*****.** An array of condition that seems satisfied at least by leaving beings.

I think Van Inwagen's proposal does not actually fit in an ontological analysis concerning the parthood of wholes but rather a larger

metaphysical view of the nature of reality in the search for a reply to the famous question of Quine: What is there in the world? Without saying anything about how we have to count the entities of the world. The answer of Van Inwagen is there are nothing but aggregates of atoms but he has to add immediately that some of these atoms, as in the case of cells or living beings, are not just merely modalities to rearrange preexistent matter by physical and chemical forces. We are still far from an ontological theory able to describe in formal terms the intrinsic difference between artifacts and living beings. However, if along the line of analytical thought (e.g. Frege-Quine-Strawson) we find only spato-temporal entities called indistinct individuals, with Van Inwagen we have another approach which overcomes those presupposed ontological distinctions between inanimate things and animate ones. I believe that too much prominence has been given to the metaphysical question about ***what there is in the world*** solely from a logical standpoint. I think the former Quinean metaphysical question has brought us to an unwarranted and widespread equivalence between objects and individuals driven by the search for a most economic solutions quite often of a reductionist type, deflectionist or eliminativist in the spirit of the notorious Ockham's razor: **"*entia non sunt multiplicanda praeter necessitatem*"**.

Now, I would like to come to the problem of counting policies. To the problem of how many entities we actually have to count as elements in an inventory of the world. For instance, the strictest case of counting policy is the atomistic one: <never count an entity that has parts>.

(AV) x is included in an inventory of the world iff x is mereologically atomic, i.e. has no proper parts.

Of course this presupposes that the domain be fixed by an atomistic mereology and that we are actually able to verify that a certain entity does not have any part. We may choose among various ways of drawing up an inventory of the world, we can decide to include only the parts or we can decide to include only the wholes. But once we have chosen there is no room for double counting. This is called Minimalist View from Casati & Varzi [12]. This view says in short that a very admissible

way of drawing up an inventory of the world must satisfy a non-redundancy constraint.

(NRC) If x properly overlaps y and y is included in the inventory then x is not itself to be included.

This avoids double counting. For instance Michelangelo's statue of David or the form of that piece of marble overlaps the block of marble and its parts then we have to count only one thing, more plausibly David as Michelangelo's statue. The (NRC) is an ontological stance that recently has been challenged by a relevant philosopher of both analytical and phenomenological provenance, L. R. Baker in her *"Persons and Bodies"*, 2000. She proposes that Michelangelo's David and the block of marble constituting the statue, would be two distinct entities because they differ at least in their modal properties. Baker's account has a great interest, although it seems more plausible to think that to carry out ontological distinctions between entities in terms of modal properties is not sufficient to support this proposition. I think this problem about the possibility of an ontological subsistence of coincident or superposed things, as the relation between an object's shape and its matter might well be solved by appealing to the Husserlian notion of ontological foundation instead of Baker's account, which distinguishes among different kinds of pregnant wholes, a few of which are complexes of properties ontologically founded upon wholes.

We can see a few passages of Baker's essay: ***"The nature and identity of many of the things that populate the world of everyday life are not always or even usually, determined by what they are made of […] Our experience of things going out of existence leads to the conclusion that a statue is not identical to a piece of marble, nor is a stone wall identical to the stones that make it up, nor are persons identical to their body. But if a statue is not identical to a piece of marble, nor a person to a body, what is the relation between statue and piece or between person and body? This query motivates development of the idea of constitution-without-identity […] Constitution is a contingent relation between individuals things. The relata of the constitution relation are not properties, so constitution***

