1. Life

To die is to cease to be alive. To clarify death further, then, we will need to say a bit about the nature of life.

Some theorists have said that life is a substance of some sort. A more plausible view is that life is a property of some sort, but we should also consider the possibility that lives are events. If we say that lives are events, we will want to know something about how to distinguish them from other events, and how they are related to the individuals that are alive. It would also be useful to know the persistence conditions for a life. If instead we conclude that life (or *alive*) is a property, we will want to clarify it, and identify what sorts of things bear it. Let us briefly discuss each of these views—that life is a substance, a property, or an event.

1.1 Life as a Substance

We can deal quickly with the view called 'vitalism' (defended by Hans Driesch, 1908 and 1914, among others), which holds that being alive consists in containing some special substance called 'life.' Vitalism is a nonstarter since it is unclear what sort of stuff vitalists take life to be, and because no likely candidates—no special stuff found in all and only in living things—have been detected. Moreover, vitalism faces a further difficulty, which Fred Feldman calls 'the Jonah Problem': a dead thing, such as a whale, may have a living thing, say Jonah, inside it; if Jonah has 'life' inside him, then so does the whale, but by hypothesis the whale is not alive. Of course, in this example Jonah is in the whale's stomach, not in its cells, but the difficulty cannot be solved by saying that an object is alive if and only if it has 'life' in its cells, as an infectious agent (organisms with 'life' in them) could survive, for a time, within the dead cells of a dead whale.

1.2 Life as an Event

As Jay Rosenberg noted (1983, p. 22, 103), sometimes when we speak of a life we mean to refer to the events that make up something's history—the things that it did and the things that happened to it. (For example, the publication of *The Problems of Philosophy* was one of the events that made up one life, namely Bertrand Russell's.) Yet a rock and a corpse have histories, and neither has a life. Presumably, then, 'a life,' in the sense we are discussing, refers to the history of something that is alive. In that case what we are really looking for is clarification of a property, not an event. We want clarification of what it is to be alive.

According to a second theorist, Peter van Inwagen, while a life is indeed an event, it is not the history of something. "'Russell's life,'" van Inwagen writes (1990, p. 83), "denotes a purely biological event, an event which took place entirely inside Russell's skin and which

went on for ninety-seven years." Russell's life included the oxygenation of his hemoglobin molecules but not the publication of his books.

If lives are biological events, it would be useful to know more about what they are, how they are individuated, and what their persistence conditions are. Van Inwagen declines to provide these details (1990, p. 145). He assumes that (the events he calls) lives are familiar enough to us that we can pick them out. But he does make the useful comment that each such event is constituted by certain self-organizing activities in which some molecules engage, and that it is analogous to a parade, which is an event constituted by certain marching-related activities of some people. Having taken the notion of a life for granted, he draws upon it in his account of organisms. On his view (1990, p. 90), some things compose an organism if and only if their activity constitutes a life.

1.3 Life as a Property

Many theorists have defended the view that life, or (being) alive, is a property, but there is considerable disagreement among them about what precisely that property is. The main views on offer are life-functionalist accounts and accounts that analyze life in terms of DNA or genetic information or evolution by natural selection.

Life-functionalism, a view introduced by Aristotle, analyzes the property *alive* in terms of one or more salient functions that living things typically are able to perform. The salient functions Aristotle listed were nutrition, reproduction, sensation, autonomous motion, and thought. However, life-functionists disagree about how to formulate their account and about which functions are salient. Take Aristotle's list. Obviously, it would be a mistake to say that something is alive if and only if it can perform all of the functions on the list. Might we say that, for something to be alive, it *suffices* that it be capable of one or more of the listed functions? Is being capable of one of these functions in particular *necessary* for something to be alive? As Fred Feldman points out, neither of the suggestions just mentioned is acceptable. Devices such as Roomba cleaning robots can do one of Aristotle's functions, namely move themselves, but are not alive, so being able to do at least one listed function does not suffice for being alive. Nor is it plausible to say that any one on the list is necessary for being alive. Which on the list would this necessary function be? Perhaps nutrition? Adult silk moths are alive but lack a digestive system, so are incapable of nutrition. And, as many theorists have noticed, many living things cannot reproduce; examples include organisms whose reproductive organs are damaged and hybrid animals such as mules.

