

*Metabolic Determination  
and the  
Problem of Hierarchical Parts*

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## Abstract

In *The Human Animal*, Eric T. Olson argues for the Biological Approach to personal identity. For Olson, a human animal is a numerically single entity that persists through time from the moment that its metabolic processes are all working in tandem for the good of a single living entity until those metabolic processes cease at the time of death. This view has a major problem that I call the Problem of Hierarchical Parts. If metabolism is the anchoring feature of a biological entity's persistence, then it must be the case that certain parts of the animal—those which contribute more directly to the sustainability of the metabolism of the animal—are more important than others. In parsing Olson's view of the persistence conditions of human animals I argue that while the metabolism is a reasonable persistence condition for an organism, the Biological Approach's particular explicit claims regarding the impossibility of organisms coming to be fully synthetic yet persisting as a single entity require Olson to draw arbitrary boundaries around the brainstem, and specifically around a single organic cell inside the brainstem—Cell(B). If they are arbitrary—i.e., if an organism's persistence does not require that it remain *organic*—then we should reject his explicit claims about organisms failing to persist through the transformation from organic to fully synthetic, altering the Biological Approach and revealing it for what it is: what I call the Informational Approach.

## Introduction

Olson's *The Human Animal* puts forth the Biological Approach to personal identity. According to Olson, human beings are animals whose persistence conditions are the same as other biological creatures: they persist through time from the moment that their metabolic processes are working in tandem for the good of a single entity until those metabolic processes cease at the time of their death. This is supposed to set him apart from views of personal identity which tether the persistence conditions of persons to psychological continuity or psychological states. There is at least one major underlying problem with anchoring the persistence conditions of an organism to its metabolic processes, *The Problem of Hierarchical Parts*: Certain parts or collections of parts of the human organism which are critical to the sustainability of the animal's metabolism become more important than others, establishing a hierarchy of parts.

This implicit conclusion of the Biological Approach has the potential to push Olson towards views that he is seeking to distance himself from. At times, in light of this objection, the Biological Approach might appear to be a camouflaged version of a psychological account of personal identity given the importance of the brainstem to the human animal, but I maintain that it is not. This is simply because it is not the psychological states that Olson argues are necessary, nor their continuity when he argues for the importance of the human animal's brainstem; the brainstem can lose its psychological states and the entity maintains its identity. What matters is that an organism's metabolism is perpetuated through time by proper *genuine* parts—and by *genuine*, he means *organic*. On the Biological Approach, the *organic* condition at least seems to be necessary. Olson tells readers:

“It may be possible to replace all of your parts, including your brain, gradually and piece by piece, with inorganic prostheses in such a way that your mental capacities were preserved throughout (Unger 1990, 107 f.). The result would be a wholly non-biological person—with rationality, consciousness, free will, the works—who was both psychologically and materially continuous with you. Nevertheless, according to the Biological Approach that being would not be you, for you are a biological organism, and no organism could come to be a non-organism...[.]”<sup>1</sup>

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<sup>1</sup> Olson: 125.

If the Biological Approach is a theory of the persistence conditions of organisms, and organisms can never come to be non-organisms, then on all intuitive accounts it seems he must resist fully synthetic entities being continuous with organisms, and so he does. If the property that anchors a living entity at time  $T_1$  to itself as the same entity at time  $T_2$ , regardless of both physical **and** mental continuity, is its being biological (i.e., still alive) at both times, it must be the case that organisms require at least one organic cell that contains the biological information characteristic of that organism as it was before its parts were completely replaced. The difference between the one organic cell and the rest of the being made up of synthetic prostheses, then, would be that the one organic cell contains the original DNA of that being. As Olson says of organisms (and DNA):

Each living organism contains within it a sort of plan. This plan contains the organism's "basic operating instructions". [...] The plan...contains instructions for the for the organism's growth and development. [...] [Organisms] grow (and sometimes shrink) in a controlled, self-directed way, and they may change in form in a way that has little to do with their surroundings, as when a caterpillar turns into a butterfly, or when a human embryo stops looking like a fish and begins to grow arms and legs. Finally, the plan contains instructions for building a new organism of the same kind, and so makes reproduction possible. The plan that each terrestrial organism (or more accurately each cell) carries within itself is made of DNA (in most cases), and it carries its information in the form of a molecular code or language.<sup>2</sup>

