

# YOU ONLY DIE ONCE: WHY BRAIN DEATH IS NOT THE DEATH OF A HUMAN BEING<sup>1</sup>

A REPLY TO NICHOLAS TONTI-FILIPPINI

• D. Alan Shewmon •

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*[My argument] has revealed the total absence of any compelling philosophical or scientific reason to interpret brain-mediated somatic integration as constitutive of the human organism; all the evidence is compatible with, indeed, positively suggests, the conclusion that brain-mediated somatic integration maintains the organism's health or promotes its survival, but does not constitute it as a living whole in the first place. By the same token, there is absolutely no compelling philosophical or scientific reason to suppose that brain death, however total and irreversible, is ipso facto the death of a human being as such . . .*

*[The] accusation that I am in conflict with Church teaching about death relies . . . not only on a mischaracterization of my position, but also on a mischaracterization of Church teaching itself. In point of fact, the Magisterium does not formally oblige us to hold that the brain is the master organ of somatic integration, or that its death is therefore the death of the human being as such. Nor does the hylemorphism espoused by Boethius, Aquinas, and the Council of Vienne entail any such claim.*

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## I. Introduction

In “You Only Die Twice,”<sup>2</sup> bioethicist Nicholas Tonti-Filippini seeks to draw a line in the sand against the rising tide of what he calls the “mentalist view” of death,<sup>3</sup> which “argues in effect that when a human being ceases to be able to function at those higher levels of activity that we consider human or even sentient life, then the person has died even if the body continues to function.”<sup>4</sup> As an alternative to mentalism, Tonti-Filippini defends a mainstream integrationist version of brain death as the criterion for determining when a human organism has died. Since, Tonti-Filippini argues, bodily integration is mediated by the endocrine and nervous systems, and since both depend on brain function, total irreversible loss of brain function *eo ipso* results in loss of bodily integration and, therefore, in the death of the human organism: The brain is “essential for integration of the body and without it the parts of the body cease to be an integrated whole.”<sup>5</sup>

Tonti-Filippini regards the integrationist account of brain death as the centerpiece of an empirically airtight case against mentalism, but he also insists on its compatibility with Church teaching, in particular with that of “the Council of Vienne, which, following Boethius and Aquinas, adopted the notion of the unity of the human person with the soul as the substantial form of the body.”<sup>6</sup> Indeed, Tonti-Filippini even goes so far as to suggest that in recent times the account of brain death that he favors has been endorsed by the Church’s Magisterium in the person of Pope John Paul II.<sup>7</sup>

For Tonti-Filippini, then, the mainstream account of brain death is a godsend to loyal Catholic bioethicists, a weapon against

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<sup>2</sup>Nicholas Tonti-Filippini, “You Only Die Twice: Augustine, Aquinas, the Council of Vienne, and Death by the Brain Criterion,” *Communio: International Catholic Review* 38 (Summer 2011): 308–25.

<sup>3</sup>*Ibid.*, 308.

<sup>4</sup>*Ibid.*, 308.

<sup>5</sup>*Ibid.*, 313.

<sup>6</sup>*Ibid.*, 311.

<sup>7</sup>*Ibid.*, 313.

mentalism that is at once empirically unassailable and philosophically-theologically orthodox. By the same token, he considers my theoretical and empirical challenge to mainstream thinking about brain death to be unsound scientifically and out of keeping with Church teaching, which in Tonti-Filippini's view is committed to the proposition that total irreversible loss of brain function is (a sure sign of) the death of a human being.

In what follows, I will argue that Tonti-Filippini's critique of my position is wrong on both counts: Neither the empirical evidence nor Church teaching requires us to hold that the brain is "essential" for organismic somatic integration, or that the brain's death is automatically the death of a human being. My aim, however, is not simply to refute Tonti-Filippini's charges against me, but also to show that the integrationist account of brain death is not at all the empirically sound, theologically-philosophically orthodox godsend that he asserts.

In the next section of the paper (II. Brain Death: Sharpening the Question), I propose to work out a philosophical framework for understanding somatic integration and the role the brain plays in it. The following section (III. A Bold Assertion) will then apply this framework to the available empirical evidence, all of which suggests that the integration accomplished by the brain, rather than constituting the human organism, only maintains its health or promotes its survival. Having presented my case against the somatic integration rationale for the brain death criterion, I will conclude (IV. Conclusion: What Does the Church Really Teach?) by rebutting Tonti-Filippini's charge that my position deviates from Catholic orthodoxy, which does not in fact declare brain death to be death, end of story. Tonti-Filippini's attempt to wrap himself in the mantle of Catholic doctrine reveals more about his own flawed hermeneutic of the Magisterium than it does about the actual substance of the magisterial statements he invokes.

## II. Brain Death: Sharpening the Question

Tonti-Filippini's article is full of inaccuracies, small and large. One of the largest pertains to his treatment of Augustine, whose position about the unicity of the human soul he very seriously

mischaracterizes. A full exposure of this and other misrepresentations must wait for another occasion; for now, let me briefly clarify my view of death in general and of brain death in particular, as this clarification will help bring into focus the guiding thread of the argument that follows.

Tonti-Filippini consistently labels me a “somaticist.” He also ascribes to me the view that a brain-dead body is alive because of integration merely at the level of organs and not at a holistic level. For example, Tonti-Filippini states that he “aim[s] to defend the Church’s adoption of the loss of integration view” not only against the President’s Council’s “mode of being view” but also

against the somatic integrationists, such as Shewmon. Shewmon fails to take into account the intercommunicative meaning of the body as an integrated whole. . . . Evidence of communication between some parts of the body is not the same as the body retaining evidence of unity of the whole body.<sup>8</sup>

In a similar passage, we read that

Shewmon does overlook the intercommunicative meaning of integration. What he considers to be ‘integrative’ is something less than would seem to be meaningful in the context of considering that death is the separation of the life principle or soul from the body.<sup>9</sup>

The truth is that Tonti-Filippini seriously misrepresents my view of death, portraying it as if it were opposed to the Church’s “integrationist” view. In matter of fact, however, I hold, along with the Council of Vienne, and with Tonti-Filippini himself, that the soul is the substantial form of the body. I also subscribe to the *Catechism of the Catholic Church*’s reaffirmation of this teaching and its emphasis on the unity aspect.<sup>10</sup> Finally, I endorse every word of John Paul II’s description of the death of a human person as “a single event, consisting in the total disintegration of that unitary and

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<sup>8</sup>“You Only Die Twice,” 315.

<sup>9</sup>Ibid., 320.

<sup>10</sup>*Catechism of the Catholic Church*, no. 365, [http://www.vatican.va/archive/ccc\\_css/archive/catechism/p1s2c1p6.htm](http://www.vatican.va/archive/ccc_css/archive/catechism/p1s2c1p6.htm), accessed 21 October 2012.

integrated whole that is the personal self. It results from the separation of the life-principle (or soul) from the corporal reality of the person.”<sup>11</sup>

It seems to me, then, that both Tonti-Filippini and I agree that a holistic integration of the body is evidence of life. Where we disagree is the question of whether a body with irreversible loss of brain function instantiates death according to the integrationist view that we both share. He says it does, I say it does not. The reasons why I say it does not have been set forth in previous publications.<sup>12</sup> Nevertheless, I would like to clarify them again here.

Before doing so, however, I want to highlight two fundamental assumptions on which Tonti-Filippini’s defense of the brain criterion rests, namely, (i) that the brain is *the* master organ of organismic somatic integration and (ii) that this assertion regarding the brain somehow follows from the Council of Vienne’s embrace of hylemorphism. Consider the following key statement:

We can take from the doctrine proclaimed at the Council of Vienne that the ongoing causative effect of the soul is its informing the body. Therefore the type of integration that is relevant is a communication of information to all parts of the body. Because integration implies unity, the type of integration that is relevant is the transfer of information that keeps the body united and hence a single whole. On these grounds I would argue that Shewmon and others are wrong to claim that the type of integration that may subsist in a body after loss of all

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<sup>11</sup>John Paul II, Address to the 18th International Congress of the Transplantation Society (Rome, 29 April 2000), 4, [http://www.vatican.va/holy\\_father/john\\_paul\\_ii/speeches/2000/jul-sep/documents/hf\\_jp-ii\\_spe\\_20000829\\_transplants\\_en.html](http://www.vatican.va/holy_father/john_paul_ii/speeches/2000/jul-sep/documents/hf_jp-ii_spe_20000829_transplants_en.html), accessed 21 October 2012.

<sup>12</sup>D. Alan Shewmon, “Recovery from ‘brain death’: a neurologist’s *Apologia*,” *Linacre Quarterly* 64, no. 1 (1997): 30–96. D. Alan Shewmon, “The brain and somatic integration: insights into the standard biological rationale for equating ‘brain death’ with death,” *Journal of Medicine and Philosophy* 26, no. 5 (2001): 457–78. D. Alan Shewmon, “Mental disconnect: ‘Physiological decapitation’ as a heuristic for understanding ‘brain death,’” in Marcelo Sánchez Sorondo, ed., *The Signs of Death. The Proceedings of the Working Group 11–12 September 2006* (Vatican City: Pontificia Academia Scientiarum, Scripta Varia 110, 2007), 292–333. D. Alan Shewmon, “Constructing the death elephant: a synthetic paradigm shift for the definition, criteria, and tests for death,” *Journal of Medicine and Philosophy* 35, no. 3 (2010): 256–98.

brain function is relevant. The transfer of information merely between one part of the body and another is insufficient to establish that the soul has not separated from the body.<sup>13</sup>

Tonti-Filippini's argument in this passage is that the hylemorphic information of the body by the spiritual soul requires "information" transfer over the whole bodily organism (rather than only between one part of the body and another), that such transfer depends essentially on a central organ, and that this central organ must be the brain. Unfortunately, Tonti-Filippini never explains why hylemorphism entails a single master organ of somatic integration, or why this single master organ must be the brain.

It is hard to resist the impression that Tonti-Filippini unconsciously assumes an unfortunate picture of the brain as a kind of hardware by means of which a psychic software program exercises control over a set of movable robotic parts. But if Tonti-Filippini repudiates this dualistic and mechanistic image of ensoulment, on what grounds does he say that hylemorphism necessarily requires the brain as the master organ of somatic integration, or, indeed, necessarily requires any one such master organ at all?

Tonti-Filippini of course claims that the empirical evidence supports, or even commands, this conclusion, but he appears to read that evidence through the distorting lens of a fundamental *petitio principii*. For even if we grant his rather quick move from the soul's "informing the body" to "information transfer" (or is he in fact equivocating on the word "information"?), we still need to ask what kind of "information transfer" is constitutive of organismic integrity and what role the brain actually plays in it. Might there not be a kind of "information transfer" that, materially speaking, is sufficient for organismic somatic integration, yet doesn't require a functioning brain? Whatever his intention, Tonti-Filippini's failure to consider this possibility is a form of question-begging that vitiates his defense of the brain death criterion. This will become more evident as we pursue the argument through the rest of this section (II) and the whole of the next (III).

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<sup>13</sup>"You Only Die Twice," 318f.

*A. A philosophy of integration*

“I am inclined,” Tonti-Filippini writes, “to conclude that it is difficult to hold that functional unity of the body can exist when a major part, the brain, is no longer functioning. *The remaining integration can only be partial.*”<sup>14</sup> What Tonti-Filippini seems to assert here is that the interactions among the various parts of a brain-dead body are insufficient to unify those parts into a true organismic whole, and that what is left of unity in a brain-dead body is not the bearer of any sort of “integration,” but simply a set of “interactions” at the level of organs. The issue is this: Does a brain-dead body possess integrative unity or is it a mere collection of interacting organs in a bag of skin?

There is no developed philosophy or science of “integration” cited in the extensive brain death literature, so in that respect we are in uncharted territory. Ironically, however, one of Tonti-Filippini’s criticisms of my position actually involves a helpful hint, which he does not develop in his article but which I shall develop here into a preliminary framework for understanding and categorizing “integration.” These ideas build upon what I published on somatic integration back in 2001,<sup>15</sup> and I must thank Tonti-Filippini for having provoked this further development of thought. The key word is “type” of integration. Tonti-Filippini writes:

Therefore the type of integration that is relevant is a communication of information to all parts of the body. Because integration implies unity, the type of integration that is relevant is the transfer of information that keeps the body united and hence a single whole.<sup>16</sup>

On these grounds I would argue that Shewmon and others are wrong to claim that the type of integration that may subsist in the body after loss of all brain function is relevant. The transfer of information merely between one part of the body and another is insufficient to establish that the soul has not separated from the body. . . . Most of the examples that

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<sup>14</sup>Ibid., 319.

<sup>15</sup>D. Alan Shewmon, “The brain and somatic integration.”

<sup>16</sup>“You Only Die Twice,” 318.

Shewmon has given of integration in someone who lacks all brain functions do not involve integration in the sense of a communication that unites the parts of the whole.<sup>17</sup>

Unfortunately, Tonti-Filippini nowhere explains what he means by “type” of integration, or how many types he thinks there are, or how they are to be distinguished in practice. Reading between the lines, I suspect that “type” is actually a misnomer for “level” of integration. What Tonti-Filippini accuses me of is asserting that interactions at the level of organs and tissues, and not at a holistic level, suffice to establish bodily unity and the soul’s informing presence. In fact I have never asserted such a thing (*vide supra*), but rather have maintained that a holistic level of integration does occur in at least some brain-dead bodies—a very different proposition.

In order to make this case, I propose an account of the distinction between “level” of integration and “type” of integration below. In working out this distinction, however, we need to keep in mind at all times the following fundamental principle.

The “wholeness” that integration brings about is not to be understood in the sense of structural or functional *completeness*. James L. Bernat and colleagues were quite right to emphasize, in their seminal 1981 paper and subsequently, that what counts is not whether there is a “whole organism” but rather whether there is an “organism as a whole.”<sup>18</sup> An amputee may not be structurally complete but is no less an “organism as a whole” than a full-bodied person. Someone blind or hemiplegic may not be functionally complete but is just as much an “organism as a whole” as a fully functioning person.

### *1. Levels of integration*

We can distinguish two kinds of levels of integration corresponding to two different ways of looking at the human body: either as a set of increasingly encompassing structures and functions (“structural-

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<sup>17</sup>Ibid., 319.

<sup>18</sup>James L. Bernat, Charles M. Culver, and Bernard Gert, “On the definition and criterion of death,” *Annals of Internal Medicine* 94, no. 3 (1981): 389–94.



functional” levels) or as a hierarchically graded display of vital operations rooted in the human soul (“vital-operational” levels).

*a. Structural-functional level*

For “higher” organisms, at least five *structural-functional* levels can be distinguished: organism, body system (digestive, immune, etc.), organ, cell, and cellular organelle.<sup>19</sup> I call these levels “structural-functional,” because they involve both structures and, *mutatis mutandis*, their associated functions. The structural-functional level is determined not only by relative size and degree of complexity, but also by the kind of organism and its stage in the life cycle: a one-celled human zygote is an integrated human organism, but a fibroblast growing in a culture dish is only an integrated human cell.<sup>20</sup>

The relation between structural completeness and functional adequacy is complex. At any given level, structure and function are inherently linked, but in such a way that function cannot exist in the absence of some underlying structure (how much varies), while a structure can exist without functioning.<sup>21</sup>

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<sup>19</sup>Trunk, limbs and head could possibly be considered an additional level, structurally analogous to body systems, which are defined more functionally. It is not so clear at what level of integration various kinds of bodily tissues and fluids should be categorized; it is possible that they lack sufficient distinctness and wholeness for the concept of “integration” to apply. A compulsive theorist might also want to add levels below organelle, from macromolecule all the way down to quark. Such issues need not be decided here.

<sup>20</sup>Despite the fact that systems, organs, cells, etc. are parts of an organism, the term “integration” still applies analogically to each of them, because each has a structural and functional distinctness from the other parts, and each possesses a certain unity. A liver in an organism is legitimately considered a “whole” liver, with its own subsidiary level of integrative unity, even though it is not a whole organism. The same is true of the other parts and levels of the organism.

<sup>21</sup>For example, removal of one kidney reduces renal structure by half but does not diminish renal function (only its margin of reserve). Conversely, a body can be in renal failure despite possession of two whole kidneys. Although the nonfunctioning kidneys might appear intact macroscopically, they would not be structurally intact at the microscopic or molecular level. The same can be said about various other organs and systems, such as the lungs or the blood, whereas

Obviously there are limits to the extent that an organism, organ or cell can be reduced by mutilation and still remain that organism, organ or cell. The limit will vary according to the type of thing and the type of mutilation under consideration; no generally applicable criterion can be given, and in many cases (if not all) the limit will be surrounded by an epistemic “gray zone” of uncertainty. Fortunately for our topic, it is not necessary to have to be able to solve all possible thought experiments involving progressive mutilation in order to be sure that brain-dead bodies are neither in that “gray zone” nor on the other side of it.

Before proceeding to the next subsection, let us recall the fundamental principle that “organism as a whole” is not synonymous with “whole organism.” Structural or functional incompleteness, to lesser or greater degrees, does not per se vitiate the integral wholeness of an organism. The same concept applies at every level: a brain following a mild stroke is still a “brain as a whole,” and a cell minus some of its mitochondria or affected by a not-quite-lethal toxin is still a “cell as a whole.”

