Bachelor Degree Project

DIACHRONIC IDENTITY

Temporal Plasticity of Functional Organisms

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Diachronic Identity: Temporal Plasticity of Functional Organisms

Submitted by Patrick Fasthén to the University of Skövde as a final year project towards the degree of B.A. in the School of Humanities and Informatics. The project has been supervised by Stefan Berglund.

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I hereby certify that all material in this final year project which is not my own work has been identified and that no work is included for which a degree has already been conferred on me.

Signature: _____

Acknowledgment

”*He’s really a sad little man.*
Sometimes he stands and stares at a flower for hours.
*I really think he’d be better off if he had something to do.***”** – Charles Darwin’s Gardener

In the end, there are a selected few who I owe my special gratitude. I would like to lend my thanks to Stefan Berglund for his resourceful insights, as well as for being the gardener that consistently inspires me that it’s okay to stare. Many thanks also to Paavo Pylkäänen and Hiroyuki Kawakami for their invaluable commentary and criticism. Last but certainly not least, I would like to thank Jessica Määttä for always being there staring at flowers with me.

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Abstract

Eliminative materialism is a view that has been sparsely acknowledged and often overlooked when it comes to providing us with a criterion of what it takes for you and me to persist over time. This owes much to its counterintuitive belief in the non-existence of folk-psychological notions, such as *persons*. Against a backdrop of philosophical and scientific inquiry, this paper amounts to providing such a criterion in the form of *f-organisms*, taking a different route based on emergent descriptions, instead of conventional reductive explanations. The *temporal plasticity* (change over time) of such *f*-organisms display stable persistence conditions despite their constant state of reconstruction. What informs the question of identity in such a paradigm is dealt with accordingly, and the notion of the *self* is put in a context in which it can no longer be said to be the self we are familiar with – a context in which the center fails to hold. The imperative question for any of such criteria will be to accommodate the concept of identity as unconstrained and far away from uncertainty as possible. The main theme will thus be to reassess the general notion of *diachronic identity* to include *our identity over time*, and make explicit the various implications for such a view.

Keywords: Eliminative materialism, diachronic identity, personal identity, identity over time, functional description, *f*-organism.

Introduction

The premise for this essay is less a grand narrative than an attempt of guiding the reader through the canvas of a much neglected and misunderstood view in connection to what it takes for you and me to persist over time – *our diachronic identity*. This view, known as *eliminative materialism*, is often so ill-conceived that I hope to by the end bring out a clearer view of its central tenets, and shine some new light on the topic with a criterion that can rival some standards in *personal identity*. To the extent that this is successful, we will have at least a coarse depiction of an eliminative account of one of the most subtle and elusive aspects of our existence. For my arguments to have any teeth, some formal technicalities are introduced, but only when necessary, and as an addition to those who find them useful. Furthermore, in anticipation of the conceptual tension that typically arises when discussing metaphysical problems that challenge commonsense beliefs and intuitions, a terminological orientation is going to permeate every section of the essay to ensure some clarity of thought.

I have learned not to expect everyone to be persuaded by the arguments that often constitute this view, but I will urge the reader to endure and be submerged in suspended belief if necessary, or else you will likely start to read into a lot of things this view is meant to be refuting, and thus see the actual point as a form of critique against it. Here is a guiding mantra if you get lost: "If you say I missed [something], I say you missed my point" (Dennett, 1991).

This might sound like a bulletproof claim – "if you say I am wrong, I say you are wrong." But this view is more subtle than that – it is often motivated by an honest intent to face the facts we have, but are not satisfied with. Hence, this view is, in my opinion, the unsung hero of modern materialism, which takes the lack of proof for any form of dualistic thinking seriously. The motivation behind this essay originates from such a lack of a solid defense for the ontological intuitions that drive our *stipulative* notions upon the world, instead of taking a backseat and look for that what is *given* (S. Berglund, personal communication, 2012).

In order to achieve this, and despite the obviousness of thought experiments to clarify our intuitions, I am going to refrain from most of them and instead force an intuition upon the reader, using what is *given* to elucidate their potency in making us blind to what is *really* going on. It is not the arguments that are wrong, but our intuitions – so those are of priority.

For those not acquainted with the view of eliminative materialism, the claim is that the folk-psychological notion of the mind is false, and should be eliminated (Churchland, 1988). From this perspective, we may not be justified in claiming that some*one* has persisted, but to illustrate the subtlety of this view, we could very well say that some*thing* has persisted. Many ironically accuse defenders of this view for just eliminating the problem, instead of solving it. However, what this view really claims is that there is no problem to begin with, and that we should not create problems we can do without. So, it is rather the other way around, since those holding on to shortcuts like the instantiations of mind, mental events, and psychology are likely those not facing the facts, which have been repeated for us ever since neuroscience got a foothold in our scientific enterprise, several centuries ago. Staring jaw-dropped at the challenges that face us in figuring out the intricate complexity of the brain, and shaking our heads in fear of failure has never been very productive, so let us not get ahead of ourselves of what to address and stop with the stipulative notions of trying to sweep the problem under the rug by postulating *ad hoc* "solutions" to problems that do not exist in the first place. If we are prepared to take this seriously, the existence of the mind in general, and persons in particular is more than just a harmless mistake, as this essay is going to argue for. In any case, I strongly believe that the arguments I am going to present are of sufficient force to justify this claim.

The criterion of identity that I am going to offer in the later parts of the essay will nevertheless need some serious groundwork. It is carefully built around the idea of a new agenda, as a supplement to the reductionist framework of top-down explanation (decomposition), in favor of an integrated bottom-up description (synthesis) in complex

system dynamics. This holistic perspective has been subordinate to the reductionist agenda for centuries, and could only recently herald new methods of generating enough data to support such an integrative picture. Shifting the research paradigm to implement this is going to be crucial if we ever want to know who we are. However, this attitude requires a strong conviction to avoid tempting shortcuts of pre-judgment, and can only get off the ground if we start to look at what we already have with a keen eye, and from a different perspective.

Given the diversity and uncoordinated accounts of conceptual distinctions when it comes to different levels of reality, I will before I start make a preliminary clarification on key concepts in the essay. If you find yourself jumping between intuitions based on epistemological and ontological levels, there is a reason for that – and that is to get you acquainted with this distinction as you read. Moreover, I will be utilizing two distinguished camps of *levels of hierarchy* within such a framework. On the one hand, we have different levels of *explanation* or *organization* usually emphasizing the ontological structure of the external world, and on the other hand we have levels of *description* or *abstraction*, in turn emphasizing our epistemic knowledge of this same world. What this essay amounts to presume is, in part because of intuitions grounded in eliminative materialism, to collapse this distinction between ontological and epistemological levels of hierarchies by eliminating ontological *explanations* in favor of epistemological *descriptions*. Talk about *functions*, *activities*, *processes*, or *properties*, are often contrived in the sense that they are considered to be ontologically distinct hierarchies. On top of that, this distinction between ontology and epistemology is interdependent in the sense that neither would exist without the other. Hence, when I talk of emergent *functional descriptions* it is helpful, or in some sense crucial, to think along the terms that it is a *description* of a function, activity, process or property that is in no way ontologically *real*, but still emerges in the form of epistemic knowledge of the already underlying structure – hence making no real separation between the subject and the object.

The Concept of Identity

When we say that things are identical, we make a claim for things being the same. Identity and sameness mean the same – their meanings are identical. However, identity or sameness comes in one of two guises. If *x* and *y* share the same qualitative properties, but are *not* simultaneously at the same spatial location, they are believed to be duplicate of one another, or *qualitatively identical*. If, on the other hand, *x* and *y* share the same qualitative properties, *along* with simultaneously being at the same spatial location, they are considered the same, or *numerically identical*. In logic, this binary relation is represented with the symbol "=", and can only hold between a thing and itself. This distinction is crucial for the pending arguments.

Logical Principles

Although seemingly unproblematic at times, the identity relation also holds a number of logical principles, or axioms, that are relevant to keep track of during the discussion in order to heed some reverence to the rigorous metaphysical debates on the subject. Formal logic (i.e., first-order) often expresses identity as being *reflexive*, $\forall x\ (x=x)$, for every entity *x*, *x* is identical with *x*; *symmetrical*, $\forall x \forall y\ (x=y) \rightarrow (y=x)$, for all entities *x* and *y*, if *x* is identical with *y*, then *y* is identical with *x*; and *transitive*, $\forall x \forall y \forall z\ (x=y)\wedge(y=z) \rightarrow (x=z)$, for all entities *x*, *y*, and *z*, if *x* is identical with *y*, and *y* is identical with *z*, then *x* is identical with *z*.

I am further inclined to add two second-order principles in order to support the backbone of much of the proceeding discussions in the essay – the former of which is usually considered a necessary truth, compared to the more controversial nature of the latter. These principles are the *Indiscernibility of Identicals* (sometimes also known as *Leibniz's Law*), $\forall x \forall y\ (x=y) \rightarrow (\phi x \leftrightarrow \phi y)$, *if x* and *y* are identical, then whatever is true of *x* is also true of *y* (i.e., sharing properties); and the *Identity of Indiscernibles*, $\forall x \forall y\ (\phi x \leftrightarrow \phi y) \rightarrow (x=y)$, which conversely states that *iff* whatever is true of *x* is true of *y*, then *x* and *y* are identical.