***must be distinguished sharply from supervenience*".**[11] >> (Baker, 2000: 24-33)

According to Baker, rightly I think, to understand a thing whose identity is not determined by the identity of its parts we need to look beyond mereology. The relation of constitution is ubiquitous and, in Baker's view, is the relation that is obtained, for instance, between an octagonal piece of metal and a Stop sign, between strands of DNA molecules and genes or between pieces of paper and dollar bills. It is a relation of unity that is intermediate between identity and separate existence. However, the idea of such an intermediate position strikes many philosophers as incoherent. Here are some more passages of Baker: **"*If David and the piece of marble were identical than by a version of Leibniz's Law there would be no property borne by the piece of marble but not borne by David and no properties borne by David but not borne by the piece of marble […] But we know that the piece of marble could have existed in a world without art. By contrast, David could not exist without being a statue. So, David has a property - the property of being a statue wherever it exists - that the piece of marble lacks […] If x constitutes y at a certain place and time, then there is a unified individual at that place at that time, and the identity of that individual is determined by y. The identity of the constituting thing is submerged in the identity of what it constitutes*".**[12]

David and the piece of marble differ in their modal properties and hence are not identical. Baker clearly admits that David overlaps the piece of marble when she said <*that the* ***constituting thing is submerged...***>. What happens is that Baker's account escapes not only from the application of the non redundancy constraint (NRC) but also from a metodological more general principle that we have called the Minimalist view. The (MV) says that:

(MV) x is included in an inventory of a world iff x does not overlap (at the time when the inventory is drawn up) any distinct y that is itself included in the inventory.

In my opinion, also a strong criticism of extensional mereology cannot avoid meeting some very general mereological principles as the

MV. I think we have to regard the (MV) as a postulate: any inventory of the world must satisfy (MV). The mereology concerned with the problem of the counting policies has been called countermereology. A way of implementing one particular instance of the minimalist view is the one that is obtained by including in an inventory of the world only things completely demarcated by bona fide boundaries. A bona fide boundary is a real physical discontinuity in the world between two distinct entities, as a river between two lands, the surface of an object or the epidermis of a human being. A fiat or unreal boundary is for instance the border between France and Italy or Thailand and Myanmar. The (MV) and (NRC) playing a central role in what we might call the Normal View:

(NV) x is included in an inventory of the world iff it is strongly self-connected in at least two possible ways, (1) x is constituted with bona fide boundaries, (2) x is strongly self-connected relative to some condition ϕ. We says that x is self-connected, i. e. in one piece, iff any two regions that make up x are connected to each other.[13]

According to the condition (1) of the (NV) we count as entities of the world only things bordered by bona fide boundaries. For instance, if the right parts and the left parts of the top surface of a table seem delimited by fiat boundaries then we should count only one thing, the top of the table. However, the various pieces of the table, its tops, its legs etc. are actually pretty visible. We can state then they are real undetached not potential parts of the whole either from a purely mereological point of view or from Husserlian wholes conception. Accordingly, these parts are solely potential wholes, potential unities, that could become real wholes just in case they could be made independent and detached from the table. In that case, the parts ***qua*** detached parts become in spatial terms independent wholes provided that they have bona fide boundaries. If the condition (1) of (NV), the condition of having bona fide boundaries is respected then the (NV) is statisfied.

3. The Role of the Relations of Dependence

I think the way in which Casati & Varzi have exposed the (NV) states - at least for me - that the two conditions must be mutually exclusives and then we have two possible ways to satisfy the (NV). This clearly means that the (NV) could admit two ontological kinds of entities. The second condition of (NV) admits the central role of identity conditions in an inventory of the world but depending on the kind of unity between the parts of an entity. An example of unity satisfying the second condition of the (NV) is the following case. We easily see how a table is endowed with a functional identity that it is non constituted by, in the sense that it doesn't contain immediately, any real material part of the table. The table's functional identity is a kind of unity ontologically founded on a determined spatial and functional arrangement of some material parts. Nevertheless, the functional identity does not contain these material parts, on which it is founded, as proper parts of the functional identity. In this sense, the table's functional identity can endure over time and over any alteration or change of the constituent parts of the table. We count one thing - a table - until its functional identity is respected. We also see how the material parts of the table are completely independent from each other in terms of their existential conditions. Every part of the table exists independently from the other parts. This means that the table really exists only as the table's functional identity but not as a table-material-object. In this last case we have an extrinsic aggregate. Then we can conclude that the table as a material artifact is not essentially a table but only an aggregate of matter while a functional identity is esssentially a table's functional identity. We will see that also living beings are essentially what they are but not as functional entities. From the standpoint of Baker's theory there are two distinct entities: the object with a table-shape that submerges a second object constituted by a piece of matter. In Van Inwagen's theory the table is a virtual object, just matter arranged in a certain way.

