



RESPONSE

TOTAL BRAIN DEATH: A REPLY TO ALAN SHEWMON

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Keywords

brain death,
animal,
sentience,
radical capacity

ABSTRACT

D. Alan Shewmon has advanced a well-documented challenge to the widely accepted total brain death criterion for death of the human being. We show that Shewmon’s argument against this criterion is unsound, though he does refute the standard argument for that criterion. We advance a distinct argument for the total brain death criterion and answer likely objections. Since human beings are rational animals – sentient organisms of a specific type – the loss of the radical capacity for sentience (the capacity to sense or to develop the capacity to sense) involves a substantial change, the passing away of the human organism. In human beings total brain death involves the complete loss of the radical capacity for sentience, and so in human beings total brain death is death.

Total brain death is usually understood as the complete and irreversible cessation of functioning of all parts of the brain. Thus understood, it has been widely accepted in ethics and law as a valid criterion for pronouncing the death of a human being. But in well-documented articles and lectures, D. Alan Shewmon has challenged that view. Although he accepts one premise of the usual argument for the total brain death criterion – namely, that the termination of the integrated functioning of the organism as a whole is death – he denies that total brain death always brings about the termination of the integrated functioning of the organism as a whole.

We think that total brain death is a valid criterion for pronouncing the death of a human being but that Shewmon has shown the unsoundness of the usual argument for the criterion.¹ We will begin by summarizing

¹ Shewmon also raises serious questions regarding the reliability of the standard tests for total brain death – an issue we do not address here. See, for example: D. Alan Shewmon. Recovery from ‘Brain Death’: A Neurologist’s Apologia. *Linacre Quarterly* 1997; 64: 39–40; James J. Hughes. 2004. The Death of Death. In *Brain Death and Disorders of Consciousness*. Calixto Machado and D. Alan Shewmon, eds. New York: Kluwer Academic /Plenum Publishers: 79–88; Cicero Galli Coimbra. Implications of Ischemic Penumbra for the Diagnosis of Brain Death. *Braz J Med Biol Res* 1999; 32: 1479–1487. Available at: <http://www.unifesp.br/dneuro/brdeath.html> [Accessed 15 May 2010]. For a general discussion of some of the complications involved in the clinical tests. see Calixto Machado. 2007. *Brain Death: A Reappraisal*. New York: Springer Science: 88–131.

Shewmon’s case against the criterion. We will then show why that case is unsound, even though it rebuts the standard argument for the total brain death criterion, and we will propose our own argument for the criterion. Finally, we will reply to some objections to our argument.

1. SHEWMON’S CRITIQUE OF THE TOTAL BRAIN DEATH CRITERION

The usual argument for the total brain death criterion has been that, once a human individual’s brain has developed, it is the primary integrator of all the body’s tissues and organs into a single organism. It seems to follow that, when all parts of the brain irreversibly cease to function, what remains is no longer a single organism, but an aggregate of human tissues and organs – though some or even many items in that aggregate may continue, for a time, functioning and interacting. Shewmon advances two arguments against the total brain death criterion.

First, he presents as counter-examples cases of totally brain dead individuals who apparently survived for some time. When brain death is diagnosed, life-sustaining treatment is generally withdrawn.² Sometimes, however, it is continued, and Shewmon provides evidence that

² Shewmon’s point is not that life-sustaining treatment ought to be continued. Rather, he holds that total brain death makes it

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seems to show that some individuals then survive total brain death. In such cases, there are many functions that seem to belong to the individual as a whole. Among others, Shewmon lists homeostasis of a variety of mutually interacting chemicals, macromolecules and physiological parameters (especially through the functioning of the liver, kidneys, cardiovascular and endocrine systems, but also of other organs and tissues); 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); wound healing; appropriate defensive reactions against infections and foreign bodies (through interactions among the immune system, lymphatics, bone marrow, and microvasculature); and, of course, respiration and nutrition, which, though assisted, are functions of the organism.³ Shewmon describes an individual called 'TK' who continued to manifest all those functions for more than twenty years, even as total brain death was confirmed by repeated clinical tests, EEG's, multimodality evoked potentials, and MRI angiograms.⁴ In 2006, TK was finally pronounced dead, and those who performed an autopsy on TK's brain reported that all its parts had been completely destroyed.⁵

In a presentation to the President's Council on Bioethics, Shewmon described two other totally brain dead individuals – one surviving a little over a year and the other more than seven years – that also seemed to manifest holistic functions. Such cases, Shewmon argues, show that these individuals were not mere aggregates of tissues and cells but organisms, human beings who had survived brain death.⁶ In an earlier article, Shewmon presented a meta-analysis that included more than 150 cases of individuals manifesting organismic unity despite such 'chronic brain death.'⁷ Shewmon maintained that such

unreasonable to continue life-sustaining treatment, but that its continuation sometimes shows that an individual can survive despite total brain death.

³ D. Alan Shewmon. *The Brain and Somatic Integration: Insights Into the Standard Biological Rationale for Equating 'Brain Death' with Death.* *J Med Philos* 2001; 26: 457–478, at 467–468.

⁴ D. Alan Shewmon. 'Brainstem Death,' 'Brain Death' and Death: a Critical Re-Evaluation of the Purported Equivalence. *Issues Law Med* 1998; 14: 125–145; D. Alan Shewmon. Chronic 'brain death': Meta-analysis and Conceptual Consequences. *Neurology* 1998; 51: 1538–1545.