Diachronic Identity

With time comes change. A common intuition tells us not only that things persist through time, but also that they endure change. My car today is the same car as yesterday, in spite of receiving extensive repairs with regard to certain parts. But how can something both change, and still remain the same? This appears to be inherently contradictory and in violation with some of the principles just mentioned. I will return to a more elaborate discussion on the topic of change, but for now it just serves to reflect on whether we are referring to one thing twice, or once to each of two things, by yielding criteria in terms of necessary and sufficient conditions for a thing *x* existing at t_1 being identical with a thing *y* existing at t_2.

Hirsch (1992) present us with a way of looking at how we intuitively go about identifying things with the use of two related criteria. For explicit reasons, I am going to refer to them as the *spatio-temporal criterion* and the *compositional criterion*. The former is going to account for sustaining continuity in the sense that it does not allow for a spatio-temporal gap between *x* at t_1 and *y* at t_2 – while the latter simply states that *x* at t_1 is identical with *y* at t_2 *iff* all of the parts of *x* are identical with the parts of *y*. Here I would like to comment on what I think a usual assumption at this point is, and to loosen up the distinction for later reference.

The compositional criterion exhibits identity in composition of the parts (part-part), and not in their relation to the whole (part-whole) – otherwise we can easily be misled into thinking that the spatio-temporal criterion supervene on the compositional criterion in the sense that a stipulative number of parts are needed to sustain the continuity of the *whole*. For instance, if the mechanic decides to dismantle my car and later reassemble it, there is a clear spatio-temporal gap between my car at t_1 and my car at t_2. However, it does not say anything about the composition of the parts being reassembled. If the mechanic decides to use the same parts (i.e., numerical) there is little dispute over the fact that the car at t_2 is my car, compared to the counterintuitive notion of opting to use new parts (i.e., qualitative), which would then

be like building a completely new car on the same spot. The reason for confusion here is that we are seldom exposed to situations that could get us to question these extremes. What we experience is often arbitrary, and gradual change is relative to what we experience.

Suppose I only meant to change the tires – these qualitatively identical tires would instantly become part of my car's numerical identity, because the change would be considered too small or unimportant. In other words, there has not been enough change to convince me of a spatio-temporal gap in my car's existence, nor has there been enough compositional exchange. One can certainly ask, what is enough then? This vague sense of quantitative and qualitative stipulation is adequate enough to show that there is no clear distinction between the number of parts being necessary for sustaining spatio-temporal continuity and what these parts are composed of for sustaining compositional continuity, as long as we do not relate to what we as observers experience and can relate to. This brings us to the next topic.

Sortal Dependency

Seemingly imperative at this point is thus to ask "what is *x*?" In this case, "what is a car?" and rather than stipulating quantitative and qualitative answers take note of the fact that there could be something more *essential* that constitutes it being a car. Although it feels pressing to assume that a car is a thing that persists in virtue of just being a car, we will still need to specify an essential feature which it cannot lack without ceasing to exist, at least if we are to achieve something more than sufficient reasons to accept the two criteria above.

Wiggins (2001) explicates on the significance of *sortals* in connection to identity by inferring from *substance-concepts* in the metaphysical literature. That is, something is essentially one *sort* of thing, and cannot persist as anything other than that thing. If *x* is identical with *y*, then *x* is the same *something* as *y*. In Wiggins' words, *x* is the same *F* as *y*, and to say that *x* is an *F* is to say what *x* is. However, our initial assumption remains, albeit in a different form, viz. "what is *F*?" In addition to knowing that *x* is the same *car* as *y*, the

conditions for the identity of *x* and *y* may still seem to depend on the answer to the question: "what is a car?" Critics will have to consider going against this by saying that identity can be *relative* under different sortals, a prominent idea championed by Geach (1962), who defines it as such: *x* and *y* might be the same *F*, but not the same *G*. Wiggins (1967) is not content with such a notion, as he claims that not all concepts qualify in specifying an essential feature which can correspond to a criterion of diachronic identity, and calls for revision.

For example, the sortal term *G* (i.e., puppy) is subordinate to the sortal term *F* (i.e., dog) since it is always true that all puppies are dogs. Wiggins call these *phase-sortals* in that they only apply during a certain phase of a particular existence, and for that reason do not give us a satisfying answer to the question of "what is *F*?" Nevertheless, I am not going to worry myself with the possibility of identity being relative to *any* concept, give or take, before a brief assessment of whether it needs to relate to *a* concept in the first place.

Hirsch (1992) cunningly took note of the fact that we appear to possess a *pre-sortal* conception of continuity, and tried to elicit the notion of sortal dependency by claiming that even though we do not possess a concept of something, we would still be able to discriminate it over time. I believe the distinction I have been discussing so far aids us in showing that Hirsch potentially passes a somewhat hasty judgment on a subject now hinging on the brain's ability to discriminate discrete objects, and lend proper names by abstract semantics.

Suppose I crash my car into a wall, and all that is left is a heap of scrap metal. Is it possible, without utilizing a conceptual framework, to say that we perceive it as a heap of scrap metal turning into a different heap of scrap metal? By stretching our intuitions further, it seems even more convenient to say that *something* crashed into *something*, and turned into *something* – or simply that *something* is happening. Needless to say, we are still able to individuate discrete objects and perceive motion even if we may not have the capacity to determine if something is changing, due to our yet uninformed sense of *what* is changing.

Hence, there is a fine line between not knowing what something is (i.e., what is *x*?) to not knowing what it means for *x* to be *x* (i.e., what is *F*?) It is easy to think of circumstances in which one does not need to know the answer to the first question in order to know there is *something* – but as soon as we use an identity statement between the *something* at t_1 and the *something* at t_2, the answer to the second question becomes critical. (See Kripke, 2003, and Salmon, 2005, for a more extensive discussion on this subject). The next section will concentrate solely on trying to give a satisfying answer to the second question, "What is *F*?"

Synchronic Identity

The answer we seek must account for conditions under which an entity counts as *one* – resting on the raw assumption that things of the same sort cannot occupy the same space. I say assumption, because Wiggins (2001) maintains that two entities under the same sortal can, in fact, occupy the same space at the same time. Suppose we have a gold nugget *y* that we shape into a coin x_1. We now decide to destroy x_1 in order to make a ring x_2. In his case, x_1 ceases to exist, but *y* does not. During the process, *y* is qualitatively identical with both x_1 and x_2. Thus, both x_1 and x_2 presents us with the problem of having two seemingly distinct objects occupying the same space: $x_1 = y$ and $x_2 = y$. We can easily see how this is a problem by further removing a piece of x_2, only to replace it with a qualitatively identical piece, thus destroying *y*, but not x_2 – implying that $x_2 \neq y$. Additionally, the fact that if $x_1 = y$ and $y = x_2$, it then follows that $x_1 = x_2$, which seems absurd, and forces us to either refute *transitive* identity, or say that composition is *not* identity. I am going to concur with Wiggins (2001) here and further insist that *mere* composition is not identity. Thus, x_1 is *composed* of *y*, without necessarily being identical. Composition differs from identity in the sense that it is an *antisymmetric* relation: $\forall x \forall y\ [(Rxy \wedge Ryx) \rightarrow (x = y)]$, for all entities *x* and *y*, *iff x* has a relation to *y*, and *y* has a relation to *x*, then *x* is identical to *y*. That is, x_1 is composed of *y*, but the reverse does not hold. We can see this by substituting *y* for something else, say copper.

Extensionality

In claiming that two different objects can coincide without being identical, we can similarly take it to imply that these objects can be made up of the same parts at the same time. Extensionality then relates to common intuitions of how wholes are identical if they share the same external properties, or parts (Simons, 2000). Recall, this is not the same as the compositional criterion under diachronic identity. Extensionality is meant to show for the relation between the parts and the whole, rather than the composition of the parts themselves – even though this distinction is somewhat arbitrary, as we will see in the coming sections. Let me explicate on this by making an example out of a statement presented by Lewis (2001):

> It reeks of double counting to say that here we have a dishpan, and we also have a dishpan-shaped bit of plastic that is just where the dishpan is, weighs just what the dishpan weighs, and so on. This multiplication of entities is absurd on its face (p. 252).

This claim would count y to be a part of x_1 *iff* $y = x_1$, whereas the proper way of approaching it from our new perspective, viz. composition is not identity, would be that y is a part of x_1 *iff* y is a part of x_1 *and* $y \neq x_1$. The problem with Lewis' claim is also that it strictly contradicts our notion of transitivity by assuming that composition does not share the same transitive relations as identity. That is, any part of a part of a whole is itself part of that whole.

For instance, the handle is part of the door, which is part of the car, which consequently makes the handle part of the car. The idea of extensionality is thus under scrutiny when it comes to both sufficient and necessary reasons to accept sameness of parts as identity, because it does not bring us any closer to answering "what is *F*?" However, it can be argued that the same parts can compose different wholes depending on how they are *arranged*, or the relations they share (Simons, 2000). Hence, a sum must be composed out of at least two parts that share a relation to the whole, but from there on there is plenty of room for argument.

I will try to simplify the formalities, but the reader ought to bear in mind that these arguments are a lot more technical if we opt to raise concerns regarding identity. This is only meant to lend support. Thus, as illustrated in Figure 1, for any object to pass as a sum, it needs for any parts *x* and *y* that there are parts that *overlaps* the parts that overlap *x* and/or *y*.

