



# INTEGRATED BUT NOT WHOLE? APPLYING AN ONTOLOGICAL ACCOUNT OF HUMAN ORGANISMAL UNITY TO THE BRAIN DEATH DEBATE

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## ABSTRACT

*As is clear in the 2008 report of the President's Council on Bioethics, the brain death debate is plagued by ambiguity in the use of such key terms as 'integration' and 'wholeness'. Addressing this problem, I offer a plausible ontological account of organismal unity drawing on the work of Hoffman and Rosenkrantz, and then apply that account to the case of brain death, concluding that a brain dead body lacks the unity proper to a human organism, and has therefore undergone a substantial change. I also show how my view can explain hard cases better than one in which biological integration (as understood by Alan Shewmon and the President's Council) is taken to imply ontological wholeness or unity.*

## 1. INTRODUCTION

Those who have argued that total brain failure<sup>1</sup> is a sign of human death have traditionally done so on the grounds that it necessarily involves the loss of somatic integration. In 2008, the President's Council on Bioethics rejected this 'loss of somatic integration' rationale while reaffirming that total brain failure is a sign of human death.<sup>2</sup> On the basis of evidence presented by Alan Shewmon, the Council judged that somatic integration can sometimes persist in a body<sup>3</sup> with total brain failure. At the same time, the majority remained convinced that a body with total brain failure is no longer a *whole*, and that *wholeness* is an essential property of a living organism. Yet if integration does not imply wholeness, it significantly weakens the impor-

tance of the Council's affirmation that somatic integration can persist in a body with total brain failure. For if integration does not imply wholeness, the presence of integration does not prove what Shewmon and others think it proves – namely, that a human organism can persist after total brain failure.<sup>4</sup> Both Shewmon and the early

<sup>1</sup> In line with the recommendation of the 2008 President's Council on Bioethics, I use the term 'total brain failure' rather than the more popular (but potentially more confusing) term, 'whole brain death.'

<sup>2</sup> The President's Council on Bioethics. 2008. *Controversies in the Determination of Death: A White Paper by the President's Council on Bioethics*. Washington, D.C. Available at <http://bioethics.georgetown.edu/pcbe/reports/death/index.html> [Accessed 2 Jan 2016].

<sup>3</sup> Here, and throughout the article, I use the term 'body' in a loose sense that does not imply that the entity in question constitutes an organism as a whole.

<sup>4</sup> See, for instance: D. Alan Shewmon. Chronic 'Brain Death': Meta-Analysis and Conceptual Consequences. *Neurobiology* 1998; 51: 1538–1545; D. Alan Shewmon. The Brain and Somatic Integration: Insights into the Standard Biological Rationale for Equating 'Brain Death' With Death. *J Med Philos* 2001; 26: 457–478; D. Alan Shewmon. Constructing the Death Elephant: A Synthetic Paradigm Shift for the Definition, Criteria, and Tests for Death. *J Med Philos* 2010; 35: 256–298; D. Alan Shewmon. You Only Die Once: A Reply to Nicholas Tonti-Filippini. *Communio* 2012; 39: 422–494; Nicanor Austriaco. Is the Brain-Dead Patient Really Dead? *Studia Moralia* 2003; 41: 277–308; M. Potts. A requiem for whole brain death: A response to D. Alan Shewmon's 'The brain and somatic integration'. *J Med Philos* 2001: 479–491; Franklin Miller & Robert Truog. The Incoherence of Determining Death by Neurological Criteria: A Commentary on *Controversies in the Determination of Death*, a White Paper by the President's Council on Bioethics. *Kennedy Inst Ethics J* 2009; 19: 185–93; Robert Truog. Is It Time to Abandon Brain Death? *Hastings Cent Rep* 1997; 27: 29–37; Robert Truog, Franklin Miller, & S.D. Halpern. The Dead-Donor Rule and the Future of Organ Donation. *N Engl J Med* 2013; 369: 1287–9; Robert Veatch. The Death of Whole-Brain Death. *J Med Philos* 2005; 30: 353–378.

