Eternity is Nothing but a Second
A Reflection

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Forever – is composed of Nows –
(Emily Dickinson)

Abstract: *This reflection explores various approaches to immortality in science fiction. Toying with the literal meanings of immortality, eternity and timelessness, theoretical physics is used to acknowledge that, at some point on the universe's trajectory (an unfathomable number of years in the future) even matter itself will not be a possibility. Regardless of whether humanity manages to prolong its organic life by slowing senescence or finds a way to transfer itself to a digital counterpart, this is a deep time game. Just short of falling on gloomy or nihilistic thinking, the present reflection aims to provide an alternative to humanity's obsession with eternity as a life purpose by showing how our existence as a species is a wonder in itself and should be lived (and honoured) as such.*

Keywords: *Science Fiction; Immortality; Theoretical Physics; Rejuvenation; Trans-humanism*

"But what drives us to seek the timeless, to search for qualities that may last forever? Perhaps it all comes from our singular awareness that we are anything but timeless, that our lives are anything but forever" (Greene

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2020: xi). On *Until the End of Time: Mind, Matter, and Our Search for Meaning in an Evolving Universe*, Brian Greene (theoretical physicist and mathematician, with a special research focus on string theory) proposes that the awareness of our own aging and inevitable death plays a big part on keeping us moving forward, since most of what we do is an attempt to create something that will outlast us. Every single thing we strive to accomplish, he reflects, might as well have an underlying encompassing goal, which is to try to reach eternity.

We know we won't live forever. We are well aware of our own physical fragility, of our own ephemerality, of our own aging and impending death, as well as the unpredictably of everything and how little control we have over any of it. This awareness leads to two parallel and slightly paradoxical states. First, in order to lead normal lives and have the capability of going with our daily affairs, we have to let it go. To be human, especially an adult human, is to consciously ignore most of what we know to be truth to stay alive; otherwise, the constant wondering and worrying would crush us and drive us to a state of permanent immobile confusion. Second, while all that surface forgetting is happening, our minds still hold the truth and still inform all the choices we make. That "foreboding that quietly lives within us, one we learn to tamp down, to accept, to make light of" (ibid: 4), that almost forgotten but nonetheless always present knowledge, drives us to keep searching for something better, something that will outlast us, something that we hope will make sure our individual existence isn't forgotten the moment we are gone.

> "If high intelligence is the ability to hold two opposing ideas in our heads at the same time, then most of us are geniuses about aging a few times over. We think it will never come for us. We think it might come but it will stop before it reaches us. We think it's coming and there is absolutely nothing we can do about it",

writes Jonathan Weiner for *The MIT Technology Review* (2022). Mentioning the work of cultural anthropologist Ernest Becker, Brian Greene states that it's this "constant existential tension" – a life "pulled toward the sky by a consciousness that can soar to the heights of Shakespeare, Beethoven, and Einstein but tethered to earth by a physical form that

will decay to dust" – that angles our lives: "we are impelled by such awareness to deny death the capacity to erase us" (2020: 4). As such,

> "Some soothe the existential yearning through commitment to family, a team, a movement, a religion, a nation – constructs that will outlast the individual's allotted time on earth. Others leave behind creative expressions, artifacts that extend the duration of their presence symbolically. […] Others still seek to vanquish death by winning or conquering, as if stature, power, and wealth command an immunity unavailable to the common mortal." (ibid: 4)

"Across the millennia, one consequence has been a widespread fascination with all things, real or imagined, that touch on the timeless" (ibid: 4), he adds. Present society is no different. From Silicon Valley high-end tech companies' ongoing research to wellness and fitness post-new-age obsessive anti-aging practices, copious human energy and time is dedicated to trying to find solutions for, not only how to make us live better, but also longer. And if something is central to fiction, that is the endless possibilities our minds can imagine and create. Immortality has been a theme in fiction since the *Epic of Gilgamesh* – which is to say, ever since the birth of fiction. Immortality and eternity have always played big roles on mythology and on the fantasy genre: vampires and (some) elves, plants, fountains and elixirs that grant immortality or endless youth, dark magic performed with obscure spells, rituals or sacrifices – these are all examples of how immortality is approached. And on science fiction… well, defying what is physically possible at present lies at the core of the genre, and defying aging and mortality are as essential to sci-fi as oxygen is to Earth's living creatures. Still, this poses an interesting question: we keep circling around the idea of eternity, but is there such a thing as eternity?