⁵ Susan Repertinger et al. Long Survival Following Bacterial Meningitis-Associated Brain Destruction. *J Child Neurol* 2006; 21: 591–595, at 595.

⁶ A transcript of the presentation is available at: <http://bioethics.georgetown.edu/pcbe/transcripts/nov07/session5.html> [Accessed 15 May 2010].

⁷ Shewmon 1998b, *op. cit.* note 4. Also see Shewmon 1998a, *op. cit.* note 4.

cases seem infrequent only because there is seldom an attempt to sustain brain dead individuals.⁸

Second, Shewmon argues that totally brain dead individuals are in important respects similar to people who have suffered high cervical cord transection. In neither case does the brain perform any integrative function for the rest of the body – in total brain death, because the brain is not functioning; in high spinal cord transection, because the brain and the rest of the body are isolated from each other. But individuals with high spinal cord transection are living human beings. While they need assistance for respiration and nutrition, they not only can have normal mental functioning but their bodies continue functioning as integrated wholes, rather than becoming a mass of disintegrating organs and tissues. Shewmon concludes that, although totally brain dead individuals are not conscious, they too are living human beings.⁹

Shewmon argues that, contrary to what has been widely assumed, the brain is not the integrator of the various systems of the body, but is the modulator of an integrated somatic unit that brain functions presuppose.¹⁰ Shewmon holds that the unity of the human organism is not brought about by the brain or any other single organ. He points out that other organs, such as the spinal cord and endocrine glands, have specific integrative functions for the organism as a whole. It is a mistake to regard the brain as the 'integrator'. Rather, the integration of the bodily parts into a single organism is 'an inherently non-localizable, holistic feature involving the mutual interaction among all the parts'.¹¹

2. TOTAL BRAIN DEATH IS THE DEATH OF A HUMAN BEING

Those who suppose that brain functioning is required for the integrated functioning of the organism as a whole have usually assumed that nothing more than an aggregate of disintegrating organs and tissues survives an individual's total brain death. We think that Shewmon has disproved that assumption by showing that TK and similar individuals are living individuals. However, it does not follow that the living individual after total brain death is the individual who suffered brain death. Nor

⁸ Shewmon 1998a, *op. cit.* note 4, p. 1542.

⁹ Shewmon adds that, if one imagines the patient has also received a vagotomy (a severing of the vagus nerve), the analogy would be complete, and would still apply. Presentation to the President's Council on Bioethics, Nov. 7, 2008, at: <http://bioethics.georgetown.edu/pcbe/transcripts/nov07/session5.html> [Accessed 15 May 2010]; D. Alan Shewmon. 2006. 'Brain Body' Disconnection: Implications for the Theoretical Basis of 'Brain Death'. In *Finis Vitae: Is Brain Death Still Life?* Roberto de Mattei, ed. Rome: Consiglio Nazionale delle Ricerche: 211–250, at 236.

¹⁰ Shewmon 2001, *op. cit.* note 3, pp. 460 ff.

¹¹ *Ibid.*: 457.

does it follow that the living individual after brain death is a whole human organism – that is, a rational animal. We hold that in the case of TK and others like it, what is alive after total brain death is neither the individual whose brain died nor a *whole* member of the human species. Like others who share our view, we think that a thought-experiment about decapitation can help to show its truth. However, we think that others have not effectively used that thought-experiment.

Suppose a human being, John, is decapitated and that both the head and the decapitated body are kept alive (fatal bleeding is prevented, a heart-lung machine is provided for the head, ventilator support is provided for the decapitated body, and so forth). Since the living head and the living headless body would not be identical with each other, only one, if either, of them could be identical with John. Some have thought that it is obvious that the headless body would not be a human being, and that brain death is analogous to such decapitation (since in both cases the brain cannot integrate the body), and so, like the decapitated body, the brain dead body is dead.¹² But Shewmon correctly points out that it is only obvious that the head and the headless body could not *both* be identical to the human being who was decapitated.¹³ It is not obvious that the headless body would not be a human organism. However, what exactly is the relationship between John and that headless body?

Shewmon considers several possibilities, without himself adopting any of them.¹⁴ One possibility he considers is that the head and the headless body, though physically separated, might remain *parts* of one human organism.¹⁵ This is plausible because each of these parts came from John and in one sense is rightly called ‘John’s’. One can imagine a future in which decapitation is part of a procedure in ‘total body renovation’, that is, decapitation, repairing a person’s body, and then rejoining the body to the head. However, despite the plausibility of Shewmon’s suggestion that the head and the body are parts of a single organism, we reject it. Once the two are

separated, they can no longer affect one another, cannot interact, and thus cannot be parts of a single organism. After decapitation, the head and the headless body are ‘John’s’ head and body only in the sense that they came from him, not in the sense that they are now parts of him. Similarly, if a man receives a kidney from his father, for the rest of his life he can rightly say that he has his father’s kidney, but this is true only in the sense that the kidney came from his father. When the kidney was removed from his father, it ceased to be part of him.