defenders<sup>5</sup> of neurological criteria for human death take biological integration to imply ontological wholeness (unity) and thus persistence of the human organism, while disagreeing on whether or not a body with total brain failure can be biologically integrated.<sup>6</sup> On the other hand, the President's Council agrees with Shewmon that a brain dead body can be biologically integrated, but disagrees with his implicit claim that biological integration means ontological wholeness.<sup>7</sup> In contrasting 'biological integration' and 'ontological wholeness', I do not mean to imply that the ontological wholeness in question is not also biological. Rather, I am making a distinction between the (higher level, substantial) biological integration, which constitutes the integrated parts as an ontological whole, and the (lower level, non-substantial) biological integration which emerges from the cooperation of various parts which are themselves ontological wholes.

The ambiguous use of key concepts like 'integration' and 'wholeness' in the brain death debate calls for a more rigorous ontological analysis of what it means to be an 'organism as a whole'.<sup>8</sup> While I cannot fully resolve this complex issue, here I offer a plausible ontological account of organismal unity, drawing on the work of Hoffman and Rosenkrantz, and then apply that account to the case

of total brain failure, concluding that a body with total brain failure lacks the unity proper to a human organism and has therefore undergone a substantial change. I also show how my view can explain hard cases better than one in which the type of biological integration Shewmon refers to is taken to imply ontological wholeness or unity. Allow me to note at the outset that while I rely primarily on Hoffman and Rosenkrantz's account of organismal unity, because I consider it to be one of the most rigorous and plausible accounts available, I do not think that my conclusions stand or fall with the details of their account. I believe that other accounts of organismal unity, such as those offered by Eric Olson and Peter van Inwagen, would also support my conclusions.<sup>9</sup>

## 2. AN ONTOLOGICAL ACCOUNT OF ORGANISMAL UNITY

Hoffman and Rosenkrantz develop a neo-Aristotelian account of organismal unity as based upon functional unity, which they understand to consist in the 'logical and causal interrelationships among the natural functions of [the organism's] parts'.<sup>10</sup> They call this unifying relationship among the natural functions<sup>11</sup> of the parts the organism's principle of organization. An organism's vital parts play an important role in the maintenance of organismal unity.<sup>12</sup> For human beings, those vital parts include both organs and organ systems, as various parts of an organism may act jointly to perform unitary natural functions.<sup>13</sup> Not all parts of the organism are vital parts. What is characteristic of a

<sup>5</sup> See, for instance: James L. Bernat, Charles M. Culver, & Bernard Gert. On the Definition and Criterion of Death. *Ann of Intern Med* 1981; 94: 389–394.

<sup>6</sup> There is also disagreement about the adequacy of current diagnostic tests to determine total brain failure. In this paper I focus exclusively on the question of whether or not total brain failure is *in principle* a sign of human death, prescinding from practical issues about diagnosis.

<sup>7</sup> Some have argued that we should move beyond attempts (which they consider hopeless) to defend total brain failure as a sign of the death of the human organism. Truog, Miller and Halpern claim that there is no ethical problem with harvesting organs from the still-living human organism after total brain failure, as long as there is informed consent. (Truog, Miller, & Halpern, *op. cit.* note 4.) Veatch argues that while, from a biological perspective, a human organism can persist after total brain failure, for moral and legal purposes we should consider higher brain death to be the death of a human being because it marks the loss of embodied mental function. (Veatch, *op. cit.* note 4.) Michael Green and Daniel Wikler similarly claim that brain death is the death of the *person*, but not the death of the organism. (Michael Green & Daniel Wikler. Brain death and personal identity. *Philos Public Aff* 1980; 9: 105–133.) Nonetheless, it is still worth considering whether a more rigorous ontological account of human organismal unity can provide a coherent rationale for the view that total brain failure is a sign of the death of the human organism. Aside from its inherent theoretical interest, this question is worth considering in part because, unlike abandonment of the dead donor rule or higher brain conceptions of death, such a rationale could be acceptable to the Catholic Church, which is the largest non-governmental provider of healthcare services in the world. Also, unlike higher brain conceptions of death, such a rationale would also be acceptable to those who hold that the human person is a particular type of organism.

