

SEVENTH EDITION

BIOMEDICAL ETHICS

DAVID DEGRAZIA

George Washington University

THOMAS A. MAPPES

Frostburg State University

JEFFREY BRAND-BALLARD

George Washington University





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- phrase "persistent vegetative state" is used in a contrasting way. In this sense, a persistent vegetative state does not entail that the condition is permanent. When PVS is understood in this way, there is no contradiction in saying that a patient has recovered from PVS. Of course, whenever a patient has been in a vegetative state for a significant period of time, a medical determination of irreversibility is of great practical importance. For further clarification of PVS and the difference between permanent vegetative state and permanent coma, see Ronald E. Cranford, "Definition and Determination of Death: Criteria for Death," in Warren R. Reich, ed., *Encyclopedia of Bioethics*, rev. ed. (New York: Macmillan, 1990), pp. 531–533.
- 2 The Ad Hoc Committee of the Harvard Medical School to Examine the Definition of Brain Death, "A Definition of Irreversible Coma," *JAMA* 205 (August 6, 1968), p. 338.
 - 3 See, for example, *Journal of Medicine and Philosophy* 26 (October 2001). The articles in this issue are grouped under the title "Revisiting Brain Death." Some critics of the whole-brain approach are opposed to the higher-brain approach as well. See, for example, Michael Potts et al., eds., *Beyond Brain Death: The Case Against Brain Based Criteria for Human Death* (Dordrecht: Kluwer, 2000).
 - 4 See, for example, Ruth Macklin, "Consent, Coercion, and Conflicts of Rights," *Perspectives in Biology and Medicine* 20 (Spring 1977), pp. 360–371. For a discussion of added complexities, see Dena S. Davis, "'No' Mean 'Yes'? The Continuing Problem of Jehovah's Witnesses and Refusal of Blood Products," *Secular Opinion* 19 (January 1994), pp. 35–43.
 - 5 The morality of suicide is discussed in Chapter 6.
 - 6 Some commentators also recommend that patients complete a "values history," a document that is designed to provide background information on patient values and attitudes. A values history might function as a supplement to an instructional directive, intended to guide any necessary interpretation, or it could be intended as a resource for one's designated proxy or surrogate.
 - 7 For one articulation of the "standard wisdom" regarding surrogate decision making for incompetent adults see Dan W. Brock, "Surrogate Decision Making for Incompetent Adults: An Ethical Framework," *Mount Sinai Journal of Medicine* 58 (October 1991), pp. 388–392. In contrast, John Hardwig calls for a fundamental revision in the theory of surrogate (proxy) decision making. He challenges the appropriateness of exclusive patient-centered standards of surrogate decision making, and he argues that it is morally unsound to expect proxy decision makers to disregard their own interests and those of other family members. See John Hardwig, "The Problem of Proxies with Interests of Their Own: Toward a Better Theory of Proxy Decisions," *Journal of Clinical Ethics* 4 (Spring 1993), pp. 20–27.

THE DEFINITION AND DETERMINATION OF DEATH

THE WHOLE-BRAIN CONCEPT OF DEATH REMAINS OPTIMUM PUBLIC POLICY

James L. Bernat

After briefly tracing the origins of the concept of whole-brain death, Bernat defends this approach as capturing more effectively than other approaches the standard concept of death. He criticizes the higher-brain approach, favored by some scholars but not reflected in public policy anywhere in the world, as failing to reflect what ordinary people mean by "death," namely the irreversible loss of the critical functions of the organism as a whole. In Bernat's view the whole-brain concept also provides a more clinically reliable criterion for death than does the higher-brain criterion, and is superior in other respects to the brain-stem and circulatory-respiratory criteria proposed by others. While conceding to critics that the whole-brain criterion suffers from some conceptual and practical weaknesses, Bernat emphasizes that it has proven a workable basis for public policy in many countries around the world. Any competitor, he believes, must show that it, too, translates into policies that would be intuitively acceptable and would maintain

public confidence in the medical profession. Bernat admits, however, that flaws may exist in the procedures by which determinations of brain death are presently made. If such flaws exist, then these procedures should be supplemented by clinical tests for cessation of all intracranial blood flow, so as to avoid false determinations that death has occurred.