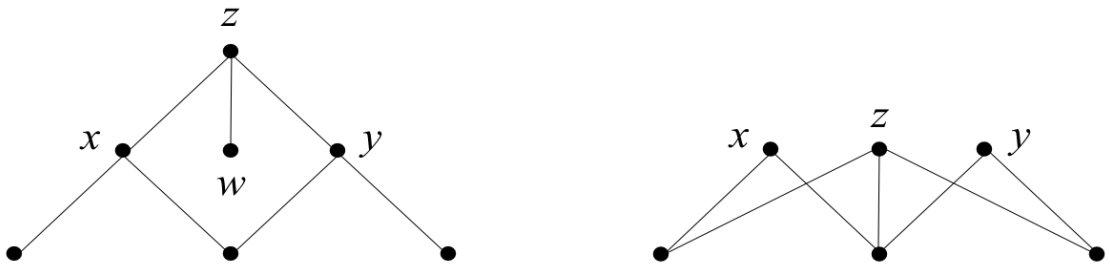

Figure 1. Mereological Sum. *Left*: we can see that *z* is not composed of *x* and/or *y* due to the inclusion of a separate part *w*, which does not overlap *x* and/or *y*. *Right*: here *z* is composed of *x* and/or *y* to the degree that it includes supplementing parts which in turn overlaps *x* and/or *y*. From "Mereology," by A. Varzi, 2009, http://plato.stanford.edu/entries/mereology/. Copyright 2009 by Achille Varzi. Reprinted with permission.

Considering this, we can also reach for some interesting similarities to identity in terms of being *reflexive*, $x = x + x$; *symmetrical*, $x + y = y + x$; and *transitive*, $x + (y + z) = (x + y) + z$. However, as we take a closer look at the relations between *x*, *y*, and *z*, we can start to question whether an infinite regress of potential predicates representing these relations are possible, and, if affirmative, will confirm that we need a criterion that tells us *why z* is to be considered a whole, while *x* and/or *y* are merely parts. To say that we can always find a way to create a larger sum is only to stipulate a reason for accepting composition as identity by holding on to the idea that a sum is *mere* composition, or as Lewis would have it – just the parts taken together. If we accept this view, then we are also forced to say that these parts must provide us with the same essential features as its sum, which only leads us to the same inevitable conclusion as before, that *y* is a part of x_1 *iff* $y = x_1$. But is a tire really the same thing as a car?

Such a notion would not be feasible, as we intuitively take every discrete object to be distinct from its parts, whatever they are. Regardless, how can we talk about a sum or its composing parts if we have no idea what these are? Hence, how can we proceed from the antisymmetrical principle that y is a part of x_1 *iff* y is a part of x_1 *and* $y \neq x_1$, while providing an explanation of how such a relation would present itself to *us* as final designators of identity?

Intentionality

If extensionality stands for principles that relate to how wholes are identical if they share the same external properties or parts, intentionality can be said to relate to how wholes are identical if they have the same intentional purpose, or *function* (Simon, 1996). Objects are generally used *for something*, or are part of something that is used for something. The proceeding discussion will hopefully emphasize the importance of incorporating intentions along with extensional principles if we are to achieve a tangible definition of identity.

Suppose we have a *coin-shaped y* lying at the slope of a mountain. In trying to answer what F is in this case, we may come to realize that what makes something into x_1 is the intention behind it, since y has been splintered from the mountain to coincidently *look* like x_1. That is, despite the shape of the gold nugget, it *could* have been a coin, if it had been shaped with the intention of fulfilling some purpose (i.e., currency). At the same time, this does not necessarily isolate the problem since a particular object may entertain the possibility of fulfilling multiple functions even on the basis of design. Imagine we pick up y and mold it into x_2, but without the purpose to match a finger. Later, we come back to realize its potential and equip it for aesthetic purposes. Now, did x_2 exist prior to the intention, or did we bring a new object into existence by merely intending? Should it really matter if we reverse the order of said inquiry by sustaining the intention prior to the molding of y into x_2? Some may still want to assert, under the belief that identity *is* composition, that $y = x_2$; but can y really entertain the same function as x_2? I would say that this depends on how we define *function.*

I will remain affirmative with my previous assessment that *mere* composition is *not* identity, by further nursing the claim that *arrangement* of parts enables a *functional description f* to emerge without necessarily be grounded in intentional design. For instance, a hammer has the *f* of being able to deliver an impact, but could also suffice as a table cloth weight. One may contend at this point that a rock could then suffice just as much in fulfilling the same *f* as the hammer. In a broad sense, yes, both can deliver an impact, but how about in a narrow sense? A rock does not fulfill the same *f* as a hammer, because the hammer have a higher description based on amplifying force on impact by increasing the mass of the head by accelerating speed using gravity in addition to muscular force, which is why we can supplement a high density metal for something with less density if we extend the handle.

To get a clear picture of how we can allow for a novel *f* to emerge without an intentional design, Simon (1996) informs us that we need look no further than to how we interact with our surroundings. The most basic type of interaction can be characterized by *separation* of parts of a whole. If we saw off a branch from a tree, it can become a walking stick or a fishing rod, solely dependent on our purpose behind it. However, we are also exposed to the situation in which we ascribe *f* to unintentional residue like the sawdust, which in turn can be used *for something* (i.e., composite chipboards). Then we have the two types of interactions that we have been concerned with so far, viz. the *forming* of objects without separating or adding anything to its collective mass (e.g., x_1, x_2), and *composition*, that up till now have only dealt with the intentional functions of man-made artifacts (e.g., car, hammer), but which are also prone to arguments regarding the *non*-intentional functions in nature (e.g., rock, tree).

However, my contention is going to account for rejecting all claims that amount to strengthen the conceptual distinction between man and nature, and make an effort to try and raze the bridge between natural objects and purpose ridden artifacts. Thus, instead of dwelling on finding criteria to fuel this dichotomy, I hope that by the end of the next section I can get

my point across to show that, bearing on the identity relation, the conception of *our* identity over time coincides with the general problem of diachronic identity. That is, we are just as much part of nature as anything else, and yield to exactly the same principles and laws. Hence, in contemplating a novel *f*, we are going to remain neutral to intentionality both when it comes to a bottom-up (synthesis), as well as a top-down (decomposition) approach.

As of now, it is important that we clear up any confusion that may have perforated the discussion thus far between intentionality and extensionality in relation to diachronic identity. To summarize the present discourse: For x at t_1 to be identical with y at t_2, x must be the same F as y, and to be F is going to require whatever *arrangement* of composition necessary to sustain *f*, providing us with the much favorable conclusion that $F = f$. This will become more apparent with increasing complexity, but even at the level of separation and forming, we can see that the *f* of the hammer depends on the relation between the head and the handle. If we remove any arbitrary amount of matter from the head and add it to the handle, we might influence *f* in a negative way, shifting the weight as to make it less effective for *whatever* purpose that requires *f*, without separating or adding anything to its collective mass.

To put things in perspective before continuing – for those who claim that composition is identity, arrangement does not bring new objects into existence, it merely puts existing objects into new arrangements – like that of rearranging your furniture. However, this view is forced to accept that by removing even a single atom, the object ceases to exist (Unger, 1979). Viewed from the perspective that composition is *not* identity, on the other hand, arrangement *could* bring new objects into existence *per se*, *iff* it allows for a novel *f* to emerge – which clearly is not the case when rearranging your furniture. This could mean that these objects can gain and lose parts, while still maintaining their identity over time, due to the non-essential role of a single atom for *f* to persist. In the next section, the anticipation of a novel *f* eventually takes us into uncharted waters, on a pursuit called science, enforcing the top-down approach.

Levels of Description

The discussion thus far has only dealt with things on a macroscopic level of reality. This is *our* reality, due to limiting natural constraints. But as we continue to dissolve this barrier by means of perceptual enhancement and improved methods, we can begin to explore different microscopic levels of reality that allow us to either observe or eavesdrop on how a novel *f* can emerge from an ever increasing complexity of arrangement. The kind of rigid distinctions that I am going to present in this section unfortunately run the risk of being taken too literally, often as an immediate result of our limited capacity to react to the fact that nature is not clearly demarcated. This will put a strain on the reader to delay certain aspects of criticism regarding indeterminacy until later, for explanatory purposes. As expected, things become exceedingly more complex from the perspective of a humbling 14 billion years of physical, chemical, and biological evolution – and it would be a sign of blatant ignorance to think that we can understand it all in what would seem like a heartbeat in comparison. On a less serious note, there must be a reason for why we cannot patch the branch and the tree back together and expect it to start growing again. That said we cannot be at fault for trying at least.

In my request for *f* to be emergent, it is to be seen as a weak form of epistemological emergence, rather than some infusion of ontological status. Hence *f*, and consequently *F*, emerges as a *result* of lower-level arrangements, and is not in any way *irreducible* with regard to such arrangement (Bedau, 1997). Now, this obviously calls into question the novelty of *f* that I have been so diligent in preserving. This novelty is thus to be seen as merely *temporal*, and not as something claiming *spatial* extension and causal powers on its own. From the outset, it may seem that way, due to the sophisticated level of complexity that is often presumed when dealing with this kind of radical novelty – but that would, yet again, be to express our ignorance toward the unprecedented level of sophistication present in nature. Some may want to dispute this by introducing the concept of *downward causation* in an

attempt to show that because *f* can causally exert its influence on its lower-level arrangement, it has causal powers and consequently ontological status. However, I think this argument misses the point by assuming that *f* has *irreducible* causal powers. For instance, even a car, with its relative simplicity, can exhibit a perpetuating momentum that can interact with laws of friction to exert its influence on the tires. Hence, I urge the reader to endure the notion of emergence as a whole not being *more* than the sum of its parts – merely *distinct* (cf. identity).