<sup>8</sup> Frances Kamm likewise has argued for the need to articulate more clearly the relationship between brain capacity and organismal unity. (Brain death and spontaneous breathing. *Philos Public Aff* 2002; 30: 297–320.)

<sup>9</sup> Eric Olson holds that human beings are animal organisms, and that an organism 'persists just in case its capacity to direct those vital functions that keep it biologically alive is not disrupted' (Eric Olson. 1997. *The Human Animal: Personal Identity Without Psychology*. New York: Oxford University Press: 135). Olson believes, in line with what I argue below, that it is the brain (more precisely, the brain stem) which is primarily responsible for directing vital functions in a post-natal human being. Peter van Inwagen claims that the only truly unified composite beings are organisms, and that, for humans, the brain is 'the seat of our capacity to have lives [i.e. to be unified organisms],' because instructions from the brain direct the activities of the body for the sake of the whole (Peter van Inwagen. 1990. *Material Beings*. Ithaca: Cornell: 179). Nonetheless, I find Hoffman and Rosenkrantz's analysis more helpful because it offers a more detailed explanation of *why* the brain is required for organismal unity in post-natal human beings.

<sup>10</sup> Joshua Hoffman & Gary S. Rosenkrantz. 1997. *Substance: Its Nature and Existence*. New York: Routledge: 101.

<sup>11</sup> In general, a function or trait counts as 'natural' if it is the result of natural selection (Ibid: 115). The life-processes or microstructure of a particular organism are natural to the extent that they conform to that individual's 'original hereditary nature' encoded in that organism's DNA or (in the case of more primitive organisms) other organic macromolecules (Ibid: 119).

<sup>12</sup> A vital part is defined as a proper part of an organism that has a function the performance of which is necessary to sustain the life of the organism.

<sup>13</sup> This occurs at all levels, from the sub-cellular level to the level of multi-organ systems (Ibid: 123).

vital part (as opposed to a non-vital part) is that, if a vital part fails to perform its function, the organism will die – i.e. lose its principle of organization and thus undergo a substantial change – unless some proxy (a transplanted organ, artificial life-support machine, etc.) successfully takes over that function.<sup>14</sup> Yet not all vital parts play an equally important role in the unification of the organism. Rather, ‘a regulative vital part’ – that is, a vital part which regulates or controls the other vital parts – ‘plays a more central role in the organization of an organism’s parts than a nonregulative vital part.’<sup>15</sup> Hoffman and Rosenkrantz claim that the principle of organization, which accounts for the unity of all the organic living entities that compose an organism, is the direct or indirect subordination of the activities of the parts to a master part, which is itself ‘a system of parts which have a joint natural function.’<sup>16</sup>

Functional subordination of the parts to a master part is required for organismal unity because the master part’s regulation and control of the other parts is what enables the organism to be self-sustaining and self-regulating.<sup>17</sup> In a more recent work, Rosenkrantz clarifies what it means for a master part to control the other parts of the body: one part (P1) of the organism controls another part or parts if that part (P1) has a biological function that causes ‘the relevant measures of [the other parts’] biological activities (e.g. heart rate, blood pressure, metabolic rate) to fall within certain *ranges*,’ just as ‘a thermostat’s temperature-controlling activity *causes* temperatures to fall within a certain range.’<sup>18</sup> The master part is the vital, essential part that has the biological function of controlling all of the organism’s parts, directly or indirectly.<sup>19</sup> The claim that a master part, so defined, is required for organismal unity is not an *a priori* truth (though it may still be a necessary one), but is based on the observation that ‘in all known cases, the regulation or control of the life-processes of the parts of an organism is accomplished by means of the activities of a system of biological parts which jointly have a natural function,’ and this system is referred to as the master part.<sup>20</sup> It appears to be the case that all known organisms have such a master part,<sup>21</sup>

although the master part need not be centralized. In plants, for instance, it is plausible that the master part is the system comprised by the roots, stem and leaves (but excluding the sap).<sup>22</sup> In adult vertebrates, the master part seems to be centralized, consisting of the central nervous system (brain and spinal cord).<sup>23</sup>