On the definition implicit in this passage, an organism is an entity that 'carries within itself' an informational plan that marks it *as itself*. It is the molecular code or language that has what Olson calls the 'characteristic form' of an organism; it can't be some over-arching form (as it is not a collection of particles that makes this unity what it is), and, per Olson's explicit claims above, organisms may change form—as in from caterpillar to butterfly—and maintain their identity. This passage lends credence to a later claim that an organism's identity is more-or-less equitable to a single cell. As the passage states, one cell contains the coding for the entire biological entity. It can still participate in regrowth, contribute to the repair of the organism should it be harmed (outside of life-ending harm), and is susceptible to all of the challenges that organic cells are susceptible to such as disease, infection, cancer, and so on. That *one organic cell* would still be what Olson refers to as being *caught up* in that being's metabolism, and thusly,

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<sup>2</sup> Olson: 129.

would be a proper part of that organism. Of course, it would be the *only* proper part of that organism. On being *caught up* and in arguing against synthetic parts, Olson explains:

Imagine that your kidneys stop working, so that you cannot live any more than a few days without attaching yourself to a dialysis machine. Still, the machine that you can't live without is never literally a part of your (or a part of your body, if you prefer). Why not? Because it is not *caught up* in your metabolism. The machine didn't grow according to the plan encoded in your genes. If it breaks down, someone has to repair it with a screwdriver and soldering iron; unlike a genuine organ, it does not heal or form scar tissue. The machine does not assimilate nutrients from your bloodstream, and the chemicals that make it up are not accessible to your metabolism in the way that those of your bones and other tissues are. If you are anemic, for example, your metabolism cannot utilize the iron that certain parts of the machine are made of. The stability or homeostasis of the system composed partly of living tissue and partly of metal or whatever is not dynamic in the way that a living organism's stability is dynamic.<sup>3</sup>

In assuming that an organism can never come to be a non-organism, Olson relies on the notion of a part of an entity being *caught up* in an organism's metabolism as the property that allows some part to be a proper part of that organism. As Olson suggests by referencing Unger, it may be possible to replace the parts of an organism one by one until all of the parts of that organism became synthetic, but once the very last part is replaced—the part of import for the human animal being the brainstem—that organism *ceases to be what it was* and becomes a new entity *even if that entity is both psychologically and materially continuous* with the organism it once was. This is because synthetic parts do not contain the DNA coding for that organism, nor do they abide by the rules contained in its organic cells. The only difference between two different entities—one almost fully synthetic but with one organic cell, and one fully organic—on the Biological Approach can be one single organic cell.

Problematically, Olson's necessary condition of *organic* becomes metaphysically arbitrary if it could be the case that an organism comes to be a non-organism in line with every stipulation that Olson puts on what it means to be an organism, and thusly persist. Following my in-depth discussion of the metabolism and the Problem of Hierarchical Parts, I offer up a thought experiment wherein all of the conditions that Olson places on the term *organic* can be met, but a fully synthetic entity results that is continuous with the organic entity from which it came. This directly contradicts his claim that no

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<sup>3</sup> Olson: 135. My italics.

organism could come to be a non-organism. If this is possible, then the Biological Approach is less a ‘biological’ approach, and more an Informational Approach: an entity that was once an organism persists so long as it persists according to the rules contained in its *genuine* or *organic* parts.

### §1: Metabolism and the Biological Approach

Olson is fervent early in the Introduction of *The Human Animal* that metaphysical designation of human animals as numerically singular entities persisting through time, “...is not merely a convenient way of talking about the arrangement of tiny particles, or about the relations among a large number of beings, each of which exists, or is a person, for only a brief period. *There really is one thing that is now rational and conscious, and has existed, and has been rational and conscious, for many years*” (Olson: 5).<sup>4</sup> That is, a human animal is a unity which from moment to moment is the same unity, regardless of how many particles that unity contains or what particular particles<sup>5</sup> they happen to be. What does matter, though, is that they are *organic*, and thusly *caught up* in the metabolism of the organism.