What, now, about accounts that analyze life in terms of genetic information? Feldman thinks that something like the Jonah problem arises for any account according which being alive consists in containing DNA or other genetic information, as dead organisms contain DNA. A further problem for such views is that it is conceivable there are or could be life forms (say on other planets) that are not based on genetic information. This latter

difficulty can be avoided if we say that being alive consists in having the ability to evolve, to engage in Darwinian evolution, assuming that evolution by natural selection is possible for living things that lack nucleic acid. We might adopt NASA's definition, according to which life is "a self-sustaining chemical system capable of Darwinian evolution." However, accounts like NASA's are implausible for a further reason: while the ability to evolve by natural selection is something that collections of organisms—species—may or may not have, it is not a feature an individual organism may have. Later members of a species come to have features earlier members lacked; some of these new features may make survival more or less likely, and the less 'fit' are weeded out of existence. An individual organism, such as a particular dog, cannot undergo this process. Yet individuals may be alive.

Because he has encountered no successful account of life, no account exempt from counterexamples, Feldman concludes that "life is a mystery" (p. 55). Despite his skepticism, however, there is a good case to be made for saying that what distinguishes objects that are alive from objects that are not is that the latter have a distinctive sort of control over what composes them, which the former lack. Let us see if we can make this claim clearer.

Consider ordinary composite material objects that are not alive. We can assume that, at a given time, these are made up of, or composed of, more simple things, such as molecules, by virtue of the fact that the latter meet various conditions. Among the conditions is the requirement that (in some sense in need of clarification) they be *bonded together*. Take the boulder near my front porch. Among the things that compose it now will be a few molecules, say four molecules near the center of the boulder, that are bonded together, in that each is bonded to the others, directly or indirectly (a molecule, A, is *in*directly bonded to another molecule, B, if A is directly bonded to a molecule C that is directly bonded to B, or if A is bonded to a molecule that is indirectly bonded to B). The things that make up the boulder are not limited to these four molecules, but they are limited to molecules that are bonded to them. Nor is the boulder unique in this way; something similar seems true of any composite material object. A composite material object is composed of some things at a time only if those things are bonded together at that time.

What sort of bonding relationship holds among the things that compose material objects? Any answer to this question will be controversial. Let us set it aside, and move on to some further assumptions about the composition of nonliving composite material objects, namely that a great many of them persist for a while (some persist for a very long time) and that what composes them at one time normally differs from what composes them at other times. Exactly how this works is a complicated matter, but among the conditions that such objects must meet if they are to persist is that any change in their composition be incremental. (Even this condition is controversial. For more on material objects, see the article Material Constitution and Ordinary objects.) Consider the boulder again. Suppose that at one time, $t0$, it is composed of some molecules, and that all or most of these

molecules remain bonded to each other until a later time *t*1. Suppose, too, that no or few (few as compared to the number of molecules that composed the boulder at *t*0) molecules come to be newly bonded to these by the time that *t*1 rolls around. Under these conditions the boulder undergoes an incremental change in composition, and it seems plausible to say that the boulder remains in existence over the interval *t*0–*t*1, and, at *t*1, is composed of the molecules that remain bonded together with the molecules that are newly attached to them. Presumably, it will also survive a series of such incremental changes in composition. But it will not survive drastic and sudden changes. It would stop existing, for example, if the molecules that compose it were suddenly dispersed.

Enough said about composite material objects that are not alive. Now let us see if we can shed some light on what makes living objects special. What is it that distinguishes an object that is alive from an object that is not?

The answer seems to be that, normally, a live object has a distinctive sort of control over whether things come to be, or cease to be, part of it. The control in question is made possible by activities its constituents themselves are capable of. Contrast objects that are not alive, say automobiles. What an ordinary car is composed of is settled *for* the car by the mechanics who repair it (detaching some parts and affixing others), by whether it is involved in an accident and loses some parts, and so forth. Imagine a car that is not passive in this way. Imagine that its parts were somehow capable of replacing some of themselves with fresh parts, without assistance from outside, so that the activities of the parts that compose the car today were responsible for its being composed of certain parts tomorrow. That would make it quite lifelike.

Let us describe, in a bit more detail, what the molecules that compose living objects can do:

1. Working together, these molecules can engage in activities that are integrated in conformity with (under the control of) the information that some of them carry (information that is comparable to blueprints and instructions), much as soldiers that make up an army can engage in activities that are integrated in conformity with battle plans and instructions issued by the commanding officers that are among them.
2. Deploying these activities, the molecules can self-modify, in the sense that they can bond new (perhaps recently ingested) molecules to themselves, or prune (and excrete) some away, combining themselves in various ways (e.g., constructing cells), thereby giving way to a slightly different assembly of molecules at a later time, and fueling their activities by drawing upon external energy sources or stored reserves.
3. The molecules can also pass along their ability to self-modify, enabling the molecules to which they give way to continue these activities, thus allowing the object they compose to sustain a given form (or forms) over time (say that of a dog) despite the fact that what composes that object at one time differs from what composes it at another time.