### 3. APPLICATION TO THE CASE OF TOTAL BRAIN FAILURE

#### 3.1 Healthy Adult Humans Have a Centralized Master Part

It is generally accepted that in a healthy human adult, the central nervous system plays the role of regulating and controlling (either directly or indirectly) all organismal functions. Although Shewmon seems to believe that human beings have (or at least *can* have) a decentralized master part, his own evidence supports the claim that healthy adult humans have a centralized master part. After listing a number of ‘integrative’ functions that are ‘non-brain mediated,’ Shewmon clarifies that ‘directly or indirectly, to a greater or lesser extent, the brain is surely involved in all of them.’<sup>24</sup> As an example, he notes that ‘emotional states affect the immune system via the brain.’<sup>25</sup> Yet in this case, he emphasizes, the brain’s role ‘is one of modulating, fine-tuning, and enhancing an already well-functioning immune system, not of imperiously micromanaging a passive and basically incompetent immune system.’<sup>26</sup> The same is true, explains Shewmon, of ‘all other somatically integrative functions: they are all the more effective when modulated by the brain, but they do not entirely vanish without the brain.’<sup>27</sup>

Yet the role of the master part (at least *qua* master part) is precisely to *regulate* the functions of other parts directly or indirectly, not to take over or ‘micromanage’ those functions. The body’s organ-systems, organs, cells, etc. have natural functions that they perform with a certain autonomy – indeed, if they continue to receive the necessary oxygen and nutrients in a suitable environment, they will continue to perform those functions even *ex vivo*. That these organic living entities can continue to carry out their natural functions after total brain failure as long as they continue to receive oxygenated blood is

<sup>14</sup> Ibid: 122.

<sup>15</sup> Ibid: 125.

<sup>16</sup> Ibid: 125.

<sup>17</sup> It also enables us to offer a plausible interpretation of hard cases, some of which are discussed in section 4.

<sup>18</sup> Gary Rosenkrantz. *Animate Beings: Their Nature and Identity*. *Ratio* 2012; 25: 442–462 (at 460).

<sup>19</sup> Ibid.

<sup>20</sup> Hoffman & Rosenkrantz, *op. cit.* note 10, p. 125.

<sup>21</sup> According to Rosenkrantz, ‘Apparent examples of master-parts include a mammal’s *central nervous system*, an insect’s *nervous system*, a jellyfish’s *neural net*, a unicellular, myriad-nucleated, [*plasmodial*] slime mold’s *nuclear system*, an amoeba’s *nucleus*, and a bacterium’s *nucleoid* (containing DNA and RNA). Such examples *inductively confirm* that every carbon-based living organism has a master-part.’ (*op. cit.* note 18, p. 460–461).

<sup>22</sup> Hoffman & Rosenkrantz, *op. cit.* note 10, p. 126; Rosenkrantz, *op. cit.* note 18, p. 461.

<sup>23</sup> Hoffman & Rosenkrantz, *op. cit.* note 10, p. 126. It also appears that the master part which accounts for organismal unity can change throughout an organism’s natural developmental process, as seems to be the case for human beings.

<sup>24</sup> Shewmon. *The Brain and Somatic Integration*, *op. cit.* note 4, p. 471.

<sup>25</sup> Ibid.

<sup>26</sup> Ibid.

<sup>27</sup> Ibid.

therefore not surprising. Nor is it surprising that these entities can communicate and coordinate with one another (as this is itself part of their natural function) to benefit the body in a holistic way. Far from contradicting the thesis that the central nervous system directly or indirectly regulates all parts of the body, Shewmon's evidence actually supports it.