To further fuel this discussion, I am going to wrap the concept of emergence in a temporal coating and define it strictly in terms of the limits to our understanding of complex systems. Thus, a complex system is a set of parts that share relationships not just based on their *arrangement* (spatial), but their *interaction* (temporal) as well. Complexity is a relative concept that changes over time (i.e., everything is simple when it is easy), which together with the cascading number of possible non-linear interactions makes any complex system highly *dynamical*. Bedau (1997) posits that this practically implies that a small change in the initial conditions may have widespread effects throughout the system, as well as cascading failures.

This potentially allows for complex patterns to emerge as a *result* of less complex patterns. Bedau (1997) further recognizes that this will obviously mean that we need to model *all* the interactions on the microscopic level leading up to it from the initial conditions, which may include aspects of the environment (i.e., evolution). Combined with the fact that physics works by approximation and verification principles, it may seem futile for any finite knower to grasp this highly contextualized picture. The next two topics are going to account for a way of painting this picture using the conceptual framework of dissipative structures in nature obeying *thermodynamical* laws, coupled with a clear account of how these are able to individuate and sustain their organization in the context of *complex system dynamics*. These two topics belong to the fields of physics, chemistry, and biology, so I will reserve myself in my interpretations, and pay my respect by making my point as elementary as possible.

Inorganic Organization

Quarks are to date believed to be elementary particles with no *known* composition, in the same vein the atom was once thought to be. They are each identified by their *spin*, which in some sense can be compared to angular momentum in classical mechanics, although replaced by quantum mechanical explanations. The kinetic energy created by the spin of two *up quarks* and one *down quark* make up roughly 99% of a proton's mass. The proton, by strong interaction, attracts a neutron, which is composed out of qualitatively identical quarks, albeit in reverse quantity, to form the atomic nucleus. This gives us a rather crude picture to work with, because if the general definition of physical reality consists of matter, and 99% of the mass of subatomic particles is in fact energy, we have to suspect that something is happening on a perceptual level that allows us to actually perceive matter in the way we do.

In fact, we know that the number of protons in the nucleus is what determines what element the atom is going to constitute. One single atom, does not, however, allow for the kind of elements we are used to perceiving, because in order to perceive things, they need to reflect light, and since atoms are smaller than the wavelength of light, we cannot see them.

What we can do, on the other hand, besides using an electron-microscope, is rely on the fact that atoms are the smallest particle of an element that retain the properties of the element in question. This way we can let them bind into large structures that emit sufficient quantities of electromagnetic radiation for our eyes to receive on the appropriate wavelength of the electromagnetic spectrum (i.e., visible light). Hence, ordinary matter is just a manifestation of energy, condensed into a structure according to Einstein's famous $E = mc^2$, and objects can be seen to be in a transient state of existence in which one form can be converted into the other. On a crude assessment then, this seems to imply that if the arrangement at the previous level (i.e., atomic nucleus) is what enables *f*, it is not until the next level of arrangement (i.e., atomic structures) that we can actually *perceive f* the way we are used to perceiving it.

For example, if the atomic nucleus gains or loses a proton, invariably changing from one element to another, it does so in virtue of gaining a novel *f*. Thus, the element is no longer considered to be the *same* element, due to the proton's essential role for *f* to persist (e.g., density, ductility, elasticity, toughness, hardness, etc.) Similarly, if the atomic nucleus gains or loses a neutron, we consider it merely an isotope of the same element, due to its less essential role for *most* of *f* to persist. We can clearly see that at such a minute level, there is not much structure to play with (i.e., gold, 79), and it seems that the number of protons in the atomic nucleus have explanatory priority when it comes to identifying a particular element.

However, this is not necessarily the case, and there are several discoveries that lead us to believe that this is a merely sufficient criterion. When dealing with Nano-clusters, for instance, which contain only a dozen or so atoms, gold can exhibit completely different properties compared to the bulk properties at our macroscopic level (Landman & Yoon, 2007). Allotropes are also known to have different structural arrangements of an element, providing it with new functional descriptions because of it. The allotropes of carbon may be the most prominent example, which include diamond (i.e., tetrahedral) and graphite (i.e., hexagonal sheets). Nanotechnology can likewise show for a wide variety of structures that have enabled us to synthetically create new inorganic materials, which helps to conclude that in order to accommodate *f*, the identity of an element needs to include spatial *arrangement* of parts, along with the *interaction* of the strong force (i.e., bonds) holding them together.

Thanks to covalent chemical bonds, and the sharing of negatively charged electrons, atoms need not necessarily have to be of the same element to match in electronegativity (i.e., molecules) and allow for yet more complex functional descriptions to emerge. The reason I have not brought up electrons until now is because there is a great deal of ambivalence towards them with regard to bonds, because quantum mechanics provides us with evidence of electrons as delocalized and "smeared out" over the molecules. Thus, as far as they are

involved in bond*ing*, they are not to be seen as bonds localized between atoms (Hendry, 2010). However, the density of the electron-"cloud" (i.e., electrical charge) is spatially localized to certain parts around the molecule, which could likely be why the structural conception of the bond has proven to be so successful in explanation (Hendry, 2008).

The contention is unfortunately the same, that by combining two hydrogen atoms with an oxygen atom, we get H_2O (i.e., water). What is often missed is that these novel functional descriptions depend on the angular relation between these atoms, along with the strength of the bonds, because they dictate the spatial arrangement of the molecule in question, and consequently the bulk properties that are invariantly scaled to our perception of it (i.e., ice).

Hence, water is *composed* of H_2O-molecules, without being identical to either a single molecule or an extensional aggregate, due to the antisymmetric relation showing that H_2O need not necessarily be water. Van Brakel (2000) extends on this claim by arguing that molecular compounds such as water are dynamic structures depending on polarization principles (i.e., hydrogen bonds) that form structural chains. Relevant for diachronic identity, these constantly break and re-form at different rates, depending on how strong the bond is.

Hence, water cannot be just a collection of H_2O-molecules. Strangely enough, not even "water-molecules" can be considered *water* unless they form into larger molecular structures properly scaled to our perception of them. Water is made *from* H_2O-molecules, and "H_2O" is but a mere compositional formula indicating the *proportions* of ingredients to make water, but can just as much be used to make ice. Finney (2004) elaborates on the problem of identifying water nicely by saying that we also need the details of its interconnected structure, as well as how it reacts in an open system over time. This is not a meddling in unnecessary pedantic behavior, as these complexities give rise to great abundance and diversity. I now turn from the question of *how* matter is structured in accounting for its identity conditions, to the question of *why* – hopefully to provide us with a lasting impression of *reasons* for this diversity.

In a closed system there is no input and output of energy fluctuations, and it will eventually distribute its energy content to a state of equilibrium according to the second law of thermodynamics. In order to exhibit the formation of complex structures, the system will need a significant imbalance of energy to fluctuate spontaneously, which is nearly impossible in global equilibrium. To illustrate an open system, Churchland (1988) conveys his example of a glass box filled with water, with a heat source on one end and a heat sink at the other. Dissolved in the water is some nitrogen and carbon dioxide, which will absorb the energy from the heat source and excite into higher energy states. As they then drift around in the box, they will coincidentally interact with less energized compounds at the cool end to form chemical bonds that would have been impossible in a closed system, resulting in a wider variety of complexity and combinations over time. These energy fluctuations force the system into order by *competing* for internal stability. The Earth has been such an open system for the last 4.5 billion years, with the sun as a constant heat source, and empty space as its heat sink. Hence, my interpretation of Finney (2004) is that the paradoxical nature of identity owes much to the fact that *we,* as entities in our own right, treat open systems as closed and static.

Organic Organization

This level is somewhat arbitrarily distinguished from the inorganic due to the inclusion of carbon atoms, mainly because carbon forms more compounds than any other element (10^7), which can sometimes be considered a small number compared to the potential probability rates that are introduced with signaling proteins and molecular geometry. It is also the fourth most abundant element by mass in the universe, which together with its diversity makes it the ideal candidate for the self-regulating properties we define as *life*. Carbon molecules are also the ideal example of spatial arrangement, thanks to the discovery of isomers, which are *distinct* chemical compounds with the *same* molecular formula. Again, a single carbon molecule does not breathe life into anything being composed of it beyond its diversity.

Much due to the sun-driven process of chemical evolution around three to four billion years ago, complex carbon-based molecular structures began exhibiting self-replicating functional descriptions that could stand against the relentless pressure towards thermal equilibrium. The eventual winner in this competition was the *cell*, which not only could self-replicate, but also protect itself against this external pressure (i.e., membrane), and form internal self-regulating structures (i.e., organells) that could manipulate needed molecular sequences in the environment to fuel further self-replication (i.e., metabolism). In the cell nucleus sits the most complex molecular structure we know of, the double helix (DNA), governing the activity in the cell (Churchland, 1988). The cell is a highly complex and dynamically organized molecular structure capable of producing new and emergent functional descriptions based on adaptation to the dynamics of the open system for which it is part of. It does this while still succeeding to be an open system on its own, in constant need of energy to keep a stable internal environment far from thermal equilibrium. Hence, it is not to be seen in the light of a *mere* composition of molecules, but as an organization of separate functions converging upon the emergence of the functional description we call life. In this respect, thermal equilibrium can be seen as the very definition of *death* (Schrödinger, 2012).

