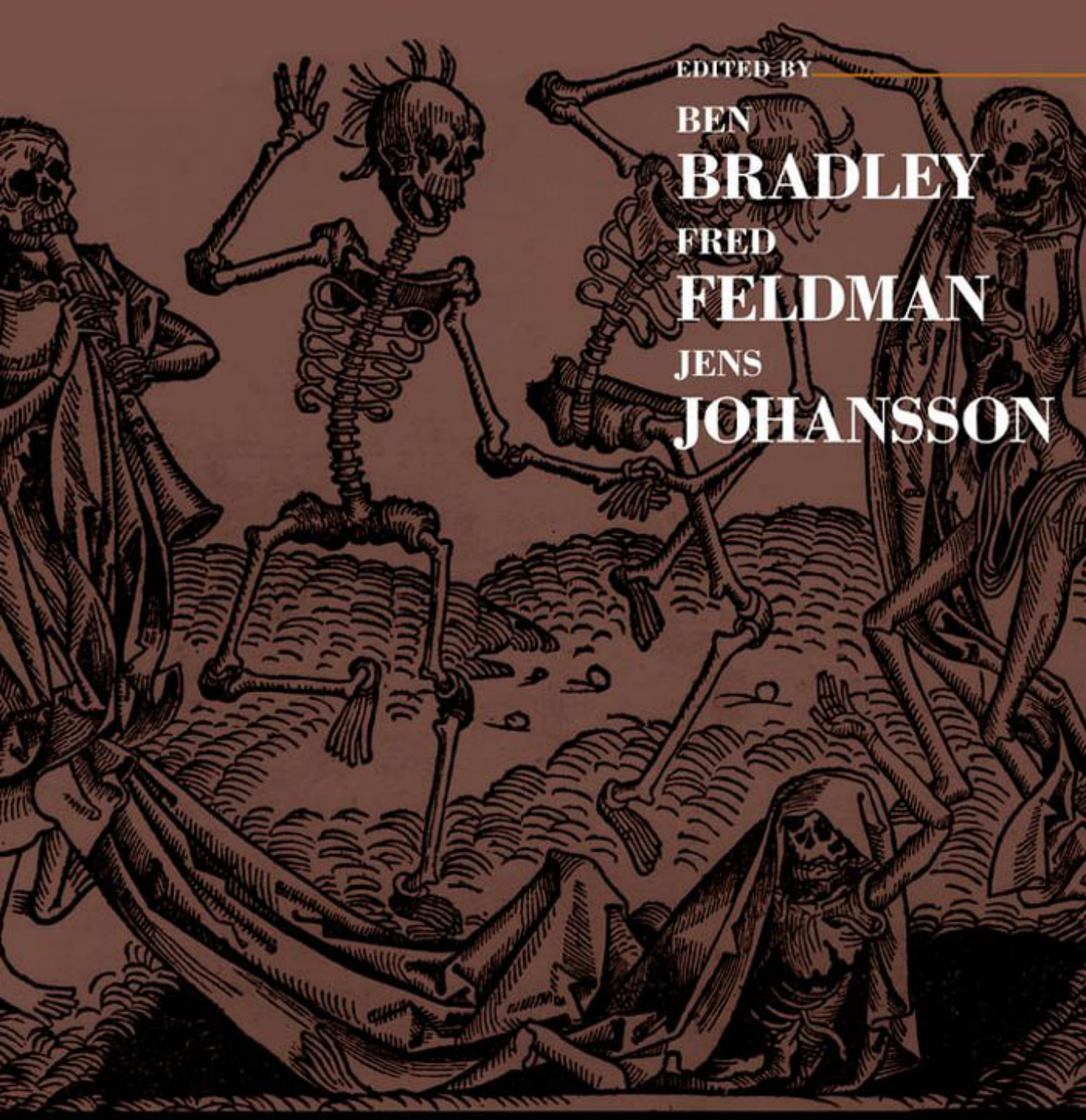

EDITED BY
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The Oxford Handbook *of* PHILOSOPHY OF DEATH

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Preface

Peter Ohlin, the philosophy editor at Oxford University Press in New York, had been thinking about the idea of putting together a collection of essays on topics connected with the metaphysics and ethics of death. Oxford had already published several books on these topics. Peter was aware that they were also being addressed in a large and growing body of new work—journal articles, books, book proposals, conferences, and so on. He thought it would be good to put together a collection of the best of these.

The idea was discussed with the editors of the current volume. We were all enthusiastic about working together on the project. We had high hopes, but at the same time, some concerns. We agreed that there would not be much point in reprinting some previously published (and in many cases *republished*) old papers from the 1970s and 1980s. There are already several very useful collections of that work. Indeed, there is already a fair amount of overlap among those anthologies. We did not have much enthusiasm for creating yet another reshuffling of those papers, however impressive and important they may be. We were much more excited about the idea of putting together a collection of all new papers on these topics.

In recent years it has become increasingly clear that serious philosophical reflection on the nature and value of death essentially involves a number of subtle and sometimes complex topics in metaphysics, axiology, and the philosophy of mind. In addition, there are quite a few concepts that have resisted straightforward analysis. We agreed that we wanted to have papers written by philosophers with the requisite expertise; we wanted authors whose views about death had firm foundations in metaphysics, ethics, conceptual analysis, and philosophy of mind.

Since the publication of some important work several decades ago, critics have pointed out a wide variety of previously unnoticed difficulties and confusions. New puzzles have come to light. We hoped to have original papers in which contributors would deal creatively with these difficulties. We hoped to be able to offer papers that would reflect and advance the current state of the debates about death. We wanted work that would not just report on the history of the debates; we wanted things that would move the debate forward. We recognized that we would not succeed unless we could get papers from truly outstanding philosophers.

Accordingly, we spent a fair amount of time trying to construct a list of possible contributors. We hoped to find people who would be able to produce sophisticated, knowledgeable, creative, new papers. After some discussion, we finally agreed on a list of people to invite. Most invitees had already made significant contributions to

the philosophical literature on death, but some were better known for their work in other areas. We were confident that they would make especially valuable contributions even if they had not previously written specifically about death. We sent out our invitations; we explained the sort of collection we were trying to construct. We were thrilled when just about everyone on our list shared our enthusiasm and agreed to participate.

We are very grateful to Peter Ohlin. The idea for this handbook originated with him. We have benefited from his generosity, insight, and steady support throughout the production of the book. He fully understood and appreciated our concerns at every stage. We are also grateful to all the others at Oxford University Press who played a role in bringing the book to fruition. We also benefited from the careful editorial work of Aaron Wolf.

We are especially grateful to the outstanding philosophers who have contributed papers for this collection. These are busy people. They have plenty of projects of their own to pursue. Some of them would otherwise have not thought of writing a paper about philosophical problems about death. But each of them agreed to spend some extra time working on a paper that would fit naturally into our scheme.

One of our contributors deserves special mention. Gary Matthews contributed an interesting and original paper to this volume; of course we are grateful to him for that. But we are grateful to him for far more in addition. Gary was Fred's colleague at the University of Massachusetts for more than forty years; throughout that time Gary was a steadfast friend and generous commentator. Ben had the good fortune to be able to study with Gary during his (Ben's) student days at UMass. And Jens also briefly knew Gary during a semester when he (Jens) was visiting Amherst. Though we all came at these questions from different perspectives, Gary's influence can be seen in all of our work, and indeed in the work of several others who have contributed to this volume. We all benefited from his insight, patience, broad knowledge of the history of philosophy, and tremendously agreeable manner. Gary died before this book was completed; he is sorely missed.

With respect, affection, and gratitude—all still tinged with grief—we dedicate this book to our teacher and colleague, Gary Matthews.

Contributors

Christopher Belshaw is a Senior Lecturer in Philosophy at the Open University. His other work on death includes *10 Good Questions about Life and Death* (Blackwell 2005) and *Annihilation: The Sense and Significance of Death* (Acumen 2009), as well as a number of book chapters and journal articles. He has also written on environmental philosophy and is working now on a book on animals.

Lars Bergström is Emeritus Professor of Practical Philosophy at Stockholm University, where he also defended his doctoral dissertation *The Alternatives and Consequences of Actions* in 1966. Between 1974 and 1987 he was Professor of Practical Philosophy at Uppsala University and he is a member of the Royal Swedish Academy of Sciences. His main areas of interest are moral philosophy, philosophy of science, and the philosophy of W. V. Quine.

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Fred Feldman is Professor of Philosophy at the University of Massachusetts Amherst, where he has been teaching since 1969. He has long been fascinated by philosophical problems about the nature and value of death. He is author of *Confrontations with the Reaper: A Philosophical Study of the Nature and Value of Death* (Oxford University Press, 1992), *Pleasure and the Good Life: On the Nature,*

Varieties, and Plausibility of Hedonism (Oxford University Press, 2004), *What Is This Thing Called Happiness?* (Oxford University Press, 2010), several other books, and more than seventy-five papers in professional journals.

John Martin Fischer is Distinguished Professor and Chair of the Department of Philosophy at the University of California, Riverside, where he has held a University of California President's Chair (2006–2010). He has written on various topics in philosophy, including free will and moral responsibility. He has published papers on the metaphysical and ethical dimensions of death, and he is the editor of *The Metaphysics of Death* (Stanford University Press, 1993). His collection *Our Stories* (Oxford University Press, 2007) includes papers on death, immortality, and the meaning of life.

Cody Gilmore is Associate Professor of Philosophy at the University of California, Davis. He is the author of "Time Travel, Coinciding Objects, and Persistence" (*Oxford Studies in Metaphysics*, vol. 3, 2007), "Defining 'Dead' in terms of 'Lives' and 'Dies'" (*Philosophia* 2007), "Parts of Propositions" (in Shieva Kleinschmidt, ed., *Mereology and Location* (Oxford University Press, forthcoming), "Slots in Universals" (*Oxford Studies in Metaphysics*, vol. 8, forthcoming), and other papers in metaphysics.

Matthew Hanser is Professor of Philosophy at the University of California, Santa Barbara. His papers on killing and harm include "Harming Future People" (*Philosophy and Public Affairs*, 1990), "Why Are Killing and Letting Die Wrong?" (*Philosophy and Public Affairs*, 1995), "The Metaphysics of Harm" (*Philosophy and Phenomenological Research*, 2008), and "Harming and Procreating" (M. Roberts and D. Wasserman, eds., *Harming Future Persons*, Springer 2009).

Jens Johansson is Associate Professor of Philosophy at Uppsala University, Sweden. He is the author of several journal articles about the philosophy of death and related issues, including "Non-Reductionism and Special Concern" (*Australasian Journal of Philosophy* 2007), "Kaufman's Response to Lucretius" (*Pacific Philosophical Quarterly* 2008), "Parfit on Fission" (*Philosophical Studies* 2010), and "Past and Future Non-Existence" (forthcoming in *The Journal of Ethics*).

F. M. Kamm is Littauer Professor of Philosophy and Public Policy, Harvard Kennedy School, and Professor of Philosophy, Department of Philosophy, Harvard University. She is the author of *Creation and Abortion* (Oxford University Press, 1992), *Morality, Mortality*, vols. 1 and 2 (Oxford University Press, 1993, 1996), *Intricate Ethics* (Oxford University Press, 2007), *Ethics for Enemies: Terror, Torture, and War* (Oxford University Press, 2011), and numerous articles on normative ethical theory and on practical ethics.

Steven Luper chairs the philosophy department at Trinity University in San Antonio, Texas. His books include *The Philosophy of Death* (Cambridge University Press 2009) and *Invulnerability: On Securing Happiness* (Open Court 1996), and he is presently editing the *Cambridge Companion to Life and Death* (Cambridge University Press, forthcoming). Among his essays are "Annihilation" (*Philosophical*

Quarterly 1985), "The Absurdity of Life" (*Philosophy and Phenomenological Research* 1992), "Exhausting Life" (*Journal of Ethics: An International Philosophical Review*, forthcoming), and "Adaptation," to appear in *The Metaphysics and Ethics of Death* (Oxford University Press, forthcoming).

Don Marquis is Professor of Philosophy at the University of Kansas. He is the author of a widely reprinted and widely discussed essay on the ethics of abortion that was published in 1989. He has written a number of essays on the ethics of abortion since that time.

Gareth B. Matthews was Professor of Philosophy Emeritus at the University of Massachusetts. He wrote books and articles on ancient and medieval philosophy, philosophy of religion, philosophy of mind, and philosophy of childhood, including *Socratic Perplexity and the Nature of Philosophy* (Oxford University Press 1999) and *The Philosophy of Childhood* (Harvard University Press 1994).

Phillip Mitsis is A. S. Onassis Professor of Hellenic Culture and Civilization at New York University and Academic Director of the American Institute of Verdi Studies. He has published on Greek epic and tragedy, and on the history of ancient and early modern philosophy. His writings on Epicurus include *The Pleasures of Invulnerability: Epicurus' Ethical Theory* (1988).

Alastair Norcross is Associate Professor of Philosophy at the University of Colorado. He has written many articles on consequentialist moral theory and various topics in applied ethics, including "Puppies, Pigs, and People: Eating Meat and Marginal Cases" (*Philosophical Perspectives* 2004), "Animal Experimentation" (*Oxford Handbook of Bioethics* 2007), and "Good and Bad Actions" (*Philosophical Review* 1997).