### 3.2 A Body with Total Brain Failure Lacks a Master Part

There is no dispute about the fact that after total brain failure, the body lacks a centralized master part. Although the spinal cord does regulate *some* parts of the body,<sup>28</sup> it does not (directly or indirectly) regulate *all* of them. Indeed, Shewmon himself denies that spinal cord regulatory activity is the sole or even the primary basis of the brain dead body's integration. Nor does the ventilator act as an artificial master part, since the ventilator cannot regulate all parts of the body. Moreover, even if one *could* artificially substitute for the regulatory function of the master part, there would still be reason to doubt that the remaining entity is an organism (or at least an organism of a natural kind), since (natural) organisms are *self-regulating*.

Shewmon's view is that the master part of a human organism is decentralized, like that of a plant.<sup>29</sup> Yet it seems implausible to claim that humans, like plants, have decentralized master parts. It is plausible to claim that in plants there is a decentralized system, composed of roots, stem and leaves, the joint natural function of which includes the regulation of all parts of the plant. This is plausible both because we have no evidence to indicate the existence of a centralized master part in plants, and also because plants are simple enough that each of the parts that make up the decentralized master part can regulate the others as well as itself. This is seen in the fact that, in principle, plants can be propagated with cuttings from either root, stem or leaves, indicating that, even in a mature plant, root, stem and leaves all continue to have within them active instructions for the function of the other parts. Similarly, the parts of early human embryos are still unspecialized enough that, if for some reason the embryo should split, both parts will then develop into a mature human being, indicating that active instructions for the whole are still diffuse throughout the parts. In more complex organisms, however, such as mature mammals, this is no longer the case. Instructions for the whole have been 'turned off' in the formation of an

enormous variety of highly specialized cells, organs and organ systems. It thus makes sense, evolutionarily, that organisms with such a high degree of complexity should have a centralized regulator that enables these highly specialized parts to engage in truly unified natural functioning.

If, then, a body with total brain failure has neither a centralized nor a decentralized master part, it lacks organismal unity (and the organism it once was is therefore dead, having undergone a substantial change).<sup>30</sup>

### 3.3 A Body with Total Brain Failure Lacks the Unity Proper to a Human Organism

One could argue that, given evidence that in some cases a body with total brain failure can function holistically, it is implausible to claim that it *completely* lacks unity. Perhaps, with the help of aggressive medical support to aid in the transition, the organism's master part can change from a centralized one to a decentralized one after total brain failure. This interpretation would be congruous with evidence indicating that in some cases, after a critical period following brain failure, the body's condition will stabilize to the point of requiring little support beyond ventilation and nutrition.<sup>31</sup>

Yet even if the body with total brain failure has some sort of unity, it lacks the unity proper to a human organism. Unity is not a univocal term. Rather, it applies analogously to different types of entities. The unity of a mereological compound, the unity of an artifact, and the unity of an organism are all different because they have different requirements. For instance, while the unity of a mereological compound requires physical adherence of

<sup>28</sup> As Shewmon notes, 'The autonomous spinal cord not only mediates intra- and inter-segmental autonomic reflexes and maintains sympathetic vascular tone but even possesses plasticity for primitive forms of sensorimotor 'learning'.' (Ibid: 470.)

<sup>29</sup> He states this view somewhat hyperbolically, claiming that all parts contribute to the human body's unity, and that this 'unity-contributing ... role is as true of the brain as it is of the little toenail.' Ibid: 472). This is also the view defended by Austriaco. (Austriaco, *op. cit.* note 4.)