*b. Vital-operational level*

We can also distinguish at least three main levels of vital integration, each of which physically expresses one of the main kinds of vital operation rooted in, though not identical with, the essence of the soul: vegetative, sensorimotor, and intellectual-volitional.

Vegetative-level integration is the most basic, involving nutrition, metabolism, growth, self-assembly and self-maintenance, etc. It is intrinsic to life in general. It occurs in and among all cells and organs of an organism, and embraces many sublevels and degrees of complexity (down to some minimal qualitative limit, below which there is no life). Integration at the sensorimotor level is carried out by the nervous system in conjunction with the sensory organs and muscles. It too features many sublevels. For example, our unified and seamless experience of vision results from synthesis within the brain of many integrative subprocesses such as

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with still other organs, such as the heart or an eye, removal of half or even just a small part of it (depending on which part) can eliminate its entire function.

edge detection, motion detection, color perception, shape identification, etc. The human body's highest vital integration involves those brain processes that participate in (and are necessary for properly human, as opposed to angelic) spiritual activities: concept formation, language, self-awareness, intention and voluntary action. Here, too, there are many sublevels and degrees of complexity (underlying types and degrees of cognitive abilities or disabilities).

The subordinated structural-functional levels of integration within an organism may stand in different relationships to the vital-operational levels of integration. For example, the functions of the respiratory and circulatory systems are more crucial for the immediate vegetative survival of the organism than that of the nervous system, while the functions of the nervous system are more decisive for the exercise of the hierarchically highest dimensions of human rational life.

*c. Resolving discrepancies between types of levels*

Structural-functional and vital-operational levels of integration are distinct, but they are also mutually relevant. Their joint consideration therefore provides a basis for determining how discrepancies between them affect the organismic status of a human body. In particular, we need to consider what happens to the organism when the highest structural-functional level—that of the body as a whole—coexists with a physical impediment to the exercise of the higher vital operations.

Consider two dissociative extremes of a disabled “organism as a whole”: disabled human organism A with the highest vital operation (rationally conscious life) but only an organ level structural-functional completeness (the brain), and disabled human organism B with structural-functional integration at the whole body level but with vital-operational integration only at the vegetative level.<sup>22</sup>

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<sup>22</sup>I am assuming that an embodied human being is by definition a human organism. If a consensus definition of “organism” is reached such that the brain-in-a-vat would not qualify, then the terminology in this article would need to be

To illustrate example A, compare two living human organs technologically maintained in respective vats: one a kidney and the other a brain. The kidney is merely an organ, because its structural wholeness is obviously at the organ level, its function is at the organ level (production of urine), and, in vital-operational terms, its integrative function is at the vegetative level. The envatted brain, on the other hand, despite being structurally also an organ, nevertheless *ex hypothesi* supports the rational consciousness characteristic of a human organism.<sup>23</sup> The absence of many lower-level acts would certainly be severely disabling but it would not entitle us to conclude that the brain-in-the-vat was not a living human organism.<sup>24</sup>

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modified accordingly.

<sup>23</sup>In a previous article I referred to the brain-in-a-vat as a “conscious non-organism” (D. Alan Shewmon, “On conscious non-organisms, unconscious persons, and bisected person-organisms,” *American Philosophical Association Newsletter* 9, no. 1 (2009): 14–18). After the subsequent three years of reflection, I think I prefer to call any embodied human person a human organism, even if all that is left of his original body is only a brain, for which the vat and its contents would of course have to serve as an artificial body. A preliminary foray into a philosophy of organism has been made by Bonelli et al., in Raphael M. Bonelli, Enrique H. Prat, Johannes Bonelli, “Philosophical considerations on brain death and the concept of the organism as a whole,” *Psychiatria Danubina* 21, no. 1 (2009): 3–8. They propose four criteria for life in general and four additional criteria for an organism as a whole. Although they argue that brain-dead bodies do not fulfil the latter criteria, I would maintain that *if* their criteria (accepting them for the sake of argument) are understood in such a way as to judge that a moribund, almost-but-not-quite-brain-dead patient with multisystem failure in an intensive care unit is still a living organism-as-a-whole, then those same criteria would also qualify a brain-dead body as a living organism-as-a-whole. This line of reasoning will be further developed below.

<sup>24</sup>This thought experiment rests of course on the unproven assumption that the brain-in-a-vat would be supporting the full consciousness of the same person, from whose previously intact body it was extracted. There is an almost sacred mysteriousness enshrouding the question, which cannot ever be empirically investigated in an ethical manner. Example A is mentioned here simply to illustrate, through the starkest contrast with example B, the principle for resolving structural-hierarchical discrepancies. More realistic but less symmetrical (and less entertaining) comparisons could also be made. For further discussion of the uncertainties surrounding isolated-brain and brain-transplant thought experiments, see Josef Seifert, “On ‘brain death’ in brief: philosophical arguments against equating it with actual death and responses to arguments in favour of such an

In example A, then, we find that the hypothetical exercise of the highest vital-operational activity in the brain-in-a-vat suffices to establish the existence of a live human organism, despite its abnormal situation with respect to organ-level structure.

Note, however, that the vat (and its contents) would have to provide the functional equivalent of a human body, which in the normal case is both a necessary condition of the brain's facilitation of rational consciousness and the basic reference-point of that consciousness itself (in that I am aware of myself, not of my brain). Contrary to what we might suppose, then, the thought experiment of the brain-in-the-vat does not in fact entail that the brain alone is the master organ of somatic integration, but merely that it plays a necessary role in man's exercise of rational consciousness.

What, then, about example B? The human organism does not lose its organismic status even when it becomes physically incapable of manifesting sensitive or rational vital operations due to some defect in its higher-level neural integration. Exercise of vital operation at the structural-functional level of organism therefore suffices to assure us that (1) we are still dealing with an organism despite that vital operation being only at the vegetative level, and that (2) by virtue of the unity of the human soul, the organism we are dealing with is still rationally animate. Hence example B: If an otherwise structurally complete human body survives while exercising only vegetative-level integration, it is still a living human organism, albeit one cognitively incapacitated to the extreme.<sup>25</sup> The soul continues to inform and give life to the human body even if the person cannot exercise higher acts or faculties proper to human

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equation," in Roberto de Mattei, ed., *Finis Vitae: Is Brain Death still Life?* Consiglio Nazionale delle Ricerche (Soveria Mannelli: Rubettino, 2006, 2007), 189–210. For a critique of the explanatory utility of thought experiments in general, see Kathleen V. Wilkes, *Real People: Personal Identity Without Thought Experiments* (Oxford: Clarendon Press, 1988).

<sup>25</sup>Obviously a permanently vegetative human body is not structurally complete *stricto sensu*: parts of the brain are damaged; but this does not undermine the structural integral wholeness of the organism. Also, it should be emphasized that example B is about a true "vegetative state," not some misdiagnosis of "super locked-in syndrome" or another inwardly aware but externally unresponsive state. The difficulties of establishing that distinction in practice are beside the point of the example.

beings due to incapacitation of the neural integration required for that purpose.

The real-life example of the person in a vegetative state and the science-fiction example of the brain-in-a-vat are not the two incommensurable cases they at first appear to be, but two widely divergent illustrations of the same truth. To be an “organism as a whole” does not imply or require either structural-functional or vital-operational wholeness. If there is a discrepancy between these two types of levels, the higher one is determining. In other words, something from the species *homo sapiens* is a human organism if it is either at the highest structural-functional level of “organism” (regardless what deficits in vital-operational level it may suffer due to some impediment) or at the highest vital-operational level of self-awareness, intellection and volition (regardless what deficits in structural-functional integrity it may suffer due to mutilation).

## 2. *Types of integration*

We turn now from *level* of integration to the other axis of categorization: *type* of integration. By “type” I am not referring to Tonti-Filippini’s usage of the term (implicitly synonymous with “level”) but to its proper meaning, i.e., a *kind* of integration. I propose that there are at least two basic types of integration, each of which applies at each structural-functional and vital-operational level, making *type* and *level* conceptually orthogonal “axes” of categorization. The two main types will be designated “life-constituting” and “life-sustaining”; the latter will be subdivided into “health-maintaining” and “survival-promoting.”

### a. *Life-constituting integration*

Integration is “life-constituting” (or “constitutive”) when it makes a body simply *to be* alive and *to be* a whole (at least *materialiter*, which is the point of view I will be considering here).

As a lead-in, consider the question: On what basis do we say that a vegetative state patient is an integrated organism, but a fresh corpse in a morgue is not (at *any* level) despite possessing the same

full complement of body parts? The corpse may appear *grossly* intact, but microstructurally (at the molecular level), and even more clearly functionally, it is not at all intact. The only dynamism of a corpse is the process of decay, the giving-in to the second law of thermodynamics (the general tendency of closed physical systems to increase in entropy). By contrast, a living organism is in a dynamic state of endogenous active opposition to the tendency to increasing entropy.

Looked at in terms of physically exercised vital operation, an “organism” could be described as a “bubble of anti-entropy.” This thermodynamic view of the essence of life has been advanced by well-known physicists, such as Erwin Schrödinger<sup>26</sup> and Ilya Prigogine,<sup>27</sup> and by biologist Francisco Varela, who coined the term “autopoiesis” (“self-generation”).<sup>28</sup> Of course, as philosopher Josef Seifert emphasizes, neither life (as the being-alive of a living body), nor its vital operations, nor even their exercise can be reduced to purely thermodynamic considerations.<sup>29</sup>

Biological anti-entropy involves crucial biochemical processes powered with energy generated, for the most part, by the oxidation of basic molecular substrates in mitochondria. It is an orderly process (it does not happen just by throwing all the same chemicals together in a test tube) consisting in innumerable, highly complex and mutually influencing biochemical exchanges within and between all the cells throughout the body or organ (depending on the structural level at issue<sup>30</sup>). Long-distance exchanges are accomplished by blood circulation (intravascular fluid compartment), while short-distance exchanges occur in the extravascular compartment through diffusion, active and passive

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<sup>26</sup>Erwin Schrödinger, *What is Life? The Physical Aspect of the Living Cell* (New York: The Macmillan Company, 1946).

<sup>27</sup>Gregoire Nicolis and Ilya Prigogine, *Self-organization in Nonequilibrium Systems: From Dissipative Structures to Order Through Fluctuations* (New York: Wiley, 1977).

<sup>28</sup>Francisco J. Varela, *Principles of Biological Autonomy* (New York: North Holland, 1979).

<sup>29</sup>Josef Seifert, *What is Life? The Originality, Irreducibility, and Value of Life* (Amsterdam: Rodopi, 1997).

<sup>30</sup>If the level at issue is cellular, then the integrative biochemical exchanges would be within and between all the parts of the cell.

transport across cell membranes, etc.; these two compartments intercommunicate across the capillary endothelium. The circulation also accomplishes critical energy-maintaining exchanges between the internal milieu and external environment, at specialized interfaces between the “bubble of anti-entropy” and the surrounding “sea of entropy” (e.g., at the alveoli of the lungs, bringing in oxygen and eliminating carbon dioxide; at the intestinal lining, absorbing molecular substrates for eventual oxidation; at the glomeruli of the kidneys, eliminating soluble wastes, etc.).

Let me be clear: When I say, for example, that active anti-entropic exchange “constitutes” the living body, I simply mean that it is, physically speaking, the very life process itself of the living body, insofar as the living body can be looked at (somewhat abstractly, to be sure) as a “bubble of anti-entropy.” But if this “bubble” is the same, physically, as the body, then it owes its actuality to the same formal cause that the living body does: the soul. That is, while the anti-entropic bubble constitutes the living body *materially*—it is the living body described biochemically—the soul constitutes the living body *formally*. The soul is the immanent first principle accounting for the living body’s actuality, for its being vitally integrated in the first place.<sup>31</sup>

Now, constitutive integration occurs at every functional-structural level. Not only does it make an organism to be a *live* organism (as opposed to a decaying former organism), but also a kidney on its way from donor to recipient to be a *live* kidney, and a fibroblast in tissue culture to be a *live* fibroblast.<sup>32</sup> Our question regarding brain death thus boils down to whether the integration materially constitutive of human life occurs at the highest structural-functional level of organism or merely at the level of organs, i.e., a collection of interacting organs enclosed in a bag of

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<sup>31</sup>I do not mean, of course, that constitutive integration is that which is alive (on any structural-functional level of bodily organization). Rather, constitutive integration is a fundamental criterion of being alive. One could say that it is the primary and fundamental manifestation of *being alive*, though we must keep in mind that being alive belongs per se to the order of (non-material) formal causality.

<sup>32</sup>At whatever structural level, integrative unity is spatially coextensive with anti-entropic interactions. For example, a gangrenous toe does not participate in the organism’s anti-entropy, and strictly speaking it is not part of the organism.



skin. Does a brain-dead body still exercise organismic somatic integration, albeit only on the vegetative level, thus remaining a living human organism (and so a person) by virtue of the unity of the human soul? I will argue for an affirmative answer to this question in the following section (III) of the paper.<sup>33</sup>

*b. Life-sustaining integration*

Whereas constitutive integration makes something to *be* alive in the sense just explained, life-sustaining integration merely helps it to *stay* alive. At least two subtypes can be distinguished: “health-maintaining” and “survival-promoting,” the difference being that the former is internally directed while the latter is externally directed.

*i. Health-maintaining integration*

Health-maintaining integration keeps the organism’s/organ’s/cell’s internal milieu optimal, with a wide safety margin far from death. The complex integration of the immune system, for example, protects the body from attack by pathogens. If the immune system is completely destroyed, as for example by chemotherapy and radiation in the initial stage of a bone marrow transplant, the body is not *ipso facto* dead, but it is at high risk of dying soon without medical intervention. Similarly, the integrative functions of the pancreas are of the “health-maintaining” type. Surgical removal of the pancreas does not *ipso facto* make the body dead at the moment of removal, but loss of its integrative functions *will* result in death

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<sup>33</sup>In man, constitutive integration can be found at each of the three hierarchical levels of life that are in turn integrated with each other in the one human person (who, in virtue of this unity, only “dies once”); but it need not occur at all three levels. For example, if constitutive integration at the highest vital-operational level (i.e., self-consciousness) is present, then a human organism is unquestionably constituted. But if it is absent at the highest level, that would not necessarily mean that a human organism is not constituted. For indeed, anti-entropy at the structural-functional level of organism could represent another kind of constitutive integration that constitutes a human organism, even though it is at the lowest vital-operational level.

after a few days if left untreated. Upon a little consideration, it becomes obvious that the integrative functions of *every* non-brain organ and organ system at the vegetative level are of the health-maintaining type. Even heart and lung functions are of the health-maintaining type, although the latency to death if they fail is much shorter than in the case of an organ like the pancreas—on the order of minutes rather than days.

*ii. Survival-promoting integration*

Survival-promoting integration has to do with goal-directed interactions with the environment, so it is primarily at the sensorimotor and cognitive levels. It therefore involves the brain and other body parts closely related to the brain, such as sensory organs and muscle. Such integration, for example, underlies instinctive and need-driven behaviors (such as satisfying hunger and thirst), the anticipation and avoidance of danger, the planning and carrying out of survival strategies for adverse weather, etc. In higher vertebrate organisms, survival-promoting and health-maintaining integration are coordinated with each other through the limbic system, the autonomic nervous system and the hypothalamic-pituitary axis (e.g., the autonomic and hormonal changes associated with “fight and flight reactions”). As with health-maintaining integration, loss of survival-promoting integration does not make an organism instantly, *ipso facto*, dead, but it will lead to premature death if not compensated for. A blind or paralyzed or demented person is not dead, but will be soon if unassisted.

*c. Non-substitutability: Correlate of constitutive integration*

Health-maintaining and survival-promoting integration are replaceable, in the sense that the organism can survive without such integration as long as its role is fulfilled by some exogenous replacement. Referring to the previous examples, patients with immunodeficiency can survive with the help of antibiotics whenever they get an infection. Patients with pancreatic insufficiency can survive by taking insulin and digestive enzymes.

People without heart or lung function can survive with the help of extracorporeal membrane oxygenation (ECMO) or an artificial heart. Blind people compensate by walking sticks, seeing-eye dogs and a society that accommodates their disability. Paralyzed people get around with the help of wheelchairs and assistants. Demented people survive through the ministrations of caregivers.<sup>34</sup>

By contrast, constitutive integration is intrinsically and absolutely not substitutable. By its very nature, if it does not exist at a given hierarchical level, neither does the corresponding organism, organ or cell exist. Nor is it even partially substitutable. Unlike the therapeutic replacement of a health-maintaining integrative function, which can replace the natural function well or poorly, constitutive integration is all or none, just as “unity” is all or none. Some or many cells might cease to participate in an organism’s anti-entropic constitutive integration, for example, but if the remaining ones suffice to maintain the organism’s anti-entropy, the constitutive integration remains undiminished; indeed it is undiminishable, only present or absent. No futuristic intensive-care technology can prevent the increase in entropy (i.e., biological decay) if it is not endogenously opposed from the very life-processes themselves of the living organism.

What about the extraordinarily complex electrochemical information exchange within the brain that facilitates specifically human consciousness? Clearly, it is another type of constitutive integration, as its absolute non-substitutability attests: No computer, no matter how futuristically advanced, can take the place of someone’s brain in supporting that person’s self-awareness and intellectual-volitional acts.<sup>35</sup> It does not follow, however, that the

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<sup>34</sup>Substitutability, in the sense intended here, does not imply equivalence; obviously it is better to have seeing eyes than a seeing-eye dog. We are concerned with types of integration as they relate to life versus death. Substitutability is also a relative thing: futuristic computerized stimulation of the occipital cortex will be a better substitute for lost natural vision than a seeing-eye dog. Pancreatic integrative functions are more easily and more thoroughly replaceable than are sensory integrative functions.