Eric T. Olson is Professor of Philosophy at the University of Sheffield. He is the author of *The Human Animal: Personal Identity without Psychology* (Oxford University Press 1997) and *What Are We? A Study in Personal Ontology* (Oxford University Press 2007) as well as many articles on the nature and persistence of human people.

Connie S. Rosati is Associate Professor of Philosophy at the University of Arizona. Her research mainly addresses issues about personal good, moral motivation, and the nature and objectivity of law. She is the author of "Persons, Perspectives, and Full Information Accounts of the Good" (*Ethics* 1995), "Personal Good" (*Metaethics after Moore*, edited by Terry Horgan and Mark Timmons, 2006), "Objectivism and Relational Good" (*Social Philosophy and Policy* 2008), and "Some Puzzles about the Objectivity of Law" (*Law and Philosophy* 2004). She is currently working on a book about personal good.

Theodore Sider is Frederick J. Whiton Chair of Philosophy at Cornell University. He is the author of *Four-Dimensionalism*, *Riddles of Existence* (with Earl Conee), *Logic for Philosophy*, and *Writing the Book of the World*.

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(Oxford University Press/Clarendon Press, 1988), *Thought Experiments* (Oxford University Press, 1992) and *Pseudo-Problems* (Routledge, 1993), *Vagueness and Contradiction*, (Oxford University Press, 2001), *A Brief History of the Paradox* (Oxford University Press, 2003), and *Seeing Dark Things* (Oxford, 2008). He is currently taking his time completing a short book entitled *A Brief History of Nothing*.

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Dean Zimmerman is Professor of Philosophy at Rutgers University. He is editor or coeditor of several books, including an ongoing series, *Oxford Studies in Metaphysics* and *The Oxford Handbook of Metaphysics*, to which he contributed a chapter on materialism and persons. Zimmerman is author of "The Compatibility of Materialism and Survival: The 'Jumping Elevator' Model" (*Faith and Philosophy* 1999), along with numerous other articles in metaphysics and philosophy of religion.

THE OXFORD HANDBOOK OF

PHILOSOPHY OF DEATH

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INTRODUCTION

PHILOSOPHY OF DEATH

BEN BRADLEY, FRED FELDMAN, AND JENS JOHANSSON

The philosophy of death spans many subdisciplines of philosophy. It is "inter-subdisciplinary." Perhaps in part for that reason, philosophy of death is not typically recognized as a distinct subfield of philosophy. If you look at Brian Leiter's *Philosophical Gourmet Report* specialty rankings in philosophy, you will not find a specialty ranking for philosophy of death. If you are on a search committee in a philosophy department, you might have no applicants who list philosophy of death as an area of specialization or competence. Yet many philosophers are working on the philosophy of death even if they don't think of their work in that way. As we will see, what we say about many well-known questions of philosophy will have implications for what we think about death.

The first philosophical question to ask about any X is "what is X?" Thus our handbook begins with the question "what is death?"—or, as Cody Gilmore puts it, "when does a thing die?" (chapter 1). It is natural to say that to die is to cease to be alive. But there seem to be cases in which a thing ceases to be alive without dying. These include cases of suspended animation, where life processes stop but could be restarted, and fission, where a living being divides into two new living beings. One of the main challenges in understanding death is to understand the difference between cases where fission involves death and cases where it does not. Gilmore provides a novel account of this difference; he suggests that fission entails death unless it involves what he calls "generative division."

Among the oldest philosophical questions are questions about personal identity. What is a person? What are the persistence conditions for people? The answers

to these questions bear on the question of what happens to us when we die. Most nonphilosophers seem to believe that each person has a nonphysical soul that continues to exist after the death of the body, perhaps in heaven, hell, or purgatory. But this view is not widely held by philosophers, because the existence of a nonphysical soul is usually thought to be problematic. The most popular views about what we are include the view that we are, fundamentally and essentially, animals—the biological view—and the view that we are essentially psychological entities—the psychological view. If the biological view is true, then what we say about our persistence conditions should mirror what we say about the persistence conditions of other biological organisms such as trees. If we are essentially psychological entities, and our persistence conditions are determined by relations of psychological connectedness over time, it would seem we go out of existence at or before biological death (unless, perhaps, another organism stands in the appropriate psychological relations). Fred Feldman defends the view that we continue to exist after death, either as dead people or as dead things that were once people (chapter 2). Eric Olson gives objections to this view, but concludes that all views about what happens to us when we die are beset with problems (chapter 3). In chapter 4, Dean Zimmerman argues that the view that it is possible to survive one's death is defensible on a variety of metaphysical views (which is not to say that we in fact do survive our deaths).

Philosophical questions about time have been thought to be relevant to questions about death. In various ways, it has been thought to matter whether the past and future are real. If the future is not real, perhaps we should not be afraid of our future deaths, since they are not real. If the past is not real, perhaps death cannot be bad for us, since once we die and are purely past, we will in no way exist to be the subject of harm. Ted Sider argues that we need not adopt any particular view about the metaphysics of time in order to hold that death is bad (chapter 5). According to Sider, we must be careful to distinguish whether we are making ordinary claims, such as that the table is hard, or claims about fundamental reality, such as that there are no tables but only simples arranged tablewise. The claim that death is bad is an ordinary claim, while views about the reality of the past and future are views about the underlying nature of reality; the ordinary claim about death could be underwritten by a variety of metaphysical views but might not be undermined by any of them. Lars Bergström suggests another way in which facts about time might affect how we should think about our deaths (chapter 6). If time is not linear but circular, then we will, in some sense, live again one day. Perhaps accepting this view about time should to some degree temper our sadness about our deaths.

As Gareth Matthews and Phillip Mitsis explain in chapters 7 and 8, the great Ancient Greek philosophers (Socrates, Plato, Aristotle, Epicurus) typically argued that we should not fear death, because it is not bad for us. Most of these arguments do not strike contemporary philosophers as compelling. For example, Socrates's suggestion that death is like a dreamless sleep (how refreshing!) seems hard to take seriously. But Epicurus's arguments, and those of his Roman admirer Lucretius, have continued to engage us; a few are convinced by them, and even those who

think them unsound have different views about where they go wrong. Two arguments have received the most attention. The timing argument goes like this: there is no time at which death could harm me, since, as I go out of existence at the moment of my death, I do not overlap in time with my own death; thus death cannot be bad for me. The symmetry argument goes like this: there is no reason to be afraid of my own future nonexistence, because future nonexistence is no more to be feared than past nonexistence, and I neither fear nor have any reason to fear (or have any negative attitude toward) my own past nonexistence. Roy Sorensen and Jens Johansson address these arguments at length in chapters 10 and 11, and they are also addressed in several other chapters.

Epicurus seemed to think that since a person goes out of existence when she dies, death cannot be bad because the dead person can have no painful experiences. But those who think death is bad are not moved by this line of reasoning. The standard way to account for the badness of death is to endorse some sort of deprivation account. According to the deprivation account, death is bad for someone if, and to the extent that, it deprives that individual of a more valuable life. Thus it is possible for death to be bad without involving any painful postmortem experiences. Deprivation accounts are defended in the two papers that did the most to restart the contemporary philosophical discussions of death: Thomas Nagel's "Death" (1970) and Bernard Williams's "The Makropulos Case" (1973). John Broome provides a careful statement of the deprivation account in chapter 9.

Some have wondered whether the fact that death deprives its victim of the goods of life is sufficient for death to be a genuine misfortune for its victim. Kai Draper has argued that other mere deprivations, such as failing to find Aladdin's lamp, do not seem like genuine misfortunes, because it is inappropriate to feel bad about them. In chapter 13 he takes up the question of what attitude it is appropriate to take toward one's death. Christopher Belshaw also argues that mere deprivation is insufficient for death to be a misfortune. Rather, he says (chapter 12), the victim must also have had a desire to live.

There is another desire-based view of the badness of death that has found a number of adherents. Joel Feinberg and George Pitcher claimed that death is bad in virtue of the fact that it frustrates the interests, that is, the desires, of the deceased (Feinberg, 1984; Pitcher, 1984). When death frustrates an interest, it is bad for the individual who had that interest, and moreover, it is bad for her at the time she had the interest. Thus we would seem to have an answer to the timing problem: death is bad for its victim at times before she died. This view enables us to account for posthumous harm in the same way we account for the harm of death: events occurring after one's death can frustrate interests one had while alive. Steven Luper defends a version of this view of posthumous harm in chapter 14.

Williams's 1973 paper sparked much interesting discussion of immortality: would it be a good thing to live forever? Williams claimed that one would eventually run out of reasons to live, and then death would cease to be a misfortune. His arguments for these claims were suggestive but cryptic. John Fischer and Connie Rosati criticize those arguments in chapters 15 and 16. Fischer argues that a certain

sort of immortal life might well be worth having, while Rosati appeals to facts about agency to explain why we want to extend our existence.

One reason we might care about these questions about the badness of death is that we care about justifying the claim that killing is wrong, and the wrongness of killing seems to have something to do with how bad death is for the victim. If death weren't bad, we might think our attitudes toward murder were unjustified. But it seems wrong to say that the degree of wrongness of killing someone depends on how bad it is for that person to die, because even if death would not be very bad for its victim (perhaps because he is very old and does not have long to live anyway), it would still be seriously wrong to murder that person. Matthew Hanser attempts to explain this in chapter 17 by appeal to a respect-based view of the wrongness of killing.

While killing another person is normally seriously wrong, there are some cases of killing about which it is not so obvious what to say. What, if anything, might make it permissible to kill fetuses, nonhuman animals, combatants, murderers, or the terminally ill? Some of these topics are taken up in the final four chapters.

Sometimes there is controversy over the wrongness of killing certain individuals at least in part in virtue of controversy over whether death is bad for those individuals. For example, it is sometimes argued that death is not bad for nonhuman animals or human fetuses in virtue of the fact that they lack relevant desires, or have insufficient psychological connectedness over time. Don Marquis and Alastair Norcross criticize these arguments concerning animals (Norcross, chapter 20) and fetuses (Marquis, chapter 18).

Sometimes there is little controversy that death is bad for an individual, but there are reasons to think that killing that individual might be justified in any case. Frances Kamm takes up the case of killing in war (chapter 19), while Torbjörn Tännsjö considers the case of killing convicted murderers (chapter 21).

In various ways, and from different perspectives, all these essays might be thought to answer one or both of the following questions: what is death, and why does death matter? These are the questions that define the growing intersubdisciplinary field of philosophy of death.

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CHAPTER 1

WHEN DO THINGS DIE?

CODY GILMORE

Many different projects have been pursued under the heading "the definition of death." Those who pursue these projects differ in what they are trying to define and in what sense they are trying to define it. Some take their target to be a notion of death that applies only to human beings or only to persons.[1] Some try to "define" their target merely in the epistemic sense of specifying a reliable and easily detectable mark or indicator of it.[2]

This chapter pursues a more general and metaphysical project. My central target will be *dying*, the concept (or property or relation) expressed by the verb "to die" as it occurs in sentences in the perfective aspect, such as "Mary died at midnight." I assume that this is a general biological concept that applies univocally across a wide range of entities, including human beings, cats, trees, bacteria, and individual cells (e.g., human skin cells) that are not organisms. These things all die, in the same sense of "die." My main concern in the chapter is not to define the word "die" or to analyze the concept it expresses. Rather, it's the project of giving informative, metaphysically necessary and sufficient conditions for a thing to die at a time. In particular, it's the attempt to formulate a true and informative instance of the following schema:

S Necessarily, for any x and any t, if t is an instant, then x dies at t if and only if _____.[3]

Each instance of S can be thought of as an answer to the question "when does a thing die?"[4] One natural answer is, "when it stops being alive." This corresponds to an instance of S that I dub the Cessation Thesis (CT):

CT Necessarily, for any x and any t, if t is an instant, then x dies at t if and only if x ceases to be alive at t.[5]

CT does not purport to specify the meaning of the word "dies" or to be an analysis of the concept expressed by that word. One can endorse CT even if one holds that (i) the given concept is simple and unanalyzable or that (ii) the concept does have an analysis but not one that involves the concept of being alive. Likewise, one can endorse CT even if one holds that the sentence "if John died at noon, then he ceased to be alive at noon" is not analytic. What the Cessation Thesis says is merely that there is a metaphysically necessary connection of a certain sort between dying and ceasing to be alive.[6] Whether any of the relevant concepts have analyses is a separate question.

Here is an analogy noted in a similar context by Ned Markosian (1998, pp. 214–215). One can give an answer to Peter van Inwagen's Special Composition Question ("Under what conditions do some things compose something?") without thinking that one's answer constitutes an analysis of the concept of the composition or a definition of the word "compose." For example, van Inwagen himself endorses the following answer to the Special Composition Question: (VIPA) necessarily, for any xx, there is something that xx compose if and only if the activities of xx constitutes a life. (Here "xx" is used as a plural variable.) But VIPA is not an analysis of the concept of composition. That concept can be analyzed as follows:

> xx compose y at t = df. (i) no two of xx overlap at t, (ii) each of xx is a part of y at t, and (iii) each part-at-t of y overlaps-at-t at least one of xx,

where "x overlaps y at t" is defined as "$\exists$z[z is a part of x at t & z is a part of y at t]." Composition is a purely mereological concept, one whose analysis involves only logical and mereological notions. Rather than analyzing the concept of composition, VIPA aims to specify certain metaphysically necessary connections between that concept and other concepts that are not involved in its analysis. One might take a parallel view about CT and dying. One might think that while CT is true, the analysis of the concept of dying does not involve the concept of being alive, but rather, runs something like this:

> x dies at t = df. x becomes dead at t,

where the concept of being dead is unanalyzable. I want to leave this analysis open. (For more on this, see note 24.)