Suppose that eventually it becomes possible to salvage everything from the waist down of a youthful accident victim and to sustain that living unit for weeks pending transplantation to a suitable recipient. Suppose, too, that pending transplantation, such units manifest some internal organization – some organic unity arising from the interaction of their parts (even if this supposition is physically impossible, it will be helpful to consider the hypothetical case).¹⁶ The waist-down unit would be human in the sense that all of its cells would have the human genome, and they would constitute tissues and interact as human cells do. However, it would not be a whole human organism; it would not be a rational animal. In fact, it would not even be an animal – that is, a sentient organism. By contrast, if someone in an accident survived despite eventually losing everything below the heart and lungs, that individual would remain a rational animal and a human person, even though severely disabled by lacking legs and genitals, and being dependent on artificial feeding. But the decapitated body and the totally brain dead individual are similar to the waist-down unit rather than to the individual who has lost everything below the heart and lungs, because the headless body and the brain-dead individual are no longer sentient organisms. Neither of them is an animal, and so neither can be a human being.

On what basis do we say that the living individual after brain death (for example, the totally brain dead TK described by Shewmon) is similar to a sustained torso and thus not a human being? Our answer, briefly stated, is this: Since a human being is a rational animal, anything that entirely lacks the capacity for rational functioning is not a human being. Since rational functioning in an animal presupposes sentient functioning, anything that entirely lacks the capacity for sentient functioning also lacks the capacity for rational functioning and so is not a human being. Since the human being is a mammal, a brain, or the capacity to develop a brain, is necessary for

¹² For example: James L. Bernat. 2001. Philosophical and Ethical Aspects of Brain Death. In *Brain Death*. Eelco F. M. Widjicks, ed. Philadelphia. Lippicott Williams and Wilkins: 171.

¹³ Shewmon discusses decapitation scenarios in: The Metaphysics of Brain Death, Persistent Vegetative State, and Dementia. *The Thomist* 1985; 49: 24–80. Note that in this article in *The Thomist*, Shewmon defends the total brain death criterion but in later articles he rejects it. See also: Shewmon 1997, *op. cit.* note 1; Shewmon 2006, *op. cit.* note 9.

¹⁴ Shewmon 2006, *op. cit.* note 9, pp. 244–245. After discussing the thought experiment, Shewmon indicates his own current agnosticism about the identity of the head and headless body (that is, which one, if either, is identical to John?). But he does not think this inability to determine where John is in this situation is a point against his view of brain death. We think that thought-experiments are a helpful heuristic device to introduce our main argument, which, however, does not depend on them.

¹⁵ Shewmon 2006, *op. cit.* note 9, pp. 244–245.

¹⁶ Mouse limbs detached from whole mice have been kept alive for prolonged periods in cultures (as part of an experiment to determine the specific effects of the cell adhesion molecule n-cadherin in embryogenesis). Such mouse limbs are not mice, but they do have some internal organization. See: Yang Luo et al. N-Cadherin Is Not Essential for Limb Mesenchymal Chondrogenesis. *Developmental Dynamics* 2005; 232: 336–344.

its capacity for sentient functioning.¹⁷ Therefore, any entity that entirely lacks a brain and the capacity to develop a brain is not a human being. That brief answer may be clarified by the following considerations.

In daily life we recognize beings of distinct types, centers of specific types of actions and reactions, and we treat each type of being according to its nature. Thus, we deal with a lion and a lamb differently, because they have distinct tendencies to act and distinct ways of reacting – different natures. An individual with a particular nature is a stable entity with an inherent tendency, or unified set of tendencies, to act and react in certain ways.

Material living things (organisms) have capacities – tendencies to grow, nourish themselves, adapt to environmental conditions, maintain inner balance, and reproduce. In organisms that reproduce sexually, a new individual comes to be when material constituents (gametes from parent organisms) are joined to form a new stable unit of the same species as its parents, with an inherent dynamism to develop itself to the stage at which it will perform operations characteristic of its species. When organisms die, the materials that went into their makeup become things of other kinds, that is, become formed or unified differently – even if still organized on a lower level, as when an animal dies and its remains include a disintegrating aggregate of organs, tissues, and cells.

Living things often have capacities that are not functioning. Something has a capacity to function if it is able to perform a certain type of action: for example, an animal that has the capacity to see is able to see. But an entity that has that capacity may not be able to exercise it. For instance, even a mammal with good eyesight cannot see in pitch darkness. So, a capacity can be present even if its exercise is impeded. The impediment may be external (an animal that is chained cannot pursue prey) or internal (an anesthetized patient cannot feel pain). If the impediment is removed, the individual will again be able to exercise its capacity.¹⁸

Moreover, a living being has a radical capacity or potentiality for a function if it has within itself a material constitution that disposes it, given a suitable environment, to develop sufficiently to perform that function. Cuttings from many species of plants, although without

an immediately exercisable capacity to reproduce, have the internal resources to develop themselves to the stage at which they will have all the exercisable capacities of a complete plant of their species, including the capacity to reproduce. So, an organism has a radical natural capacity for a function, even if it has not yet developed the organs needed to perform that function, if it has, at an early stage of its development, the capacity, given a suitable environment, to develop those organs for itself. The preceding point can also be expressed as follows: natural kinds are defined not only by their first-order capacities, but also by their second-order capacities. A second-order capacity is a capacity to develop a first-order one.