<sup>35</sup>Enthusiasts of “strong” artificial-intelligence would take issue with this statement, but this paper is a response to Tonti-Filippini, not to them. I trust that Tonti-Filippini and the readers of *Communio* agree with me on this point.

failure of conscious activity, or even of the electro-chemical exchange underlying it, is *ipso facto* the death of a person.

In any case, this latter consideration is irrelevant, since the only integration at issue in the brain death discussion is *somatic* integration. The crux of the debate can therefore be reframed in terms of the following question: Is brain-based somatic integration indispensable to the constitutive integration of a human organism, or is it only health-maintaining and survival-promoting? In the following section, I propose to demonstrate the latter.

### III. A Bold Assertion

Tonti-Filippini's defense of the somatic-integration rationale for brain death implicitly presupposes that brain-based integration is not only *necessary* for organism-level constitutive integration (i.e., without it, the organism ceases to be a living "organism as a whole"), but that it is actually *sufficient* for it (i.e., if there is any residual brain function at all,<sup>36</sup> the person is neither brain dead nor dead). Two respective corollaries are that the absence of the soul is always deducible from the irreversible absence of all brain function and that the presence of the soul is deducible from the presence of any brain function.

My task now is to show that these assumptions have no sound basis in the available empirical evidence. I will thus assert something that I have never previously formulated quite so clearly or in such terms—something bold, which warrants placing in bold: **The empirical evidence suggests that all brain-mediated somatic integration is either of the health-maintaining or of the survival-promoting type.** Or, expressed the other way around: **The constitutive integration minimally needed for**

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<sup>36</sup>Or in Bernat's scheme and terminology, any residual "critical" brain function. Cf. James L. Bernat, "How much of the brain must die in brain death?" *Journal of Clinical Ethics* 3, no. 1 (1992): 21–26; discussion 27–28. James L. Bernat, "The biophysical basis of whole-brain death," *Social Philosophy & Policy* 19, no. 2 (2002): 324–42.

**the existence of a rationally ensouled human organism is entirely non-brain-mediated.**

In the remainder of the present section I will prove this assertion and refute the main empirical components of Tonti-Filippini's central theses (both explicit and implicit). In subsection A, I will refute the claim that the somatically integrative activity of the nervous system derives wholly from the brain (A, 1) and that the integrative activity of the endocrine system is entirely directed by the brain (A, 2). In the following subsection B, I will highlight Tonti-Filippini's mistake in downplaying the importance of the circulatory system, which he seems to believe has no integrative role other than serving as a vehicle for endocrine-mediated integration. Finally, in subsection C, I will refute the assumption, which Tonti-Filippini shares with many advocates of the brain death criterion, that the integration observed in cases of chronic brain death is only at the structural-functional level of organs, not at that of the organism as a whole. This discussion will also give me the opportunity to rebut one other charge: that my claim that at least some brain-dead bodies manifest integrative functions at the organism-level has been based on a misattribution to the holistic level of the supposedly "local phenomenon" of wound healing.

*A. Two major bodily systems and their types of integration*

*1. The nervous system*

The assertion that "the brain . . . mediates . . . the neural . . . system"<sup>37</sup> is a non-starter. The brain is *part of* the nervous system. The human brain is considered by many to be the crown jewel of God's physical creation, the most marvelous and complex structure in the entire universe. This does not imply, however, that the rest of the nervous system counts for nothing, or that in pathological states where brain functions are lost the rest of the nervous system carries out no autonomous integrative functions.

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<sup>37</sup>"You Only Die Twice," 318.

*a. Spinal cord-mediated integration*

When the spinal cord suddenly loses rostral influences from the brain (e.g., in high cervical cord transection), the structurally intact cord below the lesion goes into a state of temporary shut-down, called spinal shock; then after a few days or weeks it regains autonomous functioning. During spinal shock, blood pressure regulation and other autonomic functions (apart from vagus nerve functions) cease, requiring pressor medications and complex ICU support. As the spinal shock resolves, autonomous thoracolumbar sympathetic and sacral parasympathetic functions return, roughly in parallel with return of tendon reflexes; blood pressure supporting medications can be tapered off, and overall medical management becomes easier. Of course autonomic regulation mediated by the cord is much less robust than that mediated by a fully functioning nervous system, but it is also a lot better for the body than no central nervous system regulation at all. It is cord-mediated integration that no doubt underlies, for example, the cardiovascular and hormonal stress responses that can occur during unanesthetized organ harvesting from brain-dead donors.<sup>38</sup>

From the perspective of the spinal cord, transection at the base of the brain and destruction of the brain have the same effect: it makes no difference to the cord whether the brain above the transection is intact or not. In either case there is sudden, complete loss of brain control over the cord, and consequent spinal shock. In a detailed clinical and physiological comparison between high spinal cord injury and brain death, I showed that the respective somatic dysfunctions, apart from the endocrine disturbances in brain death and the preserved glossopharyngeal and vagus nerve functions in

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<sup>38</sup>R. D. Fitzgerald, I. Dechtyar, E. Templ, P. Fridrich, and F. X. Lackner, "Cardiovascular and catecholamine response to surgery in brain-dead organ donors," *Anaesthesia* 50, no. 5 (1995): 388–92. Hans-Joachim Gramm, Jürgen Zimmermann, Harald Meinhold, Rüdiger Dennhardt, and Karlheinz Voigt, "Hemodynamic responses to noxious stimuli in brain-dead organ donors," *Intensive Care Medicine* 18, no. 8 (1992): 493–95. S. H. Pennefather, J. H. Dark, and R. E. Bullock, "Haemodynamic responses to surgery in brain-dead organ donors," *Anaesthesia* 48, no. 12 (1993): 1034–8. Randall C. Wetzel, Nancy Setzer, Judith L. Stiff, and Mark C. Rogers, "Hemodynamic responses in brain dead organ donor patients," *Anesthesia & Analgesia* 64, no. 2 (1985): 125–28.

spinal cord injury, are virtually identical, in terms of both clinical manifestations and evolution over time.<sup>39</sup> If we consider that some cases of brain death do not have clinically significant endocrine disturbances (*vide infra*) and that in some cases of spinal cord transection atropine is administered to suppress unopposed parasympathetic functions of the vagus nerve, the somatic physiologic comparison can be made exact.<sup>40</sup> This gives strong empirical support to the theoretical predictions that (1) the *acute* non-endocrinologic somatic disturbances of brain death are due more to spinal shock than to loss of brain-mediated integration, and (2) the relative somatic stability of the rare cases of *chronic* brain death (rare because the motivation to support such patients more than a few days is rare) is due in large part to recovery of cord-mediated somatic integration following spinal shock.

*b. Enteric and cardiac nervous systems*

Not only does the spinal cord carry out autonomous integrative functions, but the body even has two other nervous systems that have still less to do with the brain. The gastrointestinal system has its own enteric nervous system, which autonomously carries out such complex integrative functions related to digestion as to warrant being called a “second brain.”<sup>41</sup> Although often classified as

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<sup>39</sup>D. Alan Shewmon, “Spinal shock and ‘brain death’: somatic pathophysiological equivalence and implications for the integrative-unity rationale,” *Spinal Cord* 37, no. 5 (1999): 313–24. D. Alan Shewmon, “The ‘critical organ’ for the organism as a whole: Lessons from the lowly spinal cord” in *Brain Death and Disorders of Consciousness*, Advances in Experimental Medicine and Biology 550, Calixto Machado and D. Alan Shewmon, eds. (New York: Kluwer Academic/Plenum Publishers, 2004), 23–41.

<sup>40</sup>In the context of suppressed vagus nerve function, the very limited afferent function of the glossopharyngeal nerve would have no somatic effect.

<sup>41</sup>Michael D. Gershon, “The enteric nervous system: a second brain,” *Hospital Practice (Minneapolis)* 34, no. 7 (July 1999): 31–32, 35–38, 41–42 *passim*. Michael D. Gershon, *The Second Brain* (New York: Harper Collins, 1998). Pankaj Jay Pasricha, “Stanford Hospital’s Pankaj Pasricha discusses the Enteric Nervous System, or brain in your gut,” <http://www.youtube.com/watch?v=UXx4WTVU34Y>, accessed 21 October 2012.

a subdivision of the autonomic nervous system, it differs radically from the sympathetic and parasympathetic subdivisions, insofar as it is anatomically self-contained (not part of the central or peripheral nervous systems) and it can and does function independently from the brain and spinal cord. Likewise, the heart has its own intrinsic nervous system, including a pacemaker and a network of neurons that synchronize and optimize the heart's function. The autonomous integrative role of the intrinsic cardiac nervous system with respect to cardiac function is most evident in the continued, coordinated beating of a freshly explanted heart.

*c. Brain-mediated integration is of the non-constitutive type*

The foregoing reveals that, as a matter of fact, it is simply not true that all neural-based integration is mediated by the brain. The next question is: What *types* of integration are accomplished by the brain, the spinal cord, and the enteric and cardiac nervous systems?

Neurologist Julius Korein claimed that in higher vertebrates what opposes the otherwise relentless increase in entropy is the organism's "critical system," which he identified with the brain, and this is precisely why brain death is death.<sup>42</sup> Paraphrased in the terminology introduced above, he maintained that brain-based somatic integration was of the constitutive type. His evidence for this was that brain-dead bodies demonstrate multisystem dysfunction and invariably undergo imminent (within a few days) cardiac arrest despite all resuscitative measures. This "evidence" was in fact nothing of the kind: some brain-dead bodies—those with primary brain pathology and no direct damage to other organs—do not demonstrate multisystem dysfunction, and some can be maintained chronically with relatively little technological support.

In any case, Korein's claimed "evidence" was also irrelevant. Even in those cases that do spiral downhill to cardiovascular

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<sup>42</sup>Julius Korein, "The problem of brain death: development and history," in *Brain Death: Interrelated Medical and Social Issues*, Annals of the New York Academy of Sciences 315, Julius Korein, ed. (1978): 19–38. Julius Korein, "Ontogenesis of the brain in the human organism: definitions of life and death of the human being and person," *Advances in Bioethics* 2 (1997): 1–74.



collapse despite all therapeutic measures, all that is proved is that the lost integration could just as well have been of the health-maintaining type. Korein suggested no definition or means of measuring entropy in a living system, and *a fortiori* no means of measuring the strength of active opposition to entropy. By the same token, he suggested no empirical evidence whatsoever that an organism's endogenous, active opposition to entropy requires or even involves brain function. His claim that the brain is the body's thermodynamically "critical system" was merely a bald assertion that supported itself essentially by its own bootstraps.

Citing Korein, Bernat, a preeminent proponent of the somatic integration rationale, endorses the idea that an organism's "most important control system is the 'critical system,'"<sup>43</sup> as though it were a foregone conclusion that any organism necessarily has to have a single critical control system; this assumption is neither self-evident nor backed up by Bernat (nor even true—e.g., embryos). Significantly, in light of the distinction of types of integration introduced above, Bernat pulls the rug out from under himself by continuing:

The critical system is the irreplaceable, indispensable, complex, structural-functional control system that *maintains the health and life* of the organism, without which the organism no longer can function as a whole. The vital importance of this system *for the continued health* of the organism. . . . No organism *can survive* the loss of its critical system (emphasis added).

In essence, he is stating that the critical system, which later in the article he identifies with the brain, performs health-maintaining and survival-promoting integration. This line of thought then makes an enormous logical leap to thermodynamics, without explaining in any way how or why the loss of those two types of life-sustaining integration would result in loss of constitutive integration:

With the loss of the critical system, the organism loses its life-characterizing processes, especially its anti-entropic capacity, and

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<sup>43</sup>James L. Bernat, "The biophilosophical basis of whole-brain death," *Social Philosophy & Policy* 19, no. 2 (2002): 324–42.

entropy (disorder) inevitably increases. The inexorable increase in entropy is conceptually tied to the irreversibility of the process.

In the context of his whole article, Bernat seems to be endorsing the idea, following Korein, that brain-dead bodies lack anti-entropic capacity and that their entropy is in fact inexorably increasing. But, like Korein, he suggests no method for measuring entropy in a biological organism, and *a fortiori* presents no evidence to back up the claim that entropy increases in brain-dead bodies but remains opposed in still living, moribund, non-brain-dead bodies in ICUs. To my knowledge, no other defender of the somatic integration rationale of brain death has taken up this ball and run with it.

The empirical evidence actually points to quite the contrary conclusion. In terms of sheer volume, the bulk of the human brain is in the cerebral hemispheres, the integrative functions of which are sensorimotor and cognitive in nature. Therefore, it is fair to say that the great preponderance of brain-based integration is of the survival-promoting type. In the words of Bernat, the brain is the body's critical organ, because

it is primarily the brain that is responsible for the functioning of the organism as a whole: the integration of organ and tissue subsystems by neural and neuroendocrine control of temperature, fluids and electrolytes, nutrition, breathing, circulation, appropriate responses to danger, among others.<sup>44</sup>

Of the functions explicitly cited by Bernat, one is obviously of the survival-promoting type, while the rest are clearly of the health-maintaining type.

The parts of the brain that regulate the body's internal milieu are the relatively small brain stem and hypothalamus. The role of the hypothalamus will be considered below under the heading of the endocrine system; here we shall focus on the integrative role of the brain stem through its neuronal connections with the rest of the body. The key question is whether brainstem

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<sup>44</sup>James L. Bernat, "The definition, criterion, and statute of death," *Seminars in Neurology* 4, no. 1 (1984): 45–51, at 48.

integrative functions, whether individually or collectively, are of the constitutive type. A quick survey of all the brainstem reflexes that are tested in clinical brain death determinations<sup>45</sup> reveals that every single one is of the survival-promoting or possibly health-maintaining type (pupillary light reflex, corneal reflex, oculocephalic and oculovestibular reflexes, grimacing to noxious stimuli, gag and cough reflexes).<sup>46</sup> Respiratory drive, assessed by the apnea test, is clearly a health-maintaining integrative function. The bellows function of the diaphragm, driven by medullary centers and modulated by more rostral brainstem and even cortical influences, is easily substitutable by a mechanical ventilator, and the huge majority of patients without respiratory drive supported in ICUs across the world are not brain dead and are obviously living organisms as a whole.<sup>47</sup>

*i. The heuristic value of brain disconnection examples*

The brain destruction vs. brain disconnection comparison was the

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<sup>45</sup>Eelco F. M. Wijdicks, *Brain Death* (Oxford: Oxford University Press, 2011), 32–41. Eelco F. M. Wijdicks, “Determining brain death in adults,” *Neurology* 45, no. 5 (1995): 1003–11. American Academy of Neurology—Quality Standards Subcommittee, “Practice parameters for determining brain death in adults (Summary statement),” *Neurology* 45, no. 5 (1995): 1012–4. Eelco F. M. Wijdicks, Panayiotis N. Varelas, Gary S. Gronseth, David M. Greer, “Evidence-based guideline update: determining brain death in adults: report of the Quality Standards Subcommittee of the American Academy of Neurology,” *Neurology* 74, no. 23 (2010): 1911–8.

<sup>46</sup>Arguably, the classification of some brainstem reflexes is ambiguously survival-promoting or health-maintaining, such as the corneal reflex, which directly maintains the health of the eye and therefore indirectly promotes survival.

<sup>47</sup>Someone might object that the above set of clinically testable, non-constitutive brainstem integrative functions is merely a reliable surrogate for constitutively integrative brainstem functions that are clinically untestable; i.e., their collective absence, in the proper clinical context, guarantees associated absence of all other brainstem functions, including untestable constitutively integrative ones. Nevertheless, the only potential candidates for somatically unifying brainstem functions are the autonomic ones: the visceral parasympathetic components of the vagus nerve and the entire sympathetic system, which originates in the hypothalamus and is highly modulated by various brainstem centers along its way to the spinal cord and from there to its visceral, vascular and other targets.

epiphany that directly occasioned in 1992 my radical change of opinion about the nature of brain death, and its explanatory power has not diminished over the intervening 20 years. Experts on brain death have either ignored it (as did, in effect, the majority of participants in the Pontifical Academy of Sciences' 2006 working group on brain death<sup>48</sup>) or accepted it as definitive (as did many participants in the 3rd International Symposium on Coma and Death in 2000 following my keynote lecture,<sup>49</sup> most notably the famous neurologist Fred Plum, who exclaimed in essence during the question and answer session, "OK, I'll grant you that the brain-dead body is a living human organism, but is it a human *person*?"—thereby shifting the arena of debate from the biology of "organisms as a whole" to the philosophy of "personhood"<sup>50</sup>).

Ever since I first proposed the brain-disconnection comparison, defenders of the somatic integration rationale of brain death have been scrambling and grasping at straws to escape its implications. For it is in fact easy to show that the entire set of brainstem functions, including the clinically untestable ones, is *not* constitutively integrative for the living body. Their virtually complete absence, as in high spinal cord transection or fulminant Guillain-Barré Syndrome (an autoimmune inflammation of the nerves and nerve roots, which in rare cases can be so severe as to functionally disconnect the body from all non-pituitary-related central nervous system control, mimicking brain death<sup>51</sup>), results in

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<sup>48</sup>Sánchez Sorondo, *The Signs of Death*.