But how can order give rise to order? Important for this function is the dynamics of non-linear interactions, where the output of the system can be larger than the input it receives. The self-replicating *f* is primarily a chemical reaction that is autocatalytic, in that the product of the reactive reagents can serve as a catalyst for that reaction. A system of such autocatalytic cycles can even be self-regulating if provided with the input of energy. Any such self-replicating *f* which does not make a qualitatively identical copy of itself will create diversity and thus be subject to the process of natural selection and coded for as information in the DNA to fuel its evolution. The functions of the cell thus cannot be defined solely in terms of its parts, but also as a whole, capable of adapting to the environment over time (Weber, 2010).

As an added reminder at this point, it is important not to confuse functional *descriptions* with functional *explanations* that so often take teleological form in biological examples. However, I raise the same kind of doubts regarding their definition, viz. that none refers to nature having some kind of intentional purpose, as hinted upon in the previous section.

Continuing down our path of biological evolution, cells eventually combined into aggregates of tissue to form organs, which in turn make up the complexity of today's organisms – new dissipative structures with self-replicating functional descriptions, much like the cell. For any organism to maintain a stable state of homeostasis, it needs to manage a myriad of highly complex interactions in order to retain its distance from thermal equilibrium. Accordingly, each level of organization can potentially exhibit its own isotopic variations – cells can become muscle cells or brain cells, organs can become livers or brains, and organisms can become humans or dogs, all with diverse functional descriptions.

Despite this seemingly fluent hierarchy, we have throughout history given certain priority to a highly specialized organ in order to account for *our* existence, viz. the brain – and we have certainly more than once underestimated its complexity and capacity to supply a wide variety of functional descriptions ready to be "selected" for. With the diversity in cell types due to sloppy copying and the occasional mutation, Churchland (1988) informs us of the need for coordination of these specialized cells, which eventually paved way for those cells specializing in *communication* between cells to get the upper hand in the competition, and to represent the humble beginnings of a central nervous system. This new type of electro-chemical communication between neurons turned out to be much faster than the mere chemical communication that had been prominent up to this point. This also made its impact as the sole reason for why the brain is the *dynamically interconnected* organ it is today, capable of remarkable functional descriptions due to its spatial arrangement and temporal interactions, as well as being able to maintain instant adaptive traits through plasticity.

For those still not sold on the idea, I will extend on why we are so keen to underestimate this elaborated structure with my previous claim that we have to blame our lack of knowledge of dynamically complex systems. Penrose (2005) makes a rough estimation that there are 10^{11} (cf. computer, 10^{8} transistors) neurons in the cerebral cortex alone, which already leaves us with considerable scope for complexity. Each neuron has approximately up to 10.000 dendritic spines, with each ending in a synaptic cleft, connected to another nearby neuron. The cerebellum, in turn, contains half the number of neurons, but far excels in the number of connections with nearly 80.000. This brings the number of possible connections close to 10^{14}. However, the number of connections alone does not necessarily ensure emergence – there are also circular feedback loops and time-delayed temporal frequencies to account for between neurons. Electronic circuits in transistors compute at a speed of 10^{9} Hz, compared to the slow and sloppy action of neurons at 10^{3} Hz. Although circuits are faster, any given transistor is only connected to a few other neighboring transistors, and compute in a linear fashion, with only one process at a time. This makes the computer exceptionally fast, compared to the brain, at calculating vast mathematical problems due to its serial processing (Penrose, 2005).

As further explicated upon by Churchland (1988), any organism that takes more than a few milliseconds to recognize a predator will be sorted out from the competition relatively quickly. Luckily, the brain is a vast *non*-linear *parallel* system, and does not have a central that information must pass through. Instead it possesses a dynamical structure that allows for computations to be performed in parallel, with many processes being run simultaneously. Parallel processing takes away the computational bottleneck and the whole system can now show for great functional persistence despite non-arbitrary removal or damage to the system. It can even lose a vast number of connections as long as they are distributed randomly, as happens with the gradual cell death when we age. Compare this to the feeble conclusion of what happens to a serial system if it sustains damage to any part of its processing chain.

Now, due to the fact that neurons form elaborate dynamical networks, their boundaries are often refrained from being explicitly defined, and we have yet to account for the synchronized oscillations between local networks, along with their temporal frequency as well – which may well be enough to convince us of its near uncanny computational capacity. But if that was not enough, there are still chemical variables in the synaptic transmissions that induce plasticity on the level of both individual neurons, as well as whole networks – new connections can grow and old ones are lost, on a time scale of minutes down to a few seconds. This means that the system can *re*organize itself from environmental input (experience) and potentially mold new output (behavior) if needed. Thus, Penrose (2005) notes that most material, organic as much as inorganic, is being continuously replaced, and it is just the *pattern* (cf. *f*) that persists. All this helps describe how increased knowledge about complex system dynamics will enable us to turn seeming randomness into order – or as Dennett (1991) so vigorously informs us:

> When we factor in the complexity, as we must, we really have to factor it in, and not just pretend to factor it in. That is hard to do, but until we do, any intuitions we have about what is 'obviously' not present are not to be trusted (p. 440).

Now that the paint is dry, and the strokes has been counted, the picture we are left with explains how a nested hierarchy of organization is able to supply us with novel functional descriptions on the basis of extensional complexity – but as previously explicated upon, something seems to be missing in the form of intentionality. We have so far overlooked the fact that among the multitude of functional descriptions of the brain, it is to be seen as the sole supplier of identity conditions, including its own. This inevitably amounts to circular notions when confronted with the *self* – the single uniform *f* that supposedly is *you*. The proceeding discussion will thus focus on trying to show that *our identity over time* coincides with the general problem of *diachronic identity*, mainly by reconstructing the figurative tendency to think that the end product of apple trees is not apples – it is actually more apple trees.

Identity and Reduction

Recall our previous claim: For *x* at t_1 to be identical with *y* at t_2, *x* must be the same *F* as *y*, and to be *F* is going to require whatever *arrangement* of composition necessary to sustain *f*. We can now extend on this claim by adding *interactions* along with the arrangement of composition necessary to sustain *f*, and reformulate it in reductive terms: *if x* at t_1 is the same F as *y* at t_2, then there is a physical relation *f* such that *x* is *f*-related to *y*. I also stated that this will become more apparent with increasing complexity, and although that was the point of the previous section, we have yet to come to terms with the fact that there is no single unified *f* when it comes to the brain, without taking some steep shortcuts. Different theories diverge in their attempts to explain this *f*-relation, which obviously is a massive undertaking in progress.

In order to avoid misunderstanding, I will set out to clarify that although this view assumes a materialistic standpoint, not by any means does it try to reduce *f* down to "nothing but" some other lower-level *f*, which would again be to confuse an emergent *description* with a reductive *explanation.* That is, our *theories* of how a novel *f* may emerge changes, but the *f* stays the same. Remember also that this emergence is to be seen merely as an epistemological emergence, so all talk of psychology or mental events in any ontological sense are directly disposed of in an eliminative fashion, where these concepts only serve in allowing us to systematically understand science in favor of the *f*-relation falling under the sortal F.

To clarify, the criterion of identity (*f*) stays the same, while our theories aimed at explaining the *f*-relation may change. Being able to explain "away" some higher level description does not make it disappear, so there is no cause for concern. Thus, reduction or *decomposition* suffers in the wake of scale and complexity, whereas at each level of description new concepts and generalizations may emerge or *synthesize*, which call for a different research paradigm as fundamental as any other (Anderson, 1972). Accordingly, what is *essential* need not necessarily be less complex, as this next example is meant to show us.

Odd as this may sound – *chaotic systems* are different from complex systems in the sense that they can be simple. That is, both are non-linear systems, but non-linearity can also hold in systems with very few constituents. The constituents of complex systems, on the other hand, are not only numerous, but *interdependent*. Thus, with an increasing complexity comes an even greater dependency (Kellert, 1993). For instance, consider the compositional formula of H_2O again, but this time with a gaseous arrangement of molecules (i.e., water vapor). This is a chaotic system in that no single molecule can be seen as any less *essential* as any other for the *f* of the whole system of molecules. However, this is not the case for complex systems. In fact, though chaotic systems are deterministic, they can be seen as less predictable. A complex system, let us not forget, also ranges between dependent hierarchies of functional descriptions, whose regularities enable emergent behaviors to occur at distinct levels, and consequently provide us with rather static forms of identity conditions by vigorous analysis.