<sup>30</sup> Although Rosenkrantz does not offer an account of death that directly employs the concept of organismal unity, his own account of death complements my own. He claims that death is loss of first-order metabolic capacity which cannot be reversed through a wholly natural cause that does not require a chemical change in the organism's remains (Gary Rosenkrantz. *Life and Death. Monist* 2015; 98: 303–317, at p. 308). To understand this definition, it is crucial to understand his definition of metabolism, which itself implies the existence of a master part: 'O [a living organism] has a *metabolism* over a period of time *t* just when throughout *t*, processes in *O* sustain and *control* a continual systemic change of *O*'s parts, e.g. a living human animal's metabolism is sustained and controlled by activities of its heart and brain, respectively' (Ibid: 304.) Thus, irreversible failure of brain function (like irreversible failure of heart function, unless replaced by an artificial heart or donor heart) would mark the death of the organism on Rosenkrantz's view. However, it is worth noting that the heart, unlike the brain, can be replaced without a substantial change in the organism's identity, because only biological continuity of the master part is necessary for continuity of organismal identity. (Rosenkrantz, *op. cit.* note 18, p. 461.) Thus, plausibly, there is continuity of identity between a caterpillar and the butterfly that results from it. Conversely, and also plausibly, if 'the nucleus of some single-celled organism, *O1*, is destroyed and replaced with a [transplanted] nucleus, *N*, from *O2*, a diverse co-specific organism, producing a viable organism,' then, 'assuming that *N* is master-part, ... *O1* ceases to exist and *O2* continues to exist.' (Ibid: 462.)

<sup>31</sup> Shewmon. *Chronic 'Brain Death.'* *op. cit.* note 4, p. 1542.

the parts, the unity of an organism does not.<sup>32</sup> Likewise, the conditions for the unity of relatively simple organisms are not the same as those of more complex organisms. Given the undisputed evidence that healthy mature mammals *do* have a centralized master part capable of regulating the other parts of the organism, it seems plausible to claim that the unity *proper* to mature mammals requires such a centralized master part.

Analogously, the unity of a chamber orchestra does not require a conductor since the group is small enough that each player can remain in sync with the others by listening to them and watching their movements, but a symphony orchestra would not be able to remain unified without a conductor. Further, in the case of a symphony as in the case of a complex mammalian organism, each of the parts ‘knows’ what to do, and can coordinate to a certain extent with some of the other parts, without a conductor. The conductor’s role, like the central nervous system’s, may be merely one of ‘modulating’ and ‘enhancing’ (as Shewmon describes the role of the brain), but it is nonetheless necessary for the unity proper to a symphony. Of course, a musical ensemble is not an organism, but the point is that the conditions for unity differ according to the complexity of the entity in question.

Another consideration in favor of the view that the unity proper to mature mammals depends on the central nervous system is that healthy mature mammals have a capacity for mental functions like conscious sense perception. Comprising as it does both the cerebrum (the seat of mental functions), as well as other parts of the brain and spinal cord, the central nervous system enables the organism to collect and unify sense data from all parts of the body, and to set in motion a highly complex and unified response to that data through its ability directly or indirectly to command all systems of the body. It seems plausible, then, that the unity proper to a mature mammal requires the capacity for this type of central command, even if, in the absence of such centralized regulation, many of the life-processes of that organism can maintain themselves and each other through locally coordinated action with the help of ventilator.

Even if the body with total brain failure possesses a certain functional unity, it does not possess the unity proper to its natural type, which involves a capacity for centralized regulation and coordination, nor does it possess unity proper to *any* natural type. If a unified organism does still exist, it therefore must be a fundamentally different type of entity than it used to be – i.e. it must have undergone a substantial change. This new entity could perhaps best be described as a kind of organic artifact, like other organic entities – i.e. cells and tissues in culture – that were originally proper parts of organisms but can be maintained *ex vivo* with the help of technology.

<sup>32</sup> Hoffman & Rosenkrantz, *op. cit.* note 10, p. 80.

#### 4. HARD CASES

What does this master part account of organismal unity imply about those with pacemakers to regulate heart function, or who rely on dialysis to replace or supplement failing kidney function? What about patients with high cervical spinal cord transection injuries who need mechanical ventilation and other medical support to stay alive? Do such individuals retain the unity proper to a human organism, despite the fact that some of their parts are regulated mechanically or pharmacologically, rather than by their central nervous system?