<sup>49</sup>D. Alan Shewmon, "The 'Critical Organ' for the 'Organism as a Whole': Lessons from the Lowly Spinal Cord" (Keynote address at the 3rd International Symposium on Coma and Death, Havana, Cuba, 22–25 February 2000).

<sup>50</sup>Cf. Sánchez Sorondo, *The Signs of Death*, 297.

<sup>51</sup>N. Bakshi, R. A. Maselli, S. M. Gospe, Jr., W. G. Ellis, C. McDonald, R. N. Mandler, "Fulminant demyelinating neuropathy mimicking cerebral death," *Muscle & Nerve* 20, no. 12 (1997): 1595–7. Taj Hassan, Colin Mumford, "Guillain-Barré syndrome mistaken for brain stem death," *Postgraduate Medical Journal* 67 (1991): 280–81. F. G. Langendorf, J. E. Mallin, J. C. Masdeu, S. L. Moshe, R. B. Lipton, "Fulminant Guillain-Barré syndrome simulating brain death: clinical and electrophysiological findings (Abstract)," *Electroencephalography and Clinical Neurophysiology* 64 (1986): 74. J. F. Marti-Masso, J. Suarez, A. Lopez de Munain, N. Carrera, "Clinical signs of brain death simulated by Guillain-Barré syndrome," *Journal of the Neurological Sciences* 120, no. 1 (1993): 115–17. F. Vargas, G. Hilbert,

a very sick patient requiring intensive support, not an *ipso facto* decomposing corpse. Moreover, the number of brainstem functions that need to be technologically substituted in order to sustain life is very small compared to the total number of brainstem integrative functions, implying that all the unsubstituted functions (many known, probably most as yet unknown) are even less critically health-maintaining than the substituted ones.

Some of the participants in the Pontifical Academy of Science's 2006 working group dismissed the heuristic value of such comparisons on the grounds that patients with disconnected, intact brains are conscious, and these cases are clinically very distinct from brain death.<sup>52</sup> (In the case of cervical cord transection this is obvious; with fulminant Guillain-Barré, greater clinical expertise is required.) But such dismissal misses the whole philosophical point: the claim is not that these conditions are clinically indistinguishable from brain death, but that they prove that the vitality and unity of the body remains even absent brain-based integration.

Another participant dismissed the comparison on the grounds that it ignores the non-neuronal control pathway of several hormonal substances "that help the organism survive when the spinal cord is transected, but are required for survival when the brain is destroyed."<sup>53</sup> His very own words place that type of integration in the survival-maintaining rather than constitutive category. Moreover, the only such substance mentioned specifically was vasopressin, which is not even absent in about one-third of brain death cases (*vide infra*), and is easily substituted pharmacologically in the other two-thirds. He asserted, without citing any evidence, that the brain "may make several other cytokines, hormones and substances," which together with vasopressin "may help achieve homeostasis even when neural communication between the brain and the rest of the body is

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D. Gruson, R. Valentino, G. Gbikpi-Benissan, J. P. Cardinaud, "Fulminant Guillain-Barré syndrome mimicking cerebral death: case report and literature review," *Intensive Care Medicine* 26, no. 5 (2000): 623–27.

<sup>52</sup>Sánchez Sorondo, *The Signs of Death*, XL (Wijdicks, Daroff, Bernat, Bousser), XLI (Tandon). See also Eelco F. M. Wijdicks, *Brain Death*, 155.

<sup>53</sup>Sánchez Sorondo, *The Signs of Death*, XLI (Posner).

destroyed.”<sup>54</sup> Cases of chronic brain death (*vide infra*) readily disprove that the brain releases any substance into the circulation that is necessary for any form of homeostasis aside from water balance.

Yet another participant dismissed the cervical cord transection comparison on the grounds that “the neurobiology . . . is incorrect”: in that condition, unlike in brain death, the ninth and tenth cranial nerves bypass the disconnection, preserving medullary control “over most of the other organs.”<sup>55</sup> He expressed puzzlement by the comparison, as though the difference of these two cranial nerves was an aspect that I, a fellow neurologist, had inexplicably and inexcusably overlooked. This difference had been carefully considered and accounted for:<sup>56</sup> vagal (tenth nerve) parasympathetic control over the thoracic and abdominal viscera is necessary for their proper functioning, but not for life itself: surgical or pharmacological ablation of the vagus (e.g., by atropine) results in cardiovascular, gastrointestinal and genitourinary side effects, not organismal decomposition. The only somatically integrative function of the glossopharyngeal (ninth cranial) nerve is the medullary reception of visceral sensory input from the carotid bodies and carotid sinus, which are involved in the regulation of respiration and blood pressure, respectively. In the context of apnea the former is irrelevant, and in the context of absent sympathetic vasomotor control the latter is irrelevant (the unopposed vagal parasympathetic influence on the heart being a source of potential cardiovascular dysfunction rather than control, which is why the vagus nerve sometimes has to be therapeutically suppressed in high cervical cord injury victims).

*ii. The requirement of irreversibility—Trojan horse for brain death theory*

As with brain-body disconnection, examples of suppression of brain function without structural damage also provide insight into the

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<sup>54</sup>Ibid. Emphasis added.

<sup>55</sup>Sánchez Sorondo, *The Signs of Death*, XLI (Masdeu).

<sup>56</sup>D. Alan Shewmon, “Spinal shock and ‘brain death,’” 313–24. D. Alan Shewmon, “The ‘critical organ’ for the organism as a whole,” 23–41.

necessity, or lack thereof, of brain-based integration for somatic unity. Neurological criteria for death everywhere in the world require that the loss of all brain functions be *irreversible*, no doubt because death itself is necessarily irreversible (apart from miracles). Ironically, this requirement actually undermines the integrative unity rationale. If that rationale were correct, the body should begin to dis-integrate immediately upon loss of all (or at least “critical”) brain-based integration, whether that loss be irreversible or reversible, permanent or temporary. Suppose a general anesthetic were administered at such a high dose as to suppress essentially all brain function.<sup>57</sup> Such a patient would require expert anesthesiology and ICU management, but no one would diagnose the patient as brain dead, because the anesthetic would be a major clinical confounder, and all diagnostic protocols require that reversible causes be excluded.<sup>58</sup> Nevertheless, the body is not receiving any integrative influences from the brain for as long as the anesthetic is maintained at that high level.

This scenario puts integrative-unity apologists in a bind, because they can analyze it in only three possible ways, all of which are incompatible with their hypothesis. (1) They could say that, since integrative brain function is absent, the body must be already dis-integrating (i.e., the anesthesiologist killed the patient), regardless of the fact that the patient will make a full recovery after the lifting of the anesthesia (a true “Lazarus phenomenon”!). (2) They could say that there is a latency between the loss of brain function and the beginning of somatic dis-integration, and

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<sup>57</sup>Barbiturate overdose, for example, can mimic brain death and produce a flat electroencephalogram, although typically not *all* brainstem functions are suppressed. Suppose, for the sake of our hypothetical, that the patient were given an anesthetic (or combination of anesthetics) at whatever dose might be required to eliminate not only all cortical activity but all hypothalamic and brainstem function as well. We further assume that an anesthetic is chosen that has insignificant direct toxicity to other organs at brain-suppressing levels. An alternative method for selectively suppressing brain function in this hypothetical scenario might be extreme head cooling, similar to the treatment modality used for asphyxiated newborns but even cooler. The point of the hypothetical is not how selective brain suppression might be in principle accomplished, but to illustrate the logical incompatibility between the irreversibility requirement and the theoretical basis for the integrative unity rationale of brain death.

<sup>58</sup>Wijdicks, *Brain Death*, 33–34, 155–7.

therefore a short period of time without brain function would not constitute a loss of integrative unity and death. But how long would it take for the loss of brain functions to produce the deadly effect? Korein, Wijdicks and many others emphasize how so many brain-dead patients succumb to asystole within as little as 24 to 48 hours. Suppose the anesthesiologist maintained the anesthesia for that long. Then they are right back to dilemma #1. More importantly, this form of explanation would amount to an admission that the death consisted in something other than the loss of brain-based integration, something that brain-based integration would normally have prevented, i.e., that brain-based integration is of the health-maintaining type.<sup>59</sup> (3) Or they could simply concede that somatic integrative unity is not lost upon cessation of all brain functions after all.

The fact that *reversible*, sustained loss of all brain function is recognized by all as *not* death implies that brain-based somatic integration is entirely of the health-maintaining, not constitutive type.

### *iii. Acute instabilities and early asystole in brain death*

Before leaving this subsection on the nervous system, it should be noted that patients in acute brain death tend to be physiologically very unstable, and many defenders of the integration unity rationale have taken this as evidence that the brain is indeed the body's critical integrating organ. An extreme, and factually grossly incorrect, example of this stance is the statement by one of the Pontifical Academy of Science's 2006 consultants, Conrado Estol:

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<sup>59</sup>For patients who "meet all criteria," Wijdicks pinpoints the time of death to "when the arterial pCO<sub>2</sub> reached the target value. In patients with an aborted apnea test, the time of death is when the ancillary test has been officially interpreted" (Wijdicks, *Brain Death*, 56). The patient in our hypothetical does not meet all criteria, because the loss of brain function is reversible. Nevertheless, as far as the body's need for brain-based integration goes, what difference does reversibility or irreversibility make, if somatic dis-integration begins upon loss of all brain functions as soon as the arterial pCO<sub>2</sub> reaches the target value or an electroencephalogram has been officially interpreted as isoelectric?



“Brain death is associated with immediate loss of all bodily functions.”<sup>60</sup> In a less hyperbolic vein, Wijdicks states:

Brain death affects nearly every organ system. Complications of brain death that may impact the organ donation process include hypotension, diabetes insipidus, hypothermia, electrolyte abnormalities, coagulopathy, anemia, hypoxia, cardiac arrhythmia, and cardiac arrest.<sup>61</sup>

He draws attention to the fact that many brain-dead potential organ donors undergo cardiovascular collapse and cardiac arrest before organs can be harvested, despite aggressive resuscitative efforts. Citing a recent study from Taiwan, in which “despite full cardiovascular support, 97% of 73 patients who met the criteria for brain death developed asystole within one week,” he concludes that “[t]he heart and the conduction system *need* continuous autonomic nervous system input.”<sup>62</sup> Although ostensibly further supporting this assertion but actually not, he also cites a study of heart rate variability, which in no way substantiates such a “need” but merely asserts that the measurement of heart rate variability could be a useful adjunct in the rapid diagnosis of brain death.<sup>63</sup>

At the Academy’s 2006 conference Drs. Ropper and Wijdicks complained that chronic brain death cases, such as those I reported, simply do not correspond to their extensive clinical experience as neuro-intensivists, and therefore the cases are highly suspect for being misdiagnoses.<sup>64</sup> I never claimed that they were typical, only that they occurred. The same Taiwan study cited by Wijdicks can also be interpreted the other way around: 3% of 73 patients survived at least one week. Such cases do occur. There is

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<sup>60</sup>Cf. Sánchez Sorondo, *The Signs of Death*, XL.

<sup>61</sup>Wijdicks, *Brain Death*, 111.

<sup>62</sup>Wijdicks, *Brain Death*, 117, citing T. P. Hung, S. T. Chen, “Prognosis of deeply comatose patients on ventilators,” *Journal of Neurology, Neurosurgery & Psychiatry* 58, no. 1 (1995): 75–80. Emphasis added.

<sup>63</sup>Wijdicks, *Brain Death*, 117, citing J. Freitas, J. Puig, A. P. Rocha, P. Lago, J. Teixeira, M. J. Carvalho, O. Costa, A. F. de Freitas, “Heart rate variability in brain death,” *Clinical Autonomic Research* 6, no. 3 (1996): 141–46.

<sup>64</sup>Sánchez Sorondo, *The Signs of Death*, 246, 276 (Ropper); 258, 270 (Wijdicks).

very little clinical experience in the U.S. in attempting to maintain brain-dead patients longer than two days, because there is no motivation to do so.

Spinal shock has already been mentioned as one factor contributing to the acute instabilities. But there are others. The complexities of medical management of brain-dead organ donors are reviewed in the course of 14 pages of Wijdicks' recent book on brain death, which ironically contain the seeds of the answer to his own objection.<sup>65</sup> The subsection heading "Pathophysiologic Changes *Due to* Brain Death" (emphasis added) is a misnomer, given what he proceeds to explain in the subsequent text. A more appropriate subheading would have been "Pathophysiologic Changes *Associated with* Brain Death." Some of the changes he cites are actually "due to" direct multisystem damage from whatever etiology happened to cause the brain injury (typically severe trauma or cardiorespiratory arrest). Other types of systemic dysfunction are "due to" hypoxic damage from apnea or from autonomic outpouring ("sympathetic storm") caused by the process of progressive brain destruction *prior to* reaching its endpoint of brain death. Another kind of physiologic disturbance that occurs in acute brain death is a generalized systemic inflammatory response.<sup>66</sup> This is not specific to brain death, however, as it occurs in serious brain injuries short of brain death and, like inflammatory responses in general, it is transient in patients who survive longer than a few days.<sup>67</sup>

Clearly many, if not most, of the physiologic instabilities that challenge the clinical management of brain-dead organ donors

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<sup>65</sup>Wijdicks, *Brain Death*, 111–24.

<sup>66</sup>Wijdicks, *Brain Death*, 113.

<sup>67</sup>H. Ormstad, H. C. Aass, N. Lund-Sørensen, K. F. Amthor, L. Sandvik, "Serum levels of cytokines and C-reactive protein in acute ischemic stroke patients, and their relationship to stroke lateralization, type, and infarct volume," *Journal of Neurology* 258, no. 4 (2011): 677–85; erratum 259, no. 2 (2012): 400. S. G. Rhind, N. T. Crnko, A. J. Baker, L. J. Morrison, P. N. Shek, S. Scarpelini, S. B. Rizoli, "Prehospital resuscitation with hypertonic saline-dextran modulates inflammatory, coagulation and endothelial activation marker profiles in severe traumatic brain injured patients," *Journal of Neuroinflammation* 7 (2010): 5. J. Rhodes, J. Sharkey, P. Andrews, "Serum IL-8 and MCP-1 concentration do not identify patients with enlarging contusions after traumatic brain injury," *The Journal of Trauma* 66, no. 6 (2009): 1591–7; discussion 1598.

result not from loss of brain-mediated integration but from direct or indirect damage to multiple vital organs. Even the generalized inflammatory response from exposure of damaged brain tissue to the immune system is due to reasons other than loss of brain-based integrative control over the immune system. These acute instabilities therefore cannot be cited as evidence that the mere lack of integrative brain functions *per se* is what makes some of these bodies literally dis-integrate. Moreover, the acute instabilities do not last forever in patients who are supported for prolonged periods of time. Many patients certainly do succumb early; but in those who survive more than a few days, the most serious systemic dysfunctions gradually self-resolve (medications to support blood pressure can be weaned off, gastrointestinal motility returns, etc.), again indicating that the dysfunctions were due to something other than the mere absence of brain-control.<sup>68</sup>

A meta-analysis of reported cases of brain death that survived one week or longer revealed that the potential for long-term survival correlated with two factors: age (longer survivals among younger patients, shorter among older patients) and etiology of the brain death (longer in primary brain pathology, shorter in multisystem damage)<sup>69</sup>—again indicating that the determinant of survival duration in the context of clinical brain death is the degree of integrity of the vital organs, not the mere loss of brain-based control over them. I have always maintained that there probably *are* cases of brain death in which integrative unity has been lost, and this is precisely why they deteriorate relentlessly to asystole regardless of the most aggressive therapeutic interventions. But such a clinical course is not *because* their brains are dead, but rather because their original injury caused supracritical multisystem damage (including to the brain).<sup>70</sup> In Wijdicks' own words:

The main objectives [in the medical support of brain-dead organ donors] remain the maintenance of oxygenation and circulation, control of polyuria, and control of hyperglycemia.

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<sup>68</sup>D. Alan Shewmon, "Chronic 'brain death': meta-analysis and conceptual consequences," *Neurology* 51, no. 6 (1998): 1538–45.

<sup>69</sup>*Ibid.*

<sup>70</sup>D. Alan Shewmon, "Mental disconnect," 292–333.

. . . The overriding principle is maintenance of normal or near-normal physiology. Therefore, several acute processes (i.e., pulmonary edema, hypovolemia) can and should be reversed.<sup>71</sup>

The fact that “normal or near-normal physiology” can be maintained by means of technological replacement of so few integrative functions indicates clearly that the missing integration is of the health-maintaining type, not constitutive of the organism’s vitality and unity.

## *2. The endocrine system*

Regarding the endocrine system, Tonti-Filippini’s portrayal of it as entirely brain-mediated is woefully inaccurate. What is generally called for convenience “the endocrine system” is actually not a single system but a set of relatively independent hormonal systems, only one of which is master-regulated by the brain’s hypothalamus. What follows is a brief overview of these systems.

### *a. The hypothalamic-pituitary axis*

The pituitary gland lies directly beneath the hypothalamus, to which it is connected by both a capillary vascular network and a thin stalk. The gland is composed of two main parts, distinct in both structure and embryologic origin. The hypothalamus governs the anterior part (including a rudimentary intermediate lobe) by secreting releasing and inhibiting hormones into the local capillary network; when these intermediary hormones reach the anterior pituitary, they act upon the glandular cells, which secrete their respective hormones into the systemic circulation. The posterior pituitary and connecting stalk are actually an extension of the hypothalamus itself; the axon terminals release their hormones directly into capillaries of the systemic circulation.