Unfortunately, sometimes we commit to the logical fallacy of dividing the world into opposing dichotomies that are neither jointly exhaustive and/or mutually exclusive (i.e., synthetic vs. natural). Such rigid distinctions, though practical in their own right, can blur possible alternatives – like the intermediate relationship between *environmental adaptation* in the form of evolution (natural) and what I would like to call an *adaptive environment* (synthetic). What is more, we often mistakenly assume that they occur at the same level of description (i.e., nature vs. nurture). We can reveal their dependency simply by removing one of the opposing sides and reflect on whether the other side would persist regardless. Nevertheless, these are merely logical snares compared to the intuitive distinction between the subjective and the objective that we all take for granted, and for which they owe their origin. With regard for the pre-sortal conceptualization of Hirsch (1992), we fragment what is one (the world) into parts, and then as an extension we try to *identify* what is different (Bohm, 2002), amounting to what Quine (1969) would lay claim to as *no entity without identity*.

The "I" in Identity

Consider a case of *associative agnosia*, where the concerned is no longer able to associate or identify what he or she perceives. This coincides well with Quine's former distinction, but we could similarly consider a case in which the reverse also holds, viz. a case of *apperceptive agnosia*, where the concerned is unable to accurately perceive what *would* allow him or her the opportunity to identify it – implying the inverted *no identity without entity*. Thus, if your ability to individuate (1) is dependent on your ability to discriminate (2), then (1) would exist in the absence of (2), which is clearly refuted. However, what I am pursuing is a much more substantial claim, a claim that may seem superfluous, but of outmost importance to the following arguments. In order to illustrate this, instead of the outward notion of pre-sortal discrimination of objects, entertain the notion of *entity* to mean *us* as final designators of identity conditions, as well as what would happen if we were to remove either of both sides. Hence, if your ability to discriminate (1) is dependent on your existence (2), then (1) would not be possible. Similarly, if your existence (2) is dependent on your ability discriminate (1), then (2) would not exist. Now, on its face, it might sound absurd to say that our existence would not exist, but what I mean by this is, that if we do not have the capacity to discriminate, yet alone individuate, we could not be said to be able to perceive our own identity conditions.

This will not result in the belief that the subjective/objective distinction is to be considered a false dichotomy, but instead make way for the *inescapable* fact that everything must belong to one or the other, and that nothing can belong to both at the same time. The elusive question in my estimation then is whether *subjectivity* has to imply the existence of a *subject*. This obviously has to answer for some very counterintuitive implications that may seem difficult to digest at first. To begin with, the emphasis is going to relate to the fact that subjectivity *is* that which of necessity is aware of the objective, as different aspects of the same – in the same sense the inside and outside of a circle are brought about drawing the *boundary* of the circle.

Along these lines, thermodynamically delicate systems are prone to be distinct from their surroundings, charged by the demarcation of their boundaries. Against the relentless pressure towards thermal equilibrium, organisms become *ego*istic or *self*ish within their boundaries of self-preservation, and efforts to preserve the whole world will soon squander the effort futile. These borders remain open in order to allow the exchange of domestic materials between the open system and its surroundings needed for further self-preservation (Dennett, 1991).

Bestowed with sensory organs, certain organisms can excel at navigating through their surroundings, and while we often think that vision has some naturally distinctive praise with regard to spatial content, we can sometimes see that this is not necessarily the case. Reflect on the much appraised *Sonic Guide*, a device whose purpose was to offer the blind a means for spatial navigation and perception. It transmitted a high frequency tone, which it subsequently picked up as an echo in distinct variations depending on the object, and translated it into audible sound profiles that could be auditory perceived. Those who successively used the device for some time could eventually learn to perceive sound as having spatial content (Heil, 1987). That is, just as these blind patients could *hear* the boundaries and properties of objects instead of conventional sound in their surroundings, we do the same, albeit using vision to *see* objects instead of perceiving light. By this example, I hope to have loosened the intuition of "naturally" induced perceptual experience, leaning towards a more "synthetical" one.

However, in order to experience a stable reference point in space, one has also to be able to coordinate exteroceptive sensory information with proprioceptive body and motor information, creating distinct forms of ownership and agency (Metzinger, 2009). But even then, it is not enough when it comes to Homo sapiens. This elaborate organism also *owns* the *f* of being able to understand the fact that they *have* such subjectivity – creating the much illusory *subject* of experience. The roots of this metaphysical conundrum run deep, but now we are at least able to disconnect the subject as a necessary inference from subjectivity.

What I hope has become clear by now is that the acceptance toward an indivisible entity – this *subject* of experience, is not exclusive to dualists or laymen alike; it also contaminates the water supply of many materialists as well. Dennett (1991) goes as far as to call it *Cartesian materialism,* while Olson (1997) deems it as *Cartesianism in naturalistic clothing*. This is meant to imply that when Descartes *res cogitans* is discarded, many of us still fail to discard the intuition of a center where it all comes together – much like in the serial processing of a computer. This can easily be seen in the way we ascribe ownership to things as "my car" and deflect responsibility to "my brain". The account I am going to give of a criterion of our identity over time is nevertheless going to justify such language, but more on that soon.

Talk of psychology and mental events can just as easily lead to misunderstandings regarding representative states, precisely because we fail to see that sensory information need not be *re*-descriminated to some centralized discriminator, and thus does not lead to a *re*-presentation of the discriminated object (Dennett, 1991). Contrary to what most believe then, the self is to be considered a transparent abstraction due to the non-existence of an *indivisible* entity that supposedly is *us*. Of course, this needs some defense, but for now it just serves to help the reader to adjust their intuitions before we submerge ourselves in discussion.

Hence, and rather paradoxically, our apparent sense of continuity is thus to stem from our insensitivity to changes that goes on inside our boundaries, as well as in our surroundings. On sober reflection, as Dennett (1991) again points out: "One of the most striking features of consciousness is its *dis*continuity" […] "The discontinuity of consciousness is striking because of the *apparent* continuity of consciousness" (p. 356). In addition, Revonsuo (2006) nicely sums up the intuition as such: "Our conscious experience of the world is systematically externalized because the brain constantly creates the experience that I am present in a world outside my brain" (p. 144). It has since become a well-known fact that consciousness is a graded phenomenon, immune to claims amounting to its all-or-nothing inquiry.

The "entity" in Identity

It is now time that I try to make a bold conjecture as a viable offer, so that I do not succumb to pessimism in defense of my holistic aspirations. But before I start, I just want to clear up some important terminology. In order to avoid unnecessary dabble in conceptual exuberance, and serious problems regarding multiple reference, I am going to eliminate some of the more obvious contenders from the outset, based on my previous discussion:

1. We are essentially Persons
2. We are essentially Human Beings
3. We are essentially Animals
4. We are essentially Bodies[1]
5. We are essentially Bodies[2]
6. We are essentially Bodies[3]

Although my criterion is not going to be related to any of these, I shall use them as comparison, so as to more swiftly decorate my claim. Let us being by examining (1), as it is the most well-established view in personal identity, known as *Personalism* (Parfit, 1984). This is obviously going to be the main contender for which my criterion must stand against, but as I think my discussion has shown, it has no room in this essay, and I am thus going to cling to what Snowdon (1990) has argued for, viz. that our assumptions of whether the problem of *personal* identity coincides with the problem of *our* identity are simply wrong as long as it is not clear whether we are essentially *persons*. This question can be separated and classified as the question of *personhood*, which would amount to be describing the identity conditions of persons over time with the use of other concepts that are just as arbitrarily defined (i.e., rationality). One could argue that this can just as easily suffice to serve as a critique to any criteria, with the exception of those determined by natural boundaries (Berglund, 1995).

(2) *Human Being* in the context of my discussion is just to imply a member of a particular taxonomy, Homo sapiens, as a particular isotopic variation of organisms. If it turns up in the later discussion, it will be in the form of *Human* – relinquishing it from religious ambiguity. (3) One of the main protagonists behind *Animalism*, Olson (1997), defines it this way:

> What it takes for us to persist through time is what I have called *biological continuity*: one survives just in case one's purely animal functions – metabolism, the capacity to breathe and circulate one's blood, and the like – continue. I would put biology in place of psychology, and one's biological life in place of one's mind in determining what it takes for us to persist: a biological approach to *personal* [my emphasis] identity (pp. 16-17).

On the surface it may seem like the true rival of personalism with its biological approach to what it takes for us to persist, but though animalism is not a question of Personhood, it still assumes or implicitly accepts the ontology of persons even though its defenders neglect its persistence criteria – as hinted upon in the last part of his quote. In addition – and here is where it becomes alarming – Olson (1997) makes one further defining statement: "…you and I are animals: members of the species *Homo sapiens*, to be precise" (p. 17). In this sense, what subscribers of animalism say is that all human people are animals, making a triple reference that is very hard to defend, simply by adding a concept that we can do without. It presumes that there is a dichotomy in addition to the taxonomy between humans and animals, which inevitably, and rather unfortunately, puts us at the pinnacle of phylogenic arrogance.

The last three criteria are sadly no more than a confused meddling of concepts: (4) is to stand for the Cartesian extended "body", or physical substance; (5) stands for the folk psychological distinction between the head/brain and the rest of the "body"; and (6) is meant to imply the *biological* organism as a whole (Williams, 1976), which fares closest to the criterion I am going to present next. However, I am going to concur with Van Inwagen (1980) that the word *body* is indeed eliminable in this context, as there are less contrived alternatives.