Enough about CT for now. The plan for the chapter is as follows. In sections 2 and 3, I discuss a pair of problems for CT—one arising from suspended animation, the other arising from fission—and I consider a series of repairs. Unsurprisingly, none of the repairs is completely satisfactory. We shouldn't assume that informative, individually necessary, jointly sufficient conditions for dying at a time (or for any ordinary concept) are likely to be had. On the other hand, we shouldn't assume from the outset that this is an unattainable or unworthy goal, or that there is nothing interesting to learn by pursuing it. Though it may be predictable *that* our attempts to formulate such an account will fail, I doubt that anyone will pretend to know in advance exactly *what* the most plausible accounts are or exactly

why they fail, if they do. Succeed or fail, the project ought yield a clearer picture of the distinctive "modal profile" of dying.

With an (imperfect) account of dying in place, section 4 takes up a different question: When are things *dead*? The question is harder than one might think, but it's easier than "when do things die?" and can be dealt with more quickly.

1. Preliminaries

Before we get started, it will be convenient to introduce some of the expressions, concepts, and doctrines that will be in play.

1.1 Presentism and Eternalism

These are rival views about the ontology of time. Presentism is the view that the only things that exist or are real are the present time and its contents, and eternalism is the view that past, present, and future times and their contents all exist equally.[7] Just as Neptune exists despite being far away in space, eternalists say, Pangaea and the 2086 NBA scoring champion both exist despite being "far away in time." (Presentists, by contrast, say that Neptune exists, but Pangaea and the 2086 NBA scoring champion do not.)[8] Given eternalism, we will need to draw a distinction between the ontological notion of *existing*, on the one hand, and the locational notion of *existing at* or, as I will say, *being present at*, a time, on the other. Pangaea exists, according to eternalists, but it is not present at any instant in the year 2012; rather, it is present only at pre-Cenozoic instants. Intuitively, a thing is present at a time just in case part of its career occurs at that time.

Presentists and eternalists both agree that Neptune is *present at* the current time and that Pangaea is not, and they both agree that Neptune *exists*. They disagree about whether Pangaea exists: eternalists say that it does, and presentists say that it does not. Throughout the chapter, I assume that eternalism is true, though most of what I say can probably be reframed in presentist terms, at the cost of some awkwardness. I also assume that there are such things as instants, and that time is a continuum of them.[9]

1.2 The Termination Thesis

The Termination Thesis (TT) is the view that

TT for any x and any instant t, if x dies at t, then x ceases to be present at t.[10]

Those who endorse TT—*Terminators*—will say that when Lenin died, he ceased to be present and, hence, is presumably not contained in his display case in Red

Square now.[11] What does that display case contain, according to Terminators? The two most natural options are (i) a human-shaped object that began to be present when Lenin died and that is composed of (mostly) the same particles that composed Lenin at the end of his life, or (ii) some particles that are "arranged corpse-wise" but that do not compose anything at all. We might call the former *Lenin's corpse* and the latter *Lenin's remains*.

Some friends of TT may wish to say that the things that *die* (people, organisms, what have you) are *constituted by* but not *identical to* certain other material objects (bodies, portions of matter, what have you). Further, they may wish to say that, typically, when a person or an organism dies, the thing that constitutes it in the final moments of its life typically does not cease to be present. On this view, when Lenin died, he ceased to be present, but the thing that constituted him in the final moments of his life did not cease to be present. Perhaps, then, Lenin's display case contains something that once constituted Lenin but was never identical with him, namely, his body. Together with TT as stated, this view entails that

L Lenin's body did not die when Lenin died.

L may seem surprising, since one would think that Lenin's body was characterized by the same distribution of intrinsic physical properties as was Lenin over those final moments, and that it stood in the same spatial and causal relations to other things as Lenin did. And it is tempting to think that when two things are alike in these ways, they are also alike in whether they die at the given time. But for Terminators who are willing to reject the relevant "supervenience-of-dying" principle, L is available.

However, anyone who thinks that Lenin's display case contains something that died in 1924 (Lenin, a body, an organism) will want to reject TT as I have framed it.[12] Likewise for those who think that trees often remain standing for several years after they die. Most of what I will say in this chapter should in principle be acceptable both to friends and foes of TT, though, for what it's worth, I tend to sympathize with its foes.

One final point about TT before we move on. I have stated it in terms of dying and presence. But it is typically stated in terms of dying and existence, as follows:

TT* Things cease to exist when they die.

TT* might be read just as a more colloquial formulation of TT, in which case I have no complaints about it. But it might instead be given a second reading that puts it in tension with eternalism. On the second reading, TT* entails that if Socrates has died (and has not somehow begun to exist again in the interim), then *there is no such entity as Socrates*, where this is not merely a matter of Socrates's temporal location but is a matter of ontology. Eternalists want to say that, like all past, present, and future things, Socrates *exists* (at least in a tenseless sense) and has never *ceased* to exist, though, of course, they will add that he does not bear the *being present at* relation to any instant in the year 2012. Eternalists also want to say that Socrates died. So they will need to reject TT*, on its second reading.

But it seems to me that the intuitive idea philosophers have in mind when they use the label "the Termination Thesis" is one that can be accepted by presentists and eternalists alike. It is a view about things that live and die, and about their relationship to time. Informally, it is the view that a thing "ends" when it dies; it does not keep persisting as a dead thing after it dies. This view is neutral with respect to debates about the ontology of time, as is TT, my formulation of the Termination Thesis. By contrast, TT*, on its second reading, is not neutral in this way, which makes me think that it shouldn't be identified with the Termination Thesis.

The interaction between the dispute over TT and the dispute between presentism and eternalism is summarized in table 1.1.[13] The diagram adopts the simplifying assumption that opponents of TT ("anti-Terminators") will say that *people* typically remain present for a while after they die. But not all anti-Terminators will really want to say this. Some of them will say that Lenin and his body both died at the same time, and that Lenin ceased to be present then, but his body did not.

Having introduced a pair of metaphysical controversies relevant to philosophical questions about death, I turn now to six expressions that will play a role in subsequent discussion (or that are easily confused with those that will).

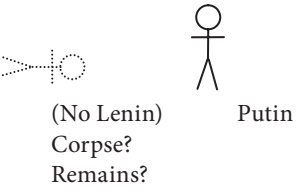
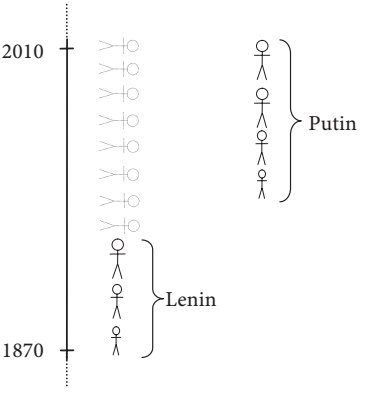
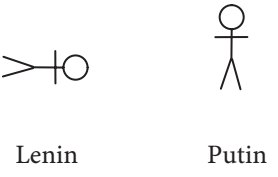
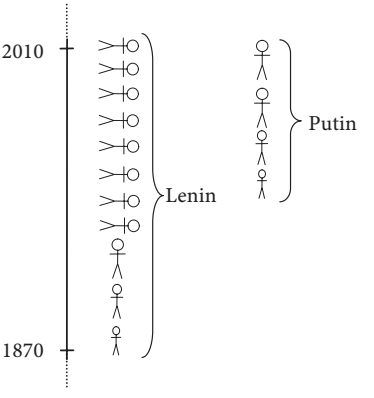
1.3 "Is Alive"

I won't try to define the adjective "alive," analyze the concept it expresses, or give informative necessary and sufficient conditions for being alive. These tasks are too much for a single chapter, not to mention one whose main focus is on death. Instead, I'll assume that, as with most ordinary concepts, we grasp the concept of being alive even in the absence of anything like an analysis of it. My project here is not to shed new light on being alive, but rather to *use* this concept to shed light on death. I think the reader will agree (at least by the end of the chapter) that even if the concept of being alive were crystal clear and perfectly understood, either as a primitive or via one's favorite analysis, there would still be hard and interesting questions about the *connections* between being alive and dying. Those connections are among the topics to be explored here.

As with "dies," my default assumption is that "alive" is not context sensitive. To see the significance of this assumption, suppose that a biologist is giving a lecture about the flora of California to a group of tourists. She points to a bristlecone pine and utters the sentence, "Surprisingly, that tree is alive." Now suppose that two paramedics arrive at the scene of a car accident. One of them rushes to a victim lying motionless in a ditch, checks the victim's pulse, and shouts, "He's alive!" According to the "no context sensitivity" assumption, "alive" expresses the same concept (or property or relation) in both contexts.

I take this concept, like the one expressed by "dies," to apply to a wide range of biological entities, including not just organisms (particular human beings, trees, amoebas) but also individual cells that are not organisms. Being alive, on this view, does not by itself entail having a properly functioning brain or a properly functioning heart. Bacteria

Table 1.1 Death and Time

	Presentists say: Things cease to exist when they cease to be present.	**Eternalists** say: Things do not cease to exist when they cease to be present.
Terminators say: Things cease to be present when they die.	Things cease to exist when they die. Reality (i.e., reality now)  	Things cease to be present but don't cease to exist when they die. Reality 
Anti-Terminators say: Things at least sometimes remain present for a while after they die.	Things at least sometimes remain present, and hence keep existing, for a while after they die, but as soon as they cease to be present, they cease to exist. Reality (i.e., reality now)  	Things at least sometimes remain present for a while after they die, and they don't cease to exist when they cease to be present. Reality 

are alive but don't have hearts or brains.[14] Whether the concept applies to biological entities that are neither organisms nor cells—such as organs, organelles, and viruses—I leave open. (The same goes for "dead" and "a death": my default assumption is that none of these is context sensitive and that each expresses a general biological concept that can apply equally to human beings, blood cells, and many things in between.)

Presumably, whether a thing is alive at a given time is a matter of what sorts of physical and chemical processes its parts are engaged in at that time.[15] I take it, in

other words, that a thing is alive at a given time just in case it is performing the right sorts of "life-functions" at that time. This much seems relatively uncontroversial, but as soon as one tries to say anything more precise about what the *right sorts* of life-functions are, one encounters difficulties.[16] So I will leave this task to others.

I noted earlier that there is controversy about whether things cease to be present when they die. One assumption I take to be shared by all participants in this controversy is that

P1 necessarily, for any x and any t, if t is an instant and x is alive at t, then x is present at t.

P1 may seem too obvious to be worth mentioning, but in fact it captures an important respect in which being alive differs from being dead (and being famous). A thing can be dead at an instant at which it is not present; it cannot be alive at such an instant.

Finally, it will be convenient to speak of a dyadic relation "associated" with being alive: *being alive at*. A thing can bear this relation to certain times and fail to bear it to others. Lenin bears it to each of the instants in 1923 but to none of the instants in 1925. I assume that, necessarily, a thing x bears *being alive at* to an instant t just in case x is alive at t. So much for "alive."

1.4 "Dies"

To die at an instant is to undergo a certain sort of *transition* then. Can we specify the nature of this transition in a more informative way? It is natural to think that, at least *typically*, a thing x dies at an instant t

- if and only if x ceases to be alive at t,
- if and only if x becomes dead at t, and
- if and only if a death of x culminates[17] at t.

Whether each of these biconditionals holds in full generality is a difficult question. We will have much more to say about the first of these in sections 2 and 3.

A number of further questions naturally arise concerning the connections between the concept expressed by "dies" and the concepts expressed by "alive" and "present": Can a thing be alive at an instant at which it dies?[18] Can it *fail* to be alive at such an instant?[19] Can a thing be *present* at an instant at which it dies?[20] Can a thing *fail* to be present at such an instant?[21] For reasons given in the notes, I think our default answer to each of these questions should be yes.

Some may balk at the claim that things die at *instants*. It is hard to know *precisely* when a thing dies, and not merely because we lack detailed information about a thing's physiological processes. Consider Nixon's death. No matter how complete our knowledge of the biochemical details in this case, we would still be unable to *know*, of any independently identified instant t, that Nixon died at t (and not a femtosecond earlier or later). One might be tempted to infer from this that, strictly speaking, Nixon didn't die at any instant, but only at some extended interval. (Such a doctrine might seem to harmonize with the slogan that "death is a process, not an event.")

I think this would be a mistake. In the first place, such a view wouldn't make it any easier to know the facts about when Nixon died. It would be just as hard to know which precisely demarcated *interval* or *intervals* were the ones at which Nixon died as it would be to know which *instant* was the one at which he died. Second, the most we can confidently infer from our observations about Nixon is that whether a thing dies at a given instant t (as opposed to some nearby instant) is often a *vague* matter. And there is no easy argument from the claim that

(a) each instance of the schema "The unique instant at which Nixon died is the one that is exactly ___ seconds earlier than midnight EST, January 1, 2000" is either vague or false,

to the claim that

(b) the sentence "there is exactly one instant at which Nixon died" is either vague or false.