The definition of death is one of the oldest and most enduring problems in biophilosophy and bioethics. Serious controversies over formally defining death began with the invention of the positive-pressure mechanical ventilator in the 1950s. For the first time, physicians could maintain ventilation and, hence, circulation on patients who had sustained what had been previously lethal brain damage. Prior to the development of mechanical ventilators, brain injuries severe enough to induce apnea quickly progressed to cardiac arrest from hypoxemia. Before the 1950s, the loss of spontaneous breathing and heartbeat ("vital functions") were perfect predictors of death because the functioning of the brain and of all other organs ceased rapidly and nearly simultaneously thereafter, producing a unitary death phenomenon. In the pre-technological era, physicians and philosophers did not have to consider whether a human being who had lost certain "vital functions" but had retained others was alive, because such cases were technically impossible.

With the advent of mechanical support of ventilation, (permitting maintenance of circulation) the previous unitary determination of death became ambiguous. Now patients were encountered in whom some vital organ functions (brain) had ceased totally and irreversibly, while other vital organ functions (such as ventilation and circulation) could be maintained, albeit mechanically. Their life status was ambiguous and debatable because they had features of both dead and living patients. They resembled dead patients in that they could not move or breathe, were utterly unresponsive to any stimuli, and had lost brain stem reflex activity. But they also resembled living patients in that they had main-

tained heartbeat, circulation and intact visceral organ functioning. Were these unfortunate patients in fact alive or dead?

In a series of scientific articles addressing this unprecedented state, several authors made the bold claim that patients who had totally and irreversibly lost brain functions were dead, despite their continued heartbeat and circulation.¹ In the 1960s, they popularized the concept they called "brain death" to acknowledge this idea.² The intuitive attractiveness of the concept of "brain death" led to its rapid acceptance by the medical and scientific community, and to legislators expeditiously drafting public laws permitting physicians to determine death on the basis of loss of brain functioning.³ Interestingly, largely by virtue of its intuitive appeal, the academy, medical practitioners, governments, and the public accepted the validity of brain death prior to the development of a rigorous biophilosophical proof that brain dead patients were truly dead. Medical historians have emphasized utilitarian factors in this rapid acceptance, because a determination of brain death permitted the desired societal goals of cessation of medical treatment and organ procurement.⁴

The practice of determining human death using brain death tests has become worldwide over the past several decades. The practice is enshrined in law in all 50 states in the United States and in approximately 80 other countries, including nearly all of the developed world and much of the undeveloped world.⁵ A 1995 conference on the definition of death sponsored by the Institute of Medicine concluded that, despite certain theoretical and practical shortcomings, the practice of diagnosing brain death was so successful and so well accepted by the medical profession and the public that no major public policy changes seemed desirable.⁶

Yet despite this consensus, from its beginning, a persistent group of critics have attacked the concept

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and practice of brain death as being conceptually invalid or a violation of religious beliefs.⁷ Recently, through the intellectual leadership of Alan Shewmon, additional critics have concluded that the concept of brain death is incoherent, anachronistic, unnecessary, a legal fiction, and should be abandoned.⁸ In this essay I show that, despite admitted shortcomings, the classical formulation of whole-brain death remains both conceptually coherent and forms a solid foundation for public policy surrounding human death determination and organ transplantation.

AN ANALYSIS OF DEATH

Defining death is a formidable task.⁹ In their rigorous, thoughtful, and highly influential book *Defining Death*,¹⁰ the President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research chose as their conceptual foundation the analysis of death that I published with my Dartmouth colleagues Charles Culver and Bernard Gert.¹¹ Our analysis was conducted in three sequential phases: (1) the philosophical task of determining the definition of death by making explicit the consensual concept of death that has been confounded by technology; (2) the philosophical and medical task of determining the best criterion of death, a measurable condition that shows that the definition has been fulfilled by being both necessary and sufficient for death; and (3) the medical-scientific task of determining the tests of death for physicians to employ at the patient's bedside to demonstrate that the criterion of death has been fulfilled with no false positive and minimal false negative determinations. Most subsequent scholars have accepted this method of analysis, if not our conclusions, with two recent exceptions.¹²