The view on offer—we might call it the *compositional account* of life—is that an object is composed of things that are capable of the activities just described if and only if it is alive.

This account of life needs refinement, but it avoids at least most of the worries mentioned earlier. It implies that an object may be alive even though it is sterile (as in the case of mules), even though it survives on stored energy (as in the case of a silk moth), and conceivably even if it lacks nucleic acid (yet is still composed of things that engage in activities integrated in conformity with information they carry). In fact, it implies that being capable of none of the items on Aristotle's list is necessary nor sufficient for being alive. What is more, the compositional account just sketched implies that being alive is a property an individual, say the last remaining dodo, may bear on its own, which suggests that it may be alive without being capable of Darwinian evolution. At the same time, it explains how collections of live individuals may evolve. Individual objects are alive only if their composition is under the control of some of their parts (e.g., nucleic acid molecules) that carry information. The mechanisms by which such information is carried tend to be modified over time, altering the information they carry, and thus the features of the organisms they help shape, introducing mutations that may or may not facilitate survival. (For more on the nature of life, see Bedau 2014 and the entry on Life.)

2. Death

The previous section discussed the nature of life, thereby clarifying what it is that death ends. This section discusses the nature of death and how death is related to the persistence of organisms and persons. (For an excellent discussion of views of death outside of the analytic tradition, see Schumacher 2010.)

2.1 Life and Death

According to the compositional account of life discussed in the previous section, objects that are alive have a distinctive capacity to control what they are composed of, fixing these constituents together in various ways, by virtue of the fact that their constituents can engage in various self-modifying activities that are integrated in conformity with information they carry. Let us call these *vital activities*.

It is one thing to have the capacity to engage in vital activities and another actually to engage in them, just as there is a difference between having the ability to run and actually running. Being alive seems to involve the former. It consists in having the relevant capacity. To die is to lose this capacity. We can call this *the loss of life account of death*.

The event by which the capacity to engage in vital activities is lost is one thing, and the state of affairs of its having been lost it is another. 'Death' can refer to either. However, the capacity to engage in vital activities may be lost gradually, rather than all at once, so it is reasonable to speak of a process of dying. In some cases that process is especially

complicated, because the self-modifying activities of some organisms result in the construction of complex physiological systems that must remain largely intact for the self-modifying activities of these organisms to remain integrated. In defining death, some theorists focus on these systems, and claim that an organism's life ends when that organism's physiological systems can no longer function as an integrated whole, or when this loss becomes irreversible (Christopher Belshaw 2009; David DeGrazia 2014).

2.2 Death and Suspended Vitality

The loss of life account of death has been challenged by theorists who claim that things whose vital activities are suspended are not alive (Feldman 1992, Christopher Belsaw 2009, Cody Gilmore 2013, and David DeGrazia 2014). When zygotes and embryos are frozen for later use in the in vitro fertilization procedure, their vital activities are brought to a stop, or very nearly so. The same goes for water bears that are dehydrated, and for seeds and spores. It seems clear that the zygotes and water bears are not dead, since their vital activities can easily be restarted—by warming the zygote or by wetting the water bear. They are not dead, but are they alive? If we deny that they are alive, presumably we would do so on the grounds that their vital activities are halted. If something's life can be ended by suspending its vital activities without its dying, then we must reject the loss of life account of death.

However, the loss of life account is thoroughly established in ordinary usage, and is easily reconciled with the possibility of suspended vitality. In denying that frozen embryos are dead, it is clear that we mean to emphasize that they have not lost the *capacity* to deploy their vital activities. When we say that something is dead, we mean to emphasize that this capacity *has* been lost. Having used 'dead' to signal this loss, why would we want to use the word 'alive' to signal the fact that something is making active use of its vital activities? Our best option is to use a pair of contrasting terms. We can use 'viable' to indicate that something has the capacity to deploy vital activities and 'unviable' to indicate that it has lost this capacity. When instead we are concerned about whether or not something is engaging its vital activities, we can use different contrasting terms, say 'vital' and 'nonvital', the former to characterize something that is employing its capacity for vital activities and the latter to characterize something that is not making use of its capacity for vital activities. What seems relatively uncontroversial is that being dead consists in unviability. To retain the loss of life account, we have only to add that being alive consists in viability. We can then say that a frozen embryo is viable and hence alive despite its lack of vitality, and it will die if its life ends (it will die if it ceases to be viable). Of course, if we are willing to abandon the loss of life account, we could instead use 'alive' to characterize something that is both viable and vital. We would then say that a frozen embryo is not alive (since it lacks vitality) but also that it is not dead (since it remains viable).