For even if (a) is true, one might think that the reason *why* it's true is just that there is vagueness as to *which* instant was the unique instant at which Nixon died. In that case, many will say that it is still true and nonvague that Nixon died at *some*—indeed, exactly one—instant, and hence that (b) is false.[22]

Granted, there may be better arguments for (b), and presumably there is a coherent view according to which things die only at extended intervals, rather than at instants. But to keep things simple, I will assume for the remainder of the chapter that things die at instants. I take no stand on whether they *also* die at intervals.

1.5 "Is Dying"

Consider the concept expressed by the verb "to die" as it occurs in sentences in the *progressive* aspect, such as "Mary was dying at midnight." To a very crude first approximation, a thing x is dying at an instant t if and only if x is alive at t but is involved in some process at t that, if allowed to continue without interference, would soon cause x to die.[23] A thing cannot *die* at an instant unless it becomes dead then, but it can *be dying* at an instant without becoming dead then. Indeed, a thing can be dying for a while but then fully recover and go on to live for many years. (Presumably, it is *metaphysically possible* for a thing to be dying for a while and then go on to live for infinitely many years thereafter, and never die.)

1.6 "Is Dead"

Typically, a thing is dead at an instant if and only if the thing died at some earlier instant (or perhaps at t itself, depending upon x's condition then).[24] I assume that *being dead at* and *being alive at* are *incompatible* in the sense that nothing can bear both of these relations to the same instant. Nothing can be both dead and alive at the same time.

Many things, however, are neither alive nor dead at a given time: Pangaea, for example, is neither alive nor dead at this time. It's not even present now. Further, there are many things that are neither alive nor dead at instants at which they are present:

my wallet was present at each instant in the year 2009 but was neither dead nor alive at any of them. (Later, I'll give arguments that support similar claims about organisms.) In sum, *being alive at* and *being dead at* are *contraries*: they exclude each other but, unlike *contradictories*, the absence of one does not entail the presence of the other.

Finally, I assume that *being dead at* is quite different from relations such as *being bent at* or *being 2 kg in mass at*. Instead, it is more like *being an ex-convict at*, *being ten miles from the North Pole at*, and *being famous at*. Roughly, whether a thing x bears *being bent at* to an instant t depends only on what x is like in itself at t and is independent of how x is related to things outside itself at t, as well as being independent of how things are at other instants. By contrast, whether a thing x bears *being ten miles from the North Pole at* to an instant t depends upon how x is related to something outside itself (the North Pole) at t, and whether x bears *being an ex-convict at* to t depends upon how things are at other times: it depends upon whether x was a convict at a time earlier than t. This is all very loose, but it points toward an intuitive distinction among dyadic relations to instants. Call those that are like *being bent at, intrinsic**; call the others *nonintrinsic**.

As an aid to grasping this distinction, some may find it helpful to think in terms of the following rough-and-ready test. To determine whether R is intrinsic*, ask the following questions:

- Is R a dyadic relation that a thing can bear to an instant?
- Must a thing be *present* at an instant in order to bear R to that instant?
- Is it metaphysically possible that (i) there is a thing x that bears R to an instant t, even though (ii) t is the only instant that exists; (iii) there is nothing before or after t; and (iv) x and its parts are the only things (other than t itself, perhaps) that are present at t?

If the answer to any of these questions is no, then R is probably not intrinsic*. If the answer to each of them is yes, then R is probably intrinsic*. So much for the notion of an intrinsic* relation in general. How does this notion apply to the specific relations that interest us here?

Being alive at might be intrinsic*; this is a hard question.[25] Likewise for *being (in the process of) dying at*. But *being dead at* is clearly nonintrinsic*. A thing cannot be dead at an instant t unless it died at some earlier instant (or perhaps at t itself). Whether a thing is dead at a given instant, then, is a partly *historical* matter; it is partly a matter of how things are at earlier times. Moreover, *being dead at*, like *being famous at*, is a relation that a thing can bear to an instant at which the thing is not present. Let t be some instant in the year 2012. Then Socrates is dead at t. (He's also famous then.) But even if he remains present for a while after he dies, he is almost[26] certainly not present at t.

Both friends and foes of TT ought to agree on all of this. However, if we drop TT and assume that some things remain present for a period of time as dead things after they die, we can provide an especially vivid illustration of the fact that *being dead at* is not intrinsic*:

> **Lenin and His Body Double**. Lenin is dead but still present at t, an instant in the year 2012. To keep museum visitors happy while Lenin is taken off display for maintenance, curators have constructed a copy of him. The copy is so well-made

> that, at t, Lenin and his copy are "molecule-for-molecule duplicates." In the terminology introduced above, they are both *present* at t, and they bear exactly the same *intrinsic* relations* to t. And yet, since the copy was never alive and never died, it is not dead at t. Lenin and his copy bear all the same intrinsic* relations to t, but only Lenin bears *being dead at* to t. Hence that relation is not intrinsic*.

Strictly speaking, this case is overkill. Regardless of whether TT is true, the points made in the previous paragraph suffice to show that *being dead at* is not intrinsic*. So much for the adjective "dead."

1.7 "Is a Death"

The word "death" is used as a count noun in sentences such as "the executioner oversaw seven deaths last year." I take it that, so used, it is a predicate of events. In particular, I assume that an entity is a death only if (i) it is an event and (ii) its subject (or "theme") dies at the instant at which it occurs (or "culminates").

1.8 The Singular Term "Death"

The word "death" is used as a singular term in sentences such as "this chapter is about death" and "death is something that we all think about from time to time." I assume that it refers to an abstract entity on such uses, but it is no easy matter to identify this entity in an independent way.[27] None of the following statements is obviously correct:

(a) Death = the property *being dead* (or the relation *being dead at*)
(b) Death = the property *dying* (or the relation *dies at*)
(c) Death = the property *being in the process of dying* (or the relation *being in the process of dying at*)
(d) Death = the property *being a death*

It seems that a novel, for example, can be about *death* without being about the property *being dead*. Likewise for each of the other properties and relations mentioned above. These considerations might drive us to postulate yet another abstract entity, the referent of "death," to put alongside those that we've already recognized. On the other hand, it might be suggested that the given considerations turn on some ambiguity or context-sensitivity in the term "death." Perhaps some occurrences of that term refer to *being dead*, other occurrences of it refer to *being a death*, and so on. In that case, we might not need to add to our stock of abstracta. I won't pursue this issue here.

2. Cryptobiosis

CT says that necessarily, a thing dies at a given instant if and only if the thing ceases to be alive then. In this section and the next, I discuss a pair of problems for CT.[28]

A first problem for CT is that it conflicts with a plausible claim about suspended animation, or *cryptobiosis*—namely, that some organisms become frozen or desiccated in such a way that they temporarily cease to be alive but do not then die. The term "cryptobiosis" was introduced by the entomologist and biochemist David Keilin "for the state of an organism when it shows no visible signs of life and when its metabolic activity becomes hardly measurable, or comes reversibly to a standstill" (1959, p. 166). Keilin contrasts cryptobiosis with *dormancy*: dormant organisms retain a detectable metabolism; cryptobiotic organisms do not. A wide variety of unicellular and multicellular organisms undergo cryptobiosis in nature. Especially noteworthy are tardigrades—small (between 1.5 and .1 mm long) insectlike animals with eight legs and a multilobed brain (Garey et al., 2007). Tardigrades are famous for their ability to undergo anhydrobiosis, a form of cryptobiosis involving desiccation, and to remain viable in such a state for years.

Some of the most interesting cases of cryptobiosis are ones that have been induced experimentally. Keilin describes experiments carried out by Paul Becquerel in the early 1950s in which already desiccated, anhydrobiotic tardigrades (among other things) were cooled to temperatures of between 0.008 and 0.047 degrees above absolute zero and successfully revived after about two hours (Keilin, 1959, pp. 178–179). One pressing question that arises here is whether the life-processes (e.g., metabolism) of such organisms have completely *stopped* or rather are merely *slowed but still-ongoing*.[29] Keilin forcefully argues that, at least in the case of cryptobiotic organisms at very low temperatures, their metabolism and other life processes have stopped. James S. Clegg argues that this conclusion applies not just to organisms at very low temperatures but also to anhydrobiotic organisms in nature:

> I have previously . . . given reasons why one is compelled to conclude that the removal of all but, say, 0.1 g H_2O/g dry weight (easily achieved by anhydrobionts), will inevitably result in the cessation of metabolism. For example, one can calculate that this amount of water is insufficient to hydrate intracellular proteins, without which a metabolism is obviously not possible . . . Central to these matters is the definition of "metabolism." It should be appreciated . . . that metabolism is not merely the presence of chemical reactions in anhydrobionts, indeed, those are inevitable at ordinary biological temperatures. It seems reasonable to require that a metabolism must consist of systematically controlled pathways of enzymatic reactions, governed in rate and direction, integrated and under the control of the cells in which they are found. An additional requirement concerns the transduction of free energy from the environment and its coupling to endergonic processes such as biosynthesis and ionic homeostasis. (2001, p. 615)

Now, to see how all this bears on CT, consider a cryptobiotic tardigrade, o, that is frozen at a temperature just a fraction of a degree above absolute zero, and suppose that it is ametabolic. Everyone agrees that it is alive before it is frozen and after it is thawed and hydrated. But its status while frozen (at time t) is more controversial. One might claim that (i) o is still alive at t, that (ii) o is dead at t, or that (iii) o is neither alive nor dead at t. As I mentioned above, I am assuming that *being alive at* and *being dead at* are incompatible, so I will ignore the view that such an organism is *both* alive *and* dead. Finally, one might think that the tardigrade's status is a vague

or indeterminate matter. In particular, one might think that (iv) the tardigrade is a borderline case of being alive, a borderline case of being dead, but a clear case of not being both-alive-and-dead.[30] (It will be a matter of debate, however, whether and in what sense (iv) is a *rival* to each of (i) through (iii). More on this below.)

Start with (ii), the claim that the tardigrade is dead (defended by Wilson, 1999, pp. 101). This is implausible, mainly because of facts about the tardigrade's internal structure: in some sense, the organism is still *structurally intact* and relatively *undamaged*. It still has eight legs, a head, a brain, and other internal organs, all of which are intact. It still has cells, and they presumably still have intact membranes, nuclei, mitochondria, and most of the same macromolecules they contained before they were frozen, a sufficient proportion of which remain undamaged. Indeed, so far as its parts and their arrangement go, the organism is in good shape. The main change that occurs when it becomes cryptobiotic is that the physical and biochemical activity in the organism largely shuts down. When the tardigrade is eventually thawed and exposed to water, this activity resumes.

These facts about the tardigrade's internal structure and behavior make it overwhelmingly natural to say that the organism is still *viable*, that it *can* be alive in the future (whether or not it is alive while cryptobiotic), and that it has the *capacity* and the *disposition* to be alive (under appropriate conditions). Indeed, it can be revived relatively easily, merely by being thawed at room temperature and then hydrated, without first being repaired. (To be sure, some damage may be sustained during cryptobiosis and some of this damage may eventually need to be repaired. But the organism must return to a more active metabolic state *before* it repairs itself.) All of this supports the claim that the cryptobiotic tardigrade is not dead and, relatedly, that it did not die when it became cryptobiotic. Note that this is intended as an argument for the negation of (ii), namely,

(v) ¬o is dead at t.

It is not intended merely as an argument for the claim that o is not a clear case of being dead.[31] Indeed, the given considerations strike me as a *persuasive* argument for (v). Organisms that are intact and undamaged in the relevant ways, and that have relevant capacity to resume metabolic activity, are flat-out *not dead*, just as a red shirt is flat-out *not green*.

So let us turn to (i), the claim that the organism is *alive* (defended by Kolb and Liesch, 2008; Luper, 2009, p. 44).[32] This also faces problems. Earlier, I suggested that a thing is alive at a time just in case it is performing "the right sorts of life-functions" at that time. *Whatever* those life-functions may be, it seems unlikely that they are being performed by a frozen or thoroughly desiccated cell or multicellular organism. Such an entity is not moving, growing, reproducing, repairing itself, or absorbing matter from its environment. If Keilin and Clegg are right, it is completely ametabolic. Assuming that being metabolic at a given time is necessary for being alive at that time,[33] we have a prima facie case for the conclusion that our frozen tardigrade is not alive. This is an argument for the negation of (i), namely,

(vi) ¬o is alive at t,

not merely for the claim that o is not a clear case of being alive.[34]

Taken together, the arguments for (v) and (vi) yield an apparently stable argument for (iii), the claim that the frozen tardigrade is neither alive nor dead. It is not alive because it is not performing the relevant life-functions; in particular, it is not metabolizing. It is not dead because it is structurally intact and undamaged in a way that makes it relatively easy for it to be alive in the future: no prior repair is needed. Having offered a positive argument for (iii), we need not give any separate consideration to (iv), the claim that our organism is a borderline case of being alive and a borderline case of being dead. Either (iv) is rival to (iii), in which case our argument for (iii) gives us a reason to refrain from accepting (iv), or (iv) is not a rival to (iii), in which case we are free to accept them both if we like. The important thing is the argument for (iii).

