
Cryonics: Traps and Transformations

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Abstract: Cryonics is the practice of cryopreserving the bodies or brains of legally dead individuals with the hope that these individuals will be reanimated in the future. A standard argument for cryonics says that cryonics is prudentially justified despite uncertainty about its success because at worst it will leave you no worse off than you otherwise would have been had you not chosen cryonics, and at best it will leave you much better off than you otherwise would have been. Thus, it is a good, no-risk bet; in game-theoretic terms, cryonics is a weakly dominant strategy relative to refraining from utilizing cryonics. I object to this argument for two reasons. First, I argue that there is a practically relevant chance that cryonics will put you into an inescapable and very bad situation. Hence, cryonics is neither a no-risk bet nor a weakly dominant strategy. Second, I argue that the experience of being reanimated and living in the distant future would likely be transformative, and this likelihood undermines your justification for thinking that reanimation would be beneficial to you. I conclude that the standard argument does not show that cryonics is prudentially justified.

Section 1: Introduction

Cryonics is the practice of cryopreserving the bodies or brains of legally dead individuals with the hope that these individuals will be reanimated in the future. Cryonics was first seriously proposed by Robert Ettinger, a university physics instructor, in a thoughtful albeit sensational book entitled *The Prospect of Immortality* (Ettinger 1964). Although cryonics has yet to catch on in the way that Ettinger initially envisioned, the practice is alive today. Several long-standing organizations offer cryonics services. Hundreds of people have been cryopreserved, and thousands of people intend to be. There are numerous cryonics communities and events (Romain 2010; Cohen 2020; Farman 2020). And cryonics has become intertwined with technofuturist movements such as transhumanism (Bostrom 2005).

No one can claim with certainty that cryonics will work, but advocates argue that there is a non-trivial possibility that it will. There are multiple ways to define 'death' (Lock 2002; Zeiler 2009), and advocates claim that while cryopreserved people are dead in some senses, they are

not dead in the *information theoretic* sense, which occurs when the structures that encode the traits constitutive of personhood are in principle unrecoverable (Merkle 1992). Therefore, it is in principle possible to recover a cryopreserved person (or at least recover what matters in survival[1]). Moreover, human technology, including biotechnology, seems to be advancing rapidly, with no end in sight (Kurzweil 2005). This suggests that humans may someday develop the technology required for reanimation.

Cryonics is often met with skepticism or derision.[2] One reason is that the technologies required to reanimate cryopreserved individuals are highly speculative.[3] Cryonics is associated with the well-developed fields of cryobiology and cryogenics (Parry 2004; Doyle 2012). However, the technology used to restore cryopreserved reproductive material or donated organs (which is possible today) is very different from the technology required to reanimate a cryopreserved human or human brain. For example, molecular assemblers may be needed to repair a cryopreserved brain (Drexler 1986), but the nomological possibility of these assemblers is disputed (Drexler and Smalley 2003). Consequently, critics argue that the chance that cryonics will work is too low to justify it.

In contrast, many advocates believe that cryonics is choiceworthy despite uncertainty because cryonics users have virtually nothing to lose and potentially very much to gain from cryonics. In this paper, I challenge this basic line of reasoning. I argue that even if we ignore the costs of cryopreservation and assume there is a non-trivial chance that the technology required for reanimation will be developed, we are not presently justified in saying that cryonics is a prudentially good, no-risk bet.

Three clarifications are in order. First, my criticism targets one common argument for cryonics, not cryonics *per se*. There may be good prudential reasons to utilize cryonics other than that it is a prudentially good, no-risk bet. I will only cursorily discuss this possibility, and I take no position on whether a person can be prudentially justified in utilizing cryonics. Second, I ignore non-prudential reasons that speak in favor of or against cryonics. Third, I ignore the possibility of a spiritual afterlife.

In Section 2, I describe in more detail the argument that cryonics is prudent because choosing cryonics is a good, no-risk bet. I raise two objections to this argument in Section 3 before concluding in Section 4.

Section 2: The Standard Argument for Cryonics

Robert Ettinger was the first to articulate what I will call *The Standard Argument for Cryonics* **(SA)**.

[1] On the distinction between survival and what matters in survival, see (Parfit 1971) and cf. (Ettinger 1964 chapter VIII).

[2] See, for example, (Pein 2016), who describes cryonics as "an expensive form of ritualistic corpse mutilation."

[3] There are probably also deeper cultural explanations for this derision. For example, acceptance of the inevitability and finality of death has long been seen as a marker of rationality in secular societies, while the opposite has been seen as a marker of superstition and unreason (Farman 2020).