A human being is a rational animal. An animal is a sentient organism. In human beings and other mammals, sentience includes such functions as seeing, hearing, feeling pain and pressure, perceiving, imagining, remembering, desiring, fearing, being angry, and so forth.¹⁹ Embryonic mammals do not actually perform such actions but they have within themselves the resources to develop themselves so that they do have the capacity. Since embryonic mammals have the resources – the genetic and epigenetic composition and structure – to actively develop sentient capacities for themselves, they too are sentient organisms.

The rationality that differentiates human beings from other animals includes such functions as conceptual thought, reasoning, and making deliberate choices. An organism that has the capacity for these types of actions is a human individual.

Human embryos and fetuses are human organisms because they too have the internal resources to develop themselves to the stage where they will be able to perform the actions characteristic of the human kind.²⁰ By contrast, even when the cells in teratomas or complete hydatidiform moles have the human genome, such disorganized growths are not human beings. They not only lack first order capacities for specifically human functions but also lack the disposition, which embryos have, to develop those first order capacities for themselves.

Conceptual thought, reasoning, and deliberate choices are not directly observable. So, human individuals can perform such actions without providing any evidence that they are doing so. However, to be a rational animal, an organism must be an animal; and to be an organism of that kind, it must have either the capacity for sentience, or the capacity to develop the capacity for sentience. Moreover, because the conceptual thought, reasoning,

¹⁷ We refer to mammals because some animals are sentient without a brain, but the brain plainly is necessary for mammals' sentience.

¹⁸ Removing an impediment to the exercise of a capacity in a cell or organism is distinct from being a co-cause with a cell or organism of an effect not proportionate to either co-cause. Thus, when a sperm and an ovum fuse, they are two co-causes generating an effect neither would be capable of by itself; whereas, brain surgery to remove a lesion or tumor is merely the removal of an impediment. In the removal of an impediment (whether external or internal) to an organism's functioning, the principal form or structure of the consequent action comes from and is proportionate to that organism, not to the agent that removed the impediment.

¹⁹ Animals are also able to move themselves from place to place to adapt to what they perceive, but this ability may be impeded or lost while the animal survives.

²⁰ See Patrick Lee and Robert P. George. 2008. *Body-Self Dualism in Contemporary Ethics and Politics*. New York: Cambridge University Press: ch. 4.

and deliberate choices of rational animals bear upon experienced things, those rational functions presuppose sensory functioning.²¹ Therefore, if an organism lacks the capacities for sentient functioning and the capacity to develop those capacities, it cannot be an animal (a sentient organism) and if an organism entirely lacks capacities for sentient functioning and is not an animal, it cannot engage in conceptual thought, reasoning, or deliberate choices and is not a rational animal.

There also is common agreement that no mammal can sense without brain functioning – a mammal's sentience requires either a brain capable of functioning or the capacity to develop a brain. But a totally brain-dead individual neither has a brain capable of functioning nor the capacity to develop a brain. It follows that any mammalian individual that undergoes brain death is no longer a sentient being, and thus not an animal, and thus not a rational animal. An individual such as TK, therefore, that has undergone total brain death is not an animal and so not a rational animal, a human being.

When an organism dies, its remains usually include *many* things of different kinds, because organisms usually pass away by entirely losing their unified functioning, with the result that, as they begin to disintegrate, many smaller things, some organic and others not, come to be in their place. It may seem that this is not the case with TK and similar entities. However, when someone undergoes total brain death, many things *have* come to be in place of the individual. One of those things is alive and much larger and far more complex than any of the usual living parts of the remains of an organism. Nevertheless, that living part of a human being's remains no longer has the capacity for sentient functioning that is presupposed by the capacity for conceptual thought, reasoning, and free choices. Moreover, the apparent whole of which that living element is a part – TK, for example – includes the skull's contents, which no longer are a human brain but many things of different kinds. A substantial change has occurred: the human being has passed away, and although the remains include a large living entity, that entity is not a human organism, and so is not the individual who suffered total brain death.²²

In a recent article Shewmon has raised two objections to our argument (which we had shared in a conversation

with him and others). The first step in our argument is that all animals have a capacity (at least a radical capacity) for sentience. Shewmon objects that this is not an essential definition but only a stipulative one, so that our argument begs the question.²³ According to Shewmon, an animal was originally defined simply as a sentient organism, but then, with advances in embryology, that definition had to be broadened because it was obvious that embryos are animals even though they are not sentient. Thus (according to Shewmon) an animal came to be defined as an organism that is *either* sentient or has a radical capacity for sentience. In the same way, Shewmon continues, the definition of animal needs to be 'fine-tuned' again in order to accommodate permanently comatose and technologically dependent animals. A rough definition, Shewmon suggests, might be something like: 'a living being with sentience or a radical capacity for sentience, or a sick or disabled or dying being that had a radical capacity for sentience'.²⁴

However, although the proposition that animals have the capacity for sentience is not an essential definition, it is not a mere stipulative definition, that is, an arbitrary assignment of a meaning to a word. Rather, it is a truth about one of many things essential to animals, and thus it also indicates a necessary condition for the persistence of an individual animal.²⁵

Shewmon's objection truly is question-begging. Natures (or natural kinds) are identified by their inherent tendencies to act and react in specific ways. Hence the classification of individuals within the same fundamental natural kind is non-arbitrary *only if* it is grounded in having the same type of real and intrinsic orientation to, or potentiality for, a certain type of behavior. One could not know that an embryo is an animal unless one first knew that an embryo actually does have an intrinsic orientation to, or potentiality for, sentience (the behaviors specific to mature members of the natural kind, animal).²⁶

²³ D. Alan Shewmon. Constructing the Death Elephant: A Synthetic Paradigm Shift for the Definition, Criteria, and Tests for Death. *J Med Philos* 2010; 35: 15.