My alternative is thus going to account for *us* being no less than *f-organisms*. That is, we are not *biological* organisms, being confined to organic organization, but the *functional description* of this particular organism, or entity. Thus, *organism* is directly related to the term *organization* rather than *organic* – putting the "entity" in Identity if you will. There is a long tradition, stretching all the way back to Kant, *Critique of Judgment*: §64, of defining organisms as self-organizing entities, and that is the definition I am going for. Furthermore, as I have been arguing for up to this point, we are the *f* of this organism – we do not *have* experiences, we *are* experiences, and experiences are the multitude of functional descriptions converging upon the whole *organism*, and not just the brain, despite its complexity. Hence, we are the continuing descriptive pattern of arrangement and interactions of organisms.

Recall that identity could not hold between different levels of description due to the rejection of the compositional criterion, so what we *essentially are* does not have to imply being less complex, which in this case means that we can justify our criterion based on emergent complexity, viz. *f*-organisms instead of brains or any part of a brain. Indeed, without the brain, the whole system collapses, but so is the case with the heart or the liver, or our immune system as well – thermal equilibrium is the winner either way, and decomposition is imminent. Thus, death is the *irreversible* loss of *f*. One may then conceive of the *self* in the same way, as the *integration* of a highly dynamically complex activation pattern, not in the brain, but in the whole *self*-preserving organism. This way we can justify talk of "my brain" from the perspective of utilizing the brain as one part among many. In the end, we are essentially *f*-organisms with *self*-preserving boundaries determined by nature, or as D'Arcy Thompson (1917) once said: "Everything is what it is because it got that way."

I will reserve myself for potential shortcomings of this criterion, as that will surely burden patience due to its holistic aspiration – but the last two topics is meant to forcefully put a strain on the concept of an *f*-organism to see how well it holds up against stern judgment.

Indeterminacy of Identity

So far, the answer to the question of whether *x* at t_1 is identical with *y* at t_2 has been determinate – that is, it has been either true or false. As sometimes happens though, the answer to this question is apparently neither yes nor no – and can be seen as indeterminate. In cases of *ontological indeterminacy*, the boundaries of mountains, rivers, and clouds become fuzzy, and we can no longer determine the boundaries by perceptual discrimination. Similarly, cases of *conceptual indeterminacy* appear when successive changes in *f* are radical enough to instill doubt whether *f* is still an F (i.e., a caterpillar turning into a butterfly) (Berglund, 1995).

This vagueness that occurs in conceptual indeterminacy may seem futile when confronted with questions such as: "How old is old?" Our need for distinctions may start out rather innocent by stipulating a few categories – child, middle-age, and old. Driven by the right context, we may need a few more, so we can add infant and teenager to the mix. If the situation requires it, we may even need to start using smaller categories (i.e., numbers). Vagueness forces us to make intentional distinctions that just seem to delay the inevitable. However, as illustrated in Figure 2, it does not prevent us from revising extensionality.

Figure 2. Indeterminate Parts. *Left*: we can see that *x* and *y* are not identical by virtue of their having *partly* overlapping parts. *Right*: here we can see that *x* and *y* share overlapping parts. From "Mereology," by A. Varzi, 2009, http://plato.stanford.edu/entries/mereology/. Copyright 2009 by Achille Varzi. Reprinted with permission.

Hence, my worry is that when given discriminatory boundaries that are not properly scaled to our perception of them, we interpret *both* cases as being cases of indeterminacy due to the inclusion of *unknown* parts – owing to their "fuzziness". What is more, and for practical

reasons, we often fail to notice that what we regard as objects, are in fact *partly* overlapping parts at a lower level of description. Take a mountain, or a tree, for instance – their boundaries are given as partly overlapping parts of the earth, and not objects in their own right – more like the wrinkle in a carpet – a mere *modificaton* (Van Inwagen, 2009). Thus, from this perspective, the only reason for which a concept seems to slide all over the place is because it fails to successively pick out the boundaries that are given by reality – and that can only be our fault. However, this does not in any way imply that there is no ontological indeterminacy.

Ontological indeterminacy can exhibit a wide variety of arbitrary boundaries given to us by reality – or so it seems. Clouds are often used as an example, that we can sharply discriminate an object up there, but as soon as we take a closer look, it dissipates into a multitude of water droplets that is neither part of it, nor not part of it. This problem has been presented, and is presented as *The Problem of the Many* by its main advocate (Unger, 1980). What holds for clouds then, is often taken to apply to objects whose boundaries *look* fuzzy depending on the vantage point of the object, which to me is a misstep of great proportions.

If we were to grant boundaries to "objects" in the way they appear to us, we could find ways to justify hallucinations and mirages. By using a micro- or telescope, we extend on our perception beyond natural constraints, but also descend or ascend in what levels of description we get the chance to perceive. The same could be said for clouds in this respect – the further away from the chaotic system we get, the more complex it *appears* to us. By shifting the vantage point from the dispersed particles in water vapor, they will either spread out or fuse together over such volumes so that they emit sufficient quantities of radiomagnetic radiation for our eyes – much like perceiving a tree at a distance, only to realize on closer inspection that it was actually two trees coming out of the focal breaking point of vision. Hence, a "cloud" is more like a "person"; it has no overlapping parts, and can thus not be said to exist. They are just abstractions, compared to the clearly demarcated boundaries given by reality.

Regardless of whether there are vague objects or not, what this seems to entail is that change (henceforth referred to as *plasticity* to separate the term from the intuitions that change has to imply the determinate change *into* something), is temporally relative to different levels of description and our perception of them. That is, the *closer* we look, at say clouds, the more sensitive we become to the temporal plasticity (change over time), which reveals the spatial influence in problems whose answers seem to demand temporal solutions. Hence, the indeterminacy may not be a question of epistemic limitations at all, but of a *perceptual* indeterminacy grounded in the relevant functional descriptions of the organism.

Although this line of thought gets scarcely close to the controversial thesis that time is independent from change, Aristotle maybe was on to something when he argued that change is at least *distinct* (cf. identity) from time, because change occurs at different rates, whereas time does not (Physics IV). If this implied that reference to time also involves spatial influence, then *spatio-temporal acceleration* robs identity of its reference to the degree that we have to say – "not too much or too fast". What "too much" means is thus relative to what the object of reference is, and the following discussion amounts to showing how *f*-organisms excel in being able to withstand cases of indeterminacy with the use of an argument similar to *Sorites Paradox* – an argument that Parfit (1984) introduced as the *Physical Spectrum*:

Premise 1: 100% of the brain is a brain.

Premise 2: If *x* % is a brain, then *x* – 1% of the brain is a brain.

Conclusion: 1% of the brain is a brain.

We are led from what seem innocent steps to a false conclusion by apparently uncontroversial reasoning, but there is obviously something wrong with the second premise, since the first is unconditionally true. Now, if we had been using a vague concept such as *cloud*, we could, as I have tried to argue for, reject the first premise and conclude that there are no clouds. Unger (1979) championed this nihilism by urging us to talk *as if* they exist.

Now, when this is applied to ordinary objects, a simple stipulation might suffice. However, when it comes to *our* existence, our intuitions reveal to us that a mere stipulation is not enough to tell us whether we exist or not – we believe that *we* are determinate. Recall that this intuition does not have to apply as a necessary consequence of accepting the ontology of the *subject*, because at some point, an *f*-organism is likewise indeterminate *former* to its cessation. There is still such a point in time where the *irreversible* loss of *f* is going to require a determinate answer to the question of whether we exist or not, even if the affirmative answer may *temporarily* end up accepting indeterminacy. Contrary to most reductionist views then, our identity can be determinate. Instead of drawing arbitrary stipulated lines upon the world, we can rely on the lines already drawn, and try to expand the boundaries on what it takes for us to persist (i.e., synthesis). Thus, think of our existence as a dimmer instead of a switch.

Suppose we were to say that we exist E just in case the cardinality of a set of *x* % was greater than the cardinality of a set of *y* % – C*x*(E) > C*y*(E). This is very counterintuitive, because it is hard to think that our existence depends on such small differences, and many argue (usually personalists) that evidence of such a boundary makes no sense, as there are people who have survived the destruction of one of their hemispheres – $C_{50\%}(E) \geq C_{50\%}(E)$.

However, the biggest problem with claims like these is that they treat complex open systems as chaotic and closed. Since complex systems are interdependent, it surely depends on *what* 50% we remove, due to its parts being more or less essential for the system to work. In the case of *f*-organisms, for instance, one hemisphere is not an arbitrary loss for most of *f* to persist, because the other hemisphere and the rest of the organism are indeed intact. Instead, if we were to handpick those 50% and remove the cerebellum or the heart, it would result in an irreversible loss of *f*, viz. death. It similarly makes no difference if we replace different percentages of this *f*, because as discussed, there is no central in which all functional descriptions at the lower levels converge, as to make it something we can reductively identify.

Just as a caterpillar can transform into a butterfly, and a seed can transform into a tree, so can we transform from an embryo into a human – all sharing the same self-preserving boundaries across a continuous existence. We survive such temporal plasticity due to the dynamical set-up of withstanding thermal equilibrium, despite current state of metamorphosis. We can gain or lose parts literally in a matter of seconds, without noticing a difference due to our insensitivity to plasticity that are not essential for most of our *f* to persist (i.e., "not too much, and not too fast"). Losing an arbitrary part of ourselves as *f*-organisms, say a finger, does not impede on our immediate survival, but does its fair share nonetheless. Just as we influence the *f* of the hammer in a negative way if we remove any arbitrary amount of matter from the head, we indirectly affect our capacity for self-preservation by losing a finger. The same defense could be agreed upon when considering being transformed into bionic parts – as long as the organism retains its functional description, viz. arrangement and interactions, it does not matter for our survival whether *f* is preserved from organic material or not. In fact, *artificial* need not imply being inorganic in the first place, as verified by organic chemistry.