We'll get back to that later. For now, let us focus on the ways to reach immortality through sci-fi technologies – and all of them are ideas that have been around for decades. Notwithstanding their value, the specifics of both the narratives and the characters' affairs in the following examples pose little relevance to the purposes of this reflection – our main focus will be on the worldbuilding elements.

The *Altered Carbon* universe poses a magnificent case of study here, as Richard K. Morgan's books, along with the Netflix production (2018–2020), gather three of the usual suspects: uploaded consciousness, cryosleep and synthetic bodies. In the *Takeshi Kovacs* series – *Altered Carbon* (2002), *Broken Angels* (2003) and *Woken Furies* (2005) –, future Earth technology has evolved (with some extra-terrestrial help) so that most people have 'stacks', cortical devices where human consciousness is copied into. This is possible through 'DHF' (digital human freight) backup, the transformation of human neural consciousness into digital code, allowing people's memories, abilities, and identity (or their digital versions) to be independent from physical bodies, since upon physical death the stack can be removed and placed onto a new body. The information on the stacks in updated by the minute, and the wealthiest guarantee that several copies are safely guarded in different vaults, since stacks can also be irredeemably damaged.

Bodies are simply called 'sleeves', and can be biologically born, genetically or cybernetically modified, cloned, or artificially created (the 'synths'). Upon physical death, since sleeves are expensive, a lot of people's consciousness will be stored in a state of suspended animation. Victims of unfair deaths (like murder) will be attributed new sleeves by the state, but all others will have to wait until their families or friends can afford to buy a new one. The prison system follows a similar route: people's stacks will be placed on a much more painful degree of suspended animation, and their bodies will be stored on cryosleep until the likely event of being attributed to someone else's consciousness. Another possibility of the digitalization of consciousness and the creation of synthetic bodies also surfaces: 'needlecasting', a specific method of (unspecified but fairly quick) interstellar travel which allows consciousness to be transmitted off-world and transferred to sleeves on other habitable planets (one at a time, as 'double-sleeving' is illegal).

Cryosleep is a tech element largely employed in sci-fi when it comes to interplanetary travelling. Productions like *2001: A Space Odyssey* (1968), *Interstellar* (2014), *Passengers* (2016) and *Star Trek* depict variations of this. The same goes for *The 100* (the TV show, that run from 2014 to 2020 and surpassed by far the time frame and the technology involved in the book

series), which encompassed, among many other future possibilities, centuries-long cryosleep, partial cyborg beings – minds enhanced by artificial intelligence (AI) devices that also store previous hosts' memories –, an entire digital city built and populated by AI, and a last stop on the transcendence ride that allows an ethereal (and eternal) existence made out of pure light. James Cameron's *Avatar* (2009) is a similarly good example as *Altered Carbon* for our purposes, given that interplanetary travel resorting to cryosleep ('cryostasis') and synthetic bodies ('avatars') are essential to the narrative. Plus, the long awaited second instalment, *Way of Water* (2022), adds a new technology to the franchise: the capacity to store human memories and 'recombine' them with Na'vi avatars.

The future reality depicted on a Ken Liu's sequence of stories and its recent adaptation – the AMC+ production *Pantheon* (2022) – brings a solution to immortality on a whole new level of innovation and (lack of?) ethics. "The Gods Will Not Be Chained", "The Gods Will Not Be Slain", and "The Gods Have Not Died in Vain" is a collection of short stories included on *The Apocalypse Triptych* books. These are three anthologies of apocalyptic and post-apocalyptic fiction edited by John Joseph Adams and Hugh Howey – *The End is Nigh* (2014), *The End is Now* (2014) and *The End Has Come* (2015). The three-time Hugo Awards' winner author Ken Liu has a story in each book, each narrative corresponding to a different stage of the apocalyptic process.