I'm deeply persuaded that the Husserlian notion of unitary ontological foundation can better describe lots of important phenomena concerning the constitution of unities. Let's think for instance of a colour that to exist it must be founded on a spatial surface but without containing

that surface as its part. In the same way the table's functional identity does not actually contain the material parts of the table. It's worth noticing in the case of the table's functional identity the condition (2) of (NV) has been satisfied. Yet it seems also clear that here we have an ontological dependence between the table's functional identity and the formal arrangement of the spatial parts composing the table. We can see how these spatial or material parts of the table are completely independent for each other in terms of their existential conditions. Every part of the table exists independently from the other parts. This means from an ontological point of view that the table really exists only as the table's functional identity but not as a table-material-objects. The functional identity of the table ontologically depends on some determined ϕ condition but the existence of the table or the existence of its material parts does not depend on each other in any sense. We have here an extrinsic aggregate.

We have seen before that topological unity can only be one of the various kinds of unity or ontological glue that can be appealed to in singling out a whole. Homogeneity, causal unity, functional unity, teleological unity are all quite relevant. There are of course many other senses in which we may speak of individual integrity besides the sense of topological connectednees. This was a central intuition of Aristotle. For Aristotle spatial continuity was only one kind of ontological glue with rigidity, uniformity and qualitative similarity (Metaphysics, Delta, 6, 1016a). And the same intuition is to be found in Husserl's *Third Logical Investigation* which may be regarded as the first thorough formulation of a theory of parts and wholes based on the notion of ontological dependence.

To perform a criterion to distinguish individuals and objects on purely ontological basis we need some specific ontological instruments. This criterion lies on the possibility to determine the nature of a few relations of dependence between the parts of a whole and the whole but not in terms of spatial connectednees. Before introducing the criterion it can be useful to see how in the extensional approach the problem of existential dependence relations between parts has never had relevance. We have seen that real entities are simply spatial aggregates of some type of matter, and spatial connectedness is the only ontological glue. On this mereo-topological account the fundamental primitive is not

parthood but connection and all the mereological notions are introduced via the following part definition:

(PD) x is a part of y if and only if everything that is connected to x is also connected to y.

In one direction this principle is obvious: the leg is part of the table only if everything is connected to the leg is connected to the table. If we interpret it as an overlap of parts then (PD) is certainly viable. It expresses a basic mereological fact: one thing is part of another just in case whatever overlaps the first overlaps the second.

On this basis and barring for the moment the complications arising from intensional factors such as time, modalities and counterfactuals, let us review some mereo-topological principles in the order of increasing strength and consequence. Most theories agree on some common ground, treating parthood as a reflexive, antisymmetric, transitive relation. In a formal way we have the following representation of parthood axioms:

(PA)
(reflexivity) Pxx
Everything is a part of himself

(antisymmetry) $Pxy \wedge Pyx \rightarrow x = y$
Two distinct things cannot be part of each other
If x is a part of y and y is a part of x then x = y

(transitivity) $Pxy \wedge Pyz \rightarrow Pxz$
If x is a part of y and y a part of z then x is a part of z
Any part of any part of a thing is itself part of that thing

We also add the principle of Proper Part:

$PPxy =_{df} Pxy \wedge \neg Pyx$
x is a proper part of y iff x is a part of y and y is not a part of x.

The crucial point is that this axiomatisation needs to be completed by an approach in terms of relations of ontological dependence. In particular, Rescher (1955)[14] and several other authors do not recognise the validity of the transitivity relation, the case in (c). In military usage, for example, a person can be part of small units which are parts of larger ones, but people are never part of large units. A part of a cell is not said to be a part of the organ of which that cell is a part. Casati & Varzi minimize on these counterexamples but we can see as transitivity is a general principle which is meant to apply to parts only spatially broadly understood. A soldier is directly part of a battalion but the soldier does not report to the head of the battalion. Likewise, a handle is a functional part of a door, the door is a functional part of the house and yet the handle is not a functional part of the house. These examples involve a departure from the broader notion of parthood that mereo-topology is meant to capture.