In Chapter 6, aptly named “The Biological Approach,” Olson argues in depth that due to a biological organism’s constant exchange of particles over time, it cannot be some particular particles or arrangement of particles that determines identity. Our cells are constantly dying, replicating, and serving their functional purposes: to keep *us*, the individual animal that we are, alive while the particular matter which composes our human bodies is constantly exchanged. The Biological Approach takes this as more than a simple fact, but also as a necessity for defining organisms. Olson suggests:

“Living organisms have a dynamic stability: they retain their characteristic form and structure despite a constant and rapid exchange of matter and energy with their surroundings. [...] In fact, the stability of living things depends on this constant exchange; without it, the elaborate internal structures necessary for the organism to remain alive would soon break down.”<sup>6</sup>

For Olson, the metabolism of an organism is, broadly, the continuous exchange of matter and energy that maintains the stability of that organism. On the Biological Approach—and generally—if it is true of an animal that it has a currently functioning metabolism, it is tantamount to saying that that animal is alive. It

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<sup>4</sup> My italics.

<sup>5</sup> Just an aside: the phrase ‘particular particle’ illuminated the meaning of the term particular for me.

<sup>6</sup> Olson: 127.

is also critical that, "... [an animal or organism has the] capacity to coordinate and regulate its metabolic and other vital functions" (133). Anything caught up in the organism's metabolism then must participate in this exchange at the organic, cellular level. Only parts that are *caught up* in the metabolism of an organism, then are proper parts of that organism.

Olson tells readers that, "It is not clear that an organism could have an inorganic object larger than a molecule such as a stainless-steel hip or a pacemaker or an artificial brainstem, as a part" (135). A stainless-steel hip surely contributes to the metabolism of the animal indirectly; it allows for the organism to ambulate, relieves undue pain, and (hopefully) solves all of the problem that warranted the hip replacement in the first place. Still, on the Biological Approach, a hip replacement, just like the dialysis machine, is not *a part* of the human animal. He writes loosely about the metabolic homeostasis of the human animal as the anchoring function of the organism, but if a part of an organism fails to be caught up in its metabolism, then it doesn't belong to that animal proper, even if it contributes massively to metabolic stability. This means that all proper parts of the human animal, for Olson, must be *organic*, as only organic parts can be caught up in the metabolism of the organism given that they participate in metabolic exchange and so on according to the instructions contained in the organism's genuine parts.

Per Olson's claims above, synthetic replacement parts cannot be *caught up* in the metabolism of the human animal. Why? What could it possibly be about the size of foreign objects—namely, that they are larger than a molecule—that prevents them from being bound up in the metabolism of an organism? It seems to me that Olson has in mind the kind of matter that is broken down and used by organic cells to build new organic matter for the organism's benefit. A steak is bigger than a molecule, but the water, proteins, and carbohydrates of which the steak is composed—that composition which is important to metabolism—used in the metabolic process do in fact get processed at the molecular level.

Importantly to my objection, the fact that it tends to be small, molecule-sized objects that get integrated into and used by the metabolism of human animals to maintain metabolic stability does not bar bigger objects from being integrated into the system by default. In order to get clear on why it might be the case that bigger objects (such as synthetic hips) fail to get integrated into the metabolic system on

Olson's view, consider again what Olson intends by the notion of a part being *caught up* in the metabolic process: parts *caught up* in an organism's metabolism must be *genuine*, and grown according to the plan contained in their DNA. The problem with relying on *genuine* parts which have been grown according to the plan contained in their DNA as a hard line for what counts as being *caught up* in an organism's metabolism is that in order for metabolic stability to occur, certain parts become more important than others to the organism as a whole—a point which Olson himself makes clear. This is what I call the Problem of Hierarchical Parts. Ultimately, the metabolism is bidirectional: bottom-up and top-down.

When it comes to the importance of the roles played by each direction—bottom-up and top-down—bottom-up contributions to the organism can only be made if and when the top-down systems are functioning properly, and the top-down systems are centrally located—at least, for the human animal—in the brainstem. Thus, the top-down contributions are more crucial (given that the metabolism is currently functioning). Bottom-up contributions are wholly crucial to the formation of the organism and starting the metabolism's engine, as it were, but once the organism is 'firing on all cylinders,' top-down control is necessary to sustain the life functions of the organism.