The 'gods' are uploaded intelligences (UI), a combination of human neural pathways' maps and artificial intelligence – "no longer quite human, and not entirely artificial, but something in-between" (Liu 2014b: 140). The process as depicted on *Pantheon* consists of the progressive reading of the brain with a laser, like if it were a scanner slicing through the organ and killing its owner in the process. Once the process is completed, the digital version of the person lives now on the 'cloud' and, once given connection to the web, has access to everything humankind has ever discovered. All that knowledge combined with AI unlimited processing, power, and access capabilities, plus the underlying self-awareness of digital immortality, makes of the UIs something similar to gods.

These divinities are very different from the ones of *Altered Carbon*. On Richard K. Morgan's world, the richest people, also known as Meths, see themselves as gods because their privilege allows them to easily 'resleeve' regularly into younger and stronger bodies (numerous times artificially enhanced with different features) or even to their own on-demand clones, while their multiple stack copies assure that they will most likely never die. However, they are still confined to more or less human brains and bodies, and limited to human intelligence – and this makes of them baby divinities when compared to what the UIs from Ken Liu's world are capable of doing. Since the UIs exist only in the digital world, they don't need to eat or sleep; they don't get sick, don't get tired and are not vulnerable to most of the things human bodies are. Their processing speed will never be reached by a human being, and the same goes for their information storage and for their universal and instantaneous reach. The digitalization of our era means that the UIs can get access to almost anything and control everything when and how they want it. Even so, the Meths do have something the UIs don't: human physical senses and sensations.

There are two other noteworthy elements in this UIs' world. First, from Liu's short stories, a 'being' entirely artificial, created by one of the UIs, mostly from his own code, as well as pieces from the other gods' lines and some new sections. Second, from the TV show, a clone created from the DNA of the genius that started it all, the man that is both the founder of Logorhythms (the primary company researching and developing the UIs) and the brain behind the UIs concept and execution. Having learned he was dying, he tirelessly tries to fix the flaw in the gods' base code that would later slowly erode them the more they used processing power, but to no avail. As such, before he dies, he and his team develop a plan B: to create a clone of him, and make sure the baby has a life path just like his, so that he can reach his full potential and figure the flaw out. Both of this pose interesting possible 'answers' to death. The completely digital 'human' mind could mean the next stage of humanity, eliminating problems like lack of resources from overexploitation of nature and overpopulation. The completely synthetic 'human' being could be an answer to

individuals death, even if, unlike the Meths' clones, these allow more of a genetic reincarnation than an existence's continuation.

The last minutes of the first season of *1899* (2022), the latest creation of Jantje Friese and Baran bo Odar, reveal a new answer: human bodies placed on suspended animation inside a spaceship drifting through space, while their minds run a simulation again and again. Could life on a conscious simulation while the body is 'preserved' allow humans to both 'live' and delay aging? Of course, the bodies framed on those last minutes, which seemingly represent reality for those individuals, could also be on a simulation in itself; unless the creators choose the divulge what they had imagined for the show on their own, the answer will remain a mystery, since Netflix hasn't picked the show for a second season.

Ready Player Two (2020), an unexpected continuation to Ernest Cline's LitRPG *Ready Player One* (2011), also plays with these ideas but with a twist. Taking place on a future Earth badly devastated by climate change and populated by social inequality, the books' narrative focuses on a virtual reality game (world?) that eventuality becomes the default area for all aspects of life (save for keeping the physical body alive, naturally). Trying to prevent the looming possibility of human extinction, the main characters place their new AI counterparts (some UI siblings, one can imagine) on a data centre-like spaceship, along with dormant copies of every user that has ever logged onto the OASIS and frozen human embryos, and send it on the direction of Proxima Centauri with the purpose of finding another habitable planet. Cline plants the seed for "immortal beings of pure intellect, freed from our physical forms and set adrift in the vastness of outer space, possibly for all eternity" (2020: 363). The last book of Blake Crouch's *Wayward Pines* trilogy (2012–2014), *The Last Town*, proposed a similar idea to this, with a whole town (unwillingly) placed in suspended animation on a mountain stronghold to prevent human extinction.