While the reductive enterprise is sometimes faced with problems of *branching*, where the application of multiple criteria at the same time can result in cases where two distinct entities become identical with one formerly existing entity, our little enterprise instead faces problems when it comes to cases of *division*. Parfit (1984) uses these two terms interchangeably with regard to a broader context of *fission*, but in this respect it is crucial that we separate them to highlight the claim. That is, if we adhere to reductionism, we can find different criteria of identity to hold at the same time due to its top-down explanation (decomposition), creating branches of multiple references (e.g., brain, body). From the perspective of an integrated bottom-up description (synthesis), on the other hand, we have to come to terms with what it would mean for *us* as *f*-organisms to be *divided* into multiple, but equally distinct entities (i.e., amoeba). How can we go from being numerically identical to qualitative duplicate?

The most prominent example of fission comes from a neuropsychological phenomenon known as *Split-Brain*, created by the medical procedure of cutting the corpus callosum, the bundle of dense connections between the cerebral hemispheres (Sperry, 1961). It is often claimed that the patient is split into two separate streams of consciousness, which amounts to the question of whether there are now two persons where there formerly was only one? Sure, each hemisphere can separately show for a unity of some sort, independent of the other, but can we really jump to the conclusion and say that there are separate persons, selves, or centers, in one body? Some even take this as evidence in support of their personalist ontology.

However, if we take the dispelled notion of persons and bodies into consideration, we can see that the corpus callosum may be no more than a very obvious distinction – one that we actually can have enough knowledge about to justify the cut. With increasing knowledge of the complex system dynamics of the brain, there may well be further surgical interventions that call for not so obvious distinctions. Hence, from the perspective of *f*-organisms, a Split-Brain is just a convenient *branching* of labor in one of its organs – not a *division* of *f*.

The same goes for patients who have fallen into an irreversible vegetative state as a result of anoxia, in which the subcortical parts of the brain remain intact (e.g., respiration, circulation, metabolism) while the cerebrum is irreversibly lost. Personalists and animalists alike, go separate ways here in pursuit of different criteria for what happens to *us* in this case. While personalists recognize that we cease to exist, an animalist clings to survival for the same convenient reasons as before – the obviousness of the distinction between cortical and subcortical parts of the brain. I say convenient because the distinction just happens to fall into the criterion, instead of the criterion embracing the distinction. This fallacy of dichotomies to ascribe the criterion at different levels of description can show for its dependency. This can be seen if we substitute the cerebrum for the cerebellum, amounting to the same answer for a personalist, but different for an animalist – much due to the *inter*dependency of the brain.

To make this point clear – imagine a surgeon transplanting your cerebrum into the head of another organism. What happens to *you*? The personalist will say that we "go with" the cerebrum, moving *you* from one head to the other by paring you down to a brain, and replacing the spare parts with qualitatively identical ones. The animalist, on the other hand, will say that we "stay behind", giving a precious organ of ours to someone *else* (Olson, 1997).

In this sense, animalism is still *conveniently* on the right track – by luck if you will. The animalist may be right in insisting that the cerebrum transplant is like a liver transplant, losing those capacities that go with it. However, in my view, they fail to do justice to the fact that the cerebrum is part of the self-preserving system as well, only in a more indirect way. For one, the organism would not survive without help for very long. Thus, when animalists make a appeal for the brain and its life supporting systems, they have their hand stuck in the cookie jar. If they wholeheartedly believe that we "stay behind", it should rather be thought of as the *animal* and its life supporting system, due to the brain's indirect role for the animal to survive. This also makes sense if we take a closer look on the cortical evolution of the brain, and the sheer luxury that Homo sapiens indulges in when it comes to anticipating survival – and the fact that for the brain not to cease functioning it has to, at least, be connected to an artificial heart-lung machine, providing further confirmation of a minimal threshold for *f* to persist.

The nail in the coffin for an animalist, though, comes with the notion of a *whole* brain transplant, giving sway for their convenience. Now that the vital functions are included in the transplant, they suddenly "go with" the brain instead of "staying behind" as if we actually were nothing more than that. What happened to "*biological continuity*"? What happened to crucial biological systems such as genes, the immune system, and the endocrine system? With the additional fact that subcortical structures only *coordinate* respiration, circulation, and metabolism, it would be rather unwise to "go with" it without them. One could also question what the "whole" brain really consist of – what are the demarcation criteria of the brain?

To conclude this topic from the perspective of *f*-organisms then – nothing goes with anything, viz. there is no branching, only division. In cases of fission, numerical identity either turns into qualitative identity like that of an amoeba (single-cell organism) dividing itself; or creating multiple new *f*-organisms (multi-cell organisms) where there *was* formerly one. The temporal plasticity of me in the case of a brain transplant gain new boundaries through a clear spatio-temporal gap, evolving into new functional descriptions. It seems appropriate to call this a division, instead of mere branching, where I am no longer. Similarly, if we can survive the destruction of one of our hemispheres, we can even justify division in the case of transplanting two hemispheres to different receiving organisms. Since the principle of transitive identity will force you to say that since you survive as one, you must survive as both $\forall x \forall y \forall z\ (x=y)\wedge(y=z) \rightarrow (x=z)$, we are on the clear if we do not even survive as one.

One part of me is there, and another part of me here (or there), but because I am no longer, they are parts of new identities – even if *what matters* is preserved. That is, what matters is preserved in the case of a brain transplant, but what matters is not identity (Parfit, 1984). In my commitment to this view then, the only reason we think we "go with" or "stay behind" is that, given a choice like that of receiving the question "where do you go?" the statement gets *value-laden*, and we lose the ontological or metaphysical perspective needed to step away from the need to put up a false dichotomy that forces us to listen to our intuitions. Although the brain is only one organ among many for the organism, it has the most *value* for us.

Intrinsicality of Identity

For the last part of this essay, let us complicate things further to see how *f*-organisms would fare against its, hands down, and so far toughest resistance. This particular argument is inspired by a discussion by Thomas Nagel in Parfit (1984) and applied as a specific version of a paradox known as the *Ship of Theseus* (Berglund, 1995) in order to work as a critique against *f*-organisms. Imagine that our well groomed surgeon decides to make one last

operation on you, split up into three intervals. In the first interval between t_1 and t_2 he successively removes 1% of *f*, and replaces it with a qualitatively identical part before continuing to remove another 1% of *f*, until he has replaced all 100% of *f*. Since the operation has been gradual, *f* has remained spatio-temporally continuous, and we have remained the same *f*-organisms during the whole operation. In the second interval, he first removes all one hundred parts, carelessly putting them on a table next to him. Shortly thereafter he reconstructs *f* using the same parts. During the third interval, he opts for medical excellence and carries out the two former operations *simultaneously*. He begins by removing 1%, putting it down on the table, and then replacing it with a qualitatively identical part, all the way to 100% of *f*. After the operation, he reconstructs *f* from the pieces on the table. The paradoxical result is that at t_2 we have two *f*-organisms that are *numerically* identical with the one at t_1.

With the tools we have been acquiring in the first part of this essay at our disposal, we can safely assume that the compositional criterion used to identify *f* in the second interval is false, or at least give us a means not to assume that the composition of an object can be replaced without affecting its identity. Consequently, we are left with the spatio-temporal criterion, which under the circumstances is not so bad considering our expanded perspective on the spatial influence of temporal plasticity. Accordingly, this would of course imply that many of our ordinary practical notions of identity do not hold – like that of our car surviving being dismantled by a mechanic. I can still say that it is my car, but not that it is the *same* car, or as Unger (1979) informed us of earlier, substitute all such talk *as if* it was the same.

However, we are now faced with a rather perplexing implication. When the surgeon, in the third interval, performs the first operation, *f* persists and gives us life. But when he performs the second, *f* ceases to exist, resulting in death. The difference between these operations is merely the *order* in which these parts are arranged together. How can alternating between inserting and removing be the difference between you existing or not (Parfit, 1984)?

This is again a case where we choose to ignore instead of deny the difference between a closed chaotic system, and an open complex system. In the first operation, we continually keep both the arrangement *and* the interactions intact. In the second operation, however, we simply assume that the arrangement is going to implement the same interactions – or as in this case, that we can bring *f*-organisms back from an *irreversible* loss of *f*, or even that we can bring the dead back to life. Thus, the order *does* make a difference for *f* to persist.

Concluding Remarks

The premise for this essay was to examine whether the temporal plasticity of *f*-organisms was able to accommodate a criterion of identity that was stable enough to put on display, and I believe that the preceding discussion, along with the intuitions of eliminative materialism, can deem this endeavor successful only for those willing to accept a constant recycling of identity conditions based on the notion of not treating open and dynamically complex systems as closed and static. We are in a constant state of reconstruction with respect to not having anything sustainable to lean back on, and for those who are content with the old Greek saying by Heraclitus: “The only constant is change”, embracing change in general is not only something we have to accept unconditionally, but also learn to live with and celebrate. Hence, stable grounds will always tremble – and all we can do is what we have always done – adapt.

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