The bottom-up system which accounts for cellular growth and the integration of matter and energy into the organism such that it can persist requires the focus of the metabolism to be on the overall sum of chemical processes that occur in some cell that contributes to the generation of organic material for the benefit and survival of the organism. At the cellular level, almost all life has fairly identical biochemical reactions and functionality. Cells are factories that break down certain kinds of matter into energy that is used to construct biomolecules required for life to go on living. This process is not automatic, however; when the brainstem dies, as Olson illustrates, "...a living thing goes out like a light..." (127).

The top-down import of a proper part of an organism relies on that part's playing a more or less crucial role in the organism's overall survival. I argue that cruciality for parts which contribute to the functionality of the top-down system can be determined by a spectrum of necessity. The more necessary a part of an organism is to its top-down coordination, the more crucial its role in the overall metabolic

system. If a part of an organism can be removed with no direct (or in some cases, immediate) effect on the metabolic stability of a creature, then, as previously argued, its role is diminished in the hierarchy of parts.

Top-down parts which are *caught up* in the metabolism of an organism are generally going to be much more difficult to replace with synthetic parts given Olson's understanding of the notion of *caught up* because their functioning well (or at all) requires a complex structure that bottom-up contributors need not maintain as they are cellular in nature (and thusly very small, although admittedly very complicated). The higher up on the hierarchy of parts, the more difficult it seems to be to allow for integration of a synthetic replacement of that part (if, as I argue, it is possible at all). This means that not only is there a general problem of hierarchical parts wherein certain parts can be completely eliminated from the organism with no disastrous metabolic effects, but a secondarily tough issue arises when considering the possibility of synthetic replacements for parts of an organism that are higher up on the hierarchy than others. Replacing crucial parts of the metabolism becomes increasingly difficult.

If metabolism is going to be the aspect of an animal that we rely on to understand the persistence conditions for that being, then we should rely on the proper part of the animal that contributes most crucially to the persistence of the metabolic stability required for the organism to live. The persistence conditions of some entity ought to be persistent themselves. In order to rely on his conditions for a part being *caught up* in the metabolism of an organism, Olson will ultimately have to draw a boundary around a single organic part: the brainstem. Ultimately, I argue that his view forces him to draw a boundary around a single cell of the brainstem—Cell(B)—which contains the original DNA of the human animal as a binding agent which provides continuity of metabolic stability required for persistence according to the Biological Approach. These boundaries—one around the whole brainstem, and one around one single cell Cell(B)—represent boundaries that respect the bidirectional relationship of metabolic stability laid out by Olson. In either case, the brainstem is the focal point of both boundaries because it finds itself at the top of the hierarchy for parts of the human animal. The problem of hierarchical parts seems to convert the Biological Approach to a kind of Brainstem Approach, which turns out to be an Informational Approach.

## §2: The Problem of Hierarchical Parts

In order to make sense of the Problem of Hierarchical Parts, I assume that each part of a human animal can play *some* role in the metabolic stability of that animal, whether or not it is actually *caught up* in the metabolism. Some contributions are direct, and some are indirect. A test of necessity can underscore the difference between direct and indirect contributions. Teeth, for example, are required to chew in order to prepare food for digestion. They serve the function of pre-digestion. In the modern age, we can replace teeth synthetic versions that work just as well (if not better). Similarly, one can lose all of their teeth and simply eat food that doesn't require chewing (my Uncle John loved to remind us kids of this fact when he would remove his dentures and eat creamed corn). In failing to pass the test of necessity, teeth contribute only indirectly to the functional metabolic process, as necessary as they might seem to us in our everyday lives. The same goes for feet, legs, hands, and arms.

Olson draws his first explicit boundary at the head of a human animal in claiming that it is absolutely necessary; if we were to sever a head from a human animal's body and hook them both up to the necessary equipment to keep them alive, the headless body would be a living organism, but no longer a human animal.<sup>7</sup> This is because, "Biology tells us that the result of cutting away a man's head is not a headless living organism, but a mere heap of flesh, a headless corpse (van Inwagen 1990b, 173 ff.). That heap is composed...of living cells; but those cells are unable to coordinate their activities in the way that the parts of a living organism coordinate theirs. They don't function together as a unit" (132).