Some may be tempted to attack (iii) by appeal to the claim that "alive" and "dead" are contradictories. (I expect to hear the words, "if a thing isn't alive, then *by definition* it's dead!") But we already have independent reason to reject this claim. My wallet is not alive, but it's also not dead. In response, one might attack (iii) by appeal to a weaker principle: for any x, if there is an instant at which x is alive, then for any instant t, either x is alive at t or x is dead at t. But we have independent reason to reject this as well: I am alive at this instant, but there are plenty of instants before my conception at which I'm neither alive nor dead. Finally, the critic of (iii) might appeal to a third, still weaker principle: for any x and any instant t, if x is alive at some instant earlier than t, then either x is alive at t or x is dead at t. This is starting to seem ad hoc, but that aside, we will see in section 2.2 that there are independent reasons (arising from "deathless fission") to reject even this third principle.[35] For now, let me just say that I find the case for (v) and (vi) far more compelling than any of the increasingly ad hoc principles just mentioned. Thus *being alive at* and *being dead at* still appear to be contraries, not contradictories. The relationship between them is like that between *being red at* and *being green at*; it is not like the relationship between *being red at* and *being non-red at*.

Among philosophers, Michael Wreen (1987), Fred Feldman (1992, pp. 60–62, 170–171), Ingmar Persson (1995, p. 500), and Christopher Belshaw (2009, p. 9) have all endorsed the view that cryptobiotic organisms are neither alive nor dead, and on roughly the grounds given here. This view has been advocated by biologists too. Here is Clegg:

> Consider that an organism in anhydrobiosis lacks all the dynamic features characteristic of living organisms, notably due to the lack of an ongoing metabolism to transduce energy and carry out biosynthesis. In that sense it is not "alive," yet neither it is it "dead" since suitable rehydration produces an obviously living organism… [T]he severely desiccated anhydrobiont is indeed reversibly ametabolic and we may conclude that there are three states of biological organization: alive; dead; and cryptobiotic. (2001, p. 615)

Anyone who accepts such a view about cryptobiosis will be forced to reject CT. To see this, consider a typical cryptobiotic tardigrade, and suppose being cryptobiotic is incompatible both with being alive and with being dead. Then when the tardigrade became cryptobiotic, it *did* cease to be alive (since it was alive throughout

some interval that immediately preceded the instant at which it became cryptobiotic), but it did *not* die (since a thing cannot die at an instant unless it becomes dead at that instant). Call this the *cryptobiosis argument*.

To be sure, the argument is not airtight. Not everyone will find it plausible that metabolism is necessary for being alive, or that being viable (in the relevant sense) is incompatible with being dead. Future research might undermine the Keilin-Clegg view that cryptobiotic organisms are ametabolic. As things stand, however, the argument strikes me as being forceful. It deserves to be taken seriously.

So, for those who are persuaded by it, let us consider some alternatives to CT. If merely *ceasing to be alive* is not sufficient for dying, what is? What more is needed? Feldman's treatment of these questions is very helpful. I end up rejecting his positive view (in section 2.4) and putting forward an alternative (in section 2.6), but his critical discussion of a trio of preliminary accounts merits a summary, so I'll start there.

2.1 Permanence

An initial thought is that the difference between entering cryptobiosis and dying is that when an organism does the former, it ceases to be alive only *temporarily*, whereas when an organism does the latter, it ceases to be alive *permanently*. This suggests:

> Permanence Necessarily, for any x and any t, if t is an instant, then x dies at t if and only if "x ceases permanently to be alive at t." (Feldman, 1992, p. 63)

But anyone who is convinced by the cryptobiosis argument will want to reject Permanence as well, as the following case brings out:

> **Shattering**. At t1, Alpha makes the transition from being "actively alive" to being cryptobiotic. It remains in this condition until t2, at which time it is dropped and shatters. At no time after t2 is Alpha alive or even present again.

If the cryptobiosis argument is correct, then things cease to be alive when they go directly from being "actively alive" to being cryptobiotic. In that case Alpha ceases to be alive at t1. Moreover, since it turns out that Alpha never becomes actively alive thereafter, friends of the cryptobiosis argument will say that Alpha ceases *permanently* to be alive at t1. So, if they were to accept Permanence, they would be forced to say that Alpha *dies* at t1. But they won't want to say that, since they think that things do *not* die when they go from being actively alive to being cryptobiotic, which is what Alpha does at t1. So they will want to reject Permanence.[36]

2.2 Permanence and Irreversibility

The same example also generates problems for the suggestion that permanently and *irreversibly* ceasing to be alive is necessary and sufficient for dying. This suggestion can be stated as

> P&I Necessarily, for any x and any t, if t is an instant, then x dies at t if and only if "x ceases permanently and irreversibly to be alive at t" (Feldman, 1992, p. 64).

Friends of the cryptobiosis argument will say that in the Shattering case, there is no instant at which Alpha ceases permanently and irreversibly to be alive. They will say that it ceases permanently to be alive at t1, when it enters cryptobiosis. If there is any instant at which Alpha becomes "*irreversibly nonliving*," that is plausibly t2, when it is shattered. But it does not *cease* to be alive then, according to supporters of the cryptobiosis argument. By t2, they will say, Alpha had already been in a nonliving condition for some time. So at neither instant does it *cease permanently and irreversibly to be alive*. Accordingly, friends of the cryptobiosis argument will see P&I as yielding the bizarre verdict that Alpha does not die at either t1 or t2, or indeed, at any instant. I take it that they will judge this principle to be unacceptable as a result.[37]

2.3 Irreversibility$_1$: The Physical Impossibility of Living Again

A natural fix is to remove the requirement that the time at which the thing ceases to be alive must be the same as the time at which its status as nonliving becomes irreversible, and to say that the thing dies at the latter time. Feldman formulates a version of this proposal that entails the following principle:

IR$_1$ Necessarily, for any x and any t, if t is an instant, then x dies at t if and only if "(i) x ceases permanently to be alive at or before t, and (ii) at t, it becomes physically impossible for x ever to live again" (1992, p. 64).

How should the relevant notion of physical impossibility be understood here? I offer the following rough suggestion. Start with a notion of *time-indexed physical necessity*. Say that it is physically necessary at t that so-and-so just in case the conjunction of (i) the laws of nature and (ii) a complete intrinsic description of the past and present relative to t entails that so-and-so.[38] Then say that it is physically impossible at t that so-and-so just in case it is physically necessary at t that *not* so-and-so.

Understood in this way, IR$_1$ may help with the Shattering case. The organism Alpha did cease permanently to be alive at or before t2, and there may be some plausibility to the thought that at t2, it became physically impossible for Alpha ever to be alive again.[39] Moreover, t2 is apparently the only time in the Shattering case that meets these conditions. So IR$_1$ may yield the desired verdict here—namely, that Alpha dies at t2 and at no other instant.

However, there are two potential problems for IR$_1$. First, it will be rejected by those who endorse the possibility of things that die and later return to life (of which more later). Second, it may be vulnerable to counterexamples of a different sort. One might think that there could be a once-living, cryptobiotic organism that, purely as the result of some change in its environment, and without undergoing any significant *intrinsic* change at all, becomes such that it is physically impossible for it ever to live again. In such a case, IR$_1$ would yield the implausible verdict that

the organism dies at the relevant instant, even though the organism undergoes no significant intrinsic change at that instant and apparently remains cryptobiotic for some time thereafter. Consider the following case:

> **Deep Space**. A desiccated tardigrade, Delta, rides through deep space on a chunk of rock, when suddenly the stars surrounding it in all directions explode into supernovas. Though the laws of nature are not deterministic, there is a certain instant t such that: (i) Delta is intuitively still cryptobiotic at t and will remain so for some time thereafter, but (ii) at t, it begins to be physically necessary that radiation from the supernovas will permanently destroy Delta before any potentially life-restoring processes reach it. Later, at t*, radiation from the supernovas finally reaches Delta and causes intrinsic changes in it that render it nonviable. Delta remains present for some time thereafter.[40]

As applied to this case, IR_1 says that the tardigrade Delta dies at t. But, to supporters of the cryptobiosis argument at least, this ought to seem incorrect. They will want to say that Delta does not die until the later instant t*.

It is worth noting that IR_1 does not even get off the ground unless one assumes that the laws of nature are not deterministic. For suppose that the laws are deterministic, and let o be an organism that ceases to be alive at t1 by entering cryptobiosis. Further, suppose that o never returns to life thereafter. Then I take it that at t1, it becomes physically necessary that o will never be alive again.[41] After all, in a world with deterministic laws, *everything* about the future is physically necessary (in the sense of being entailed by the past and present together with the laws). So, in such a world, as soon as it becomes *true* that a given thing will never live again, it also becomes *physically necessary*. In such a context, IR_1 does no better than Permanence in dealing with problems about cryptobiosis.

2.4 Irreversibility$_2$: The *Internally Grounded* Physical Impossibility of Living Again

To cope with cases like Deep Space, Feldman proposes a repair that, he thinks, "comes pretty close to solving the problem of suspended animation" (1992, p. 65). The repair entails

> IR_2 Necessarily, for any x and any t, if t is an instant, then x dies at t if and only if "(i) x ceases to be alive at or before t, and (ii) at t, internal changes occur in x that make it physically impossible for x ever to live again" (1992, p. 65).[42]

How might IR_2 help in the Deep Space case? At t, the thought goes, Delta became such that it was physically impossible for it ever to live again, but this was not because of any *internal changes* that occurred in Delta at t; rather, it was because of external changes that occurred at t. The tardigrade didn't undergo any significant internal changes then at all. So IR_2 apparently does not say that Delta died at

t. This gives it an advantage over IR_1. (Does IR_2 say that Delta *does* die at t*, the instant at which it is made nonviable by radiation? Perhaps. We will return to this question.)

2.4.1 *Clarifying Irreversibility*$_2$

Now let's look at IR_2 a bit more closely. Clause (ii) says "at t, internal changes occur in x that make it physically impossible for x ever to live again." Here is a proposal about how this clause should be understood (or what it should be replaced with).

We can start by defining a *distribution* as a (total or partial) function from real numbers to (perhaps empty) sets of intrinsic* relations. And we can say that a thing x *instantiates* a given distribution f *over* a given interval I just in case: (i) f is a distribution; (ii) I is a continuous interval of time; and (iii) for each real number n and set s, f(n) = s iff s is the set of intrinsic* relations that x bears to the instant in I that is located n minutes prior to the end of I. Loosely speaking, if x instantiates f over I, then when you feed a number n into the function f, that function will spit out the set whose members are all and only the intrinsic properties that x had n minutes before the end of I. If x was not present at the given instant, then the set in question will be empty, since things cannot bear intrinsic* relations to ("have intrinsic properties at") instants at which they are not present.

We can now use these notions to define one further technical term: "intrinsically biologically hopeless," or just "hopeless$_{ib}$":

> D1 x is hopeless$_{ib}$ at t = df. (i) t is an instant and (ii) there is some proposition p that states the laws of nature,[43] some interval I leading up to t, and some distribution f such that:
> (a) x instantiates f over I, and
> (b) necessarily, for any instant t_1, any interval I_1 that leads up to t_1, and any later instant t_2 if (p is true and x instantiates f over I_1), then x is not alive at t_2.

Intuitively, to say that x is hopeless$_{ib}$ at t is to say that x has an intrinsic history leading up to t that, given the laws of nature, guarantees that x is not alive thereafter. In other words, the distribution of x's intrinsic properties (or lack thereof) over some period leading up to t makes it physically impossible for x to be alive after t. Thus, whether or not a thing x is hopeless$_{ib}$ at a given instant t need not be purely a matter of x's intrinsic condition at t itself; it can also depend upon x's intrinsic *history*, prior to t.

It is worth pointing out that D1 does not require that a thing be present at an instant in order for it to be hopeless$_{ib}$ at that instant. To see this, suppose that it's metaphysically impossible for a thing to cease to be present at one time and then become present again later on; that is, suppose that "intermittent presence" is impossible. Further, suppose that Socrates ceased to be present at t1, and let t2 be some later instant. Then Socrates is hopeless$_{ib}$ at t2.

For there will be some interval leading up to t2 that includes t1 and, say, just the final few minutes of Socrates's career. Call that interval I_s. Now consider the

distribution f_s that Socrates instantiates over I_s, and suppose that t_1 is m minutes earlier than t_2. Then for any n less than m, $f_s(n)$ will be the empty set, since Socrates wasn't present at the instant that occurred n minutes before t_2 and hence did not bear any intrinsic* relations to that instant. But for any n* greater than m, f(n*) will be a nonempty set, since Socrates was present at the instant that occurred n* minutes before t_2 and hence[44] did bear some intrinsic* relations to that instant. Thus the distribution f_s that Socrates instantiates over I_s entails ceasing to be present during the interval over which it is instantiated. Given the impossibility of intermittent presence, nothing can instantiate this distribution over a given interval and then be present (or alive) after that interval. Therefore it is not even metaphysically possible, much less physically possible, for *Socrates* to instantiate that distribution over a given interval and then be alive (hence present) at some later instant.