²⁴ *Ibid*: 16.

²⁵ For Aristotle, sentience differentiated animals from plants. While it might be argued both that sponges lack sentience and that plants have it, those issues are irrelevant to the present discussion.

²⁶ It was precisely because he believed – mistakenly – that the orientation toward the behavior specific to animals was caused *extrinsically* – namely, by the semen persisting and guiding embryogenesis – that Aquinas believed the embryo was not an animal. With the discovery that the genetic-epigenetic constitution of the zygote together with the organization of its cells (in the multicellular embryo) organizes the development of the embryo to the stage where sentience can occur, it became obvious that from fertilization on the embryo does have an intrinsic orientation to the mature stage of a member of its species, and so is an animal, that is, is the animal at the earliest stages of its development. See John Haldane and Patrick Lee. St. Thomas Aquinas on Human Ensoulment. *Philosophy* 2003; 78: 255–278. The key point is that the cause for the actualization of the mature body plan is not

²¹ It might be objected that conceptual thought is non-material and therefore could occur without prerequisite functioning of the brain, albeit not naturally, that is, in accord with how a human being is naturally constituted. We believe such a possibility is real, but in that case the thoughts and volitions would be performed by a separated soul after death (and before resurrection). Thus, such thoughts and volitions are irrelevant to the issue addressed here.

²² In his article in *The Thomist*, 1985, Shewmon defended this position, but abandoned it in later articles (beginning with the article in the *Linacre Quarterly*, 1997). In these later articles he merged – in our view, mistakenly – the separate questions of whether what is alive after brain death is a complex organism and whether it is a whole human organism.

Likewise – but with a different result – a brain dead entity could be rightly classified as an animal only if there were some basis in it for that classification: some capacity or orientation picked out by the definition and shared by members of that class. Absent an intrinsic orientation or potentiality for sentience, the class or set composed both of entities with such a capacity *and* of entities that now lack that capacity is an arbitrary set, not a natural kind.

Shewmon claims: ‘Rather than argue that brain-destroyed mammals are no longer mammals simply “by definition (Q.E.D.)”,²⁷ we need to examine their properties and decide whether a substantial change has occurred or not. He then adds: ‘If their properties cry out for categorizing them as moribund, permanently comatose, and technologically dependent animals, then what is called for is to fine-tune the definition once again.’²⁸ But what properties of brain dead entities such as TK ‘cry out’ for being categorized as animals? The only properties Shewmon identifies are functions that persisted after brain death and do not presuppose sentience, but whether the brain dead entities are identical with the animals that underwent brain death is precisely the question, and that identity is not self-evident. The empirical question to settle the issue of identity is: does this entity at time t_2 possess the same fundamental orientation or capacity as a spatio-temporally continuous entity at time t_1 ? Our argument shows that a brain dead entity does not, and this cannot be avoided by creating a new definition or new arbitrary set.

Shewmon also objects that a totally brain dead organism might have a radical or second-order capacity for brain functioning inasmuch as it still has the genetic-epigenetic constitution that oriented it toward the development of a functioning brain. He points out that it is possible now to manipulate adult stem cells to regenerate tissues and parts of organs. And it seems that in the near future it might be possible to manipulate somatic cells – alter or re-structure their epigenetic state (that is, the way the various genes are modified so that they will or will not be transcribed) – to enable an organism to regenerate whole organs, and perhaps eventually a whole new brain.²⁹

extrinsic (as Aquinas thought) but intrinsic to the embryo. That is an empirical point, not a matter of loosening a definition.

²⁷ Ibid: 15.

²⁸ Ibid: 15–16.

²⁹ Ibid: 16. Shewmon mistakenly attributes to our position ‘the assumption that the radical capacity for sentience resides in the brain’. (16) He then contrasts this with his position that ‘the truly radical capacity for sentience lies not in the brain but in the genetic and epigenetic information throughout the living organism.’ (17) This argument is confused. The capacity for sentience resides in the agent as a whole. And, in any case, the relevant question is not where the capacity ‘resides’, but whether an organ or material part is necessary for sensory functions: if one lacks a part that is necessary for them, and lacks the intrinsic capacity to develop that part, one lacks that capacity altogether.

However, the appropriate genetic-epigenetic constitution within the cells of a multicellular organism is a necessary but not sufficient condition for a second-order capacity for brain functioning. The developing cells also must be of certain types or structures and arranged in a certain way if the organism is to develop a functioning brain. So, while a human embryo has a second-order capacity for brain functioning, a totally brain dead organism has no such capacity. If the gonads of a sexually mature mammal are surgically removed, does it have a second-order capacity to reproduce? No. It had that capacity before the gonads developed, but a mature mammal has no disposition actively to develop gonads for itself. Similarly, a brain-dead entity has no radical capacity to develop a brain.