As parts become more or less necessary, the Problem of Hierarchical Parts becomes apparent. The Biological Approach is supposed to be a view of personal identity that relies on the dynamic stability of a single organism that functions as a whole unit. After all, Olson argues that there is really *one thing that is now rational and conscious, and has existed, and has been rational and conscious, for many years*. Simultaneously, it is *not* an arrangement of tiny particles (or a bunch of parts put together). On Olson's account, it is highly coordinated molecular and biochemical interaction of the parts of an animal that give

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<sup>7</sup> Olson: 133-5.

rise to the emergent unity that we call, for instance, a ‘human’. If the coordinated biochemical reactions and life-sustaining processes are the defining aspect of a human animal—not some particular physical makeup or psychological continuity—then, as I have shown, some parts of the animal are primarily important and deserve a special placement on the hierarchy of parts given their crucial nature according to the test of necessity. If the brainstem, for instance, can be the only surviving, organic part of an animal and the animal persists, then the brainstem is not a proper part of that animal because a thing cannot be a proper part of itself. At that point, the brainstem is just identical with that animal.

If there are certain parts of the metabolic system that are more important than others in or for the system—the brain stem, for example, controls the synchronicity of the processes that when joined together make up a single metabolism underlying the persistence of a single organism—then the Biological Approach of personal identity can start to look a lot like a ‘Brainstem Approach’ when it comes to human animals. This consideration prompts further inquiry as regards the status of entities like brainstems or cerebrums in vats—not in the usual context of the thought experiment—but specifically in answering the question, “Is a cerebrum in a vat that is, on a general account, metabolically bound up with a synthetic system still the same human animal persisting through time?” Olson says no<sup>8</sup>, it is the same *living organism*, but it is no longer a human animal because, although it maintains the *capacity* to coordinate the metabolic functions of the animal (if all of the necessary parts were present), it is not currently coordinated in his metaphysically distinct way. If the vat were to be switched off—there must be something about the vat that keeps the brainstem alive—the brainstem, as a coordination center, would cease to live after a short matter of time. Even if a brainstem in a vat does not constitute a fully functional animal, there are still major problems with the Biological Approach. It relies on certain parts of an animal as being more important than others. The consequences of removing certain parts of an organism like hands versus other parts like hearts, lungs, or brainstems helps to designate which kinds of parts play crucial roles in the metabolic processes of a human animal, and thusly gain hierarchical importance.

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<sup>8</sup> Olson: 134.

Once the Hierarchy of Parts is firmly established with the brainstem at the top of the human animal's hierarchy, we can ask the question, "Under what conditions, if any, could a brainstem be synthetically replaced and still be *caught up* in that animal's metabolism?" In short, could the brainstem be replaced with synthetic pieces that meet the requirements of the Biological Approach? His response as to whether or not a brainstem can be fully synthetic and belong to the same animal that it was when it had an organic brainstem is markedly no because the synthetic brainstem cannot under any conditions be *caught up* in the metabolism of the organism. However, starting with the assumption that something which is organic cannot come to be non-organic is simply not good enough, given that his understanding of *caught up* relies more fully on the assumption that parts which are bigger than a molecule cannot be *caught up* in the metabolism of the organism coupled with the necessary condition of *organic* placed on proper parts of a human animal. That necessary condition is not simpliciter; *organic*, for Olson, means that it is *genuine*, or grown according to the original plan contained in the organic cells. I argue that it is possible for synthetic replacement parts to become proper parts of an organism according to the Biological Approach, and in showing how, I further argue that it is more reasonably characterized as an Informational Approach.