To understand the manifold parthood phenomena we have to recur to the Husserlian ontological foundation or existential dependence. Husserl pointed out two types of ontological glue between parts and wholes. A ***narrow whole*** as a material artifact is one in which a number of entities are bound together into a unity by means of which Husserl calls ***unifying moments*****,** in other terms, spatio-temporal relations of contiguity or something like that. While in a unitary pregnant whole the parts are bound by existential or ontological relations of foundation and dependence.

We have to thank the seminal work of the Manchester triad - K. Mulligan, B. Smith and P. Simons - on the notion of ontological dependence, if inquiries on this topic have received a deeper development in the 80's. The new bible of an ontology not merely exstensional is the text of P. Simons, "Parts", 1987. Another very important work is the study on the *"Third Logical Investigation, "Parts and Moments. Studies in Logic and Formal Ontology",* edited by B. Smith and K. Mulligan, 1982. My inquiring into dependence relations between parts and wholes starts from these studies also to point out some of their intrinsic limits, above all the fact that they have not shown the ontological potentialities of the Husserlian notion of unitary foundation in its two variants.

The key notion we have to work is then that of ontological dependence. We have many types of dependence relations but only some of them can play a central role in explaining the structure of an individual. The concept of dependence is a form of connection between entities that may be variously filled out. To try to find a common thread running through various notions of dependence we may appeal to the following list of definitions by P. Simons:

1. Person A is financially dependent on person B iff A cannot be solvent unless B is solvent (financial dependence).

2. Skill A is dependent on skill B iff A cannot be mastered unless B is mastered (practical dependence).

3. Judgement A <the roses are red> is dependent on the representation or idea B of the roses iff A cannot occur to a person C unless B occurs in that person (Brentanian psychological dependence).

4. Person A is dependent on drug B iff A cannot survive unless doses of B are regularly dispensed (physiological dependence).

5. An organic part A of a living being C is dependent on an organic part B of C iff A does not exercise its functions without the function of B (biological dependence).

6. A living being A is dependent on a set B of internal biological conditions or on a set C of outside environmental conditions iff A does not exist unless B and C exist (existential dependence).

7. Clause A of a contract is dependent on clasue B iff A cannot apply unless B applies (legal dependence).

8. Proposition P is dependent on proposition Q iff P cannot be true unless Q is true (one form of logical or semantic dependence).

9. Accident or property A (e.g. this whiteness) is dependent on object B (e.g. a piece of paper) iff A cannot exist unless B exists (ontological dependence or De Re dependence).[15]

This list could obviously be much longer.

4. The Ontological Core of the Third Logical Investigation

Here are the basic definitions of ontological foundation also called existential or ontological dependence. The usserlian definition of

ontological foundation stated in the Third Logical Investigation is the following:

(HDOF) "A content of the species α is ***founded*** on a content of the species β iff an α cannot exist, for its essence (that is by law, on the basis of its specific nature), without the existence of a content of the species β (III LU, § 21)".[16]

We can easily see how Husserl insists on defining the relation of foundation making appeal to the specific nature, to the specific identity of the contents embraced in the relation. The definition most simply affirms that an α is founded on a β iff it cannot exist without a β. The classical example of Husserl is that of the colours that cannot exist without a bearer as the surface of an object. We have then a formal definition of the existential dependence relation in terms of parthood. This is a reading that has been shown to be true of Husserlian definition of ontological foundation. The relation of foundation is a specific parthood pattern:

(EDD) $A\ f\ B \rightarrow (\neg (B < A) \wedge (A < B))$

We read the definition as: if A is founded (or A is existentially dependent) on B then B is not a part of A but A is a proper part of B. It is by means of the existential dependence relation that Husserl defines the notion of unitary ontological foundation. It is the unitary fondation that can be the relevant candidate to satisfy the phi-condition of the (NV) and to capture a large number of phenomena that we cannot explain in terms of pure topological relations.