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<sup>71</sup>Wijdicks, *Brain Death*, 120.

The hormones released by the anterior pituitary under hypothalamic control are:

- Thyroid-stimulating hormone (TSH, thyrotropin)
- Adrenocorticotrophic hormone (ACTH, corticotropin)
- Growth hormone (GH, somatotropin)
- Gonadotropins (leuteinizing hormone and follicle-stimulating hormone)
- Prolactin
- Melanocyte-stimulating hormone
- Beta-endorphin

Those released by the posterior pituitary are:

- Antidiuretic hormone (ADH, vasopressin)
- Oxytocin

Studies of pituitary function in acute brain death have found that the anterior pituitary hormones and their target-gland hormones tend to be either normal or subnormal, but not totally deficient.<sup>72</sup> In fact, complete panhypopituitarism virtually never

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<sup>72</sup>K. Arita, T. Uozumi, S. Oki, M. Ohtani, T. Mikami, "The function of the hypothalamo-pituitary axis in brain dead patients," *Acta Neurochirurgica (Wien)* 123, nos. 1-2 (1993): 64-75. Hans-Joachim Gramm, Harald Meinhold, Ulrich Bickel, Jürgen Zimmermann, Birgit von Hammerstein, Frieder Keller, Rüdiger Dennhardt, and Karlheinz Voigt, "Acute endocrine failure after brain death?," *Transplantation* 54, no. 5 (1992): 851-57. G. M. Hall, K. Mashiter, Jean Lumley, J. G. Robson, "Hypothalamic-pituitary function in the 'brain-dead' patient (letter)," *Lancet* 2, no. 8206 (1980): 1259. Trevor A. Howlett, Anne M. Keogh, Les Perry, Richard Touzel, Lesley H. Rees, "Anterior and posterior pituitary function in brain-stem-dead donors. A possible role for hormonal replacement therapy," *Transplantation* 47, no. 5 (1989): 828-34. David J. Powner, Ann Hendrich, Regis G. Lagler, Ronald H. Ng, Robert L. Madden, "Hormonal changes in brain dead patients," *Critical Care Medicine* 18, no. 7 (1990): 702-8. H. Schrader, K. Krogness, A. Aakvaag, O. Sortland, K. Purvis, "Changes of pituitary hormones in brain death," *Acta Neurochirurgica (Wien)* 52, nos. 3-4 (1980): 239-48. T. Sugimoto, T. Sakano, Y. Kinoshita, M. Masui, T. Yoshioka, "Morphological and functional alterations of the hypothalamic-pituitary system in brain death with long-term bodily living," *Acta Neurochirurgica (Wien)* 115, nos. 1-2 (1992): 31-36. M. Szostek, Z. Gaciong, R. Danielewicz, B. Lagiewska, M. Pacholczyk, A. Chmura, I. Laskowski, J. Walaszewski, W. Rowinski, "Influence of thyroid function in brain

occurs in brain death. The type of thyroid dysfunction in acute brain death tends to be due not to TSH insufficiency but to the “sick euthyroid syndrome,”<sup>73</sup> which has nothing to do with hypothalamic regulation and occurs in a wide variety of severe systemic illnesses and even spinal cord injury.<sup>74</sup>

Posterior pituitary function is more often and more seriously affected in brain death. Antidiuretic hormone, as its name implies, acts on the kidneys to prevent diuresis (production of copious, dilute urine—a condition called diabetes insipidus); it also has a blood pressure raising effect (hence its alternate name, vasopressin). Untreated diabetes insipidus causes rapid dehydration and electrolyte disturbances. Studies of brain-dead patients report incidences of diabetes insipidus ranging from as low as 38%<sup>75</sup> or 41%<sup>76</sup> to as high as 88%<sup>77</sup>, with most reporting around two-thirds

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stem death donors on kidney allograft function,” *Transplantation Proceedings* 29, no. 8 (1997): 3354–6.

<sup>73</sup>Gramm et al., “Acute endocrine failure after brain death?”; Howlett et al., “Anterior and posterior pituitary function in brain-stem-dead donors”; Powner et al., “Hormonal changes in brain dead patients”; K. M. Robertson, I. M. Hramiak, and A. W. Gelb, “Endocrine changes and haemodynamic stability after brain death,” *Transplantation Proceedings* 21, no. 1, pt. 2 (1989): 1197–8.

<sup>74</sup>K. C. Loh, and P. C. T. Eng, “Prevalence and prognostic relevance of sick euthyroid syndrome in a medical intensive care unit,” *Annals, Academy of Medicine, Singapore* 24, no. 6 (1995): 802–6. Andrea L. Cheville and Steven C. Kirshblum, “Thyroid hormone changes in chronic spinal cord injury,” *Journal of Spinal Cord Medicine* 18, no. 4 (1995): 227–32. Inder J. Chopra, “Clinical review 86: Euthyroid sick syndrome: Is it a misnomer?,” *Journal of Clinical Endocrinology and Metabolism* 82, no. 2 (1997): 329–34.

<sup>75</sup>Debra H. Fiser, Jorge F. Jimenez, Vicki Wrape, and Robert Woody, “Diabetes insipidus in children with brain death,” *Critical Care Medicine* 15, no. 6 (1987): 551–53.

<sup>76</sup>Dusit Staworn, Laura Lewison, James Marks, Gary Turner, and Daniel Levin, “Brain death in pediatric intensive care unit patients: incidence, primary diagnosis, and the clinical occurrence of Turner’s triad,” *Critical Care Medicine* 22, no. 8 (1994): 1301–5.

<sup>77</sup>Kristan M. Outwater and Mark A. Rockoff, “Diabetes insipidus accompanying brain death in children,” *Neurology* 34, no. 9 (1984): 1243–6.

to three-fourths.<sup>78</sup> Diabetes insipidus is treated by administering vasopressin or a pharmacologic equivalent.

The basis for partially preserved hypothalamic-pituitary function in the context of brain death is believed to be the gland's dual arterial blood supply, from both intra- and extra-dural arteries. Even in the absence of intracranial blood flow, as revealed by standard radiographic techniques, there can be just sufficient flow from extradural sources to keep portions of the gland, and in some cases even small portions of the hypothalamus, viable and functioning.<sup>79</sup>

Tonti-Filippini maintains that the one-third to one-fourth of clinically diagnosed brain death cases *without* diabetes insipidus are *not true* brain death, because they retain a brain function: the secretion of ADH. But if Tonti-Filippini wants to be consistent with his insistence on absence of *all* brain functions for true brain death, he should insist on absence of *all* hypothalamic functions, manifested not only by diabetes insipidus but also by (1) cessation of all anterior pituitary hormones dependent upon hypothalamic releasing factors, (2) decreased though not absent levels of the anterior pituitary hormone dependent on both releasing and inhibiting factors (growth hormone), and (3) an increase in the one anterior pituitary hormone regulated primarily by a hypothalamic inhibiting factor (prolactin). Given what is known about endocrine functions in brain death, such a strict diagnostic requirement would eliminate virtually all brain death diagnoses.<sup>80</sup>

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<sup>78</sup>Gramm et al., "Acute endocrine failure after brain death"; Howlett et al., "Anterior and posterior pituitary function in brain-stem-dead donors"; Eelco F.M. Wijdicks, Alejandro A. Rabinstein, Edward M. Manno, John D. Atkinson, "Pronouncing brain death: Contemporary practice and safety of the apnea test," *Neurology* 71, no. 16 (2008): 1240–4.

<sup>79</sup>Arita et al., "The function of the hypothalamo-pituitary axis in brain dead patients"; Sugimoto et al., "Morphological and functional alterations of the hypothalamic-pituitary system in brain death with long-term bodily living"; William F. McCormick, and Nicholas S. Halmi, "The hypophysis in patients with coma dépassé ('respirator brain')," *American Journal of Clinical Pathology* 54 (September 1970): 374–83. Eelco F.M. Wijdicks, *Brain Death* 2nd ed. (Oxford: Oxford University Press, 2011), 113–15.

<sup>80</sup>Tonti-Filippini's insistence that loss of integrative unity "requires evidence of loss of *all* brain function" ("You Only Die Twice," 322) is illogical to begin with, given that most brain functions have nothing to do with somatic integration in the first place.

He criticizes as lax those diagnostic protocols that do not require demonstration of absent intracranial blood flow,<sup>81</sup> and proposes that “Catholic hospitals could insist that ancillary tests including brain perfusion tests be done standardly as part of diagnosing death by the brain criterion to establish greater certainty that loss of all function of the brain has indeed occurred.”<sup>82</sup> But the standard radiographic tests have never been validated as possessing sufficient sensitivity to distinguish, in every part of the brain, no flow from low flow that is barely adequate for tissue viability.<sup>83</sup> This lack of validation is particularly problematic around the hypothalamus, where there is good reason to believe that the tests do in fact lack sufficient sensitivity. Many of the reported cases with preserved pituitary function had the brain death diagnosis confirmed by blood flow tests showing intracranial circulatory arrest.<sup>84</sup> So even Tonti-Filippini’s proposal that blood-flow confirmation be required in all brain death diagnostic protocols will not guarantee that every part of the brain (or even every somatically relevant part) is dead.

The philosophically important question, however, is not whether the *presence* of some hypothalamic-pituitary function ought to *exclude* a diagnosis of death, but whether the *absence* of *all* hypothalamic-pituitary functions (even if that hypothetically occurred in clinical brain death) ought to *establish* a diagnosis of death in the context of no other brain functions. Just how important are those endocrine functions for somatic integrative unity? An examination of the above list of anterior and posterior pituitary hormones reveals that several are related to reproduction and lactation; one is related to growth. Only three are necessary for survival, in the sense that their end-organ function is necessary for survival:

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<sup>81</sup>Ibid.

<sup>82</sup>Ibid., 324.

<sup>83</sup>Wijdicks, *Brain Death*, 47–52, 168–70.

<sup>84</sup>Arita et al., 1993; Gramm et al., 1992; Powner et al., 1990; Schrader et al., 1980; Sugimoto et al., 1992.



- Thyroid-stimulating hormone (TSH, thyrotropin)
- Adrenocorticotrophic hormone (ACTH, corticotropin)
- Antidiuretic hormone (ADH, vasopressin)

The natural secretion of these hormones, however, is not strictly necessary for survival, because their function (or target-gland function) can be substituted pharmacologically (and commonly is in clinical practice). Patients with pituitary failure secondary to hypothalamic lesions are typically treated with some form of thyroxine, cortisol, and vasopressin, and they do just fine. The substitutability indicates that these three integrative neuroendocrine functions are of the health-maintaining, not constitutive type.

A more obvious reason to conclude this is the fact that it takes days to weeks to die from untreated lack of those hormones: the patient does not instantly begin to “dis-integrate.” For obvious ethical reasons, we have no systematic data regarding the latency to death following sudden elimination of any of those three hormones. Cumulative clinical experience, however, allows us to speculate reasonably that death from cessation of ADH would likely occur in a matter of days due to dehydration and electrolyte imbalance, death from cessation of ACTH would likely occur in a matter of weeks from adrenal insufficiency, and death from cessation of TSH would likely occur in a matter of weeks to months from thyroid insufficiency.

In a word: The brain-mediated endocrine integrative functions are of the health-maintaining, not constitutive type.

#### *b. Non-hypothalamic-pituitary endocrine systems*

Tonti-Filippini asserts that a person without brain function lacks “a unified endocrine system,”<sup>85</sup> one implication being that persons *with* brain function *possess* “a unified endocrine system.” This is not true, because in reality there is no “unified endocrine system,” but rather multiple systems of mutually interacting hormones, these systems being relatively independent of one another. Consequently Tonti-Filippini’s assertion that “the brain . . . mediates . . . the

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<sup>85</sup>“You Only Die Twice,” 319.

endocrine system”<sup>86</sup> is doubly false, both because there is no such thing as “*the* endocrine system” and because only one of the multiple endocrine systems is brain-mediated. I shall now give some important examples of integrative endocrine functions that have no direct relationship to the hypothalamic-pituitary axis.

Probably the most widely known is based in the digestive system. Insulin, produced by the exocrine pancreas, has an important role in glucose uptake by cells throughout the body and in the balance between carbohydrate and lipid sources of biochemical energy. Other digestive-system-produced hormones that play a role in the assimilation of nutrients throughout the body and in metabolism include somatostatin, secretin, cholecystokinin, insulin-like growth factor, glucagon, pancreatic polypeptide, ghrelin, and vasoactive intestinal peptide. The latter has been described as the messenger in a “neuroimmune axis.”<sup>87</sup>

A hormonal feedback loop important for blood pressure and blood volume regulation is the renin-angiotensin-aldosterone axis, involving kidneys, liver, lungs and adrenal glands. A hormone with the opposite effect on blood pressure and volume is atrial natriuretic peptide, which is produced by cells in the atria of the heart and acts on the kidneys, blood vessel walls, and on the rest of the heart; it also increases the release of free fatty acids from adipose tissue.

The adrenal medulla secretes the “stress hormones” adrenaline (epinephrine) and noradrenaline (norepinephrine) in response to signals from preganglionic sympathetic fibers originating in the spinal cord. In fact, this core of the adrenal gland is actually a ganglion of the sympathetic nervous system itself, releasing its neurotransmitters directly into the bloodstream rather than into a synapse with another neuron. Many types of physiological stresses activate the release of these hormones, which produce essentially the same effects on target cells as direct sympathetic nervous stimulation, such as increased heart rate and blood pressure, vascular constriction in the skin and gastrointestinal tract, dilation of bronchioles, and increased metabolism. It is likely

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<sup>86</sup>Ibid., 318.

<sup>87</sup>G. D. Wenger, M. S. O’Dorisio, E. J. Goetzl, “Vasoactive intestinal peptide: messenger in a neuroimmune axis,” *Annals of the New York Academy of Sciences* 594 (1990): 104–19.

that the hormonal and vascular stress responses to unanesthetized organ retrieval in brain-dead donors are mediated by the spinal cord, spinal sympathetics, and adrenal medulla,<sup>88</sup> just as occurs in surgical operations on high spinal cord injury victims despite their lack of subjective perception of pain below the level of the spinal lesion.<sup>89</sup>

The liver and kidneys produce thrombopoietin, which regulates the production of platelets by the bone marrow. The kidneys also produce erythropoietin, which stimulates the formation of red blood cells in the marrow. Calcium homeostasis is maintained by interactions between the parathyroid glands (parathyroid hormone), the thyroid (calcitonin), skin (cholecalciferol), bone, liver and kidneys. Adipose tissue secretes leptin, adiponectin and resistin, which affect energy metabolism.

The above list of non-brain-regulated integrative hormones is already several times larger than the brain-regulated list, and it is far from complete. There are also the cytokines, small proteins secreted by numerous kinds of cells and used extensively in intercellular communication. Beyond their local immunomodulating actions, they exert systemic effects. As more is learned about them, the definitional boundary between cytokines and hormones is becoming increasingly blurred.

It is clear that *all* endocrine-mediated integration, whether by the hypothalamic-pituitary axis or non-brain-related hormonal subsystems, is of the health-maintaining type. Every hormone is either pharmacologically substitutable or simply unnecessary for life, even if it may be necessary for optimal health. (After all, the

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<sup>88</sup>Fitzgerald et al.; Gramm et al.; Pennefather et al.; Wetzel et al.; op. cit.

<sup>89</sup>Andrei Krassioukov, Darren E. Warburton, Robert Teasell, Janice J. Eng, Spinal Cord Injury Rehabilitation Evidence Research Team, "A systematic review of the management of autonomic dysreflexia after spinal cord injury," *Archives of Physical Medicine and Rehabilitation* 90, no. 4 (2009): 682–95. Kyung Y. Yoo, Cheol W. Jeong, Seok J. Kim, Seong T. Jeong, Woong M. Kim, Hyung K. Lee, Kyung J. Oh, Jong Un Lee, Min H. Shin, Sung S. Chung, "Remifentanyl decreases sevoflurane requirements to block autonomic hyperreflexia during transurethral litholapaxy in patients with high complete spinal cord injury," *Anesthesia and Analgesia* 112, no. 1 (2011): 191–97. Subramanian Vaidyanathan, Bakul Soni, Fahed Selmi, Gurpreet Singh, Cristian Esanu, Peter Hughes, Tun Oo, Kamesh Pulya, "Are urological procedures in tetraplegic patients safely performed without anesthesia? A report of three cases," *Patient Safety in Surgery* 6, no. 1 (2012): 3.

heart, lungs, gut, and kidneys are themselves all substitutable and not strictly necessary for life, so *a fortiori* neither are their related hormones.<sup>90</sup>) Need any more be said about the necessity of brain function for “a unified endocrine system” and the constitutive necessity of the latter for a unified living organism?

*B. The true sine qua non for somatic integration is circulation,  
not the brain*

Tonti-Filippini chides me for failing “to take into account the intercommunicative meaning of the body as an integrated whole,” because I have allegedly discounted the two systems which he claims “unify the body by communicating with and between all parts of the body.”<sup>91</sup> But the nervous system actually does *not* reach all parts of the body (e.g., bone marrow and blood), and the hypothalamic-pituitary axis certainly does *not* communicate “with and between all parts of the body.” But if the brain is not the *sine qua non* for somatic integration, what is?