On the master part account of unity what matters is not so much the presence or absence of artificial life support, but the functional subordination of the parts to a master part.<sup>33</sup> In a patient with a pacemaker or on dialysis, to the extent that the vital part in question is not functionally subordinate to the central nervous system, that part is no longer united to the whole. Someone with complete kidney failure, for instance, is an organism without kidneys, just as someone whose right leg has been amputated is an organism without a right leg. Nonetheless, the remaining parts still do form a whole, all subordinate to the central nervous system, even though artificial means are now needed to replace the vital functions of the kidneys.<sup>34</sup>

The case of a high cervical spinal cord injury (SCI) patient is more difficult.<sup>35</sup> Assuming that brain-mediated

<sup>33</sup> It seems, however, that permanent artificial replacement of the master part itself would mean that the body has lost the capacity for self-regulation, thus arguably changing its ontological status. See also note 28 on the conditions for organismal continuity of identity, which implies that replacing the master part with a non-biologically continuous new master part would change the essential identity of the organism. If all of a human being’s parts are slowly replaced with inorganic parts such that, *ex hypothesi* (though extremely implausibly), psychological continuity is maintained, there would no longer be a human *organism*, and the resulting thing would have the unity proper to an artifact (like a computer), not the unity proper to a human organism (or any organism at all). Regardless of whether or not there would be *personal* continuity of identity in such a case, there is clearly no *organismal* continuity of identity.

<sup>34</sup> In the case of a successful transplant, by contrast, the transplanted organ *is* functionally subordinate to the central nervous system, and therefore becomes a proper part of the organism.

<sup>35</sup> Shewmon has argued that an SCI patient’s body below the site of the transection is functionally equivalent to a brain dead body. (Shewmon. Constructing the Death Elephant. *op. cit.* note 4). There are differences, however, such as continued functioning of the ninth and tenth cranial nerves, as well as continued brain-mediated hormone regulation through the blood stream. Nonetheless, the almost complete disconnection between the brain and the rest of the body in severe SCI cases means that at least many parts of the body below the transection are no longer able to be regulated by the central nervous system. This lack of functional subordination is not *in principle* irreversible, since the problem is not (as in total brain failure) an irreversible loss of brain function, but is rather one of disconnection of the brain from the rest of the body. If brain and body could be reconnected, the organism would once again have the unity proper to it. There is thus a real potential for unity between the brain and the rest of the body in SCI patients that is absent in cases of total brain death.

hormonal regulation (which can still be present in an SCI patient) is insufficient for full unity as it does not regulate all parts of the body, it seems that an SCI patient is a head united only partially to the rest of the body. The organs of the head – eyes, ears, nose, etc. – remain functionally subordinate to the brain, and thus the head retains the unity proper to a human organism, despite its incompleteness. The SCI patient could therefore be considered a human organism whose ‘parts’ below the transection are no longer fully united to the whole, analogous to someone with a pacemaker whose heart is no longer fully functionally subordinate to the central nervous system.<sup>36</sup>

Some may consider this interpretation of the SCI patient’s condition implausible. Yet denying that the unity of a mature human organism requires functional subordination of all the parts to a centralized master part has implications in other cases that are even more implausible. Consider the case of Abigail and Brittany Hensel, dicephalus conjoined twins who share a circulatory system along with several organs including the liver and intestines.<sup>37</sup> Having lived over twenty years in remarkably good health, the twins (and their body parts) are arguably more integrated than the parts of a ventilator-supported brain dead body, in the sense of their being able to function holistically without external support.<sup>38</sup> If it were true that biological integration in Shewmon’s sense implies ontological unity, then Abigail and Brittany would be only one organism.<sup>39</sup>

<sup>36</sup> Although the SCI case is more radical than the pacemaker case, in both cases there is a fully united organism as a whole plus some entities which used to be proper parts of that whole but are now imperfectly united to it. The analogy breaks down to the extent that the heart, unlike the body below the neck, is itself an organ in which all of the parts are unified in virtue of a joint natural function. Thus the degree of unity with the organism may be different for each part of the SCI patient’s body below the transection, depending on the extent to which each part is still regulated by the master part. More radically, one could interpret the SCI patient’s case as one in which the organism as a whole is located only in the head, and what used to be the rest of the body is an artificially maintained organic artifact uniquely well-suited (because of its prior full unity and continuing partial unity with the organism) to act as life-support for the organism.

