While experiences can lead to formation of memories, it seems that the future loss or erasure of a memory cannot undo the experience. This realization, that we need not remember something to have experienced it has important implications. We must conclude that memory is not a definitive guide for what we have experienced. Our first years of life, the three to five dreams we have each night, the daily minutia from months or years past, they have all been forgotten, yet there is a time in which we were fully aware of them.

Thought experiment two: The curious aliens

With the realization that one's memory does not necessarily indicate what they have or haven't experienced, we come to the next thought experiment. This thought experiment involves two different alian races, with advanced but different technology. The first group of aliens are known as the *Duplicators* while the second group is known as the *Restorers*.

Now consider your encounter with the Duplicators:

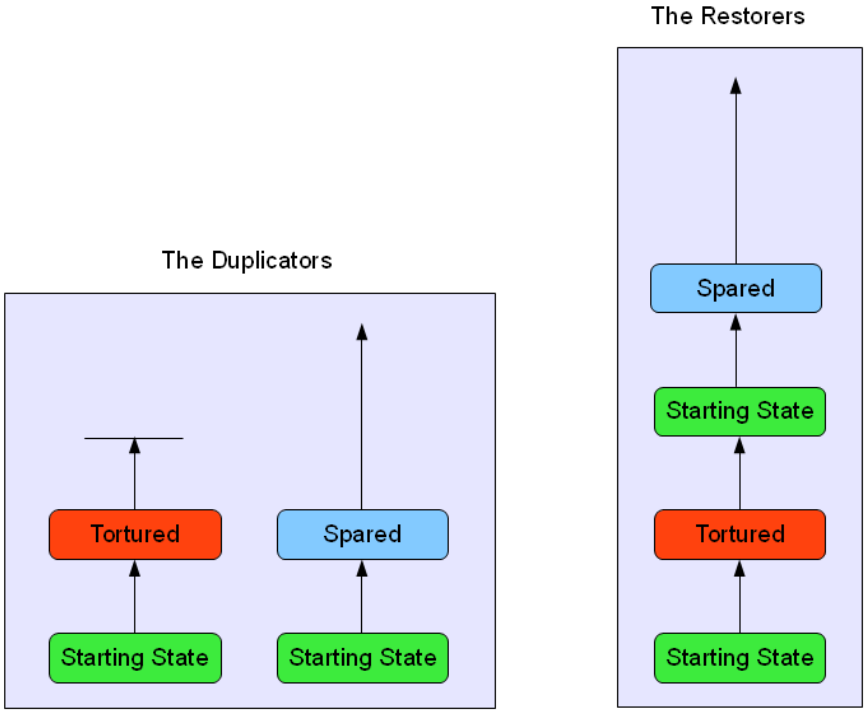
Tomorrow you will be abducted by aliens. The aliens tell you not to worry, that you won't be harmed but they wish to conduct some experiments on the subject of pain, which is unknown to them. These aliens possess technology far in advance of our own. They have the ability to scan and replicate objects down to the atomic level and the aliens use this technology to create an atom-for-atom duplicate of yourself, which they call you_2. The aliens thank you for your assistence and return you unharmed back to your home by 5:00 PM. You ask them "What about the pain experiments?" and they hand you an informational pamphlet and quickly fly off. You read the pamphlet which explains that your duplicate, you_2, was created and subjected to some rather terrible pain experiments, akin to what humans call torture and at the end of the experiment you_2 was euthenized. You consider this awful, but are nonethless glad that they tortured your duplicate rather than you.

Now consider your encounter with the Restorers:

Tomorrow you will be abducted by aliens. Unlike the aliens with the duplication technology, these aliens possess an advanced restorative technology. They can perfectly erase memories and all other physical traces to perfectly restore something to its previous state. The aliens tell you not to worry, that you won't be harmed but they wish to conduct some experiments on the subject of pain, which is unknown to them. They then proceed to brutually torture you for many hours, conducting test after test on pain. Afterwards, they erase your memory of the torture and all traces of injury and stress from your body. When they are finished, you are atom-for-atom identical to how you were before the torture began. The aliens thank you for your assistence and return you unharmed back to your home by 5:00 PM. You ask them "What about the pain experiments?" and they hand you an informational pamphlet and quickly fly off. You read the pamphlet which explains that your duplicate, you_2, was created and subjected to some rather terrible pain experiments, akin to what humans call torture and at the end of the experiment you_2 was euthenized. You consider this awful, but are nonethless glad that they tortured your duplicate rather than you.