Following a series of published critiques and rebuttals of our position over the past two decades, I concluded that much of the disagreement over our account of death resulted from the lack of acceptance by dissenting scholars of the "paradigm of death." By "paradigm of death" I refer specifically to a set of conditions and assumptions that frame the discussion of the topic of death by identifying the nature of the topic, the class of phenomena to which it belongs, how it should be discussed, and its con-

ceptual boundaries.¹³ Accepting a paradigm of death permits scholars to rationally analyze and discuss death without falling victim to the fallacy of category noncongruence and consequently talking past each other. But the paradigm remains useful even if scholars do not agree on all its elements, because it can help clarify the root of their disagreement.

My paradigm of death comprises seven sequential elements. First, the word "death" is a common, nontechnical word that we all use correctly to refer to the cessation of a human being's life. The philosophical task of defining death seeks not to redefine it by contriving a new meaning, but rather to divine and make explicit the implicit meaning of death that we all accept but that has been made ambiguous by technological advances. Some scholars have gone astray by not attempting to capture our consensual concept of death and instead redefining death for ideological purposes or by overanalyzing death to a metaphysical level of abstraction—thereby rendering it devoid of its ordinary meaning.¹⁴

Second, death is fundamentally a biological phenomenon. We all agree that life is a biological entity; thus also should be its cessation. Accepting that death is a biological phenomenon neither denigrates the richness and beauty of various cultural and religious practices surrounding death and dying, nor denies societies their proper authority to govern practices and establish laws regulating the determination and time of death. But death is an immutable and objective biological fact and not fundamentally a social contrivance.¹⁵ For the definition and criterion of death, the paradigm thus exclusively considers the ontology of death and ignores its normative aspects.

Third, we restrict our analysis to the death of higher vertebrate species for which death is univocal. That is, we mean the same phenomenon of "death" when we say our cousin died as we do when we say our dog died. Although individual cells within organisms and single-celled organisms also die, our analysis of defining human death is simplified by restricting our purview to the death of related higher vertebrate species. Determining the death of cells, organs, protozoa, or bacteria are valid biophilosophical tasks but are not the task at hand here.

Fourth, the term "death" can be applied directly and categorically only to organisms. All living

organisms must die and only living organisms can die. Our use of language may seem to confuse this point, for example, when we say "a person died." But by this usage we are referring directly to the death of the living organism that embodied the person, not to a living organism ceasing to be a person. Personhood is a psychosocial construct that can be lost but cannot die, except metaphorically. Similarly, other uses of the term "death" such as "the death of a culture" clearly are metaphorical and fall outside the paradigm.¹⁶

Fifth, a higher vertebrate organism can reside in only one of two states, alive or dead: no organism can be in both states or in neither. Based on the theory of fuzzy sets, the concept that the world does not easily divide itself into sets and their complements, Amir Halevy and Baruch Brody proposed that an organism may reside in a transitional state between alive and dead that shares features of both states.¹⁷ This claim appears plausible when considering cases of gradual, protracted dying, in which it may be difficult and even appear arbitrary to identify the precise moment of death. But this claim ignores the important distinction between our ability to identify an organism's biological state and the nature of that state. Simply because we currently lack the technical ability to always accurately identify an organism's state does not necessitate postulating an in-between state. Using the terminology of fuzzy set theory as a guide, the paradigm requires us to view alive and dead as mutually exclusive (non-overlapping) and jointly exhaustive (no other) sets.