> Clearly, the freezer is more attractive than the grave, even if one has doubts about the future capabilities of science. With bad luck, the frozen people will simply remain dead, as they would have in the grave. But with good luck, the manifest destiny of science will be realized, and the resuscitees will drink the wine of centuries unborn. The likely prize is so enormous that even slender odds would be worth embracing. (Ettinger 1964, p. 6; cf. pp. 73, 90)

In other words, SA says that cryonics is prudentially justified despite uncertainty about its success because at worst it will leave you no worse off than you otherwise would have been had you not chosen cryonics (i.e., dead), and at best it will leave you much better off than you otherwise would have been. In game-theoretic terms, choosing cryonics is a *weakly dominant strategy* relative to refraining from utilizing cryonics.

SA, or something close to it, has been proffered by many cryonics advocates over the years. Ettinger's book, and therefore SA, is still promoted by major cryonics organizations like the Cryonics Institute ("About Cryonics" 2023). Anthropologist Tiffany Romain reports that SA, which she describes as the "why not?" approach, is circulated widely in cryonics communities (Romain 2010 p. 198). And some bioethicists who advocate for cryonics, such as David Shaw, advance arguments that are at least suggestive of SA. Shaw, following earlier writers (Rostand 1964), compares SA to Pascal's Wager,[4] arguing that because it is in principle possible for a person's life to be extended indefinitely via technology, the potential benefits of cryonics are "virtually infinite." Thus, as long as there is a non-trivial chance that cryonics will succeed, cryonics is a wager worth taking (Shaw 2009; 2013; *see also* Moen 2015; Gibson 2022b).

There are various types of costs associated with cryopreservation. Cryonics users have to spend $80,000 or more to be cryopreserved. This is usually funded through life insurance ("Membership - Alcor" 2019). Besides financial costs, cryopreservation may have undesirable effects on others, and these can impact its prudential value for a user. For example, there is some reason to think that cryopreservation can disrupt the mourning process (Hillenbrink and Wareham 2023), and a cryonics user might reasonably feel distressed about this prospect. Additionally, some users choose to end their life earlier than its natural terminus in order to mitigate the deleterious effects of disease or aging on their bodies and hopefully thereby increase the likelihood of successful reanimation, a practice sometimes called *cryothanasia* (Minerva and Sandberg 2017; Buben 2023; Andrade and Redondo 2023). When cryothanasia deprives a user of life that would have been on balance good, the user incurs a cost measurable in quality-adjusted life years.[5]

Many advocates argue that some or all of these costs are not only justified but insignificant relative to the potential benefits of cryonics.[6] By analogy, the cost of spending a

[4] For information about Pascal's Wager, see (Pascal 2003; Hájek 2022).

[5] Of course, any cost of this kind will normally be relatively small since cryothanasia is normally proposed only for moribund individuals.

[6] Some commentators go so far as to suggest that the possibility of living for a very long time through technologies like cryonics gives us strong prudential reason to mostly ignore the short-term effects of our actions on our wellbeing (e.g., pleasure experienced today or next year) and focus mostly on their potential impact on our well-

few dollars on a wager may be not only justified but insignificant if there is a non-trivial chance of winning trillions of dollars. This is why the costs associated with cryopreservation are often ignored in SA.

In the next section, I will argue that SA is flawed, even if we ignore the costs of cryopreservation.

Section 3: Two Objections to the Standard Argument

There are two main problems with SA. The first has to do with the possibility that reanimation will be significantly and inescapably bad for a cryonics user. The second problem has to do with the fact that reanimation would likely be a transformative experience. I consider each in turn.

Section 3.1: The Trap Objection

Let a *Trap Situation* be any situation wherein (i) an individual's life has permanently ceased to be worth living yet (ii) the individual does not have the capacity to end their own life. For example, late-stage Alzheimer's patients with intractable depression are often in Trap Situations, as are prisoners who are being slowly tortured to death. Trap Situations are bad, sometimes very bad, for the individuals stuck in them, and people have strong prudential reason to want to avoid them.[7]

It is possible that a cryonics user will be reanimated into a Trap Situation. This is a result of the fact that cryonics users can exercise at most limited control over the conditions into which they are reanimated. The body of a cryonics user in stasis must be managed by others. And since it may remain in stasis for a very long time, possibly through periods of major social and technological change, there is no guarantee that the entity that manages a cryopreserved body when it enters stasis will continue to do so until reanimation occurs, nor is there a guarantee that a cryopreserved person will be reanimated into hoped for conditions.

Some of the Trap Situations a user could conceivably be reanimated into are either idle possibilities or not very bad. For example, it is logically possible that we are living in a computer simulation (Bostrom 2003) run by simulators who intend to punish cryonics users with billions of years of agony. If this were true, cryonics would lead to a very bad Trap Situation. However, this possibility can be ignored for practical purposes since no available evidence supports it. Another possibility is that an error will occur in the reanimation process that will cause the user to experience nothing but pain and confusion for a few minutes before dying in the information

being in the far future (e.g., an increased likelihood of future reanimation) (Gustafsson and Kosonen forthcoming). If this were true, we might be prudentially justified in incurring almost *any* short-term cost for the chance to utilize cryonics and similar technologies.