Of course, one might manipulate stem cells or even somatic cells to restore an organ necessary for a capacity once lost. But that does not mean that the corresponding radical capacity was latent all along. One also can use factors in a somatic cell to produce a whole new organism (as in cloning), but that only shows that those factors have the passive capacity to be used to produce new organisms – otherwise, each of our somatic cells would already actually be an immature organism. Likewise, by manipulating the epigenetic states of cells and converting them into other types of cells, one might provide an organism with a new capacity or restore to it a capacity it once had but has lost. In both cases, the capacity the organism has for what is realized in it is a passive one: to become a new organism or to receive a new organ or the capacity to develop one. In such instances the organism is not the agent performing the change, for it does not have within itself the formal or structural specification for the production of that effect. Thus, if factors in the somatic cells of an organism were used to restore to it a capacity to develop a functioning brain, a new capacity would be produced by agents other than the organism whose cells are used, and (since this capacity is necessary for a certain type of organism’s survival or identity) then the manipulation of the epigenetic state of these cells would generate a new organism.

One entirely lacks a capacity for a certain sort of action if one both lacks something without which one cannot perform that action under any condition whatsoever and one lacks the capacity to develop that necessary equipment. Having eyes is essential to seeing in any condition: if one lacks eyes and lacks the capacity to develop eyes, then one entirely lacks the capacity for vision. Likewise, in mammals, having brain tissue is essential for any kind of sentience. If an organism has neither brain tissue nor the capacity to develop it, then it entirely lacks mammalian sentience.

Someone might object that one could retain one’s capacity to see despite losing one’s eyes: one might be fitted with digital cameras and microchips that would

stimulate the occipital cortex to bring about a sort of vision.³⁰ But this objection mistakenly supposes that as long as one retains many of the essential constituents of a capacity one still has that capacity. If this were true, then one would have to say that every female mammal has the capacity to nurse babies. While we admit that someone who has lost the capacity to see can be given it again by artificial intervention, we deny that someone without eyes still has a capacity to see.

What if – as Shewmon speculates – it eventually becomes possible to develop in individuals similar to TK a living brain and thus restore the sentience presupposed by specifically human acts? This achievement would not count against our position. For, as we have argued above, someone who has lost the capacity for sentient functioning has passed away, and thus is no longer present to undergo and benefit from any intervention. Therefore, a procedure for rebuilding brains in the living remains of totally brain dead individuals would artificially generate new human beings.

Another objection might be that just as some characteristics that enable us to differentiate mammals from other kinds of creatures can be missing in some mammals – such as being hairy or having a certain kind of inner ear – so sentience is a characteristic of animals that some animals can lack while still being mammals.³¹ However, we concede that some characteristics that are generally useful for identifying mammals – and for that reason are often included in definitions of ‘mammal’ though usually with qualifications – are not essential for something’s *being* a mammal. But we deny that sentience is one of those characteristics. Without sentience an entity cannot be a mammal. And so if an entity entirely lacks both brain functioning and the capacity to develop a brain, it is not a mammal and so not a rational animal.

3. THE LIVING REMAINS IN A BRAIN-DEAD BODY

To our position, however, someone might object that, because there is a continuity of life processes in the organism referred to as TK (and others like TK) before and after brain death, it is the same living organism before and after brain death, and therefore what is alive remains a human organism. This objection is plausible enough to deserve a careful answer.

In most deaths, the remains do not constitute a large living unit but, perhaps, much smaller ones. However, sometimes in an early embryo what results from the

embryo’s death is a teratoma; and such a growth does have some organization. Moreover, there is no physical necessity that the remains of an organism that has died *not* belong to a distinct living entity. Imagine Max, a newborn who has attached to his chest a headless but otherwise complete additional individual, with linked circulatory system. Clearly this nearly complete human body would not be a whole human being, although if amputated it might be maintained for some time as a distinct unit.

Again, imagine dicephalic twins called Adam and Ben.³² They have only one abdomen, pelvis and thorax, one trunk and two heads. Hence they share many but not all of their organs.³³ Significantly, their circulatory systems are merged; there is only one circulatory system serving both individuals.

Suppose that Adam, Ben, and their family are vacationing in the north woods. The twins are sitting on the patio, chatting with their dad, while he’s cooking on an electric grill. Tragically, a stray rifle bullet from a deer hunter enters Adam’s mouth and exits the back of his head, taking with it a large piece of the skull. Blood is gushing and both twins would die quickly, but Dad has the presence of mind to use the cord from the electric grill as a tourniquet about Adam’s neck. Adam’s head is amputated. Ben survives, recuperates, marries, and has children.

No one would say that Adam is still alive. But on Shewmon’s account of TK and similar cases, when a body with its organs continuously functioning remains alive even though it no longer has any brain, the very same individual continues to live. But Adam’s body remains alive with all its organs (except the lung or lungs on his side) continuously functioning. Therefore, the ongoing continuity of functioning of a big part of what had been an organism does not show that the brainless entity that remains after brain death is the individual it was before becoming brainless.³⁴

Nevertheless, we concede that Shewmon has shown that in some cases the remains after a person’s total brain death do include a large living entity. We have argued that it cannot be the same individual as the human being who died. To explain the sort of entity that it is, we begin by considering a single organ that is donated after

³² There is a factual ground for supposing that there might well be such twins as we are describing: Jan Bondeson. Dicephalus conjoined twins: A Historical Review with Emphasis on Viability. *J Pediatr Surg* 2001; 36: 1435–1444; Abigail and Brittany Hensel: http://en.wikipedia.org/wiki/Abigail_and_Brittany_Hensel [Accessed 15 May 2010].