Inexplicably, Tonti-Filippini dismisses circulation from his scheme of bodily integration, apart from being a vehicle to distribute brain-regulated hormones. In reality, however, circulation, unlike the influence of the brain, *does* reach essentially everywhere, and the few structures without capillaries communicate with the nearest capillaries by diffusion. This is not merely the transference of information “between *some* parts of the

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<sup>90</sup>If we accept that an irreversibly comatose human is a living human being so long as the body is a living organism, the question arises: how much of that body can be replaced by artificial organs, limbs, etc. before it ceases to be an organism (since we cannot rely on consciousness to constitute organism status, as with the brain-in-a-vat, or brain-in-a-cyborg)? I do not pretend to know the answer, and I doubt that a philosophy of “organism” has been sufficiently developed to provide a framework for a reasoned answer. Fortunately, we need not know the answer in order to validly address our main question: whether a body without brain function, but otherwise intact, is an organism.

<sup>91</sup>“You Only Die Twice,” 315.

body”<sup>92</sup> or “merely between one part of the body and another,”<sup>93</sup> but it precisely fulfills Tonti-Filippini’s own litmus test of communication “with and between all parts of the body.”<sup>94</sup>

Circulation, in fact, provides the means of the intercellular communication involved in *homeostasis*, an organism’s tendency to maintain a stable internal equilibrium in the face of external changes. The term “homeostasis” can refer to the maintenance of a particular component within a physiologic range or to the stability of an organism’s internal environment as a whole. The anti-entropic processes at the basis of life depend on the homeostasis of literally thousands, perhaps tens of thousands, of interacting biochemical components, ranging in complexity from simple ions to enzymes and even more complex molecules like large glycoproteins. Circulation connects all the parts of the body in a way that allows them to cooperate in this immensely complex dynamic. It distributes oxygen and nutrients everywhere for energy production (necessary for opposition to entropy) and removes carbon dioxide and other cellular wastes resulting from that energy production and the orderly turnover of cellular components. It allows myriad interacting biochemical feedback systems to maintain countless organic compounds within their respective physiological ranges. The importance of the relatively few hormones for bodily integration pales drastically in comparison. Moreover, in contrast to neural and hormonal integration, the anti-entropic homeostasis mediated by circulating blood is of the *constitutive* type: it is absolutely non-substitutable.

### C. Structural-functional level of integration in brain death

It bears stressing that circulation is not mere heart function (which is eminently substitutable), but is a much more fundamental system for mediating anti-entropic homeostasis. But is circulation therefore anything more than a necessary condition of organism-

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<sup>92</sup>Ibid., 315.

<sup>93</sup>Ibid., 319.

<sup>94</sup>Ibid., 315.

level integration?<sup>95</sup> What structural-functional *level* of life is constituted by the anti-entropic interactions via the circulation, in the absence of all brain function?

In effect, defenders of the somatic integration rationale make the following claim about brain death. Loss of a particular form of health-maintaining or survival-promoting integration (i.e., brain-mediated), they claim, causes a drop in the structural-functional level on which constitutive integration occurs: a drop from the organism-level to the organ-level. What looks like a whole human body holding itself together as an organism through the medium of the circulatory system is actually just a man-shaped bag of interacting organs lacking any real organismic status at all.

Consider Tonti-Filippini's assertion that "what remains possesses only the non-integrated life of the individual organs, rather than the life of the body as an integrated whole."<sup>96</sup> Bernat has asserted that "[t]he cardiac arrest patient with whole brain destruction is simply a preparation of unintegrated individual subsystems, since the organism as a whole has ceased functioning."<sup>97</sup> Some participants in the 2006 conference of the Pontifical Academy of Sciences expressed the same idea with great rhetorical flair. Robert Daroff, for example, described a brain-dead body as nothing more than "a ventilator [keeping] a heart beating in a corpse."<sup>98</sup> Bernat, after citing the examples of a human cell kept alive in a culture medium and an artificially perfused kidney or liver, agreed with Daroff, stating that "having a heart perfusing blood to a series of organs mechanically supported is really not materially different than either of those examples and does not necessarily prove that that preparation in question is a living human being."<sup>99</sup> Wijdicks and Bernat described a brain-dead body as "a

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<sup>95</sup>For organisms that normally possess circulation—obviously circulationless organisms like zygotes or plants are not under discussion.

<sup>96</sup>*Ibid.*, 310.

<sup>97</sup>Bernat, "The definition, criterion, and statute of death," 48.

<sup>98</sup>Sánchez Sorondo, *The Signs of Death*, LXXII, 275.

<sup>99</sup>*Ibid.*, LXXIII, 275.

magnificent cell culture.”<sup>100</sup> Joseph Masdeu even likened it to an amputated finger perfused in a flask.<sup>101</sup>

The confidence of such assertions about the structural-functional level of integration is unwarranted given that we lack any operational definition or methodology for measuring or otherwise assessing it. An empirically sensitive approach to the question must be indirect, because no measurement scale or methodology exists.

### *1. Criteria for determining the structural-functional level of integration*

Accept for the sake of argument that integration occurs along a continuum of degrees, even if we don't know how to measure it; let us represent that continuum by a horizontal line segment. The left extreme represents what everyone accepts as a healthy organism-as-a-whole, and the right extreme represents what everyone accepts as a decaying corpse. Starting at the left extreme, the further to the right we go, the less healthy the organism is, until we cross a dividing line between moribund organism and non-organism.<sup>102</sup> It is a sharp dividing line, even if we don't know where to place it, because the concepts “unity” and “organism as a whole” are necessarily all-or-none. Because this cannot be measured by a quantitative methodology, we cannot say where that dividing line is or exactly where entity X lies along the continuum. It suffices, however, to know merely what side of the dividing line X is on.

In 2001 I proposed two criteria for determining just that.<sup>103</sup> So far no one has seriously challenged them, and I believe they are just as valid now as 11 years ago. They are:

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<sup>100</sup>Ibid., LXXIII, 276.

<sup>101</sup>Ibid., 146.

<sup>102</sup>For the sake of simplicity I have described the continuum as one-dimensional with a dividing “line” somewhere along it (mathematically, it would actually be a dividing point). The reality is surely much more complex, with degrees of integration being fully representable only in a multidimensional space, in which case our concern would be to determine on which side of the multidimensional boundary separating “organism as a whole” from “non-organism” X lies.

<sup>103</sup>D. Alan Shewmon, “The brain and somatic integration,” 457–78.

Criterion 1. “Integrative unity” is possessed by a putative organism (i.e., it really *is* an organism) *if it possesses at least one emergent, holistic-level property*. A property of a composite is defined as “emergent” if it derives from the mutual interaction of the parts,<sup>104</sup> and as “holistic” if it is not predicable of any part or subset of parts but only of the entire composite.

Criterion 2. Any body requiring *less* technological assistance to maintain its vital functions than some other similar body that is nevertheless a living whole must possess at least as much integration and hence also be a living whole. Thus, if A has more integration than reference entity B, and B is on the “whole” side of the dividing line, then A is necessarily also on the “whole” side of the dividing line.

Tonti-Filippini does not seem to take issue with either of these criteria, but with my application of them to the facts about brain-dead bodies.

## *2. Application of the criteria to brain-dead bodies*

Regarding Criterion 1, in that same 2001 article I compared litanies of brain-mediated and non-brain-mediated somatically integrative functions. Tonti-Filippini objects to my inclusion of teleological wound healing in the non-brain-mediated list on the grounds that it is a local rather than holistic phenomenon, involving “only parts rather than the whole.”<sup>105</sup> Others have also made the same kind of

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<sup>104</sup>The term “emergent property” is chosen for its familiarity within the scientific community, prescinding however from possible reductionistic philosophical overtones (for example, one would have to explain carefully what is meant by “derives” in my definition of emergence). Let us accept, for the sake of argument, the ontological premise that “wholes” larger than quarks do exist and that living organisms are in fact “wholes.”

<sup>105</sup>“You Only Die Twice,” 319.



objection to healing as an example of a holistic property.<sup>106</sup> My position does not depend on defending wound healing as a holistic property; it was just one of many examples of what seemed to me in 2001 to be holistic properties that are not brain-mediated and that occur in brain-dead bodies that survive longer than a few days. Tonti-Filippini omits mention of any of the others, apart from homeostasis.

The complete 2001 litany of holistic properties, however, sufficiently impressed the President's Council on Bioethics that they quoted it essentially verbatim in their white paper as "Table 2: Physiological Evidence of 'Somatic Integration,'"<sup>107</sup> and it is worth quoting again here for the readers of *Communio*:

- Homeostasis of a countless variety of mutually interacting chemicals, macromolecules and physiological parameters, through the functions especially of liver, kidneys, cardiovascular and endocrine systems, but also of other organs and tissues (e.g., intestines, bone and skin in calcium metabolism; cardiac atrial natriuretic factor affecting the renal secretion of renin, which regulates blood pressure by acting on vascular smooth muscle; etc.);
- Elimination, detoxification and recycling of cellular wastes throughout the body;
- Energy balance, involving interactions among liver, endocrine systems, muscle and fat;
- Maintenance of body temperature (albeit at a lower than normal level and with the help of blankets);
- Wound healing, capacity for which is diffuse throughout the body and which involves organism-level, teleological interaction among blood cells,

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<sup>106</sup>Sánchez Sorondo, *The Signs of Death*, XXXV (Estol), XXXVI (Bernat), XXXVII (Masdeu), XXXIX (Tandon, Rossini, agreeing with Estol).

<sup>107</sup>President's Council on Bioethics, 56.

capillary endothelium, soft tissues, bone marrow, vasoactive peptides, clotting and clot lysing factors (maintained by the liver, vascular endothelium and circulating leucocytes in a delicate balance of synthesis and degradation), etc.;

- Fighting of infections and foreign bodies through interactions among the immune system, lymphatics, bone marrow, and microvasculature;
- Development of a febrile response to infection;
- Cardiovascular and hormonal stress responses to unanesthetized incision for organ retrieval;
- Successful gestation of a fetus in a [brain-dead] pregnant woman;
- Sexual maturation of a [brain-dead] child;
- Proportional growth of a [brain-dead] child.

The Council then comments:

If being alive as a biological organism requires being a whole that is more than the mere sum of its parts, then it would be difficult to deny that the body of a patient with total brain failure can still be alive, at least in some cases.<sup>108</sup>

Not quoted by the Council but in my 2001 paper are the following additional examples of holistic functioning in those rare cases of chronic brain death where there was some motivation to maintain them for long periods of time:

- resuscitability and stabilizability following cardiac arrest, and ability to bounce back from episodes of

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<sup>108</sup>President's Council on Bioethics, 57.

hypotension, aspiration, sepsis and other serious systemic setbacks;

- spontaneous improvement in general health . . . , i.e., the gradual stabilizing of cardiovascular status so that initially required pressor drugs can be successfully withdrawn, the gradual return of gastrointestinal motility so that initially required parenteral fluids and nutrition can be successfully switched to the enteral route via gastrostomy, etc.;
- the ability to maintain fluid and electrolyte balance in the absence of diabetes insipidus, or even in its presence but with no or rare monitoring of serum electrolytes and no or rare adjustments in administered fluids and hormonal replacement therapy;
- the overall ability to survive with little medical intervention (although with much basic nursing care) in a nursing facility or even at home, after discharge from an intensive care unit.

Someone might take issue with one or more of these examples, as Tonti-Filippini did with wound healing. I am by no means wedded to every single one of them and am quite ready to relinquish any that can be proved to be not truly holistic after all. But the Council is surely correct to state that “it would be difficult to deny” that this list contains *at least one* legitimate example of a holistic property, especially homeostasis—and Criterion 1 requires only one such property, because if there is even *just one* holistic property, there must be a whole of which it is the property.

Moreover, the last four examples emphasize how some brain-dead bodies are actually more physiologically stable and integrated than many moribund, comatose, ventilator-dependent non-brain-dead ICU patients with multisystem failure and an inexorable downhill course, whom everyone considers still alive despite their inability to maintain their tenuous integrated wholeness for much longer, thereby fulfilling Criterion 2.

Tonti-Filippini admits being “troubled” by the example of homeostasis,<sup>109</sup> and rightly so, because in his own words, “[h]omeostasis would seem to involve the transfer of information in a way that keeps what is left of the body functioning as a single dynamic unit. Thus one might conclude that it is evidence that the body is being maintained as a single functioning being with the parts in a functioning relationship to one another.”<sup>110</sup> But he resolves that concern by begging the question. Rather than recognizing that homeostasis constitutes “evidence that the body is being maintained as a single functioning being with the parts in a functioning relationship to one another,”<sup>111</sup> he gives unquestioning logical priority to his assumption that the brain simply *has to be* the master integrator of the body, and concludes that *therefore* in the absence of brain-based integration “the remaining integration can only be partial.”<sup>112</sup>

#### IV. Conclusion: What does the Church really teach?

The foregoing discussion has revealed the total absence of any compelling philosophical or scientific reason to interpret brain-mediated somatic integration as constitutive of the human organism; to the contrary, all the evidence positively points to the conclusion that brain-mediated somatic integration maintains the organism’s health or promotes its survival, but does not constitute it as a living whole in the first place. By the same token, there is absolutely no compelling philosophical or scientific reason to suppose that brain death, however total and irreversible, is *ipso facto* the death of a human being as such.

Of course, even if Tonti-Filippini accepted these findings, he might still claim that Catholics are bound to embrace the somatic integration rationale for brain death on *religious* grounds. In fact, he repeatedly makes statements to the effect that “the Church

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<sup>109</sup>“You Only Die Twice,” 319.

<sup>110</sup>Ibid.

<sup>111</sup>Ibid.

<sup>112</sup>Ibid.

holds that death can be diagnosed on the basis of evidence that shows a complete loss of brain function, but may not be diagnosed if there is still some function,”<sup>113</sup> and “the determination that a person has died when they suffer complete loss of brain function was readily accepted by the Catholic Church in the 1980s.”<sup>114</sup> But is Tonti-Filippini right about the Church’s “acceptance” of the somatic integration version of the brain death criterion?

#### A. Concept, criteria, and tests for death

Brain death is a complex topic spanning several hierarchical levels of discussion. To hold a position at one level does not necessarily entail or imply holding a position at every other level. The tripartite scheme introduced by Bernat and colleagues in 1981 is still helpful for maintaining clear thinking about the diagnosis of death: namely, the distinction between concept, criterion, and tests for death.<sup>115</sup>

The *concept* or definition of death (in general or specifically of humans) is a philosophical matter; examples of candidate death-concepts include departure of the soul, loss of integrative unity of the organism, loss of personhood, and arbitrary stipulation by society. The *criterion* of death is the physiological event(s) taken to be a sign of death as defined at the concept-level. The *tests* for death (sometimes called diagnostic “criteria,” resulting in semantic confusion with “criteria” in the above sense) establish whether a criterion for death has been fulfilled in an actual individual case.

Every criterion of death presupposes, then, a concept of death. From this point of view, it falls directly under the competence of the Church’s Magisterium. But every criterion of death also presupposes particular judgments about the physical tokens indicating that death, as so defined, has in fact occurred. This aspect of the criterion does not fall under the competence of the Magisterium, as Pope Pius XII himself said in his address to anesthesiologists on 24 November 1957: “Where the verification of

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<sup>113</sup>Ibid., 324.

<sup>114</sup>Ibid., 312.

<sup>115</sup>James L. Bernat, Charles M. Culver, Bernard Gert, “On the definition and criterion of death,” *Annals of Internal Medicine* 94, no. 3 (1981): 389–94.

the fact [of death] in particular cases is concerned, the answer cannot be deduced from any religious and moral principle, and, under this aspect, does not fall within the competence of the Church.”<sup>116</sup>

According to Pius XII, then, the Church tells us *what* death is, but does not pre-empt our judgment *that* it has occurred in a given case (except insofar as our factual judgment is compromised by a false concept of death that is incompatible with Catholic teaching). Tonti-Filippini’s failure to grasp this crucial distinction underlies his charge that, in challenging the reigning brain death orthodoxy, I also challenge the Magisterium. In reality, however, it is Tonti-Filippini, not I, who misunderstands what the Church really obliges us to believe about brain death, as I will now show.

### *1. The Church’s view on the concept of death*

Does the Church have a view on the concept of death? A cornerstone of that view, as Tonti-Filippini rightly points out, is the 1312 Council of Vienne’s declaration that “the rational or intellectual soul is . . . of itself and essentially the form of the human body.” This doctrine remains official Catholic teaching, as articulated in the second edition of the *Catechism of the Catholic Church*, no. 365:

The unity of soul and body is so profound that one has to consider the soul to be the “form” of the body [citing here the Council of Vienne]: i.e., it is because of its spiritual soul that the body made of matter becomes a living, human body; spirit and matter, in man, are not two natures united, but rather their union forms a single nature.<sup>117</sup>

In his address to the Transplantation Society on 29 August 2000, John Paul II applied that understanding of soul to the basic concept of death:

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<sup>116</sup>Pius XII, “Answers to Question 3” in the Address to an International Congress of Anesthesiologists” (Rome, 24 November 1957), [http://www.lifeissues.net/writers/doc/doc\\_31resuscitation.html](http://www.lifeissues.net/writers/doc/doc_31resuscitation.html), accessed 21 October 2012.

<sup>117</sup>*Catechism of the Catholic Church*, no. 365.