With the notion of hopelessness$_{ib}$ in hand, we can formulate a new instance of the schema S:

> IR_2* Necessarily, for any x and any t, if t is an instant, then x dies at t if and only if: (i) x ceases to be alive at or before t, and (ii) x becomes hopeless$_{ib}$ at t.

This, I suggest, is the best way to capture the intuitive idea underlying Irreversibility$_2$ in explicit terms. At least I am not aware of any formulation that clearly does better on this score.[45]

To get a feel for the principle, let's return to the Deep Space case. Suppose that the tardigrade was alive at t1, that it became cryptobiotic and ceased to be alive at the later time t2, that (due to extrinsic factors) it became physically impossible for the tardigrade to live again at t, and that the tardigrade was badly damaged by radiation at t*. The tardigrade does not become hopeless$_{ib}$ until t* at the earliest. Nothing about its pre-t* intrinsic history guarantees (given the laws) that it won't be alive later. There are possible worlds governed by the same laws in which that tardigrade goes through qualitatively the same intrinsic history but, because of its more favorable surroundings, manages to return to life again later. Hence IR_2* avoids the result that the tardigrade dies at t.

Does IR_2* say that the tardigrade dies at t*, when it is damaged by radiation? That depends upon whether the tardigrade then becomes hopeless$_{ib}$—that is, on whether it then becomes such that its intrinsic history makes it physically impossible for it to live again. And that is not a question that we can usefully pursue here, although we will soon address some related questions.

One small point about IR_2* is worth making before we move on: this principle leaves open the possibility that a thing dies at an instant at which it is not hopeless$_{ib}$. To see this, suppose that Bob is alive at t1, at the later instant t2, and at each instant in between, but not at any instant after t2. Further, suppose that Bob is hopeless$_{ib}$ at each instant after t2, but not at t2 itself or at any earlier instant. Then I take it that Bob ceases to be alive at t2 and that he *becomes* hopeless$_{ib}$ at t2, even though he is not hopeless$_{ib}$ *at* that time. If so, then IR_2* tells us that Bob dies at t2.

2.4.2 *Is Postmortem Revitalization Physically Impossible? Necessarily So?*

So far I have been trying to get clear about what Irreversibility$_2$ says. I think it is best formulated as IR$_2$*. Now I want to argue that Irreversibility$_2$ is false.

Dead things tend not to return to life. But must it in every case be *physically impossible* for a dead thing to live again? This is doubtful. To begin to see why, consider the following story:[46]

> **Restoration**. Beta is an ordinary organism. It begins to be alive at t1, lives a typical life, and at t2, as a result of old age and standard wear and tear, it ceases to engage in metabolism or any other life-functions. The portion of matter that constituted Beta[47] in the moments leading up to t2 then begins to decompose slightly. (Call this portion of matter p_B.) At t3, before much further decay has had a chance to set in, p_B is frozen and preserved. At t4, scientists begin the delicate process of causing p_B to constitute something viable once again. Without introducing any new matter or removing any of the original matter, the scientists gradually and nondisruptively reverse the damage that has recently occurred. At t5, p_B constitutes something that is a perfect intrinsic duplicate of *Gamma*, a frozen organism that entered cryptobiosis in the normal way. The scientists then thaw p_B. At t6, p_B constitutes something that is alive and has an active metabolism.
>
> Moreover, at no point in this sequence of events is any law of nature violated. On the contrary, there are laws of nature (perhaps different from ours), there is a proposition that states them, and they are "obeyed" throughout the entire process.

Note that there are certain issues on which Restoration is careful not to take an explicit stand. It takes no stand on whether Beta dies at any point in the story, and it takes no stand on whether the thing that becomes actively metabolic between t5 and t6 is Beta. More generally, it takes no stand on whether there is someone that both ceases to engage in metabolism at t2 and begins to engage in metabolism between t5 and t6.

We can ask a number of questions about the case. First, is it, or something relevantly like it, physically possible? That is, do the *actual* laws of nature permit it? Second, is it, or something relevantly like it, metaphysically possible? Third, if we further specify the story by stipulating that it involves something that dies and then comes to be alive again later, is the resulting story physically and/or metaphysically possible?

We can start with the first question. Is Restoration physically possible? I doubt that anyone *has in fact* reanimated the remains of bacteria or insects (not to mention humans) that have been rendered nonviable by old age and structural damage. Indeed, the case may be technologically impossible, by present-day earthly standards. Perhaps the technology that would be required to carry out such a procedure is unlikely ever to be developed by creatures with brains like ours. Moreover, the

likelihood that such processes of repair will occur *spontaneously*, without intervention by intentional agents, may for all practical purposes be zero.

Still, it would come as a surprise to learn that *the laws of nature* somehow bar the occurrence of such processes. One would think that, in principle, those processes ought to be physically possible, even if humans will never develop the technology needed to make them happen. After all, a thing that has been partially disassembled and rendered nonfunctional can typically be reassembled and made functional again, without violating any laws of nature. I can see no antecedent reason to think that organisms are different from cars in this regard.[48] Organisms are just more intricate and harder for us to manipulate.

Admittedly, this is all speculative. Whether the laws of nature permit the relevant "reanimation procedures" is an empirical question, and nature is full of surprises. I don't know whether these processes are physically possible. But for all I know—and, I suspect, for all *anyone* knows—they are.

Even if Restoration is *not* physically possible, the second question arises: is it metaphysically possible? Is there a metaphysically possible world in which a story relevantly like Restoration is true? Some may think not, on the grounds that the story violates a law of nature and that these laws are all metaphysically necessary (Bird, 2007). Others, however, ought to take the story to be metaphysically possible. It is, after all, consistent, conceivable, and intuitively possible. It involves nothing more exotic than some matter, and an associated object or two, possessing different intrinsic properties at different times, and standing in the right sorts of causal relations. Even if the laws of nature in the *actual* world rule out the given story (which I doubt), surely there are possible worlds governed by different laws in which something like that story is true.

So let us turn to the third question. Is it physically and/or metaphysically possible that the given processes occur *and in such a way that they involve something that dies and then becomes alive again later*? Suppose that we further specify the story by adding the following:

> Organism Beta dies at t2 or shortly thereafter and is alive at t6, after the "repaired matter" that composes it is thawed.

Call the resulting story *Restoration+*. In Restoration+, we have one and the same organism first dying, then having its remains restored (whether or not it is present during that process), then returning to life later. Restoration does not take an explicit stand one way or the other on the question of whether something dies and later returns to life; Restoration+ does. Are there metaphysically possible worlds at which Restoration+, or something relevantly like it, is true?

For those who admit the metaphysical possibility of Restoration itself, I can think of two main reasons for denying the possibility of Restoration+. First, one might think that

(a) Restoration entails that the organism Beta does not really *die* at t2 (or shortly thereafter), when it ceases to engage in metabolism.

Second, one might think that

(b) Restoration entails that it is a mere *copy* of Beta, not Beta itself, that is alive and constituted by p_B at t6.[49]

I don't find either reason compelling.

According to (a), Restoration is not a case in which an organism lives, dies, and is subsequently revitalized; rather it is a case in which an organism is actively metabolic, then becomes cryptobiotic, and then subsequently becomes actively metabolic again, all without dying or becoming dead in the process.

This strikes me as strained. By any ordinary standard, Beta is dead at t3 and has been for some time. I doubt that any biologist who considered the case would say that Beta has merely entered a phase of dormancy or cryptobiosis. It did not cease to engage in the relevant life-functions as the result of any of the standard causes of cryptobiosis—desiccation, freezing, and so on. Rather, it ceased to engage in those life-functions as the result of a standard cause of *death*—namely, old age and structural damage. Its trajectory thereafter was common to things that have *died*: it continued to sustain further damage and was decomposing—if it even remained present at all! This is quite unlike the typical trajectory of things in cryptobiosis: they remain approximately static. Moreover, by t3, Beta is no longer *disposed* to live (or metabolize), even in circumstances that are favorable to life for things of its kind. It is no longer *viable*. It manages to metabolize again only with the help of advanced technology. Thus the natural thing to say is that, in the story, Beta is dead at t3 and died at some earlier time, probably t2 or very shortly thereafter.[50]

Next consider (b), which says that Restoration entails that Beta is neither alive nor constituted by p_B at t6. According to (b), the organism that is constituted by p_B at t6 is merely a copy of Beta, not Beta itself. Is this plausible? If one (i) holds that Beta dies at t2, (ii) takes TT to be a necessary truth, and (iii) denies the possibility of intermittent presence, then one will accept (b). But as far as I can tell, the rest of us will want to reject it.

Opponents of the TT will presumably want to say that the organism Beta continues to be present throughout the entire story. After all, it's not as if Beta's death is especially violent. Its remains don't get scattered or radically altered in shape or superficial appearance. Throughout the entire case, there is what might be described as "the body of an organism." Thus, if it *ever* happens that a thing continues to be present for a while after it dies, this would seem to be just such a case. In particular, if one rejects the TT, then the overwhelmingly natural thing for one to say will be that, in the story, Beta is alive from t1 to t2, that Beta dies at t2 or shortly thereafter, that Beta continues to be present as a dead thing, that it gets frozen at t3, that it gets repaired from t4 to t5, that it is then thawed and revived, and that it is alive again at t6. This conflicts with (b).

But even those who *accept* TT will presumably want to say that Beta dies and lives again later (or at least that Restoration doesn't rule this out), unless they take a hard line against the metaphysical possibility of intermittent presence.[51] For suppose that Beta dies and ceases to be present at t2. Then if it's so much as *possible* for

a material substance to become present again after it has ceased to present, it ought to be possible that Beta does this at some point during the process of repair and revitalization.[52] After all, the "postrepair organism" is made of the same matter, in roughly the same arrangement, as was the original organism (Beta) just before its death, and no *other* organism was composed of that matter in the interim. Moreover, the final predeath phases in Beta's life presumably stand in a rather intimate causal relation to the initial postrepair phases in the life of the repaired organism: the repaired organism has the intrinsic properties that it has at t6 largely because the original organism had the intrinsic properties that it had just prior to t2.[53] If Beta had been different in any of various ways prior to t2, the repaired organism would also have been different in those same ways at t6. Finally, it's plausible that, if the given organisms are (or constitute) *people*, then those people could be psychologically continuous with each other and could stand in any other mental relations that might be required to support the intermittent presence of a person. In sum, even Terminators should reject (b), unless they are foes of intermittent presence.[54]

The issues here are complex and subtle, and they allow for a wide variety of internally consistent, stable positions. We shouldn't expect any decisive refutations. On the whole, however, neither (a) nor (b) looks very promising to me. If one admits, as I think one should, the metaphysical possibility of Restoration, then one ought to admit the metaphysical possibility of the more specific story Restoration+, in which Beta dies and later returns to life.

And in that case one ought to reject Irreversibility$_2$. Even if it is *true* that things die only when they become hopeless$_{ib}$ (which I doubt), this is not *metaphysically necessary*: there are possible worlds in which a thing dies and later comes to be alive again, all in conformity with the laws of nature governing the given world. Hence there are possible worlds in which a thing dies without then becoming such that its intrinsic history, together with the laws governing the given world, guarantee that the thing won't be alive again later. Contrary to Irreversibility$_2$, becoming hopeless$_{ib}$ is not necessary for dying.

As I said earlier, I suspect that for all anyone knows, Restoration is physically possible. But it's plausible that if Restoration is physically possible, then so is Restoration+. This makes me suspect that for all anyone knows, (i) Restoration+ is physically possible and hence (ii) there are physically possible counterexamples to Irreversibility$_2$.

2.5 Irreversibility$_3$: The *Technological* Impossibility of Living Again

Because it invokes the notion of physical impossibility, Irreversibility$_2$ makes it "too hard" to die. Contrary to Irreversibility$_2$, a thing can die at a time even if it continues to be physically possible for the thing to live again.

One likely suggestion at this point is that we should understand irreversibility not in terms of physical impossibility but rather in terms of technological

impossibility. Roughly, the idea is that a thing dies when its having ceased to be alive becomes "technologically" irreversible. This might lower the bar for dying. Even if it is still physically possible for a given organism to return to life, it might not be technologically possible.

Regardless of how this "technological irreversibility thesis," Irreversibility$_3$, is spelled out, it faces three problems. The first and most fundamental problem is that it entails that whether a thing dies at a given time can depend upon extrinsic factors that intuitively should have no bearing on the thing's vital status. To see this, consider:

> **Alpha and Omega**. Alpha and Omega are duplicate organisms of the same species that live at different times. At t1, as a result of damage, Alpha ceases to be alive and starts to decay. No technology that is available to Alpha could reverse the situation. Omega's career is an intrinsic duplicate of Alpha's career (and is governed by the same laws of nature) but occurs later. Thus Omega, as it is when it is n years old, is a duplicate of Alpha, as *it* is when *it* was n years old. At t2, Omega ceases to be alive and starts to decay just as Alpha did. However, at t2, new technology is available to Omega. This technology could be used to revitalize Omega, but is not so used. Omega continues to decay in just the same manner as did Alpha.

Irreversibility$_3$ entails that Alpha dies at t1 but that Omega does not die at t2. This is extremely implausible. Intuitively, whether or not a given organism o dies at a given instant t should be fixed by facts about the laws of nature governing o, together with facts about what o is like intrinsically at certain times—times such as t itself, any earlier instants at which o is present, and perhaps some fairly brief period of time following t. The point is well put by David Hershenov: "death is best thought of as a nonrelational alteration in an individual's body or organs. "Death" is a biological concept (and a nonrelational one) and thus should be determined solely by biological factors rather than technological features." (2003a, p. 93).