2.3 Being Dead

People often speak of being dead as a 'state' or 'condition' as opposed to an event or process. They say an organism comes to be in this state once it dies. This way of speaking can be puzzling on the assumption that what dies ceases to exist. (This assumption is discussed below.) If the assumption is true, then an organism that dies stops existing but simultaneously comes to be in the state of death. Mustn't something exist at a time if it is (literally) in some state at that time? But of course it would be absurd to deny that something can truly be dead on the grounds that death is a state and what does not exist at a time cannot be in any state at that time.

Why not solve the problem by saying that upon dying an organism leaves a corpse, and it is the corpse that is in the state of being dead? There are several problems with this suggestion. Some organisms do not leave corpses. What corpses are left eventually disintegrate. Whether an organism leaves a corpse or not, and whether its corpse exists or not, if that organism dies at time *t* and does not regain life then it is dead after *t*.

The difficulty can be avoided if we say, with Jay Rosenberg 1983, p. 42), that dead is a relation between an organism, the time it died, and a subsequent time, and that when someone asserts, at some given time *t*, 'Socrates is dead,' what is asserted (ignoring the possibility of restored life, discussed in the next section) is roughly that Socrates died before *t*.

As is mentioned below, some theorists deny that an object that is at one time an organism may continue its existence as a corpse. Such theorists will say that organisms and their corpses are two different objects. They may conclude that 'dead' is ambiguous—that it means one thing as applied to organisms, and another thing as attributed to the corpses organisms leave. In any case, they will need to deny that, as concerns corpses, being dead implies having died, as corpses are never alive, according to them. If, on the other hand, an object that is an organism may continue its existence as a corpse, then, at any time *t* after that object dies, 'dead' applies univocally to it at time *t*, and means roughly *died before t*.

2.4 Resurrection

It will be useful to sharpen the loss of life account if, as seems conceivable, it is possible to *restore* life to something that has died.

Restoration in this sense is quite different from the revival of something, such as a frozen embryo, whose vital activities have been halted. Something can be *revived* only if it is alive —only if it has the capacity to deploy vital activities, as in the case of a frozen zygote. It is revived when it regains vitality. Something's life can be *restored* only if it has lost its capacity for vital activities. Life is restored when this capacity is regained.

To bring the possibility of restoration into view, imagine a futuristic device, the *Disassembler-Reassembler*, that chops me into small cubes, or individual cells, or

disconnected atoms, which it stores and later reassembles just as they were before. It is far from obvious that I would survive—and that my life would continue—after Reassembly. (Assuming that I am a material object, the account of objects sketched in Section 1.3 implies that chopping me into bits ends my existence forever.) But even if my existence would pick up again after Reassembly occurs, it is quite clear that I would not live during intervals when my atoms are stacked in storage. I would not even exist during such intervals. If I can be Reassembled, my life would be restored, not revived. Restoration, not revival, is a way of bringing a creature back from the dead.

Now imagine a *Corpse Reanimator*, a device that moves molecules back to where they were prior to the death of the creature that left the corpse, and restarts its vital activities. Some theorists say that I continue my existence as a corpse if it remains in good shape; they will assume that I remain in existence after losing my life, and continue my existence after the Corpse Reanimator does its work. On their view the Corpse Reanimator *restores* my life--it gives me back the capacity to engage in vital activities.

Given the possibilities of restoration and revivification, it seems best to refine the loss of life account, as follows:

Dying is the loss of an object's life—the loss of its capacity to perpetuate itself using vital activities. An object dies at the time it loses this capacity. It is *dead* at all times afterwards, except while that capacity is regained.

2.5 Death and What We Are

Death for you and me is constituted by the loss of our capacity to sustain ourselves using vital activities. This characterization of death could be sharpened if we had a clearer idea of what we *are*, and its implications concerning our persistence. After all, we cannot retain *any* capacities if we fail to persist, so if we fail to persist we stop being capable of vital activities. We die. However, what we are, and what is involved in our persistence, is a matter of controversy.