[T]he death of the person is a single event, consisting in the total disintegration of that unitary and integrated whole that is the personal self. It results from the separation of the life-principle (or soul) from the corporal reality of the person.<sup>118</sup>

## *2. The Church's view on the criterion of death*

Does the Church have a view on the criterion of death? Yes and no. Yes, as far as the conceptual aspect is concerned; no, in that the conceptual aspect informs, but does not pre-empt, judgments as to which particular physiological phenomena are sufficient indicators of death as defined on the concept-level. Let me explain by way of a comparison of two classically competing versions of the neurological criterion: the so-called “higher brain” versus the “whole brain” criterion.

### *a. The concept behind the criterion*

“Higher brain” advocates, whom Tonti-Filippini labels “mentalists,” defend the neurological criterion for death on the dual conceptual-physiological grounds that (1) the concept of personhood entails at least a natural potential for mental activity, if not actual mental activity, and (2) human mental activity requires brain function; therefore, destruction or irreversible nonfunction of the brain results in cessation of the person whose brain it was (i.e., death of that person). A consequence of this so-called “higher brain death” criterion is that only those parts of the brain involved in consciousness need be irreversibly nonfunctional for the death-concept to be fulfilled.

Although to my knowledge the Church has not explicitly addressed this criterion, its implicit opinion logically follows from its understanding of the nature of the human soul and the soul's relationship to the body. If the Church were to say anything at all about this criterion, it would have to say that the criterion's core

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<sup>118</sup>John Paul II, Address to the 18th International Congress of the Transplantation Society, 4.

*concept of human personhood* (expressed in #1 of the preceding paragraph) is inadequate, insofar as (a) human personhood derives from the spiritual dimension of the human soul, transcending actual or potential mental activity, and (b) if some pathology of the organ(s) of the internal senses were to impede all intellectual and volitional functions of the human soul, even permanently, the soul would still be present as the substantial form of the body so long as the body remained an integrated, unified organism.

This is clear from the words of John Paul II on 20 March 2004, to the participants of an international congress on the vegetative state:

The person in a vegetative state, in fact, shows no evident sign of self-awareness or of awareness of the environment, and seems unable to interact with others or to react to specific stimuli. . . . Faced with patients in similar clinical conditions, there are some who cast doubt on the persistence of the “human quality” itself. . . . In opposition to such trends of thought, I feel the duty to reaffirm strongly that the intrinsic value and personal dignity of every human being do not change, no matter what the concrete circumstances of his or her life. *A man, even if seriously ill or disabled in the exercise of his highest functions, is and always will be a man, and he will never become a “vegetable” or an “animal.”* Even our brothers and sisters who find themselves in the clinical condition of a “vegetative state” retain their human dignity in all its fullness.<sup>119</sup>

Thus the Church would have every right to repudiate the higher-brain-death criterion as incompatible with its concept of human life and death. Could the Church have anything directly to say about the *anatomical-physiological aspects* of the higher-brain-death criterion (#2 above)? In other words, would it be within the Church’s competence to declare that the organ underlying mental functioning is this or that part of the brain, or the entire brain, or the fluid in the cerebral ventricles (as believed by Augustine on the

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<sup>119</sup>John Paul II, Address to the Participants in the International Congress on “Life-Sustaining Treatments and Vegetative State: Scientific Advances and Ethical Dilemmas” (Rome, 20 March 2004), [http://www.vatican.va/holy\\_father/john\\_paul\\_ii/speeches/2004/march/documents/hf\\_jp-ii\\_spe\\_20040320\\_congress-fiamc\\_en.html](http://www.vatican.va/holy_father/john_paul_ii/speeches/2004/march/documents/hf_jp-ii_spe_20040320_congress-fiamc_en.html), accessed 21 October 2012.



testimony of the physicians of his time), or perhaps the heart (as many also believed in antiquity)? Clearly not. That remains within the sphere of biologists and medical experts to determine through empirical investigation, though of course they always in fact sight and sift the evidence through the filter of some philosophy that *does* fall more directly under the Church's competence.

We now apply this line of reasoning to the orthodox "whole brain" criterion, which is based on the dual conceptual-physiological grounds that (1) death is the cessation of integrative unity of an organism, and (2) for humans and higher animals, the brain is the master organ that integrates all the parts of the body. Accordingly, without brain function the body literally "dis-integrates" into a collection of organs and tissues; it is no longer a living organism.

John Paul II, in his address to the Transplantation Society, after reiterating the Church's concept of death (already quoted above), explicitly stated that the *concept of death* at the core of this criterion (#1 above) is indeed *compatible* with the Church's understanding of the human soul as the substantial form of the body:

[T]he criterion adopted in more recent times for ascertaining the fact of death, namely the complete and irreversible cessation of all brain activity, if rigorously applied, does not seem to conflict with the essential elements of a sound anthropology.<sup>120</sup>

Had the conceptual component of the criterion been anything other than the integrative unity of the human organism, it would surely have "seemed" to him to conflict with a sound anthropology.

Clearly, what John Paul II cared most about here, and had the competence to say something about, is whether the death-concept underlying this version of the neurological criterion conflicts or not "with the essential elements of a sound anthropology." Note, however, that the Pope refrained from fully mobilizing this competence. He was not making a definitive magisterial pronouncement that the whole-brain criterion is compatible with a "sound anthropology," but only advancing a

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<sup>120</sup>John Paul II, "Address to the 18th International Congress of the Transplantation Society," 5.

more tentative claim that such a compatibility “*seems*” to exist. I will return to this point below.

*b. The empirical aspects of the criterion*

What about the *anatomical-physiological* evidence cited in favor of the whole-brain criterion? In his address to the Transplantation Society, John Paul II appeared to place acceptance (or rejection) of it in the same category as particular judgments regarding the factual verification of death, judgments that Church teaching informs, but does not pre-empt:

It is a well-known fact that for some time certain scientific approaches to ascertaining death have shifted the emphasis from the traditional cardio-respiratory signs to the so-called “*neurological*” *criterion*. Specifically, this consists in establishing, according to clearly determined parameters commonly held by the international scientific community, the complete and irreversible cessation of all brain activity (in the cerebrum, cerebellum and brain stem). This is then considered the sign that the individual organism has lost its integrative capacity. With regard to the parameters used today for ascertaining death—whether the “encephalic” signs or the more traditional cardio-respiratory signs—the Church does not make technical decisions. She limits herself to the Gospel duty of comparing the data offered by medical science with the Christian understanding of the unity of the person, bringing out the similarities and the possible conflicts capable of endangering respect for human dignity.<sup>121</sup> (emphasis in original)

Note that John Paul II was speaking of what he called “scientific” approaches to death, and that the “clearly determined parameters” he referred to are those “commonly held by the international scientific community,” not those dictated by magisterial pronouncements. The Pope, then, was merely registering the fact that the “international scientific community” considers the neurological criterion to be “the sign that the individual organism has lost its integrative capacity.” What attitude,

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<sup>121</sup>Ibid.

then, did the Pope expect the believer to adopt with respect to the scientific consensus he describes?

First of all, echoing his predecessor Pius XII to the effect that “the verification of the fact [of death] in particular cases . . . does not fall within the competence of the Church,”<sup>122</sup> John Paul II explicitly reiterated that “the Church does not make technical decisions” regarding the physiological “parameters” for ascertaining death. And, as if the Church’s role in this matter were not already clear enough, he explained that the Church “limits herself to the Gospel duty of comparing *the data offered by medical science* with the Christian understanding of the unity of the person, bringing out the similarities and the possible conflicts capable of endangering respect for human dignity” (emphasis added).

Thus, while John Paul II implicitly claimed in this text direct magisterial competence over the question of whether the neurological criterion is *conceptually compatible* “with the essential elements of a sound anthropology,” he did *not* claim direct magisterial competence over assessment of the technical empirical arguments for (or against) the claim that the brain is the coordinating agent of somatic integration, or that its death is therefore the death of the human person. Why not? Clearly, because he was willing to give the scientific consensus on brain death a certain credit: just enough to allow further discussion of the subject, but without either declaring the whole-brain criterion to be a necessary implication of the Church’s “sound anthropology,” or even that the whole-brain criterion *is* conceptually sound, but only that it *seems* to be at the present time.

Clearly, John Paul II did not officially declare that a scientist, even a believing one, must be convinced by the physiological evidence adduced in favor of the somatic integration rationale for brain death. But then my scientific critique of that evidence, though certainly a challenge to the consensus of the “international scientific community,” is not at all a challenge to magisterially defined Catholic orthodoxy. A defense of brain death based, say, on mind-personhood and mind-brain reductionism clearly contradicts the “view of the Church,” but my rejection of the somatic integration rationale for brain death just as clearly does *not*.

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<sup>122</sup>Pius XII, Address to an International Congress of Anesthesiologists.

*B. An evolving position*

*1. The Pontifical Academy of Sciences 2005 conference*

In his address to the Transplantation Society, John Paul II's understanding of what the "international scientific community" holds was no doubt based in large part on the conclusions of the two sessions of the Pontifical Academy of Sciences devoted to the topic of brain death in 1985 and 1989<sup>123</sup> and the 1997–98 Task Force on Brain Death of the Pontifical Academy for Life, the unpublished papers from which were forwarded to the Congregation for the Doctrine of the Faith. Indeed, we have to wonder whether the information made available to the Holy Father on this subject included the published surveys of healthcare professionals regarding their understanding of brain death. Although the great majority of medical professionals accept that irreversible nonfunction of the entire brain is death, one third to one half of them think so for reasons quite opposed to what the Holy Father considered "sound anthropology."<sup>124</sup> The consensus of the scientific community is "superficial and fragile" indeed.<sup>125</sup>

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<sup>123</sup>C. Chagas, ed., *Working Group on the Artificial Prolongation of Life and the Determination of the Exact Moment of Death. October 19-21 1985* (Vatican City: Pontifical Academy of Sciences, 1986). R. J. White, H. Angstwurm, I. Carrasco de Paula, eds., *Working Group on the Determination of Brain Death and its Relationship to Human Death. 10-14 December 1989* (Vatican City: Pontifical Academy of Sciences, 1992).

<sup>124</sup>Stuart J. Youngner, C. Seth Landefeld, Claudia J. Coulton, Barbara W. Juknialis, Mark Leary, "'Brain death' and organ retrieval. A cross-sectional survey of knowledge and concepts among health professionals," *Journal of the American Medical Association* 261, no. 15 (1989): 2205–10. Ari R. Joffe, N. Anton, "Brain death: understanding of the conceptual basis by pediatric intensivists in Canada," *Archives of Pediatric and Adolescent Medicine* 160, no. 7 (2006): 747–52. Ari R. Joffe, N. Anton, V. Mehta, "A survey to determine the understanding of the conceptual basis and diagnostic tests used for brain death by neurosurgeons in Canada," *Neurosurgery* 61, no. 5 (2007): 1039–45, discussion 1046–7. Ari R. Joffe, N. R. Anton, J. P. Duff, A. Decaen, "A survey of American neurologists about brain death: understanding the conceptual basis and diagnostic tests for brain death," *Annals of Intensive Care* 2, no. 1 (2012): 4.

<sup>125</sup>Stuart J. Youngner, "Defining death. A superficial and fragile consensus," *Archives of Neurology* 49, no. 5 (1992): 570–72.

Nevertheless, the Pope clearly understood the dynamic, evolving nature of scientific inquiry, and he by no means intended his address to the Transplantation Society as a veto on all further philosophical debate or scientific investigation regarding the physiological basis of somatic integration. In fact, it was he himself who, five years later in response to the increasing critiques of mainstream brain death theory, requested the Pontifical Academy of Sciences to sponsor yet a third conference on this topic, with the express purpose of hearing the other side of the scientific debate.<sup>126</sup> This interdisciplinary conference, entitled “The Signs of Death,” took place on 3–4 February 2005, with the preponderance of participants arguing that the irreversible loss of brain function per se does *not* entail loss of bodily integrative unity and hence death. Being too ill to grant a personal audience, the Holy Father sent a letter to the participants dated 1 February 2005, which was read in his absence. In it he expressed gratitude and encouragement for their ongoing study of this important scientific question. He once again reiterated the perspective of “Christian anthropology,” that “the moment of death for each person consists in the definitive loss of the constitutive unity of body and spirit.” He went on to state:

4. . . . From the *clinical* point of view, however, *the only correct way—and also the only possible way*—to address the problem of ascertaining the death of a human being is by devoting attention and *research* to the individuation of adequate “signs of death,” *known through their physical manifestation* in the individual subject.

This is evidently a topic of fundamental importance, for which *the well-considered and rigorous position of science must therefore be listened to in the first instance*, as Pius XII taught when he declared that “it is for the doctor to give a clear and precise definition of ‘death’ and of the ‘moment of death’ of a patient who lapses into a state of unconsciousness.” [citing Pius XII’s 1957 address to anesthesiologists]

5. *Building upon the data supplied by science*, anthropological considerations and ethical reflection have the duty to put forward an equally rigorous analysis, listening attentively to the Church’s Magisterium.

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<sup>126</sup>Sánchez Sorondo, *The Signs of Death*, XIX.

*I wish to assure you that your efforts are laudable and will certainly be of assistance to the competent Dicasteries of the Apostolic See—especially the Congregation for the Doctrine of the Faith—which will not fail to ponder the results of your reflection. . . .*

*In exhorting you to persevere in this joint commitment to pursue the genuine good of man, I invoke the Lord's copious gifts of light upon you and your research, as a pledge of which I affectionately impart my Blessing to you all.*<sup>127</sup>

These are hardly the words of a pontiff who considered his 2000 address to represent a definitive Magisterial validation of the scientific assumptions underlying the neurological criterion, such that any Catholic who would dare to challenge the physiological notion that the brain is the master integrator-organ of the body would make himself *ipso facto* a heretic!

## *2. The Pontifical Academy of Sciences 2006 conference*

Without mentioning this 2005 conference at all, Tonti-Filippini speaks of the Pontifical Academy of Sciences' subsequent conference on brain death almost in the same breath as the perspective of "the Church." This fourth conference, under the same title "The Signs of Death," took place 11–12 September 2006. What transpired between the two conferences and afterwards will supply abundant material for Church historians researching the kinds of intrigues and politicking that can take place within the walls of the Vatican. This is not the place to enter into such details; interested readers can get the gist from a web-based article by Mercedes Arzu Wilson, who co-organized the 2005 conference with the Pontifical Academy.<sup>128</sup> For the purpose here of correcting

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<sup>127</sup>John Paul II, Letter to the Pontifical Academy of Sciences (1 February 2005), [http://www.vatican.va/holy\\_father/john\\_paul\\_ii/speeches/2005/february/documents/hf\\_jp-ii\\_spe\\_20050201\\_p-acad-sciences\\_en.html](http://www.vatican.va/holy_father/john_paul_ii/speeches/2005/february/documents/hf_jp-ii_spe_20050201_p-acad-sciences_en.html), accessed 21 October 2012. Emphasis added.

<sup>128</sup>Mercedes Arzu Wilson, "Save The 'Brain Dead' Victims," [http://www.lifeissues.net/writers/wils/wils\\_03braindeath.html](http://www.lifeissues.net/writers/wils/wils_03braindeath.html), accessed 21 October 2012.

Tonti-Filippini's view of "the Church's view" on brain death, it suffices to mention the following:

- The Academy's promise to publish the proceedings of the 2005 conference—as with the 1985, 1989, and soon-to-be 2006 conferences—was rescinded.
- Almost as soon as the 2005 conference had ended, the Academy began plans for another conference the following year on the same topic, with the same name. Such further exploration of the scientific developments related to determining the moment of death was encouraged by Pope Benedict XVI.
- The selected participants of the fourth conference were mostly world-famous neurologists or neuroscientists, chosen for their prestige in their respective areas of research, even though in some cases the area of expertise and list of publications had nothing to do with the topic of brain death. There was no requirement that participants share the "Christian anthropology" which John Paul II declared to be the philosophical basis for any valid criterion of death.
- The only participants known to be critical of the neurological criterion, namely myself and philosopher Robert Spaemann, were invited at the last minute at the express request of the secretary to Benedict XVI. Unable to physically attend, I was graciously allowed to submit a paper and to comment on the transcript of the discussion.
- The proceedings of the conference were published in March 2007 in a large (552-page) monograph of the same title, "The Signs of Death" (*Scripta Varia*, 110). Eventually this publication became freely available

over the Academy's web site.<sup>129</sup> Although the introductory chapter, "The Purpose of the Meeting," mentions the 2005 conference (p. XIX), many of the chapters surprisingly have nothing to do with the debate whether and why brain death is death, and many of the challenges to brain death orthodoxy raised at the 2005 conference went virtually unaddressed in the transcribed discussions.

- Receiving pride of place at the beginning of the publication is a "Statement by Neurologists and Others," entitled "Why the Concept of Brain Death is Valid as a Definition of Death" (pp. XXI–XXIX). Remarkably, in the course of its nine pages, the 28 signatories repeatedly assert in various ways that brain death is death, but contrary to the title utterly fail to explain "*why*" it should be death itself as opposed to an irreversible, deep coma in a moribund patient.
- Soon after the conference the Academy's web site featured a separate document consisting of the statement "Why the Concept of Brain Death is Valid as a Definition of Death" plus a "Response to the Statement and Comments of Prof. Spaemann and Dr. Shewmon," without inclusion, for the benefit of the reader, of our statement and comments being responded to. The document included translations into German, Italian, Spanish, and French.<sup>130</sup> (Sometime after 1 February 2012, the Academy changed its web site's URL and did a major makeover

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<sup>129</sup>Currently <http://www.casinapioiv.va/content/accademia/en/publications/script varia/signsofdeath.html>, accessed 21 October 2012.