Regardless of how one articulates this "intrinsicality of dying" principle in detail, it will entail that whether or not an organism dies at a time cannot depend upon *wildly* extrinsic factors, such as facts about what sorts of technologies are available to the organism at the given time. Hence, on any remotely adequate way of formulating the intrinsicality principle, it will tell us, when applied to the case above, that Alpha and Omega don't differ in whether they die (at t1 and t2, respectively). Thus the intrinsicality principle will rule out Irreversibility$_3$.

Here is a second problem for that thesis. It does not state a *sufficient* condition for a thing to die. Suppose that Gamma has ceased to live by going into cryptobiosis. Further, suppose that, at time t, it becomes technologically impossible for Gamma to live again, not because of any intrinsic change in Gamma, but because the only existing technology that could have been used to revive Gamma ceases to be available to it, and indeed ceases to be present altogether. (Perhaps the civilization that developed the technology is destroyed in a nuclear war.) As applied to such a case, Irreversibility$_3$ will tell us, incorrectly, that Gamma dies at t.

Third, that thesis fails to state a *necessary* condition for a thing to die. In the Restoration case, I claimed, Beta dies at t2. But technology is then available to Beta that could be—and indeed *will* be—successfully used to revive Beta, and such technology continues to be available to Beta throughout the rest of the story. So Beta's ceasing to be alive does not then become "technologically irreversible" in either of the relevant senses. Thus Irreversibility$_3$ tells us, incorrectly, that Beta does not die at t2.

2.6 Incapacitation

In effect, we have so far been asking, "What's the difference between dying and becoming cryptobiotic?" I think the difference is best captured in terms of dispositions or capacities, roughly as follows: when a living thing becomes cryptobiotic, it retains a sufficiently robust, intrinsically grounded *disposition* or *capacity* to be alive (under an appropriate range of conditions). In short, it remains viable. But when it dies, it loses the relevant capacity; it ceases to be viable. Neither dead things nor cryptobiotic things are alive. But cryptobiotic things are viable, whereas dead things are not.

This doesn't entail that it's physically or technologically impossible for dead things to return to life. What it does entail is that it's "harder" for dead things to return to life than it is for cryptobiotic ones. Cryptobiotic things often do it "on their own," "without external intervention" and without first being repaired.[55] Dead things need help, or else a lot of luck.

Ingmar Persson has suggested a definition of "dies" that harmonizes with these thoughts. Persson's definition entails the following instance of schema S:

> Incapacity Necessarily, for any x and any t, if t is an instant, then x dies at t if and only if "at t, x loses the capacity to live" (1995, p. 501).[56]

In my view, this account has two important virtues. (Persson himself, however, invokes only one of these, and he seems to deny that the account has the other virtue). Indeed, as far as the problems about cryptobiosis go, the account is approximately right. But I also think that it has a drawback worth noting. I'll start with the virtues.

2.6.1 Virtues

First, as Persson notes, Incapacity plausibly makes dying an intrinsic matter (or at least a *not-radically-extrinsic* matter). Whether or not a thing x has, at a time t, the capacity to φ depends only on the intrinsic properties that x has at t, together with the laws of nature—at least when the property *φ-ing* itself is intrinsic.[57] Suppose that two chameleons are intrinsic duplicates and are governed by the same laws of nature. Then, if one of them has the capacity to turn brown, so does the other. If two people are duplicates and one of them is lactose intolerant (lacks the capacity to digest lactose), then so is the other. So, since *being alive* is intrinsic (or almost

intrinsic[58]), we get the result that whether or not a given thing has, at t, the *capacity* to be alive will depend only on the thing's intrinsic properties at t, together with the laws. Organisms that are intrinsic duplicates and governed by the same laws will never differ with respect to the capacity to be alive. And two duplicate organisms that undergo duplicate "internal processes" over a given interval (and are governed by the same laws) will never differ with respect to whether they *lose* the capacity to be alive during that interval.

Thus, unlike Irreversibility$_1$ and Irreversibility$_3$ (but like Irreversibility$_2$), Incapacity avoids the bizarre result that whether or not a thing dies at a time can depend on "wildly extrinsic" factors. At time t, when distant events make it physically impossible for the frozen, intrinsically unchanging tardigrade ever to live, that organism doesn't lose the *capacity* to live and so, according to Incapacity, doesn't die. The tardigrade does, however, plausibly lose that capacity at t*, when it's damaged by radiation. So Incapacity again yields the desired verdict—namely that the tardigrade *does* die at t*. Incapacity also helps with the case of Alpha and Omega. These organisms have duplicate careers, and they both cease to perform any life-functions and begin to decay at an age of n years old. Since Omega has access to "revitalization technology" at the relevant age but Alpha does not, Irreversibility$_3$ says that Alpha dies at an age of n years but that Omega does not, despite their intrinsic similarity at those ages. Incapacity does better. In view of their intrinsic similarity and the fact that they are governed by the same laws, either they both lose the capacity to live at age n years, or neither of them does. So, according to Incapacity, either they both die at that age, or neither does. This seems right.

Incapacity also has a second virtue. One can lose the capacity to do something without its then becoming physically impossible for one ever to do it again. Broken watches get fixed, athletes make comebacks, and so on. If one stops exercising for a while, one might lose the capacity to bench press 150 lbs. Then, after lifting weights for a few months, one might regain that capacity. One thus loses the capacity to bench press 150 lbs without then undergoing some internal change that makes it physically impossible for one ever to bench press 150 lbs again. Or some engine component in one's car might break, causing the car to lose the capacity to run, without its then becoming physically impossible for the car to ever run again.

Thus, unlike Irreversibility$_1$ and Irreversibility$_2$ (but like Irreversibility$_3$), Incapacity allows for the possibility of a thing—such as the organism Beta in the Restoration+ case—that dies at a time without its then becoming *physically impossible* for the thing ever to be alive again. In that case, it seems plausible to say that Beta *loses* the capacity to be alive at t2, when it stops metabolizing and starts to decompose, and that it *regains* that capacity later on, at some point during the process of repair. (Still later, it goes on to *manifest* or *exercise* that capacity.) According to Incapacity, therefore, Beta does die at t2, even though it continues to be physically possible for Beta to live again.

Interestingly, Persson himself does not see the matter this way (1995, p. 501). Instead, he says that his proposal is equivalent to Feldman's (which we have labeled Irreversibility$_2$). Accordingly, Persson does not argue, as I have, that Feldman's

account faces a problem that Incapacity avoids. If I'm right, Incapacity deserves more credit than Persson gives it.

In sum, Incapacity has two major virtues: (i) it doesn't entail that dying is a "wildly extrinsic" matter, and (ii) it doesn't entail that, as a matter of metaphysical necessity, postmortem revitalization is physically impossible. Indeed, I'm not aware of *any* plausible counterexamples to Incapacity stemming from cryptobiosis, revitalization, or any similar phenomenon.

2.6.2 A Vice

The word "capacity" probably introduces some context-sensitivity into "at t, x loses the capacity to live" that is lacking in "x dies at t."[59] This in itself is no problem for Incapacity, provided that the relation expressed (relative to the present context) by the former expression is necessarily coextensive with the relation expressed by "x dies at t."

But I wonder how likely it is that those relations are necessarily—or even actually—coextensive. After all, I doubt that there is some uniquely natural or "reference-eligible" relation in the vicinity that both expressions can just "lock onto." Rather, I suspect that there is a huge range of more-or-less equally natural relations in the vicinity that differ just a little from one another. Consider, for example, the relations expressed (relative to the present context) by "at t, x loses a robust capacity to live", "at t, x loses a very robust capacity to live", "at t, x ceases to be very capable of living", "at t, x ceases to be disposed to live in normal conditions", "at t, x ceases to be viable", "at t, x ceases to be robustly viable", and "at t, x ceases to be even remotely viable".

Some of these relations may have the same extension in the actual world but different extensions in other possible worlds. Others may have different (but probably largely overlapping) extensions even in the actual world. None of them seems any more likely than any of the others to be necessarily coextensive with *dies at*, and each seems to be roughly as good a candidate as the relation expressed by "at t, x loses the capacity to live." So I'm not confident that "x dies at t" and "at t, x loses the capacity to live" express necessarily (or even actually) coextensive relations. Accordingly, I'm not confident that Incapacity is true. But there probably isn't much we can do to improve on it. Things die when they cease to have a *sufficiently robust* capacity to live. How robust is sufficiently robust? I see no way to give an informative answer to this question. The best we can do is to point to examples.

After so many false starts, this may seem a bit anticlimactic and underwhelming as a positive view. Admittedly, Incapacity is less informative and less precise than one might have hoped. But as far as the problem of cryptobiosis goes, I doubt we can do better. In my view, all the other accounts we've considered do worse.

Before we turn to a different puzzle about death, one final point about Incapacity: it leaves open the possibility of a thing that dies without ever having been alive. We can imagine an organism popping into existence fully formed but

in a state of cryptobiosis. If it shattered and ceased to be viable soon thereafter, Incapacity would yield the result that it died, even though it never lived. This is in the spirit of the "intrinsicality of dying" principle that we gestured toward earlier. If two cryptobiotic things undergo the same sequence of intrinsic changes over a given interval (and are governed by the same laws of nature), they shouldn't differ with respect to whether they die during that interval, even if only one of them was ever alive previously. Incapacity respects this claim.

3. Fission

To die is not merely to cease to be alive. For one thing, an organism that goes directly from being alive to being cryptobiotic does cease to be alive but doesn't die—at least not then! For another, if an amoeba divides into two new amoebas, it does cease to be alive[60]—indeed, it ceases to be present at all. But, as Jay Rosenberg has pointed out, it doesn't die then.[61] (Or *ever*, unless the case is rather bizarre. See the "Annie" case at the end of section 4.) The passage from Rosenberg is worth quoting:

> Some amoebae, to be sure, do die. Sometimes an amoeba cannot get sufficient food or oxygen or moisture to sustain its life, and that kills it. But some amoebae do not get an opportunity to die…let us consider a well-fed, healthy amoeba alone in a drop of well-oxygenated pond water. I shall call it "Alvin." Alvin, let us suppose, lives happily through Tuesday and then, precisely at the stroke of midnight, Alvin divides, producing two offspring whom I shall call "Amos" and "Ambrose." On Wednesday, we find two amoebae—Amos and Ambrose—swimming happily about in our drop of pond water. But what has become of Alvin? One thing is quite clear: Alvin is not an inhabitant of our drop of pond water on Wednesday…His life, therefore, must have come to an end. But it is equally clear that Alvin did not die. (1983, pp. 21–22; 1998, pp. 34–35)

Fred Feldman accepts Rosenberg's point and draws parallel conclusions about certain cases of biological fusion. His main example involves chlamydomonas, single-celled plants that sometimes engage in a process of fusion in which two haploid individuals combine to form a new, diploid individual. Feldman claims that when a haploid chlamydomona engages in fusion, it ceases to be alive but doesn't die. (As Feldman notes, one might take certain cases of metamorphosis to have a similar structure. Perhaps caterpillars cease to be alive but don't die when they metamorphose into butterflies.)

These cases are threats to Incapacity no less than to CT. Not only did Amos cease to be alive at midnight; he also ceased to have the capacity to live at that time. (I assume that, necessarily, if a thing has, at t, the capacity to live, then it is present at t.) So even if Incapacity solves the problem of cryptobiosis, it's still false. It offers no help with Rosenberg's case.

3.1 Three Extant Attempts at a Repair

The new puzzle cases all involve biological entities that go directly from being alive to being nonpresent—and hence not alive—without dying. Why is it that the entities in question do not die in these cases? Presumably, there are cases in which a biological entity *does* die when it goes directly from being alive to being nonpresent. If a healthy, active bacterium is sliced in half and its remains quickly disperse and decompose, maybe it dies and ceases to be present at the same time. Thus a puzzle arises: what's the difference? Say that a case in which a biological entity goes directly from being alive to being nonpresent is a *termination*, and that it is *deadly* if the thing dies when it ceases to be present, but *deathless* otherwise. In virtue of what are the deadly terminations deadly? In virtue of what are the deathless terminations deathless?

Not everyone will be gripped by these questions. Some will lack firm intuitions about the cases. Some will doubt that anything significant is at stake here. I won't try to argue that the facts about the modal profile of dying have instrumental value. I don't know what use they are for ethics, biology, or other parts of metaphysics. But for those who find the questions of some intrinsic interest and who would like to press on, there is progress to be made. (Others are free to skip ahead to section 4, which stands on its own.)

3.1.1 First Try: Deathless Division as Division into Living Things

One thing that all these cases have in common is this. We have a living thing and its constituent matter (or some living things and their constituent matter). Then, at a certain instant, the living thing ceases to be present, while the matter continues to be present. Immediately after the thing ceases to be present, the given matter makes up some other thing or things. The original thing "turns into" the other things.