There are three main views: *animalism*, which says that we are human animals (Snowdon 1990, Olson 1997, 2007); *personism*, which says that we are creatures with the capacity for self-awareness; and *mindism*, which says that we are minds (which may or may not have the capacity for self-awareness) (McMahan 2002). Animalists typically say that we persist over time just in case we remain the same animal; mindist typically suggest that our persistence requires our remaining the same mind. Personism is usually paired with the view that our persistence is determined by our psychological features and the relations among them (Locke 1689, Parfit 1984). (For more on what we are, see the entry on Personal Identity.)

If we are animals, with the persistence conditions of animals, we die when we cease to be the same animal. If we are minds, with the persistence conditions for minds, we die when we cease to meet these conditions. And if persistence is determined by our retaining certain psychological features, then the loss of those features will constitute death.

These three ways of understanding death have very different implications. Severe dementia can destroy a great many psychological features without destroying the mind, which suggests that death as understood by personists can occur even though death as understood by mindists has not. Moreover, human animals sometimes survive the destruction of the mind, as when the cerebrum dies but the brainstem does not, leaving an individual in a persistent vegetative state. Many theorists also think that the mind could survive the extinction of the human animal, say when the brain is removed from the body, kept alive artificially, and the remainder of the body is destroyed (assuming that a bare brain is not a human animal). These possibilities suggest that death as understood by mindists can occur even though death as understood by animalists has not (and also that the latter sort of death need not be accompanied by the former.)

2.6 Death and Existence

What is the relationship between existence and death? May people and other creatures continue to exist after dying, or cease to exist without dying?

Take the first question: may you and I and other creatures continue to exist for some time after our lives end? Fred Feldman (1992, p. 91) coins the term *termination thesis* to refer to the view that "when a person dies, he or she ... goes out of existence; subsequently, there is no such thing as that person." (A version of the thesis applies to any living thing.) We can call those who accept the termination thesis *terminators*, and those who deny it *anti-terminators*. One point anti-terminators such as Feldman (1992, 2000, 2013) cite is that people who encounter corpses sometimes call them dead animals, or dead people. Such talk may suggest that we believe that animals continue to exist, as animals, while no longer alive. The idea might be that an animal continues to count as the same animal if enough of its original components remain in much the same order, and animals continue to meet this condition for a time following death (Mackie 1997). On this view, if you and I are animals (as animalists say), then we could survive for a time after we are dead, albeit as corpses. In fact, we could survive indefinitely, by arranging to have our corpses preserved.

However, this way of defending the anti-terminators's view may not be decisive. The terms 'dead animal' and 'dead person' seem ambiguous. Normally, when we use 'dead people' or 'dead animal' we mean to speak of persons or animals who lived in the past. One dead person I can name is Socrates; he is now a 'dead person' even though his corpse surely has ceased to exist. However, in certain contexts, such as when we are standing inside morgues, we seem to use the terms 'dead animal' and 'dead person' to mean "remains of

something that was an animal" or "remains of something that was a person." On this interpretation, even in morgues calling something a dead person does not imply that it is a person.

Still, the dispute between terminators and anti-terminators is unlikely to be settled on the basis of how we use terms such as 'dead animal' and 'dead person.' Metaphysical considerations must weigh in. For example, consider that the remarks made in Section 1.3 about the persistence of objects are consistent with the possibility that objects that are people may continue their existence as corpses, which may be useful to anti-terminators. On the other hand, many theorists think that nothing is a person unless it has various psychological features, which corpses lack, and some think that nothing is an organism unless it is alive. Terminators may be able to exploit these thoughts.

What about the second question: can creatures cease to exist without dying? Certainly things that never were alive, such as bubbles and statues, can be deathlessly annihilated. Arguably, there are also ways that living creatures can be deathlessly annihilated (Rosenberg 1983, Feldman 1992, Gilmore 2013). Perhaps an amoeba's existence ends when it splits, replacing itself with two amoebas, and the existence of chlamydomonas ends when pairs of them fuse to form a zygote. Yet when amoebas split, and chlamydomonas fuse, vital activities do not cease. If people could divide like amoebas, perhaps they, too could cease to exist without dying. (For a famous discussion of division, fusion, and their implications, see Parfit 1981.) If such 'deathless exits' are possible, we would have to modify the loss of life account of death.

However, proponents of the loss of life account can hold their ground. They can say that division, fusion, and other apparent examples of deathless exits are unusual ways of dying, because, in such cases, nonexistence is not brought about via the destruction of vital activities, but they are not ways of escaping death altogether. Proponents of the loss of life account might also turn the tables on its critics, and argue as follows: nothing can be alive unless it exists, so if something ceases to exist it ceases to be alive, but to cease to be alive is to die. So there are no deathless exits.