### **§3: Synthetic Human Animals & The Informational Approach**

Olson makes the claim that new entities come about from substantive changes in the metabolism of an organism. Animals become corpses when they lose their bottom-up and top-down coordination. Headless animals kept 'alive' by machines are still *living organisms*, but they lose the characterization of *animal*. In doing this, the Biological Approach claims to point to the continuity of the effects of the different token metabolic processes, taking the functional metabolism as a type of process that anchors persistence when it is working in tandem for the good of a single animal. However, his explicit claims about metabolic stability, specifically those having to do with what it is for a part to be a proper part of an animal and being *caught up* in that animal's metabolism, have very little to do with this overall functional coordination, although he claims time and time again that they do. His explicit claims about what it is for a part to be a proper part leave the Biological Approach open to major criticisms about synthetic parts—

synthetic hearts, lungs, and brainstems—having the capacity to be bound up in the organism’s metabolism, which Olson rejects. Given that the foundation of the Biological Approach is in the underlying ideas of what it means for a part to be *caught up* in an organism’s metabolism and not what it means for the animal’s functions to be coordinated, I argue that the approach is better considered an Informational Approach. This is because it is the coding—the plan contained in the DNA of the animal—that allows it to persist on the Biological Approach, and not the fact that it is organic.

If, on the Biological Approach, an organism can persist with completely synthetic parts, even synthetic brainstems—the control center of the metabolism and thusly the organism—then some of Olson’s explicit claims about the subject of synthetic parts fall flat. Olson argues that a completely synthetic being that comes to be by replacing the organism’s parts one piece at a time is no longer the same organism; in fact, it fails to be an *organism* at all.

Olson explicitly rejects the possibility of fully synthetic human animals: He assumes that, “...no organism can come to be a non-organism” (125). Simply declaring the impossibility of some occurrence by using two words that seem to be at odds with each other is not enough to make it so. Olson gives many examples of organisms coming to be non-organisms: every organism dies, and so becomes a non-organism. What he must mean is that no *living* organism can go on to be a *living* non-organism, which is why he tethers the Biological Approach to self-coordinated metabolic processes in the first place. This is further evidence that he is strongly relying on cellular growth, and *not* functionality.

If metabolic integration and being *caught up* in the metabolism of an organism is to ‘grow according to the plan encoded in your genes,’ to self-repair, and so on, then the arbitrary line that Olson draws at the size of the synthetic part that can be integrated into the metabolism is unnecessary. There is no hard and fast metaphysical reason that something bigger than a molecule could not become caught up in the metabolism of an organism. Still, to keep in line with Olson’s explicit claims, I shall assume that it is metaphysically impossible for some foreign object bigger than a molecule to become *caught up* in an organism’s metabolism; specifically, I shall take this to be true of human animals. I have argued in §1 that the metabolism is a reasonable anchor for the persistence conditions of a human animal. In §2, I argued

that there is a hierarchy of parts, to which the brainstem holds the top position because it is the control center of the coordination of vital organs and the metabolism itself. On the Biological Account, and on Olson's explicit wording, the head can go on living as an organism in ways that no other proper part of the organism can; the Biological Approach is at least something of a Brainstem Approach when it comes to human animals. In relying on the fact that the brainstem is at the top of the hierarchy of parts and that the real anchor of the persistence of a human animal is not the metabolism *per se*, but the genetic information that propagates the coordination of the processes that come together to form that unity, I offer up a thought experiment that results in a fully synthetic human animal which comes from an organic human animal.

Imagine a Mad Biotechnologist that left the majority of the human body alone while tinkering solely with the brainstem, since *mutatis mutandis* the persistence conditions of the part of an organism at the top of its Hierarchy of Parts is what we are really after. Imagine the Mad Biotechnologist replaces just one molecule—since that is Olson's arbitrary size limit of a part that can be bound up in the metabolism of an organic creature—inside of one neuron in the brainstem with a synthetic molecule. This molecule has bilateral functionality: it copies the genetic coding of the cell as a whole—and thusly, the organism—as well as has the ability to 'infect' or synthesize the other parts of the cell. It slowly destroys the cellular material next to it, and as it destroys it, 3D prints exactly the pieces of the cell it has destroyed out of silicone. It converts organic material into synthetic material over time in an *organic* way. That is to say that it strictly follows the explicit rules encoded in the genetic material that is being hijacked.