So what's the difference between the deadly and the deathless cases? One natural thought is that the deathless terminations involve a living thing or things that turn into some other *living* thing or things. The reason why an amoeba doesn't die when it divides is that it turns into two other *living* things; and the reason why two chlamydomonas don't die when they fuse is that they turn into another living thing. Correspondingly, the reason the bacterium does die when it gets sliced in half is that none of the pluralities of things it turns into—*two halves of a bacterium*, or *some organelles and miscellaneous cell parts*, or *some fundamental particles*—is such that each of its members is alive.

As for the notion of *turning into* invoked here, I doubt that it can be rigorously defined, but here is a rough characterization that should be good enough for present purposes:

TI xx *turn into* yy at t if and only if there is a portion of matter m such that (i) xx are made up of[62] m throughout some interval leading up to t;

(ii) each of xx ceases to be present at t; and (iii) throughout some interval that immediately follows t, yy are made up of m, plus or minus a little.

The predicate "___turns into . . . at ****" is nondistributive. From "a turned into b and c at t," one cannot validly infer "a turned into b at t" or "a turned into c at t." The relation expressed by this predicate has two slots for pluralities of things (corresponding to the two plural variables, "xx" and "yy" in TI) and one slot for a time (corresponding to the singular variable "t"). That relation can hold in various patterns: between one thing, many things, and a time (as in the case of amoebic fission); between many things, one thing, and a time (as in fusion); perhaps between one thing, one thing, and a time (in metamorphosis); and between many things, many things, and a time (as when two amoebas divide at the same time, thus turning into four amoebas). The vague phrase "plus or minus a little" in clause (iii) is needed to allow for cases in which, say, a little matter is lost at the moment of division. Without this phrase, we wouldn't be able to say that the original amoeba turns into the two new amoebas, since the portion of matter that they're made up of at the beginning of their lives *mostly overlaps*, but is not *strictly identical to*, the portion of matter that made up the original amoeba at the end of its life.

With this notion in hand, we can state a new instance of schema S based on the "natural thought" proposed above. The idea is that a necessary condition for dying is *not turning into some other living thing or things*. Borrowing from Feldman, we can formulate it thus:

A_1 Necessarily, for any x and any t, if t is an instant, then x dies at t if and only if (i) at t, x loses the capacity to live; (ii) "it's not the case that x turns into a living thing, or bunch of living things, at t; and [iii] it is not the case that x is a member of a set of living things whose members fuse and turn into a living thing at t" (1992, p. 68).

Since Rosenberg's dividing amoeba does turn into some living things when it divides, it does not satisfy clause (ii), and as a result A_1 does not tell us that the amoeba dies. Since Feldman's fusing chlamydomonas do turn into a living thing when they fuse, they do not satisfy clause (iii); and as a result A_1 does not tell us that they die. So far, so good.

But as Feldman notes, A_1 is vulnerable to counterexamples too. Suppose that we put a mouse into a "cell-separator" that "grinds up mice and emits a puree of mouse cells . . . in such a way that all the mouse cells come out alive" (1992, p. 69). In this case, Feldman claims, the mouse turns into a bunch of other living things (namely, its cells) and hence it fails to satisfy clause (ii).[63] A_1 thus yields the intuitively incorrect verdict that the mouse does not die when put into the cell separator.

We can extract a lesson. Sometimes, when a living thing turns into some other living things, the original thing dies. Sometimes it doesn't. What's the difference? What makes the mouse's termination deadly? What makes the amoeba's termination deathless?

3.1.2 Second Try: Deathless Division as Division into Living Organisms

Here is a tempting thought. What makes the amoebic fission deathless is the fact that it involves an amoeba that turns into two amoebas, where both of these resulting amoebas are *organisms* in their own right; and what makes the mouse fission deadly is the fact that it involves a mouse that turns into mere living cells, where these cells are *not* organisms. The suggestion, then, is this: necessarily, a case of biological fission is deathless if and only if it involves a thing that turns into some living organisms. This suggestion, generalized so as to apply to cases of fusion as well, can be incorporated into a new instance of schema S:

A_2 Necessarily, for any x and any t, if t is an instant, then x dies at t if and only if (i) at t, x loses the capacity to live; (ii) "it is not the case that x turns into a living organism or a bunch of living organisms at t; and [iii] it is not the case that x is a member of a set of living organisms that fuse to form a living organism at t" (Feldman, 1992, p. 70).

But A_2 is vulnerable to the following counterexample, also due to Feldman. An isolated frog cell, C, is kept alive in a laboratory. Eventually, C undergoes fission: it ceases to be present and turns into two daughter cells. Since neither of these is an *organism* (they're both mere living cells), C satisfies clause (ii) of A_2. And since the other clauses are obviously satisfied as well, A_2 yields the verdict that C died when it divided. But this verdict seems wrong. Neither an amoeba nor an isolated frog cell dies when it divides into two new cells. So A_2 is false as well. At this point Feldman draws his discussion to a pessimistic close: "Fission and fusion are puzzling. I find that I cannot explain the difference between their deathless forms and their deadly forms" (1992, p. 71).

3.1.3 Third Try: Deathless Division as Division into Living Things without Downgrading

Edward Wierenga is more optimistic. He suggests that the reason the mouse died when it turned into living cells is that the mouse was an organism but the cells weren't. The mouse, we might say, was "biologically downgraded." When the frog cell divided into two frog cells, however, it was not biologically downgraded, since, although the daughter cells were not organisms, neither was the original parent cell. According to this proposal, then, a case of biological fission is deathless if and only if it involves (i) an organism that turns into some organisms or (ii) a living nonorganism that turns into some living things (organisms or not). When this idea is generalized in such a way as to apply to fusion as well as fission, it can be grafted on to Incapacity to yield:

A_3 Necessarily, for any x and any t, if t is an instant, then x dies at t if and only if (i) at t, x loses the capacity to live; (ii) "if x is an organism then it is not the case that x turns directly into a living organism or a bunch of living organisms at t, and it is not the case that x is a member of a set of

> living organisms whose members fuse and turn into a living organism at t, and [iii] if x is not an organism then it is not the case that x turns into a living thing, or a bunch of living things, at t, and it is not the case that x is a member of a set of living things whose members fuse and turn into a living thing at t" (Wierenga, 1994, p. 81).

A_3 handles all the cases so far considered. It tells us that the amoeba doesn't die when it divides into two new amoebas; *mutatis mutandis* for the frog cell. And it tells us that the mouse does die when it is sent through the cell separator.

Does A_3 succeed? It depends on what we should say about cases in which a multicellular organism is composed of cells each of which is an organism in its own right. If such cases are possible, then there are counterexamples to A_3. For, suppose that such a multicellular organism is sent through a cell separator. This strikes me as a way of *killing* that organism and hence that the organism *dies*. But the organism does turn into some living things—its cells—that are themselves organisms, hence it doesn't satisfy clause (ii) of A_3. So A_3 tells us, incorrectly, that the organism does not die.

Could there be a multicellular organism each of whose cells is itself an organism? It's easy to image a creature that we'd be tempted to describe that way. But we can focus on an actual case. Consider the slime mold slug (or "grex"), described here by Jack Wilson:

> At one point in the life cycle of certain species of cellular slime molds, a number of independent, amoebalike single cells aggregate together into a grex. The grex is a cylindrical mass of these cells that behaves much like a slug. It has a front and back, responds as a unit to light, and can move as a cohesive body. The cells that compose a grex are not always genetically identical or even related. They begin their lives as free-living single-cell organisms. The grex has some properties of an individual and behaves very much like one. (1999, p. 8)

Wilson seems to be taking care not to assert that the slug is an *organism*, but, for what it's worth, it's easy to find biologists making this assertion in journal articles. ("The cellular slime mold *Dictyostelium discoideum* undergoes a transition from single-celled amoebae to a multicellular organism as a natural part of its life cycle" (Devreotes, 1989, p. 1054). "During the life cycle, solitary amoebae collect to form a multicellular organism" (Siegert and Weijer, 1992, p. 6433).)[64]

So my best guess is that the Wierenga-inspired proposal, A_3, is false. Whether or not a slime-mold slug and its constituent cells are all organisms, I suspect that it's at least metaphysically possible for there to be a multicellular organism each of whose cells is an organism too. Such a thing could be sent through a cell separator, and if it were, it would turn into a bunch of organisms, but it would die nonetheless.

3.2 Three New Attempts at a Repair

Three new proposals are worth floating at this point. Call them (i) the *teleological* approach, (ii) the *causal* approach, and (iii) the *generative* approach.

3.2.1 Fourth Try: Deathless Division as Biologically Normal Division

The teleological approach says—roughly—that a biological fission is deathless if and only if its occurrence is *biologically normal* and/or has some *biological purpose* or *function*. The thought here is that mice and slime mold slugs die when they go through the cell separator because the divisions in question are not biologically normal. Those divisions do not conform to the normal life cycle of the entities in question. Amoebas and frog cells divide deathlessly because these divisions are biologically normal. As programmatic as it may be, the idea is already clear enough to generate at least three worries.

First, one might think that facts about biological teleology are grounded in facts about evolutionary history and hence are extrinsic, historical facts. In particular, one might claim that intrinsic duplicates could undergo duplicate processes but differ in whether those processes are biologically normal. Ordinary amoebas evolved; many of their structures and behaviors were selected for. This is why the given behaviors and structures count as biologically normal or have biological purposes. But a "swamp amoeba" is metaphysically possible. Such a thing is an intrinsic duplicate of an ordinary amoeba, but it has no evolutionary history: it comes into existence via "cosmic coincidence." A swamp amoeba might undergo a division that is intrinsically just like the division of an ordinary amoeba. If it did, one might think that its division is just as deathless as the ordinary amoeba's. But since the swamp amoeba has no evolutionary history, many will want to say that its division is not biologically normal and has no biological purpose or function, and hence that the teleological approach wrongly counts the swamp amoeba as dying when it divides.

A second potential objection to the teleological approach concerns actual cases of abnormal cell division. Many cells in multicellular organisms undergo *programmed cell death* (apoptosis) as the normal conclusion of their life cycle. But sometimes, a cell malfunctions and divides into two daughter cells instead of undergoing the programmed cell death that would have been biologically normal for it. In such a case, one might find it plausible that (i) the division is not biologically normal and has no biological purpose or function and that (ii) the cell does not die when it divides (although it does cease to be present and hence does cease to have the capacity to live). If so, then one will see the teleological approach as yielding an incorrect verdict in this case.

The first two objections to the teleological approach argue that a division can be deathless without being biologically normal; hence, normality is not necessary for deathless fission. A third objection argues that normality is not sufficient for deathlessness. Suppose that mice or slime mold slugs had a different evolutionary history. Suppose that they evolved in world in which cell separators were common. Perhaps a certain dramatic end-of-life behavior enhanced the fitness of genetically related individuals and was selected for: the aged organism climbs onto the rim of the churning cell separator, says its final good-byes, and dives straight in. The organism ceases to be present, and a bunch of living cells emerge from the opposite end, preserved in a nutrient bath, waiting to be harvested by the kin of the recently departed organism.

(I assume that more realistic examples are not hard to formulate.) In such a case, one might find it plausible that (i) the division is biologically normal and does have a biological purpose or function and that (ii) the multicellular organism nevertheless kills itself, and hence dies, in the process. Moreover, such a conclusion shouldn't seem surprising. In cases that don't involve fission or fusion, death is often biologically programmed. In those cases, the fact that a given organism or cell is doing something that it is biologically programmed to do doesn't stop it from being true that the organism or cell dies. Why should fission cases be any different?

3.2.2 Fifth Try: Deathless Division as Internally Caused Division

The causal approach says—roughly—that a biological division is deathless just in case its proximal causes (or the bulk of them, anyway) are internal to the entity that divides. (A proximal cause is a *direct* cause: c is a proximal cause of e if and only if c is a cause of e, and there is no c* such that c is a cause of c* and c* is a cause of e.) According to the causal approach, a mouse (or a slime mold slug) dies when it goes through a cell separator because the proximal causes of its division are outside events—namely, the actions of the cell separator machine. The mouse does not divide on its own; some external thing divides it. (This is true even if the mouse is biologically programmed to throw itself into the cell separator.) By contrast, when an amoeba or frog cell divides, it does this on its own. The causes are internal. Likewise for the malfunctioning cell that divides instead of dying as it was programmed to do.

It would be nice to be able to say what it is for a given thing or event to be an *internal cause* of a given division, but this is not the place to attempt it. So set this aside, and just give the friends of the causal approach the notions they need to formulate their proposal. Even then, the proposal faces two problems.

First, one might think that when a planarian is cut in half in a science class and turns into two planarians, the division is deathless but not internally caused. This is a common view among those with whom I've discussed the case, though I find myself without a firm opinion on it.

Second, one might think that, under special circumstances at least, a multicellular organism might die when, as a result of internal causes, it divides into its constituent cells. Suppose that I drink a strange poison that becomes incorporated into each of my cells. I feel fine for a few hours. Then, at a certain moment, the poison triggers "separation behavior" in my cells, so that each cell separates itself from its neighbors while remaining alive. I dissolve into a puree of living human cells. On its face, this is a deadly but internally caused division. The proximal cause of my division is internal, but I die nonetheless.

3.2.3 Sixth Try: Deathless Division as Division into Newly Living Things

The generative approach says—roughly—that a given division is deathless just in case it involves a living thing that turns into a plurality of living things no member of which was alive before the division.