The *duplicators* gave you a pamphlet that is honest. They in fact duplicated you and tortured your duplicate instead of torturing you. The *restorers* on the other hand, gave you a pamphlet that lied. They tortured you, not some duplicate. You experienced that torture fully and vividly, but when they dropped off at home, your memory of the encounter is the same in both cases. You do not remember being tortured, only lamenting the torture experienced by someone just like you. The interesting question is what is the real difference between these two scenarios? If given the choice, would you prefer to be abducted by duplicators or the restorers?

To help decide which race of aliens we ought to prefer, let us consider a diagram of the two encounters. With the duplicators, two copies of you are created of you as you exist in some initial starting state. One of them experiences being tortured while the other at the same time experiences being told that they have been spared. Then, the tortured copy is euthenized and stops experiencing while the spared copy is returned home to live out its days. With the restorers, you enter their ship in an initial starting state, and this state is scanned so they can restore you later. Then proceed to torture you for several hours before they reset you to your starting state. You are then returned home to live out your days.



One thing that is apparent from this diagram is that all the same states exists. The difference is that in the case of the duplicators, they are spread out in space while in the case of the restorers, they are spread out through time. We can also consider that when the restorers "reset" you, it is in effect, equivalent to euthenizing the tortured copy and creating a new copy in its original state. One way of looking at it is that the restorers, like the duplicators, create two copies of you, do so with a time delay such that only one duplicate exists at any one time. Relativity suggests to us an equivalence between dimensions of time and of space. There is no fundamental physical difference between events separated by space or events separated by time.

If these two cases really are equivalent, there are some disturbing consequences. In the case of the restorers, it is clear that there is only one person, you, who experiences the torture. The only saving grace is that thanks to the amnesia of the restorative process, by the time you get home you have no memory of it. But if the two cases are equivalent, it means you experience the torture in the case of the duplicators as well! The torture is experienced by you, but from your future perspective it is not remembered. Yet we know that memory is imperfect and cannot be relied upon to instruct us what we have experienced. One day you may forget this moment. That doesn't, however, mean you never lived it.

Certainly, abduction by either the restorers or the duplicators is something to be avoided. Even though one emerges from the abduction unscathed, nonetheless, they experienced hours of

brutal torture. Being abduced by either group of aliens would be like being given an anesthetic that did not block the experience of pain, only paralyzed you, keep your vital signs normal, and blocked memory formation. To surgeons, such an anesthetic would seem as effective as any other, and patients, upon waking, would have no complaints since they have no memory of their ordeal. Yet if given the choice, who would want to be given this faux anesthetic before going in for surgery?

Lee Corbin, a writer on the subject of duplicates, wrote "Why is it easy to believe that someone could be at the same place at two different times, but very hard to believe that someone could be at the same time in two different places? The two sound similar, and educated people today are familiar with the spacetime perspective and the idea that (in some ways) space and time are interchangable. So why do they always find 'being in two places at the same time' extraordinarily counter-intuitive?"

As counter-intuitive as it sounds, it becomes harder to deny the more we think about it. If the restorers did not erase your memory you would know you experienced the torture because the memory of it would haunt you. Yet, we know that forgetting something does not change the fact we experienced something, so when the restorers erase your memory, it remains a fact that you experienced torture. The duplicator case is similar to the restorer case, and can be made identical to the restorer case if we simply delaying the creation of the second spared duplicate until after the torture is completed, and we overwrite the tortured duplicate with the delayed spared copy.

Thought experiment three: Deep space travelers

It is some point of time in the future, and NASA has selected you for your unique skillset for a 50 year voyage to the outer planets of the solar system. Given this extended time period, you and the rest of the crew will be placed into a state of suspended animation until you arrive at your destination: one of the moons of Saturn. However, due to high cost of the mission and the high the risk of micro-meteoroids impacting the hull and possibly puncturing crew members' bodies, NASA decides to create five duplicates of each crew member and place them in different areas of the ship. Thus, there exists redudancy for each crew member. If one is hit by a micro-meteoroid, other intact copies remain. NASA informs you that when the ship arrives at its destination, one of your duplicates will be thawed to conduct your mission.