Sixth, and inevitably following from the preceding premise, death must be an event and not a process. If there are only two exclusive underlying states of an organism, the transition from one state to the other, at least in theory, must be sudden and instantaneous, because of the absence of an intervening state. Disagreement on this point, highlighted since the original debate over 30 years ago in *Science* by Robert Morison and Leon Kass,¹⁸ centers on the difference between our ability to accurately measure the presence of a biological state and the nature of that biological state. To an observer, it may appear that death is an ineluctable process within which it is arbitrary to stipulate the moment of death, but such an observation simply underscores our cur-

rent technical limitations. For technical reasons, the event of death may be determinable with confidence only in retrospect. As my colleagues and I first observed in 1981, death is best conceptualized not as a process but as the event separating the biological processes of dying and bodily disintegration.¹⁹

Seventh and finally, death is irreversible. By its nature, if the event of death were reversible it would not be death but rather part of the process of dying that was interrupted and reversed. Advances in technology permit physicians to interrupt the dying process in some cases and postpone the event of death. So-called "near-death experiences," reported by some critically ill patients who subsequently recovered, do not indicate returning from the dead but are rather recalled experiences that result from alterations in brain physiology during incipient dying that was reversed in a timely manner.²⁰

THE DEFINITION OF DEATH

Given the set of assumptions and conditions comprising the paradigm of death, we can now explore the definition, criterion, and tests of death. Defining death is the conceptual task of making explicit our understanding of it. It poses an essential question: what does it mean for an organism to die, particularly in our contemporary circumstance in which technology can compensate for the failure of certain vital organs?

We all agree that by "death" we do not require the cessation of functioning of every cell in the body, because some integument cells that require little oxygen or blood flow continue to function temporarily after death is customarily declared. We also do not simply mean the cessation of heartbeat and respiration, though this circumstance will lead to death if untreated. Although some religious believers assert that the soul departs the body at the moment of death, this is not an adequate definition of death because it is not what religious believers fundamentally mean by "death."

Beginning early in the brain-death debate, Robert Veatch advocated a position that became known as the "higher-brain formulation of death."²¹ He claimed that death should be defined formally as "the irreversible loss of that which is considered to be essentially significant to the nature of man." He

expressly rejected the idea that death should be related to an organism's "loss of the capacity to integrate bodily function" asserting that "man is, after all, something more than a sophisticated computer."²² His project attempted not to reject brain death, but to refine the intuitive thinking underlying the brain death concept by emphasizing that it was the cerebral cortex that counted in a brain death concept and not the more primitive integrating brain structures.

Irrespective of the attractiveness of this idea, (it has spawned a loyal following²³) the higher-brain formulation contains a fatal flaw as a candidate for a definition of death: it is not what we mean when we say "death." Its logical criterion of death would be the irreversible loss of consciousness and cognition, such as that which occurs in patients in an irreversible persistent vegetative state (PVS). Thus a higher-brain formulation of death would count PVS patients as dead. However, despite their profound and tragic disability, all societies, cultures, and laws consider PVS patients as alive. Thus, despite its potential merits, the higher-brain formulation fails the first condition of the paradigm: to make explicit our underlying consensual concept of death and not to contrive a new definition of death.

In 1981, my colleagues and I strove to capture the essence of the concept of human death that formed the intuitive foundation of the brain-based criterion of death. We defined death as "the cessation of functioning of the organism as a whole."²⁴ This definition utilized a biological concept proposed by Jacques Loeb in 1916.²⁵ Loeb explained that organisms are not simply composites of cells, tissues, and organs, but possess overarching functions that regulate and integrate all systems to maintain the unity and interrelatedness of the organism to promote its optimal functioning and health. The organism as a whole comprises that set of functions that are greater than the mere sum of the organism's parts.

More recently, biophilosophers have advanced the concept of "emergent functions" to explain this type of phenomenon with greater conceptual clarity.²⁶ An emergent function is a property of a whole that is not possessed by any of its component parts, and that cannot be reduced to one or more of its component parts. The physiological correlate of the organism as a whole is the set of emergent functions of

the organism. The irretrievable loss of the organism's emergent functions produces loss of the critical functioning of the organism as a whole and therefore is the death of the organism.

In early writings on brain death, a few scholars proposed similar ideas. Most noteworthy was Julius Korein who asserted that the brain was the "critical system" of the organism whose loss indicated the organism's death.²⁷ Using thermodynamics theory, Korein argued that once the critical system was irretrievably lost (death), an irreversible and unstoppable process ensued of increasing entropy that constituted the process of bodily disintegration. The concept of the demise of the organism's critical system relies on concepts analogous to the cessation of functions of the organism as a whole.