<sup>130</sup>A. Battro, J.L. Bernat, M.-G. Bousser, et al., "Why the Concept of Brain Death Is Valid as a Definition of Death. Statement by Neurologists and Others"; A. Battro, J.L. Bernat, M.-G. Bousser, et al., "Response to the Statement and Comments of Prof. Spaemann and Dr. Shewmon," <http://www.casinapioiv.va/content/accademia/en/publications/extraseries/braindeath.html>, accessed 21 October 2012.



of its contents. On the new web site, translations of the document include only Italian and Spanish.<sup>131)</sup>

- Up until sometime in 2012, on the Academy's web site, under "Publications," the link to "The Signs of Death" monograph did not simply read, "*The Signs of Death* [PDF]. Working Group 11–12 September 2006. . . ." The link text continues, "Including the Statement on *Why the Concept of Brain Death is Valid as a Definition of Death* [PDF]."<sup>132)</sup> (On its new web site the link to that Statement is still present but formatted quite differently.<sup>133)</sup>
- On the Academy's previous web site, under "Activities," the 2006 conference on "The Signs of Death" is listed, but the 2005 conference is nowhere to be found, although the conference listings give an impression of completeness all the way back to 1998.<sup>134)</sup> (On its current web site the 2005 conference is mentioned, but only toward the end of a long text about the 2006 conference.<sup>135)</sup> That text is a reproduction of the monograph's introductory chapter, "The Purpose of the Meeting" (pp. XVI–XX). In it the 2005 conference is described as a "preliminary meeting" (p. XIX). The chronology of the Academy's "Events" still does not include the 2005 conference.<sup>136)</sup>

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<sup>131</sup>Ibid.

<sup>132</sup>Ibid.

<sup>133</sup><http://www.casinapioiv.va/content/accademia/en/publications/scriptavaria/signsofdeath.html>, accessed 21 October 2012.

<sup>134</sup>[http://www.vatican.va/roman\\_curia/pontifical\\_academies/adscien/own/documents/pasactivities.html](http://www.vatican.va/roman_curia/pontifical_academies/adscien/own/documents/pasactivities.html), accessed 1 February 2012.

<sup>135</sup><http://www.casinapioiv.va/content/accademia/en/events/2006/signsofdeath.html>, accessed 21 October 2012.

<sup>136</sup><http://www.casinapioiv.va/content/accademia/en/events.html>, accessed 21 October 2012.

- Out of frustration with the suppression of the 2005 conference, many of its participants departed from protocol and published their presentations independently in a book entitled *Finis Vitae*, edited by Roberto de Mattei, vice-president of the National Research Council of Italy and member of the Italian National Committee on Bio-Ethics. The book came out in early 2007 in both English and Italian.<sup>137</sup> A revised edition was published in 2009 by the Life Guardian Foundation.<sup>138</sup>

The Pontifical Academy of Sciences seems to have gone out of its way to create the impression of an official Vatican position that “Brain Death is Valid as a Definition of Death.” And Tonti-Filippini seems to have bought into it, citing the Academy’s 2006 conference along with American and Australian Bishops Conferences in support of his version of “the view of the Church.”<sup>139</sup> Nevertheless, the very first words of the Academy’s monograph “The Signs of Death,” on the copyright page, are:

The opinions expressed with absolute freedom during the presentation of the papers of this meeting, although published by the Academy, represent only the points of view of the participants and not those of the Academy.<sup>140</sup>

And, one might add, *a fortiori*, “not those of the” Church.

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<sup>137</sup>Roberto de Mattei, ed., *Finis Vitae. Is Brain Death Still Life?* (Rome: Edizioni Consiglio Nazionale delle Ricerche, Rubbettino Editore, 2006). Translated into Italian as *Finis Vitae: La Morte Cerebrale È Ancora Vita?* (Roma: Edizioni Consiglio Nazionale delle Ricerche, Rubbettino Editore, 2007).

<sup>138</sup>Roberto de Mattei and Paul A. Byrne, eds., *Finis Vitae. “Brain Death” Is NOT True Death* (Oregon, OH: The Life Guardian Foundation, 2009).

<sup>139</sup>“You Only Die Twice,” 315–17.

<sup>140</sup>The Academy’s current web page about the monograph also contains the statement, “The reader should note that the views expressed in the papers, the statement, and elsewhere, are those of the respective signatories and not necessarily those of the Pontifical Academy of Sciences.” <http://www.casinapio iv.va/content/accademia/en/publications/scriptavaria/signsofdeath.html>, accessed 21 October 2012.

### 3. *The Pontifical Academy for Life 2008 conference*

In November 2008 the Pontifical Academy for Life co-sponsored a conference on organ transplantation, at which Benedict XVI addressed the participants. There was much expectancy regarding what he would have to say about the death of organ donors diagnosed by the neurological criterion, in light of his predecessor's 2000 address and the tensions surrounding the 2005 and 2006 conferences of the Pontifical Academy of Sciences. Sandro Magister, a leading Italian journalist and expert on the Vatican, went so far as to write that "pressure was applied" to Benedict XVI to attempt to force him to confirm brain death as a valid criterion.<sup>141</sup> In that context, the complete silence of the Holy Father regarding the neurological criterion, all the while reasserting the Church's perennial insistence that donors of vital organs be dead, spoke volumes regarding "the Church's view" on brain death:

It is helpful to remember, however, that the individual vital organs cannot be extracted except *ex cadavere*, which, moreover, possesses its own dignity that must be respected. In these years science has accomplished further progress in certifying the death of the patient. It is good, therefore, that the results attained receive the consent of the entire scientific community in order to further research for solutions that give certainty to all. In an area such as this, in fact, there cannot be the slightest suspicion of [arbitrariness] and where certainty has not been attained the principle of precaution must prevail. This is why it is useful to promote research and interdisciplinary reflection to place public opinion before the most transparent truth on the anthropological, social, ethical and juridical implications of the practice of transplantation.

However, in these cases the principal [criterion] of respect for the life of the [donor] must always prevail so that the extraction

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<sup>141</sup>Hilary White, "Vatican in 'firestorm' over brain death criteria for organ transplants," <http://www.lifesitenews.com/news/archive/ldn/1981/dec/8112408>, accessed 21 October 2012. Sandro Magister, "Transplants and brain death. 'L'Osservatore Romano' has broken the taboo," 21 October 2012, <http://chiesa.espresso.repubblica.it/articolo/206476?eng=y>.

of organs be performed only in the case of his/her true death (cf. *Compendium of the Catechism of the Catholic Church*, no. 476).<sup>142</sup>

Thus, when John Paul II stated that the neurological criterion “does not *seem* to conflict with the essential elements of a sound anthropology” (emphasis added), he meant exactly what he said, leaving open the possibility that new evidence from medical science or new lines of reasoning might then make the neurological criterion in fact “conflict with the essential elements of a sound anthropology.” Benedict XVI takes a similar line. He obviously intends to take no stand on the empirical aspects of the death-criterion and to wait patiently for the international medical community to continue its investigations and debates until reaching a true consensus on how to establish in clinical practice that “the total disintegration of that unitary and integrated whole that is the personal self”<sup>143</sup> has taken place.

### *C. What the Church really teaches*

Contrary to the statements of Tonti-Filippini regarding the Church’s view on the criterion of death, quoted at the beginning of this section, the Church’s actual view can be summarized as: (1) “The death of the person is a single event, consisting in the total disintegration of that unitary and integrated whole that is the personal self. It results from the separation of the life-principle (or soul) from the corporal reality of the person.”<sup>144</sup> And (2) the means to determine clinically that this has taken place is a matter for

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<sup>142</sup>Benedict XVI, Address to Participants at an International Congress Organized by the Pontifical Academy for Life (Rome, 7 November 2008), [http://www.vatican.va/holy\\_father/benedict\\_xvi/speeches/2008/november/documents/hf\\_ben-xvi\\_spe\\_20081107\\_acdlife\\_en.html](http://www.vatican.va/holy_father/benedict_xvi/speeches/2008/november/documents/hf_ben-xvi_spe_20081107_acdlife_en.html), accessed 21 October 2012. The English translation on the official Vatican web site has the following words in place of those between brackets: “arbitration,” “criteria,” and “donator.”

<sup>143</sup>John Paul II, Address to the 18th International Congress of the Transplantation Society, 4.

<sup>144</sup>*Ibid.*

medical experts to discover and refine and “does not fall within the competence of the Church.”<sup>145</sup>

But this is not all. In his encyclical *Evangelium Vitae*, John Paul II warns:

Nor can we remain silent in the face of other more furtive, but no less serious and real, forms of euthanasia. These could occur for example when, in order to increase the availability of organs for transplants, organs are removed without respecting objective and adequate criteria which verify the death of the donor.<sup>146</sup>

John Paul’s admonition alludes first and foremost to physicians who cut diagnostic corners in ascertaining death. But no less importantly it applies to advocates of transplantation who cut intellectual corners in promoting a criterion of death: philosophers, theologians, bioethicists, neurologists and intensive care physicians who believe so strongly in the good of transplantation that their desire for brain death to be death takes precedence (whether consciously or subconsciously) over philosophical and scientific rigor. Many statutory laws and diagnostic protocols require that the physician(s) declaring brain death not be part of the transplant team, to avoid a conflict of interest. Brain death apologists often assert an analogous separation between the theoretical underpinnings of brain death and the motivation to facilitate transplantation, as though the collective efforts over the years to justify the neurological criterion and to reconcile it with Catholic anthropology would have been just as intense if transplantation never existed. Perhaps in the days of the 1968 Harvard Committee, legitimizing the withdrawal of life support was one of the motivations behind redefining death neurologically.<sup>147</sup> But that is

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<sup>145</sup>Pius XII, Address to an International Congress of Anesthesiologists.

<sup>146</sup>John Paul II, *Evangelium Vitae*, 15, [http://www.vatican.va/holy\\_father/john\\_paul\\_ii/encyclicals/documents/hf\\_jp-ii\\_enc\\_25031995\\_evangelium-vitae\\_en.html](http://www.vatican.va/holy_father/john_paul_ii/encyclicals/documents/hf_jp-ii_enc_25031995_evangelium-vitae_en.html), accessed 21 October 2012.

<sup>147</sup>Henry K. Beecher, Raymond D. Adams, Clifford Barger, William J. Curran, Derek Denny-Brown, Dana L. Farnsworth, Jordi Folch-Pi, Everett I. Mendelsohn, John P. Merrill, Joseph Murray, Ralph Potter, Robert Schwab, William Sweet, “A definition of irreversible coma. Report of the Ad Hoc Committee of the Harvard Medical School to Examine the Definition of Brain

no longer the case, and it is fair to say that for the last two or three decades the only *raison d'être* for a neurological criterion of death is to justify transplantation of vital organs.

One need not be a transplant surgeon to be a transplant enthusiast. An increase in organ and tissue transplants is the explicit motivation behind proposed protocol modifications to speed up the diagnosis of brain death (e.g., eliminating the requirement of a second examination and of ancillary tests).<sup>148</sup> In Wijdicks' recent book *Brain Death*, an entire chapter is devoted to organ procurement.<sup>149</sup> Although he states that "[t]he main purpose of establishing the clinical diagnosis of brain death is to bring closure," he proceeds immediately to add, "The next step is to activate the process of asking consent of the next of kin to donate organs and tissue."<sup>150</sup>—as though the diagnosis of brain death and the obtaining of organs and tissue were intrinsically linked "steps" in a single clinical process.

Catholic institutions and health care professionals involved in transplantation have a very highly vested interest in brain death being death. Ethical self-justification provides a strong temptation to grasp at every argument and pseudo-argument in favor of brain death being death within the Catholic anthropological framework, and to downplay, side-step, misrepresent, ignore, or "not understand" the arguments of brain death critics.<sup>151</sup> Benedict XVI has reemphasized the importance of certainty in this area, *but notably without any reference to the neurological criterion as possessing the morally*

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Death," *Journal of the American Medical Association* 205, no. 6 (1968): 337–40.

<sup>148</sup>D. Lustbader, D. O'Hara, E. F. M. Wijdicks, L. MacLean, W. Tajik, A. Ying, E. Berg, M. Goldstein, "Second brain death examination may negatively affect organ donation," *Neurology* 76, no. 2 (2011): 119–24. J. J. Egea-Guerrero, J. Revuelto-Rey, N. Latronico, F. A. Rasulo, E. F. Wijdicks, "The case against confirmatory tests for determining brain death in adults," *Neurology* 76, no. 5 (2011): 489; author reply 489–90.

<sup>149</sup>Wijdicks, *Brain Death*, 97–148.

<sup>150</sup>*Ibid.*, 27.

<sup>151</sup>I do not mean to imply that all defenders of brain death subordinate philosophical and scientific rigor to political expediency, but I have personally encountered all these aberrations in the course of my involvement in the brain death debate over the years, particularly within Catholic circles.

*requisite certainty, which may be read as a silent correction of the tentative openness shown in his predecessor's address to the Transplantation Society.*<sup>152</sup> It is worth quoting the relevant passage again:

It is helpful to remember, however, that the individual vital organs cannot be extracted except *ex cadavere*. . . . In an area such as this, in fact, there cannot be the slightest suspicion of [arbitrariness] and where certainty has not been attained the principle of precaution must prevail. . . . However, in these cases the principal [criterion] of respect for the life of the [donor] must always prevail so that the extraction of organs be performed only in the case of his/her true death.<sup>153</sup>

Given the current status of the brain death debate within expert circles, it is at least fair to say that “certainty” of the validity of the neurologic criterion “has not been attained.” Therefore, “the principle of precaution must prevail,” i.e., when in doubt, always err on the side of assuming life. The burden of proof continues to lie squarely with those who claim that brain function is necessary for bodily integration.

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<sup>152</sup>The tentativeness of John Paul II's own judgment in this matter should be kept in mind in considering his assertion that “the criterion adopted in more recent times for ascertaining the fact of death, namely the complete and irreversible cessation of all brain activity, if rigorously applied, does not seem to conflict with the essential elements of a sound anthropology. Therefore a health-worker professionally responsible for ascertaining death can use these criteria in each individual case as the basis for arriving at that degree of assurance in ethical judgment which moral teaching describes as ‘moral certainty.’ This moral certainty is considered the necessary and sufficient basis for an ethically correct course of action. Only where such certainty exists, and where informed consent has already been given by the donor or the donor's legitimate representatives, is it morally right to initiate the technical procedures required for the removal of organs for transplant (Address to the Transplantation Society, 5).” Would he have still said that today, after having read all the intervening critical literature, including this article? Even before his death, the fact that he encouraged the Pontifical Academy of Sciences to revisit the topic in 2005 to hear the “other side” of the debate indicated his openness to the possibility of new data impacting the assessment of moral certainty.

<sup>153</sup>Benedict XVI, Address to Participants at an International Congress Organized by the Pontifical Academy for Life (Rome, 7 November 2008).

*D. A new mentalism?*

Tonti-Filippini's accusation that I am in conflict with Church teaching about death relies, then, not only on a mischaracterization of my position, but also on a mischaracterization of Church teaching itself. In point of fact, the Magisterium does not formally oblige us to hold that the brain is the master organ of somatic integration, or that its death is therefore the death of the human being as such. Nor does the hylemorphism espoused by Boethius, Aquinas, and the Council of Vienne entail any such claim.<sup>154</sup>

This is not all. If total brain death is not the death of the human organism *tout court*, then Tonti-Filippini's defense of the whole brain criterion actually leaves him open to the very "two-deaths" theory he wishes to refute. Ironically, the title he has chosen for his article turns out to be as much an expression of the unconscious implications of his own position—"you only die twice"—as it is of the explicit claims of the "mentalist" theory he wishes to rebut.

Rather than defeating "mentalism," then, Tonti-Filippini merely replaces it with a "cerebrism" that repeats its fatal flaw in another, less obvious form. Could it be that Tonti-Filippini fails to notice his ironic embrace of a "new mentalism" because his impeccably orthodox *profession* of hylemorphism conceals a less-than-orthodox, because less-than-impeccable, *understanding* of hylemorphism? Isn't Tonti-Filippini's defense of brain death in fact governed by the very picture of the brain I described earlier, i.e., as a kind of computer electro-chemically transmitting the instructions of the psychic "software" to the rest of the body? But then which of us, Tonti-Filippini or myself, needs to justify his position before the bar

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<sup>154</sup>If anything, Aristotelian-Thomist hylemorphism actually invites us to adopt a healthy skepticism in this matter, lest we allow the sweeping claims about the brain currently fashionable in the "international scientific community" to betray us into unconsciously imagining it as the organ of ensoulment, or even as a material stand-in for the soul itself. If, in fact, the brain were a *Doppelgänger* isomorphically mimicking or doubling the soul (but without its formal causality), why would we need a soul in the first place, since the brain would suffice to do all its work? Even more disturbingly: Why would we need a *body*—except, perhaps, as the (dispensable) organic support of the brain's otherwise self-contained activity?



of Aquinas and the Council of Vienne? I think the answer is clear:  
The *onus probandi* lies squarely on the shoulders of my critic. □

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