[7] The Trap Objection relies on the assumption that death is not the worst possible fate. While some of the examples I give may be controversial, this assumption is not. Notably, all major views concerning death's badness, such as Epicureanism (Epicurus 2000), deprivationism (Nagel 1970; McMahan 1988; Feldman 1991; Bradley 2009), annihilationism (Kamm 1993; Blatti 2012; Benatar 2017), and categorical desire views (Williams 1993), allow that in some situations where life has become very bad (e.g., overwhelmingly and unremittingly painful), death is either not bad at all or less bad than continuing to live.

theoretic sense. This possibility is approximately prudentially equivalent to the possibility that reanimation never occurs, and thus it is already implicitly factored into SA.

On the other hand, some Trap Situations into which a user could be reanimated are both live possibilities and very prudentially bad. For example, a cryonics user could be reanimated, kept alive, and agonizingly researched by intelligent beings (e.g., future humans or superintelligent AI) who feel no compunction about harming reanimated humans. This sort of outcome would be very bad for a user, bringing them much suffering without compensatory benefits. And even if it is deemed unlikely, this sort of outcome is not an idle possibility that can be ignored in deliberation, because we know that intelligent beings are sometimes willing to harm other beings when it is expedient and that a reanimated individual would likely represent a rare opportunity to learn valuable things about the past. In another sort of example, a user's conscious mind is uploaded to a virtual world wherein mental processes are simulated at 10,000 times their normal speed. The user finds life in the virtual world to be unbearably tedious and wants to opt out but is unable to do so because the avaricious technology company that owns the virtual world prevents its profitable digital residents from terminating themselves. The virtual world is maintained for 50 real-world years, which the user experiences as 500,000 years of unbearable tedium. Again, this sort of outcome would be very bad for a user. And again, even if it is deemed unlikely, this sort of outcome is not an idle possibility, because many respectable views in the philosophy of mind support the possibility of mind uploads and moreover even in the present avaricious technology companies create and maintain virtual worlds that some people find unbearably tedious.[8]

The *Trap Objection* says that SA is flawed because choosing cryonics might leave you much worse off than you otherwise would have been had you not chosen cryonics by putting you into a Trap Situation like the ones discussed in the last paragraph. In other words, due to the live possibility of very prudentially bad Trap Situations, cryonics is not a weakly dominant strategy relative to refraining from utilizing cryonics. The Trap Objection does not rely on assigning any particular probability to the possibility that cryonics will lead to a very bad Trap Situation. As long as this is a live possibility, the SA rests on the false premise that cryonics is a no-risk bet.[9]

To my knowledge, the possibility that cryonics might lead to a Trap Situation has only been noted by a few authors (Minerva 2018; Thau 2020), and no one in the philosophical literature has explicitly leveraged this possibility to object to SA.[10] Possibly this is because Trap

[8] For a tangentially related but nevertheless interesting novella depicting the predicament of artificial persons stuck for long periods in tedious virtual worlds, see (Chiang 2019).

[9] Notably, this objection to SA resembles a stock objection to Pascal's wager: believing in God for prudential reasons might cause you to go to hell.

[10] While few authors have talked about Trap Situations, many have pointed out that cryonics users might not find life to be worth living in the future. Cryonics proponents typically respond to this worry by noting that if one were to find the future unlivable, one could always commit suicide, leaving one no worse off than one would have been had one not chosen cryonics. For example, Ettinger writes: "Before long nearly everyone will see the Golden Age shimmering enchantingly in the distance, and will not dream of relinquishing his ticket. Those that may remain stubbornly skeptical will realize they have nothing to lose: if by some chance they don't like what they see on awakening, they can *then* destroy themselves, or else climb back into the freezer" (Ettinger 1964 p, 99; cf. Moen 2015 p. 679). The possibility of Trap Situations problematizes this response. But it is worth saying that suicide is not

Situations appear unlikely relative to a favorable outcome. Even if Trap Situations are relatively unlikely, SA is flawed. Consequently, cryonics may be unappealing to people who are highly risk averse, and SA cannot be used to deflect concerns about the unlikelihood of cryonics. However, cryonics might still be a good *risky* bet. Before that can be determined, the claim that Trap Situations are relatively unlikely needs to be supported by arguments. The fact that cryogenically preserved bodies are today solicitously managed by sympathetic organizations that intend to promote the best interests of their charges in perpetuity does not ensure that this will be true when the technology to reanimate users is finally developed. Arguably, this is not even likely given the major social changes that will probably occur between now and then.[11] Thus, it may not be presently possible to say that cryonics is a good risky bet.