Examples of critical functions of the organism as a whole include: (1) consciousness, which is necessary for the organism to respond to requirements for hydration and nutrition; (2) control of circulation, respiration, and temperature control, which are necessary for all cellular metabolism; and (3) integrating and control systems involving chemoreceptors, baroreceptors, and neuroendocrine feedback loops to maintain homeostasis. Death is the irreversible and permanent loss of the critical functions of the organism as a whole.

THE CRITERION OF DEATH

The next task is to identify the criterion of death, the general measurable condition that satisfies the definition of death by being both necessary and sufficient for death. There are several plausible candidates for a criterion of death. Among brain death advocates, three separate criteria have been proposed: (1) the whole-brain formulation, the criterion recommended by the Harvard Committee and the President's Commission, and accepted throughout the United States and in most parts of the world; (2) the higher-brain formulation, popular in the academy but accepted in no jurisdictions anywhere; and (3) the brain stem formulation accepted in the United Kingdom.²⁸

The whole-brain criterion requires cessation of all brain clinical functions including those of the cerebral hemispheres, diencephalon (thalamus and hypothalamus), and brain stem. Whole-brain theorists

require widespread cessation of neuronal functions because each part of the brain serves the critical functions of the organism as a whole. The brain stem initiates and controls breathing, regulates circulation, and serves as the generator of conscious awareness through the ascending reticular activating system. The diencephalon provides the center for bodily homeostasis, regulating and coordinating numerous neuroendocrine control systems such as those regulating body temperature, salt and water regulation, feeding behavior, and memory. The cerebral hemispheres have an indispensable role in awareness that provides the conditions for all conscious behavior that serves the health and survival of the organism.

Clinical functions are those that are measurable at the bedside. The distinction between the brain's clinical functions and brain activities, recordable electrically or through other laboratory means, was made by the President's Commission in *Defining Death* though, for the sake of brevity, it did not appear in the Uniform Determination of Death Act proposed by the Commission.²⁹ All clinical brain functions measurable at the bedside must be lost and the absence must be shown to be irreversible. But the whole-brain criterion does not require the loss of all neuronal activities. Some neurons may survive and contribute to recordable brain activities (by an electroencephalogram, for example) but not to clinical functions.³⁰ The precise number, location, and configuration of the minimum number of critical neuron arrays remain unknown.

Despite the fact that the whole-brain criterion does not require the cessation of functioning of every brain neuron, it does rely on a pathophysiological process known as brain herniation to assure widespread destruction of the neuron systems responsible for the brain's clinical functions.³¹ When the brain is injured diffusely by trauma, hypoxic-ischemic damage during cardiorespiratory arrest or asphyxia, meningoencephalitis, or enlarging intracranial mass lesions such as neoplasms,³² brain edema causes intracranial pressure to rise to levels exceeding mean arterial blood pressure. At this point, intracranial circulation ceases and nearly all brain neurons that were not destroyed by the initial brain injury are secondarily destroyed by lack of

intracranial circulation. Thus the whole-brain formulation provides a fail-safe mechanism to eliminate false-positive brain death determinations and assure the loss of the critical functions of the organism as a whole. Showing the absence of all intracranial circulation is sufficient to prove widespread destruction of all critical neuronal systems. Similarly, it satisfies Korein's requirement for the loss of the irreplaceable critical system of the organism.

The higher-brain formulation fails to provide an adequate criterion of death because its conditions are insufficient for the loss of the critical functions of the organism as a whole. Its criterion is the irreversible loss of consciousness and cognition. The most common clinical manifestation of this condition is the PVS, caused by diffuse damage to the cerebral hemispheres, thalami, or disconnections between those structures.³³ In most cases of PVS, brain-stem neurons and their functions remain intact, so PVS patients, although unaware, have retained wakefulness and sleep-wake cycles (through the function of the intact ascending reticular activating system), have continued control of respiration and circulation by the intact medulla, and retain other brain-stem mediated regulatory functions.³⁴ The higher-brain formulation, thus, serves as neither an adequate definition nor criterion of death.