We insert this cell-hijacker into a mitochondrion in one neuron in the brainstem, and it goes to work generating a *synthetically organic* process whereby it completely replaces the entire brainstem, molecule for molecule, in exactly the way that the genetic code of the organism stipulates. It even preserves psychological information—not that that matters on the Biological Approach—in a way that the person to whom the brainstem belongs could never discover through introspection that this had happened. Once the mitochondrion of a cell is taken over, the process picks up momentum, synthesizing the cells next to it more quickly: synthetic axions, synthetic dendrites, fully silicone-based neural structures, and so

on. Still, there is no question that Olson will reject this possibility and my conclusion. He suggests an example that he would argue is analogous to the one I have presented:

But now imagine that your brainstem is replaced by an inorganic substitute gradually, bit by bit, rather than all at once. The rest of you is left intact. [...] [T]here is never a period when your life-sustaining functions are left without an organ to coordinate them, or when your cerebrum is not aroused and activated in the normal way by the brainstem. [...] [T]hat resulting person would not even be a human being, at least if being a human being implies being a human animal. For something with an inorganic brainstem, I argued, could not be an animal at all.<sup>9</sup>

Olson's example is not analogous, though. I have argued thoroughly—given Olson's explicit understanding of metabolic stability—that his claim that something with an inorganic brainstem cannot be an animal is not true by necessity. It is true, perhaps, given his assumption that something that is organic cannot come to be inorganic because it is not genuine, but his example does not follow his own posited rules in the way that mine does. As I have shown, a fully synthetic non-organism can come from an organic organism and persist by following the rules. Every single aspect of the Biological Approach's conditions for the persistence of an organism can be met, resulting in the external part introduced into and consequently being *caught up* in the organism's metabolism. This synthetic brainstem is grown from a part the size of a molecule or smaller, it maintains the original genetic coding, is self-regulating and self-repairing, and coordinates the vital and metabolic processes of the organism to allow the rest of its fully organic structures to go on living as though nothing had changed. This process repeats right up until the synthesizing process meets the very last organic cell in the brainstem: Cell(B). What could it possibly be about the type of matter which makes up this cell that would make the organism an entirely different animal once it is synthetically appropriated? I argue that only arbitrary answers can fill in this blank given the possibility of synthetic cells that are informationally exact but materially different, a condition which is acceptable on the Biological Approach. This makes my characterization of the Biological Approach as an Informational Approach even more appropriate; these synthetic parts have all of the properties necessary to receive the Olson's stamp of genuineness.

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<sup>9</sup> Olson: 141-2.

## Conclusion

I have argued that it is possible for human animals to persist through fully synthetic replacement on the Biological Approach. Once one can point to part of an organism at the top of its Hierarchy of Parts—in the case of the human animal, the brainstem—then there is a real possibility that that part can be synthesized within the confines of the Biological Approach such that the human animal persists through the process of becoming fully synthetic as opposed to becoming a completely different entity. This is counter to Olson’s explicit claims that ‘an organism cannot come to be a non-organism’ in the sense that he means it: an organism can come to be completely synthetic and still retain all of its properties that Olson argues define what it is to be an organism by relying on the very thing that makes it *organic*: the information encoded in its *genuine* parts; the DNA in its cells is the catalyst for its synthetic replacements, and all of its synthetic parts act as though they were *organic*.

Olson’s explicit metaphysical account requires arbitrary boundaries even when he tethers his view to the most consistent (and persistent) aspect of some organism: its genetic code. He argues that it is a consequence of his view that he considers an animal qua biology to lose identity when it becomes wholly non-organic. I argue that it is not an ontological consequence of such a transition that the statement, ‘this animal is no longer biological, and thusly no longer the same being’ is true. Even on Olson’s very careful account, synthetic organisms like human cyborgs can be fully-fledged phases of the human animal, and human animals can survive becoming fully synthetic beings without appealing to psychological continuity at all, but by appealing only to Olson’s explicit claims about what it means for some part to become a proper part of a human animal: the genetic information contained in its *genuine* parts. Thus, the Informational Approach allows for the persistence conditions of entities like fully synthetic human cyborgs (when their parts are properly *caught up* in the metabolism that has existed) without altering the explicit claims of the Biological Approach. Moreover, establishing identity conditions of entities such as fully synthetic human cyborgs will be critical in assigning moral responsibility and agency to potential entities in the future, as well as treating them as proper moral objects should they come to exist, but that is better left for a future project with a different scope.

## Works Cited

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