³³ In our view dicephalic twins are two organisms but also are united (organically one) in many respects, since they share many organs and organic functions. For discussion see Lee & George, *op. cit.* note 20, pp. 44–49.

³⁴ This argument does not suppose that Adam and Ben were only one organism – see previous note – only that they shared significant and continuous biological functioning.

³⁰ This objection was suggested in conversation by Alan Shewmon but we are not sure he would advance it himself.

³¹ See above, note 17. Shewmon also suggested this objection in conversation.

someone has died. This entity – for example a donated lung – is a living, organized unit, and it is human in the sense that it comes from a human being and its cells have the human genome. But it is not part of the individual from which it came, and is not a member of the human species, or of any animal species. Some transplantations now being done are of more than one organ at a time. One can easily imagine that, as transplantation techniques develop, increasingly larger parts of a donor's body will be transplanted as a unit into a single recipient. One can even imagine a case in which identical twin brothers Jim and Joe are in an accident. Jim suffers fatal brain damage, and Joe suffers fatal damage to his torso, but after Jim's death the team transplants his body from the neck down to Joe.³⁵ After Jim's death and before the transplantation, what was Jim's body is an entity of the same sort as the living remains of a brain dead individual such as TK. Although it is a living whole of a sort, and its tissues are human, it is neither Jim, nor a new human individual, nor a member of any animal species.

4. SENTIENT CAPACITIES IN THE SOUL?

Philosophical anthropologists who maintain that human beings have souls generally hold that a person's single soul is the principle of all his or her vital human capacities, vegetative and sentient as well as rational. Some who hold that view may object that, since all the vital powers of a human being, including his or her sensory powers, are rooted in the soul, the soul remains as long as any vital function continues, with the result that a brain-dead body, such as that of TK, continues to be a rational animal, and thus a human person, even though it no longer has the bodily organ required for sentience. After brain death, on this view, the soul still exercises its vegetative powers, and so is still united to the body, and still has its sensory and rational powers, but is prevented from exercising them due to the lack of the bodily organ essential for sentient functioning.

Our answer to this argument is that a power or capacity to do X belongs to that which does X. For living humans, the bodily individual, not his or her soul, is what reads a menu, chooses a meal, eats it, and is nourished – in short, exercises every human function. So, it would be a mistake to say that 'the soul exercises vegetative powers.' The soul is *that by which* the human being is able to do this or that, but the capacities are possessed by, or inhere in, the human being, not in his or her soul. Even in intellectual and volitional acts, it is John or Mary, not the

³⁵ To call this 'Jim's death' presupposes that brain death is death. But we are not now advancing another argument to establish this position. Rather, we are explaining it and showing that it makes sense of various possibilities.

soul, that understands or wills, even though the acts of understanding and of willing (we hold) are not performed with bodily organs. The capacity or power belongs to the whole agent, not to the soul. So, just as one does not retain a capacity to walk after one loses one's legs – the act and the capacity belong to the whole human agent – so one does not retain a capacity to sense or imagine after the death of the whole brain.

If, as we assume, a human being's soul continues to exist after he or she dies, that soul may engage in conscious acts without a brain. However, any conscious acts of a separated soul would not be acts of the bodily person, whose totally brain-dead living remains in no way participate in that act. And if the living remains themselves have a soul, then it is a vegetative soul, not a rational or animal soul. Likewise, if a heart taken from a dead donor, and not yet implanted in a recipient, has a soul, it is only a vegetative soul, which cannot be identified with the soul either of the dead donor or of the eventual recipient.

5. DOES DEATH OCCUR WITHOUT GENERAL ORGANIC DISINTEGRATION?

Nicanor Austriaco objects that our position on brain death is falsified by sound biology. Biologically, not only the brain, but other parts of the nervous system are necessary for a mammal's sentient functioning, and the death of the organism involves the loss of the nervous system as a whole, not only of the brain. The objection concludes that total brain death is not a sound criterion for the death of a mammalian organism.³⁶

The premises are true but the conclusion does not follow. An organism loses the capacity for a function if it irreversibly loses any part of what is necessary for that function. Therefore, if some parts of a mammal's brain are necessary for its sentient functioning, then its irreversible loss of its whole brain entails the loss of its radical capacity for sentient functioning. While the mammal's death results in the loss of its entire nervous system, its death necessarily follows from the loss of its whole brain or of whatever part of its brain is necessary for the capacity for sentient functioning.³⁷ Evidence of sentient functioning after a mammalian organism underwent total

³⁶ Nicanor Pier Giorgio Austriaco. In Defense of Bodily Integrity as a Criterion for Death: A Response to the Radical Capacity Argument. *The Thomist* 2009; 73: 647–659. See also his: Is the Brain-Dead Patient Really Dead? *Studia Moralia* 2003; 41: 277–308.

³⁷ Austriaco also argues that our position implies that brain-stem death by itself suffices for death; he claims: 'Individuals who have experienced brain-stem death from either illness or damage cannot perform sentient acts' (2009, *op. cit.* note 36, p. 650), and refers to David Bates. Coma and Brain Stem Death. *Medicine* 2004; 69–74. But if the cortex survives and is electrically stimulated, at least some individuals have conscious awareness despite brain stem death: see Calixto Machado, *op. cit.* note 1, pp. 45–46; Shewmon 1997, *op. cit.* note 1, pp. 51–53, 61–63.

brain death would falsify our thesis. But we do not expect such evidence from sound biology.