Later that night, as you consider NASA's plan you begin to worry. Will NASA default to waking the original me or will they pick one of the five duplicates randomly? Does it even matter? The next day you ask the mission planners about this and they tell you not to worry, all duplicates are the same down to the last molecule, and the continuity of matter is irrelevant to preserving your identity because atoms in your body are replaced all the time. You ask that assuming the original copy of you reaches the destination unscathed, that they awaken the original instead of the duplicate. The chief mission planner sighs, but agrees to do so if it will put your mind at ease.

Fifty years later, your space ship reaches its destination. You emerge well-rested from your cryo-chamber, but are initially shocked to see "Cryo-chamber #2" inscribed on it when you last remembered entering "Cryo-chamber #1". As you walk over towards Cryo-chamber #1 you see a crack in the glass, and as you move closer you find the point where a micro-meteroid passed through the self-sealing hull of the ship, shot through the glass and buried itself in the neck of your original copy. When NASA contacts you they appologize for not being able to revive the original copy as you had requested, and say that the first year into the mission while passing the asteroid belt, your original copy suffered a fatal injury. You nod and admit it was silly to have worried, as afterall, I am here and I seem to have survived just fine.

While wating your first meal in 50 years, a sudden chill comes over you as you realize that

you could have become any of your copies. If #1 and #2 had both been destroyed, I would be #3, and #3 instead of #2 would be here right now eating these dehydrated frosted space flakes. If you have the potential to become any of the duplicates that are thawed, what does that mean if all the surviving duplicates were thawed? These questions so preoccupy your mind that the next day while working on the ships electronics, you fail to pay sufficient attention to what you are doing. You touch a live capacitor which shocks you and stops your heart. When the other crew members find you it is too late to do anything. They decide to thaw #3. Informed of how your predecesssor met his end, you are extra vigilent in focusing on the mission and complete it successfully.

We can draw several conclusions from this thought experiment. The computational theory of mind suggests that one's identity does not depend on the identity of the one's atoms. Therefore, it is in principle possible to survive teleportation. If we analyze just one of the four duplicates NASA creates of you, we see that it is equivalent to teleportation. A scan of the original is made and a copy is reconstructed in a different location, while the original is destroyed. The twist here is that multiple replicas of you are created. Which one of them do you become? The only answer that appears to make sense is "all of them". Your survival does not depend on which of the five replicas is thawed, because you will survive as any of them. Therefore, if all five are thawed would you not live as each of them? In what way does it make sense to say you live as one but not the others?

These questions apply to more than just some far-fetched, contrived thought experiment. They apply to you in this very moment. According to many-worlds, untold numbers of duplicates of you are created in every moment of your life. If, as the deep space travel thought experiment suggests, we become and experience all of our duplicates, then we each experience innumerable permutations of our life throughout the ever branching structure of the multi-verse. The same is implied by a spatially infinite universe implied by eternal inflation, and by mathematical realism. In any theory which postulates the existence of copies of yourself, we must wonder, do we experience those other lives too?

Thought experiment four: Disconnected memory chips

It is the recent future, where Theodore Berger and his team have successfully built a brain prosthesis that can replace the hippocampus in a human brain. Initially, these prosthetics are given to those with brain damage frome stroke, Alzheimer's, or other disorders and injurires. The chip communicates all memory storage and retreival operations of long-term memories wirelessly to an external computer worn on the user. In the event the computer runs out of batteries, however, the user becomes amnesiac. They lose all ability to recall or form long-term memories.

The closest guide to how someone would perform with a failed external computer is Henry Molaison. Henry Molaison was an epileptic and in an attempt to cure his epilepsy his hippocampus was surgically removed. Following his surgery in 1953, he retained his intellectual abilities. He could remember recently presented digits as well as control subjects using his short term memory, he could learn new motor skills, and even enjoyed crossword puzzles (which he could solve if the clue pertained to his pre-1953 knowledge). Yet, for the rest of his life, he was unable to commit anything to long term memory. He could not commit anything to memory following his surgery, such as phone numbers, appointments, recall of post-surgery experiences, etc.

Based on the case of Henry Molaison, we can infer that a user of Berger's hippocampus chip would maintain similar capabilities and suffer similar dysfunctions to Molaison should the link between the chip and the computer be cut. However, if the user intently focused on a task involving motor skills, such as driving a car or playing a game of tennis, the batteries on computer might could run out and they might not even notice. The same seems possible with certain mental tasks, such as concentrating on a difficult Sudoko or crossword puzzle.