The relevant class of suitable candidates to satisfy the ϕ condition will be those of living beings or more generally the class of substances here represented by pregnant wholes. To Husserl, the pregnant concept of a whole goes beyond the one of an arbitrary mereological aggregate endowed with bona fide boundaries and calls for an account in terms of the two concepts of unitary ontological foundation. The Husserlian general definition of unitary ontological foundation is the following:

(HDUOF) "We understand by a pregnant whole a range of contents which are all covered by a single and unitary foundation without the help of further contents. The contents of such a range are called its parts. By talking of the unitarity of the foundation we imply that every content is foundationally dependent, directly or indirectly, with every content. This can happen in such a way that all those contents are founded on each other, directly or indirectly, without any external recourse" (III LU: § 21).

The definition affirms that a unitary pregnant whole is a strongly connected network of parts whose existence depends on the existence of the other parts. All the relations between the parts are relations of existential dependence in a strong sense of existence like coming into existence, survival or enduring. In my doctoral dissertation I have argued that in the § 21 of the Third Logical Investigation it is actually defined another complementary definition of unitary foundation. It is the following that I call unitary emergent foundation:

(HDUEF) "…this can happen in such a way that all those contents are founded on each other, directly or indirectly, without any external recourse; or **inversely *they all together*** found a *new* content, still without any external recourse. In this last case this new unitary content will be constituted by part-contents which will be founded on part-groups of the whole presupposed system of contents" (III LU: § 21), the italics are by Husserl himself.

An emergent property is such a property that emerges from a whole of more basic properties or constituents. Emergent properties are exclusively properties of a whole. Husserl adds this important specification: **"*We note immediately that differences of this type determine essential distinctions between wholes. In the first cases the parts are in foundational relations […] in the others the parts are external to one another and determine real forms of connections. When we talk about connections we have to intend a narrow sense of whole where certain contents are independent of each other*" (III LU: § 21).**

It would take too long for me to enter into the details of the Husserl definition of emergent unitary foundation but it is important to notice how these passages of Husserl are essential to understand the innovative strength of his ontology. The narrow wholes that Husserl mentions are clearly material artifacts, pure extensive contents unified by real forms of connections, while pregnant wholes can only be living beings or, still hypothetically - functional forms or perhaps, complex digital systems, where the existence of any software part depends on the existence of other parts. I think that the two definitions disclose two distinct types of pregnant wholes that we have called unitary pregnant wholes and emergent or supervenient pregnant wholes. Now, what are the new contents described in the Husserlian definition of (HDUEF)? I think this definition could refer to complexes of individual properties or complexes of tropes but also, in a very interesting way, to objects's shape or spatial configurations of parts as this passage of Husserl seems to suggest: **"*certain independent contents each from the other, (in which a whole can be divided into its pieces or fractions) found new contents as "forms of connection between them*"" (III LU, § 21).**

If the property of an object's shape, for instance the property to be round or square, is an emergent property then we could explain why we can say of many forms that they are nearly round or nearly square without actually being round or square. This is because the geometrical character of a form is never contained in its singular parts or in a particular set of its parts but only in the more comprehensive whole constituted by all the single spatial and geometrical aspects of the shape.

5. The Notion of Substance

My hypothesis about ontological differences between individuals and objects and the nature of specific identity are then the following. Full-fledged livings beings are unitary pregnant wholes because every organic part of these beings is, directly or indirectly, in a relation of existential dependence on the other parts of the whole. All parts depend on each other and the whole is not a simply sum of its parts. The network of existential dependences implemented in living beings is a recognizable pattern representing their specific identity. Every kind of living being

detains his specific pattern of unitary foundation made up by a specific network of all his parts in relations of existential dependence. We define in the following way the notion of specific identity of an individual:

(SID) An entity is an individual in an essential way iff it shows a specific identity. An entity holds a specific identity iff it is a unitary pregnant whole resulting from a unitary ontological foundation. Specific identity (SI) is a case of (HDUOF).