The criterion of the brain-stem formulation is the loss of consciousness and the capacity for breathing.³⁵ Diffuse damage to the brain stem that is sufficient to destroy the ascending reticular activating system and the medullary breathing center satisfies this criterion. But the brain-stem formulation does not require commensurate damage to the diencephalon or cerebral hemispheres. It therefore leaves open the possibility of misdiagnosis of death because of a pathological process that appears to destroy brain-stem activities but that permits some form of residual conscious awareness that cannot be easily detected. It thus lacks the fail-safe feature of whole-brain death to test for and guarantee the irreversible loss of these critical systems.

As a criterion of death, the circulation formulation fails for precisely the opposite reason of the higher-brain and brain-stem formulations. Whereas the higher-brain and brain-stem criteria both fail because they are necessary but not sufficient for death,

the circulation criterion fails because it is sufficient but not necessary for death. The loss of all systemic circulation produces the destruction of all bodily organs and tissues so it is clearly a sufficient condition for death. But it is unnecessary to require the cessation of functions of organs that do not serve the critical functions of the organism as a whole.³⁶

THE TESTS OF DEATH

Brain death tests must be used to determine death only in the unusual case in which a patient's ventilation is being supported. If positive-pressure ventilation is neither employed nor entertained, the traditional tests of death—prolonged absence of breathing and heartbeat—can be used successfully. These traditional tests are absolutely predictive that the brain will be rapidly destroyed by lack of blood flow and oxygen, at which time death will have occurred. Traditional examinations for death, in addition to testing for heartbeat and breathing, always included tests for responsiveness and pupillary reflexes that directly measure brain function.

The bedside tests satisfying the whole-brain criterion of death have been designed with a sufficiently high degree of concordance to permit the drafting of widely accepted clinical practice guidelines on the determination of brain death.³⁷ The tests require demonstrating the loss of all clinical brain functions, irreversibility, and a known structural process sufficient to produce the clinical findings. Laboratory tests showing the absence of intracranial blood flow or the absence of electrical activity in the hemispheres and brain stem can be used to confirm the clinical diagnosis to expedite the determination.³⁸

Irreversibility is an indispensable requirement for brain death. There is general belief that irreversibility can be adequately demonstrated by conducting serial neurological examinations, excluding potentially reversible factors, and demonstrating a structural cause that is sufficient to account for the clinical signs. But, while highly plausible, these conditions have never been proved to assure irreversibility. Two recent factors prompted me to reassess my previous position that irreversibility could be proved solely by clinical factors and to suggest that a laboratory test showing cessation of all in-

tracranial blood flow should become mandatory in brain death determination.

There are several published studies documenting the alarming frequency of physician variations and errors in performing brain death tests,³⁹ despite clear guidelines for performing and recording the tests. Patients with "chronic brain death" have been reported who were diagnosed as brain dead but whose circulation and visceral organ functioning were successfully physiologically maintained for months or longer.⁴⁰ Eelco Wijdevicks and I questioned whether all of the reported patients were correctly diagnosed, and if some brain-damaged but not brain dead patients were included because of inadequate examinations and resultant incorrect brain death determinations.⁴¹ Reacting to both these findings, I proposed that the mere assertion of irreversibility may no longer be sufficient to diagnose brain death and that a test showing cessation of all intracranial blood flow, such as transcranial Doppler ultrasonography, radionuclide angiography, or computed tomographic angiography, should become mandatory, at least if there is any question about the diagnosis or if the examiner is inexperienced.⁴²

* test to show irreversibility of loss of cranial flow

PUBLIC POLICY ON DEATH

Brain death is widely regarded as the prime example of a formerly contentious bioethical and biophilosophical issue that has been resolved to the point of widespread public consensus.⁴³ Evidence for this consensus is the enactment of effective and well-accepted brain death laws and policies throughout the world.⁴⁴ In the United States, the Uniform Determination of Death Act, recommended by the President's Commission and the National Conference of Commissioners on Uniform State Laws,⁴⁵ has been enacted in most states, and others have enacted statutes with similar language. Contemporaneously, the Law Reform Commission of Canada produced a similar statute.⁴⁶

But an observer unaware of this consensus and public acceptance, who relied solely on reading the output of scholarly articles and university conferences on brain death, would reach a far different conclusion. The publication of anti-brain death articles has never been greater than during the past decade.