Section 3.2: The Transformative Experience Objection

A *transformative experience* is an experience that radically changes the experiencer, both epistemically and personally. Transformative experiences give the experiencer new knowledge about what it is like to have some type of experience and change important features of the experiencer's point of view, such as core preferences and goals. For example, having one's first child is a transformative experience because it enables one to know in detail what it is like to be a parent and shifts one's preferences and goals towards one's child. Transformative experiences create special problems for standard approaches to rational decision making because it is difficult or impossible to assess the prudential value of a transformative experience before one experiences it. For example, before one is a parent one cannot choose to be a parent by assessing the prudential value of the experience of being a parent, because before one is a parent one does not know with sufficient specificity what it is like to be a parent. Moreover, since one's preferences and goals will radically change if one becomes a parent, one's current preferences and goals (e.g., a goal to travel the world, which a baby might impede) cannot be straightforwardly used to assess the prudential value of the experience of being a parent (Paul 2014; Chan 2023).

The experience of being reanimated and living in the distant future would likely be a transformative experience. This is because the world, including culture and technology, will likely change radically over time in ways that have major impacts on what it is like to live life and on peoples' points of view (Paul 2014, p. 6). This problematizes any argument, like SA, that explicitly or implicitly relies on claims about the prudential value of reanimation. The

always easy to carry out, and reanimated users who are deeply miserable but not in a Trap Situation might nevertheless be unwilling to commit suicide. So, cryonics might make one worse off even if it does not lead to a Trap Situation. Thanks to Dan Korman for pressing me to make this point.

[11] One might object that a technologically advanced society of the sort we are imagining would probably also be morally advanced enough that they would not be willing to reanimate people into Trap Situations. This might be true but cannot be known for certain. Furthermore, Trap Situations can occur *despite* the best intentions of reanimators. For example, the virtual world mentioned above might prohibit suicide for generally sound paternalistic reasons. Yet this beneficial policy might cause harm in the exceptional case of cryonics users, who, after all, would probably be very different than the average digital resident. For further (more ingenious) responses to this objection, see (Thau 2020, p. 644). Thanks to an anonymous reviewer for pressing me to address this point.

Transformative Experience Objection says that SA is too simplistic because you cannot definitively and straightforwardly assign positive prudential value to being reanimated due to the fact that probably you are not in a position to know what it is like to live in the distant future, and moreover the preferences, desires, goals, etc. with which you now evaluate the prudential value of experiences would likely not be the preferences, desires, goals, etc. you would have if you were to live in the distant future.

The Transformative Experience Objection is easy to misunderstand. The point is not that you might be ill-suited to living in an unfamiliar future and therefore there is some reason to think that living in the future might be difficult or undesirable for you, like living as a refugee in a new land (Gibson 2022a). The point is that you are not in a confident position to straightforwardly assess the prudential value, good or bad, of living in the distant future. By analogy, someone living in 400 BCE would not be in a confident position to assess whether living in the United States today would be beneficial for them (even if it in fact would be) because they would not know enough about what it is like to live there or how living there would change those aspects of their point of view that determine how they assess the prudential value of experiences.

The Transformative Experience Objection does not speak conclusively against SA. Possibly, the experience of being reanimated and living in the distant future would not be transformative. However, it seems like there is a good chance that it would be. And this is in tension with the simplistic way in which SA represents the possible outcomes of cryonics: either you will never be reanimated or you will be benefited by future life.

The Transformative Experience Objection does not just problematize SA. It represents a challenge for anyone who says that reanimation would be prudentially good for you, including many who argue that cryonics is a good *risky* bet. However, this objection does not suggest that you cannot rationally choose cryonics. One can rationally choose to have a transformative experience out of a desire to discover the nature of the radically new experience and what one will be like once one experiences it (Paul 2014). Similarly, you can rationally choose cryonics out of a desire to discover what life will be like in the distant future. In fact, ethnographic studies suggest that this is a common motivation for cryonics users (Farman 2020). Nevertheless, this reason for choosing cryonics is not the reason SA is attempting to highlight, and so this fact does not rescue SA from the Transformative Experience Objection.

Section 4: Conclusion

The Standard Argument for Cryonics says that cryonics is choiceworthy because you have nothing much to lose and very much to gain by being cryogenically preserved. I have raised two objections to this argument. The first objection says that you do have much to lose through cryonics given the live possibility that cryonics will put you into a very bad Trap Situation. Thus, cryonics is neither a no-risk bet nor a weakly dominant strategy. The second objection says that you cannot straightforwardly treat the possibility that cryonics succeeds as a benefit because you

do not have adequate knowledge about what living in the distant future is like or how living in the future might change you.

Nothing in what I have said entails that there are not good prudential reasons to use cryonics. For those seeking adventure, knowledge, or discovery, for those driven by ambition or hope, cryonics may be a prudent option. But we should not believe, as SA asks us to, that cryonics is a good, no-risk bet.

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