By means of (HDUOF) we obtain a systemic definition of the specific identity of an individual in terms of the complexity of its structure. An entity is an individual if and only if all of its parts are one another in relations of existential dependence. This means that the living organic structure of individuals is such that we have a continuous interdependence, either functional or existential, between their parts. We easily see how an object cannot in any sense satisfy this ontological pattern. An object, in as much as it is a narrow whole, constituted by relations of spatial connection like contiguity between its parts cannot show a specific identity.

I believe that the Husserlian definition of unitary foundation (HDUOF) together with his notion of pregnant whole can offer us a fundamental tool to explain in formal terms the Cartesian notion of substance. An entity is a substance if it matches the definition of unitary pregnant whole. R. Descartes in his Principles of Philosophy defined the notion of substance in this way:

(CDS) <*lorsque nous concevons la substance nous concevons seulement une chose qui existe en telle façon qu'elle n'a besoin que de soi-même pour exister*> (I. 51). <by substance we can understand nothing other than a thing which exists in such a way as to depend on no other thing for its existence> (eng. trans. J. Cottingham, 1985)

The notion of substance has been traditionally identified with concrete particulars, however, so doing the necessary condition of ontological independence has been reinterpreted in such a way as spatial separate existence of an entity from all the others. It is evident that concrete

particulars are not ontologically independent - all things are in some way existentially dependent entities - but at least some of them are spatially separated from others by bona fide boundaries. As the Cartesian definition stands, it should be clear that no entity could plausibly satisfy it. There are actuallly no absolutely independent entities, only God could plausibly being ontologically independent or perhaps the Prime Immovable Motor of Aristotle that turns all the celestial spheres. In any case, we woudn't have ordinary candidates for this notion.

Husserlian definition of unitary foundation can offer the right solution in the spirit of Cartesian definition. Until we think about individuals in topological or mereological terms as aggregates of parts, we'll have no solution because the existence of these type of entities depend upon their proper parts, but the parts of an object cannot actually depend on the whole object itself. The existence of the table depends on the existence of its proper parts - and this is a trivial truth - but these parts are existentially completely independent from one another and also from the table itself as a whole. The relations of dependence inside material artifacts are therefore only in one direction, from the object to its parts.

We have now to prove that an individual, differently from an object, does not properly depend on its proper parts in only one direction, and this is not a difficult task to achieve. If it is true that the existence or the functionality of every organic part of a living being depends on some other functional parts it is also true that all single parts of a living being cannot exist without the whole individual itself. To better understand this point we can think of the embryo that comes into existence almost complete with his essential parts. If the existence of the whole depends on its part, at the same time the single parts could not come into existence without the integral whole. My organic parts never could come into existence without the whole of my body that I am.

We can now state that if the existence of a whole depends on its proper parts and in turn the existence of the proper parts depends on the whole, then this type of whole is a thing which exists in such a way as to depend on no other things for its existence. The whole depends on itself. The ontological independence of the substance is not a matter of absolutely existential independence but it is determined by an interdependent structural network of mutual relations of dependence between the whole

and its parts. At the § 10 Husserl wrote: **"*establish the concept of dependence it is sufficient to affirm that an object can be dependent (in terms of its essential determinations) only inside a more comprehensive whole*" (III LU, § 10).** In this sense the relavant ontological relations of dependence are inside a whole. The existential dependence of the part upon the whole is then essential in understanding the notion of substance. We can have the following definition of substance:

(SD) If an entity has a specific identity it is a substance. A substance is a whole constituted by means of a unitary ontological foundation if: (a) the existence of every part depends on the existence of the other parts, (b) the existence of the whole depends on its parts, (c) the existence of all single parts of the whole depend on the existence of the whole itself.

In a pure topological conception of entities we cannot understand the essential dependence of the parts on the whole to which they belong. and we could not satisfy the (2) condition of the (NV). I think this is the deep ontological intent of Husserl's work when he introduces the notion of ontological foundation as the genuine ontological glue between parts of pregnant wholes. Within this ontological frame we have for example a new way to look at the puzzle of Theseus' boat. The boat exists only as a whole with certain specific properties. Its existence depends obviously on its parts but the existence of the planks of the boat never depends on the other parts nor on the whole itself. The boat then is not a substance, it doesn't have a specific identity. At any time Theseus' boat has proper parts constituted by its planks but no intrinsic relation of dependence between these parts and the boat subsists, and then any replacement of planks is admissible. Temporal continuity is then plausibly the right identity criterion for the boat.