Austriaco also objects that the argument for the total brain death criterion proves too much if it proves anything.³⁸ One step in that argument is the proposition that the complete loss of specifically human capacities is a substantial change, namely, the person's passing away. But it is obvious, some will claim, that before, and sometimes long before, people die, many of them completely and irreversibly lose their specifically human capacities – their capacities for reasoning and making free choices. Yet such people plainly are not dead.³⁹

This objection is challenging. As long as people who seem to have lost their specifically human capacities are conscious, however, the completeness of their loss is neither obvious nor demonstrable. Quite often people who seem to be totally demented unexpectedly manifest their rationality.

Moreover, the last manifestation of the exercise of specifically human capacities need not be an instance of reasoning or making a free choice, but may be the evidence of a person's simple self-awareness as I – as a conscious subject. When an infant first manifests that self-awareness, the parents realize that their child is beginning to respond personally to them. As long as people are conscious, one cannot be sure that they will never again respond personally. Thus, unless it is shown beyond reasonable doubt that someone has lost the capacity for any sort of consciousness, one cannot be sure beyond reasonable doubt that the individual has lost the capacity for specifically human functioning.

Of course, one cannot prove that someone who seems to be completely demented still has the capacity to respond personally, and we must admit that the complete loss of that capacity is death. But since the complete loss of that capacity cannot be proved, the possibility that a seemingly completely demented individual is no longer a human being is merely theoretical. Therefore, our premise that the total loss of specifically human capacities is a human being's passing away does not warrant treating demented individuals as nonpersons.

That response will not satisfy those who think that our argument proves too much. Since self-consciousness presupposes consciousness, they will claim, anyone who is permanently unconscious has irreversibly lost specifically human capacities. So, they will argue, if the argument for the total brain death criterion proves anything, it proves that everyone who is permanently comatose or in a permanent vegetative state has already died. That is false, they will conclude, for such people are still warm and pink, and may be breathing on their own.

Our position that the complete loss of specifically human capacities is the human being's passing away does not entail that everyone who is unconscious and will never regain consciousness is already dead. Many unconscious people who *will* never regain consciousness *would* regain it if they were given appropriate care. Our position only entails that the loss of the *capacity* for consciousness is death.

When a patient still warm and pink and breathing is in question, we admit that death has occurred when, and only when, it is shown beyond reasonable doubt that there no longer is any *capacity* for consciousness. Totally brain dead entities, such as TK, are warm and pink, and they breathe in the same sense that some quadriplegics do. We think it is beyond reasonable doubt that brain dead entities entirely lack the capacity for the sentient functioning that is presupposed by human consciousness. But we do not think it is beyond reasonable doubt that individuals who are warm and pink and breathing but not totally brain-dead lack that capacity. Reasonable doubts follow from several considerations.

To begin with, patients confidently judged to be unconscious after careful and repeated examinations have sometimes later told about undergoing those examinations. The immediately exercisable capacity to respond to stimuli is one thing; consciousness is another. Thus, to establish beyond reasonable doubt even the fact that a patient is unconscious is far more difficult than is generally supposed.

Then, too, patients confidently judged to be permanently comatose or in a permanently vegetative state have sometimes recovered, and attempts to treat such patients have recently met with some success.⁴⁰ Pathological unconsciousness is one thing; the loss of the capacity for consciousness is another. Thus, the fact that a patient has lost the capacity for consciousness is extremely difficult to establish beyond reasonable doubt.

Some argue that the capacity for consciousness can be lost without total brain death, and conclude that it is too stringent a criterion for death. But such arguments depend on identifying parts of the brain required for sentient functioning, and several recent studies have made it clear that such identifications are problematic.⁴¹

Inasmuch as those who think that the death of some part of the brain is a sufficient criterion for the death of a human being must agree that total brain death is a

³⁸ Ibid: 649–652.

³⁹ Austriaco 2003, *op. cit.* note 36, pp. 301–304.

⁴⁰ See, for example: R. Claus and W. Nel. Drug Induced Arousal from Vegetative State. *NeuroRehabilitation* 2006; 21: 23–28; Sergio Canavero et al. Bifocal Extradural Cortical Stimulation-induced Recovery of Consciousness in the Permanent Post-traumatic Vegetative State. *J Neurol* 2009; 256: 834–836; M. Sara et al. An Unexpected Recovery from Permanent Vegetative State. *Brain Injury* 2007; 21: 101–103.

⁴¹ See, for example: D. Alan Shewmon et al. Consciousness in Congenitally Decorticate Children: 'Developmental Vegetative State' as Self-Fulfilling Prophecy. *Dev Med Child Neurol* 1999; 41: 364–374.

sufficient criterion, total brain death is currently very generally accepted as a sufficient criterion for the death of a human being. Unless and until a similar consensus for a criterion less stringent than total brain death develops, evidence that any less stringent criterion is met will not show beyond reasonable doubt that anyone is dead.

Finally, the present paper has been concerned exclusively with the adequacy of total brain death as criterion for the death of a human individual. The judgment that this criterion – or any other criterion – of death is met is an entirely different matter. Nothing that we have said should be mistaken as supporting the adequacy of the

procedures that have been used in pronouncing patients brain dead.

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