Yet, despite those arguments, the 1995 Institute of Medicine conference on brain death recommended no changes in public laws in the United States,⁴⁷ no jurisdiction has abandoned its brain death statute, and there is evidence that many additional countries have embraced the practice of determining brain death during the past decade of scholarly dissention.⁴⁸ What accounts for the mismatch between public acceptance and scholarly agitation? POC

Higher-brain proponents continue to accept brain death but argue that the criterion of death should be changed to the higher-brain formulation. Brain stem death proponents also accept the conceptual validity of brain death but hold that the criterion of death should be the brain stem formulation. Religious authorities continue a debate that has raged for 40 years about whether brain death is compatible with the doctrines of the world's principal religious traditions.⁴⁹ Protestantism, including fundamentalism, has accepted brain death.⁵⁰ The debate in Roman Catholicism was largely settled by Pope John Paul's 2000 pronouncement embracing brain death as consistent with Catholic teachings.⁵¹ In Judaism, brain death is accepted by Reform and Conservative authorities, but an Orthodox rabbinic debate continues between those who declare brain death compatible with Jewish law and those who do not.⁵² Brain death determination is also practiced in several Islamic societies,⁵³ Hindi societies,⁵⁴ and in Confucian-Shinto Japan.⁵⁵

The principal active opponents within the academy are those who reject the concept of brain death outright and promote the concept that a human being is not dead until the systemic circulation ceases and all organs are destroyed. The circulation proponents see no special role for brain functions in a determination of death. Alan Shewmon, the intellectual leader of the circulationists, has written eloquently on the conceptual problems inherent within the whole-brain (or any brain criterion) formulation.⁵⁶ He cites evidence that the brain performs no qualitatively different forms of integration than the spinal cord and argues that therefore it should enjoy no special status above other organs in death determination. He claims further that his cases of "chronic brain death" show that the concept of brain death is inherently counterintuitive, for how could a dead body gestate infants or grow?⁵⁷

Another critic, Robert Taylor, has called the brain death concept a "legal fiction" that is accepted by society in a manner analogous to the concept of legal blindness. Taylor explains that legal blindness is a concept invented by society to permit people who are functionally blind from severe visual impairment to receive the same social benefits as those enjoyed by people who are totally blind. We all know that most people who are declared legally blind are not truly blind. But we employ a legal fiction and use the term "blindness" in a biologically incorrect way for its socially beneficial purpose. Taylor argues that, by analogy, we know that people we declare "brain dead" are not truly dead, but we consider them dead for the socially beneficial goal of organ procurement.⁵⁸

As a longstanding proponent of whole-brain death, I acknowledge that the whole-brain formulation, although coherent, is imperfect, and that my attempts to defend it have not adequately addressed all valid criticisms. But my inadequacies must be viewed within the larger context of the relationship of biology to public policy. Our attempts to conceptualize, understand, and define the complex and subtle natural concepts of life and death remain far from perfect. Perhaps we will never be able to achieve uniform definitions of life and death that everyone accepts and that no one criticizes for conceptual or practical shortcomings.

In the real world of public policy on biological issues, we must frequently make compromises or approximations to achieve acceptable practices and laws. For these compromises to be tolerable, generally they should be minor and not affect outcomes. For example, in the current practice of organ donation after cardiac death (formerly known as non-heart-beating organ donation), I and others raised the question of whether the organ donor patients were truly dead after only five minutes of asystole. The five-minute rule was accepted by the Institute of Medicine as the point at which death could be declared and the organs procured.⁵⁹ Ours was a biologically valid criticism because, at least in theory, some such patients could be resuscitated after five minutes of asystole and still retain measurable brain function. If that was true, they were not yet dead at that point so their death declaration was premature.