I think with the Husserlian notion of unitary ontological foundation we have seen not only a useful tool to formally distinguish between individuals and objects but also a very meaningful way of describing one of the essential aspects of the phenomenon of life: his intrinsic systemic interdependence of his properties. I believe that the ontological view I have developed from Husserlian ontology can fruitfully

meet the science of complex systems also now called the science of life. On this point, I'd like to quote a few passages of F. Capra that clearly illustrate the relevance of the relations between wholes and parts for the understanding of living systems: ***"The essential properties of an organism, or living system, are properties of the whole, which none of the parts have. These properties are destroyed when the system is dissected, either physically or theoretically, into isolated elements. Although we can discern individual parts in any system, these parts are not isolated and the nature of the whole is always different from the mere sum of its parts […] System sciences show that living systems cannot be understood by analysis. The properties of the parts are not intrinsic properties but can be understood only within the context of the larger whole".***[17]

Now I'd like to sketch very briefly a notion of individual identity as an instantiation of an emergent pregnant whole. We cannot deepen the wide phenomenon of individual identity for which I advance an articulated theory in terms of emergent properties. Here is my definition of individual identity:

(IID) Individual identity is the set of properties of an individual that are constituted by means of (HDUEF). The real properties of an individual identity must be properties of the whole individual. Emergent properties can fit this requirement because - in the spirit of Husserlian definition - they have to emerge from the whole individual.

As to say, from the whole relevant set of more basic properties belonging to the proper parts of the individual. ***Emergent properties are then essential properties*** because the whole individual cannot persist as the same individual without these properties. Emergent properties show a typical character to the effect that they do not contain the parts on which they are unitary ontologically founded. In this way, they can persist across time in the case of an individual changing or losing a few of its parts. The organic and anatomic parts upon which emergent properties are founded are not constitutive parts of the emergent properties. I quote an example. If the typical way in which John expresses his sadness is an affective expression on his face, founded on some anatomic and physical

parts of John's face, then the parts of this affective expression of sadness are not the parts of his face, and vice versa. In this way, probably, we could think that mental contents are unitarily ontologically founded on neurophysiological states but without containing the parts and properties of these states as proper parts of the mental contents itself. The parts of a neurophysiological state cannot play any explicative role with regard to a mental content.

Why don't we think then that the thought is a property founded in some psycho-physical state and in this sense it points out to us the existence of a situation where the thought can play the role of a part, but not the contrary, the more basic states are not parts of the thought as in (EDD)? Probably the relations of ontological foundation best deeply represent the spirit of the Cartesian's dualism of the ***cogito ergo sum*****,** where if I think certainly my thinking is a part of a more comprehensive whole constituted by my bodily existence, but the existence in itself is not an evidence of thinking. If this is true then the thought and its conceptual content is not a proper part of anything but rather an emergent property of a whole, more specifically, an improper part as well as all the other emergent properties. We can formulate the following definition of improper part:

(IPD) x is an improper part of y iff x is EUF on y and $\neg (x < y) \wedge (y < x)$

The mental and conceptual contents are not something personal that exclusively belong to us but rather something that can be *objectively* shared in a community of persons just because of its emergent character.

ENDNOTES

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[2]Ibid., p. 21.

[3]Simons P. (1994), "Particulars in Particular Clothing: Three Trope Theories of Substance", *Philosophy and Phenomenological Research*, 3, p. 558.

[4]Ibid., p. 556.

[5]See Leonard H. S., Goodman N. (1940), "The Calculus of Individuals and its Uses", *Journal of Symbolic Logic*, 5, 45-55. See also Goodman N. (1956), *A World of Individuals*, in J. M. Bochensky, A. Church, N. Goodman, *The Problem of Universals. A Symposium*, University of Notre Dame Press, Notre Dame, pp. 13-31.

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