<sup>37</sup> Lucy Wallis. 2013. *Living a Conjoined Life*. BBC News, 24 April. Available at: <http://www.bbc.com/news/magazine-22181528> [Accessed 2 Jan 2016].

<sup>38</sup> In April 2013, at age 23, they had graduated from college and were working as primary school teachers.

<sup>39</sup> Some use cases like this to argue against an organismal view of human identity, claiming that the possibility of dicephalic twins means that it is possible for there to be two persons (with identity defined in psychological terms) ‘inhabiting’ just one organism (See, for instance: Jeff McMahan. 2002. *The Ethics of Killing*. New York: Oxford University Press: 37–38.) Yet psychological accounts of identity face serious difficulties, including the problem of ‘branching’ cases, in which hypothetically one person (after a brain bisection operation or brain state transfer) could be identical to two individuals who are themselves not identical. At any rate, the argument of this article is aimed primarily at those who hold an organismal view of human identity. (For a general defense of the organism view of identity, see, for instance Eric Olson, *op. cit.* note 9; S. Matthew Liao. 2006. *The Organism View Defended*. *The Monist* 89.)

Yet it is much more plausible to view Abigail and Brittany as two organisms who share some of their organs and other parts (or in which one is partially supported by the organs of the other).<sup>40</sup> The centralized master part view allows for this by differentiating one organism from the other on the basis of their functional subordination to one or the other’s central nervous system. Since, for instance, Abigail controls the right arm and right leg, those parts are ‘hers,’ while the left arm and left leg are Brittany’s.<sup>41</sup> They are thus united organically in some respects, but not so as to constitute only one organism, or to cease being two distinct organisms.

Consider also the hypothetical case in which a baby with heart failure is connected to the heart of a healthy adult, such that the adult’s heart is able to pump blood for both of them,<sup>42</sup> or the famous violinist case in which one person’s kidneys are removing toxins from another person’s body in addition to her own.<sup>43</sup> Again, the master part account of unity enables us to explain the ontological separateness of the two organisms, and the fact that the heart and kidney, respectively, only belong to their original bodies. Yet in these cases the organisms could plausibly count as ‘integrated,’ and therefore one, on Shewmon’s view.<sup>44</sup>

## 5. CONCLUSION

In this article I have offered an account of the ontological requirements for organismal unity and applied this account to the case of a body with total brain failure. My analysis suggests that there are two plausible interpretations of the ontological status of a body with total brain failure: (1) the body entirely lacks a master part and is therefore no longer an organism as a whole, or (2) after brain failure the body has developed a technologically-assisted decentralized master part, and

<sup>40</sup> Evidence for this is that Abigail and Brittany are not the same height, their bodies respond differently to caffeine, and their body temperatures are not always the same.

<sup>41</sup> If, as is often the case with conjoined twins, the shared organs are actually only under the control of one organism’s central nervous system, then that organ would strictly speaking belong only to that organism, even though its function would be helping to sustain the other as well.

<sup>42</sup> Hoffman & Rosenkrantz, *op. cit.* note 10, p. 139

<sup>43</sup> Judith Jarvis Thomson. A Defense of Abortion. *Philos Public Aff* 1971; 1: 47–66.

<sup>44</sup> Similarly, the master part view explains how organisms can have a symbiotic relationship and yet not be part of one another, as in the case of termites and the protozoa that live in their intestines. Under natural conditions, neither can live without the other, because the termites rely on the protozoa for digestion, while the protozoa rely on the termites for a suitable living environment (Hoffman and Rosenkrantz, *op. cit.* note 10, p. 140). While it is implausible to claim that the termite and protozoa constitute a single organism, it seems that they would count as integrated in the ontologically loose sense of the term as employed by Shewmon.

therefore lacks the unity proper to a human organism (or to any natural type). In either case, the human organism would have undergone a substantial change, and would therefore be dead.

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