But thereafter I changed my position to support programs of organ donation after cardiac death. I decided that it was justified to accept a compromise on this biological point when I realized that donor patients, if not already dead at five minutes of asystole, were incipiently and irreversibly dying because they could not auto-resuscitate and no one would attempt their resuscitation. Because their loss of circulatory and respiratory functions was permanent if not yet irreversible, there would be no difference whatsoever in their outcomes if their death were declared after five minutes of asystole or after 60 minutes of asystole. I concluded that, from a public policy perspective, accepting the permanent loss of circulatory and respiratory functions rather than requiring their irreversible loss was justified. The good accruing to the organ recipient, the donor patient, and the donor family resulting from organ donation justified overlooking the biological shortcoming because, although the difference in the death criteria was real, it was inconsequential.

Of course Alan Shewmon is correct that not all bodily system integration and functions of the organism as a whole are conducted by the brain (though most are) and that the spinal cord and other structures serve relevant roles. And Robert Taylor is correct that many people view brain death as a legal fiction and regard such patients "as good as dead" but not biologically dead. But despite its shortcomings, the whole-brain formulation remains coherent on the grounds of the critical functions of the organism as a whole and on the additional grounds of Korein's critical system theory. The whole-brain death formulation comprises a concept and public policy that make intuitive and practical sense and have been well accepted by the public throughout many societies. Therefore, while I am willing to acknowledge that whole-brain death formulation remains imperfect, I continue to support it because on the public-policy level its shortcomings are relatively inconsequential.

Those scholars attacking the established whole-brain death formulation have a duty to show that their proposed alternative formulations not only more accurately represent biological reality, but also can be translated into successful public policy that is intuitively acceptable and maintains public confi-

dence in physicians' accuracy in death determination and in the integrity of the organ procurement enterprise. Although I acknowledge certain weakness of the whole-brain death formulation, I hold that it most accurately maps our consensual implicit concept of death in a technological age and, as a consequence, it has been accepted by societies throughout the world.

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Alternatives must meet biological reality and public policy

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- 10 President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research, *Defining Death: Medical, Legal and Ethical Issues in the Determination of Death* (Washington, DC: U.S. Government Printing Office, 1981): at 31-43.
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- 12 Alan and Elisabeth Shewmon recently claimed that my approach is futile because language constrains our capacity to conceptualize life and death. They regard death as an "ur-phenomenon" that is "...conceptually fundamental in its class; no more basic concepts exist to which it can be reduced. It can only be intuited from our experience of it..." See D. A. Shewmon and E. S. Shewmon, "The Semiotics of Death and its Medical Implications," *Advances in Experimental Medicine and Biology* 550 (2004): 89-114. Winston Chiong also rejected my analytic approach claiming that there can be no unified definition of death. Yet, he agreed that the whole-brain criterion of death is the most coherent concept of death. See W. Chiong, "Brain Death Without Definitions," *Hastings Center Report* 35 (2005): 20-30.
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AN ALTERNATIVE TO BRAIN DEATH

Jeff McMahan

In this response to Bernat and other defenders of the whole-brain criterion of death, McMahan defends a higher-brain or cerebral-death criterion. McMahan's position requires drawing a metaphysical distinction between the human *organism* and the *person* to whom that organism belongs. He supports his conclusion by appealing to two scenarios. The first is a hypothetical case of cerebrum transplantation, in which we intuitively believe that the person travels with his brain from one organism to another. The second involves actual cases of dicephalic twins, in which a single human organism appears to support two distinct persons. Although he agrees with Bernat that a human *organism* dies when it irreversibly loses its capacity for integrated functioning of its major organs and systems, McMahan denies that loss of the brain's critical regulatory functions is part of our concept of death. He argues that the difference between a *person's* life and death cannot depend on whether the brain, rather than artificial life support, performs these critical functions. Whole-brain death, he concludes, is sufficient for the death of a person, but not necessary. The only necessary condition is irreversible loss of consciousness.

SOME COMMON BUT MISTAKEN ASSUMPTIONS ABOUT DEATH

Most contributors to the debate about brain death, including Dr. James Bernat, share certain assumptions. They believe that the concept of death is uni-

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vocal, that death is a biological phenomenon, that it is necessarily irreversible, that it is paradigmatically something that happens to *organisms*, that we are human organisms, and therefore that our deaths will be deaths of organisms. These claims are supposed to have moral significance. It is, for example, only when a person dies that it is permissible to extract her organs for transplantation.