All these pop culture examples pose an interesting question: the vulnerability of physicality. In none of these universes is the software able to exist without its hardware counterpart. And the quirkiest thing of all is that not even science fiction is getting (fictional) immortality quite right.

Any kind of suspended animation would be highly beneficial for humankind when it comes to space exploration (we're not on the interplanetary travel phase yet, obviously, at least not in the sense of periodic regulated travel between inhabited planets), since it would allow humans to endure the enormous duration of transit. Agencies like NASA and ESA have been testing both ways of reducing metabolic rates and different kinds of habitats or capsules for years now.

Somehow, cryonics are always presented as associated with immortality; however, suspended animation doesn't stop aging, it merely delays it – just like the dormancy periods observed in many organisms all over the world (like hibernation or diapause), where metabolic activity is reduced to a minimum to conserve energy. Plus, cryosleeping people wouldn't even be conscious – there is a reason why the concept was dubbed 'sleeping', after all –, so, while on that dormant state, individuals would be existing more than genuinely living.

Synthetic bodies can still die, and would have to be replaced again and again, until resources were no longer available. And bodies can still succumb to diseases and be destroyed by sudden accidents or natural disasters. Plus, uploaded consciousness devices can always be broken and wrecked. On *Altered Carbon*, stacks can and will be easily destroyed, both physically or though digital viruses' attacks, which can also destroy the cloud and remote copies. On *Pantheon*, it is far more complicated. The UIs require ever more storage and processing, which also imply more cooling units and electricity generators. They call themselves gods, but humans can cut parts of them by powering off servers or deleting them, and other UIs can throw them on cat-and-mouse deadly fights, killing them bit by bit. Plus, not even spreading parts of the code around the world and hiding multiple copies will save them once the electricity is out, which eventually happens on Ken Liu's post-apocalypse depiction (*Pantheon* managed to get to the lights-out phase on its last seconds but not any further, since the studio abruptly cancelled the show, even after having finalized production on its second season).

Aside from the vulnerability of physicality, another interesting concern arises from the obvious economic privilege implicated. The quest for immortality requires wealth (and not just wealth per se, but real

wealth), as well as time (tricky, since, after all, this is a run against time), and manpower, which also allows for another concern to arise, that of will and agency. Liu and Morgan are both well aware of this, as are most of these worlds' creators. In *The Apocalypse Triptych* stories, the technology behind the UIs is created by the moguls of big tech companies in total secrecy, and, since they needed to test the process's efficiency first, most of the first people to be uploaded are nothing but lab-rats, chosen for their programming skills, submitted (and physically killed) to the proceeding without consent and, already as UIs, turned into digital slaves, forced to program 24/7 for the companies in controlled simulations and with limited access to their own codes.

Ironically – or perhaps predictably – the multibillionaires' ache to achieve immortality by any means necessary (while continuing to generate the highest possible profit figures) is what ends up causing the collapse of the whole human system, since, once the UIs break free from their 'chains', they seek vengeance and start breaking apart their creators, piece by piece. Vengeance turns into open war against humanity; their access to everything-digital allows them to launch nuclear missiles from countries' arsenals into other nations, provoking responses and, by so, setting the beginning of the end of civilization as we know it in motion.

To keep the UIs running? Money – large sums of it, for storage units, for cooling units, for processing units, for security and so on – and, most likely, (organic) people on the ground, which makes this digital immortality technology a possibility only to multibillionaires. This is also the truth for *Altered Carbon*'s stacks-fuelled immortality. In theory, the technology and the possibilities exist for everyone to be indefinitely immortal; in reality, most people have guaranteed only the life they are born with, with maybe one or two sleeves' extensions at best. The only ones who have something more within their reach are the Meths, not just rich, but insanely rich – a future version of our own multibillionaires. They are the ones with spare skins, clones and stack backups. They are the ones who get to live all the experiences available to humans, even death, with no fear of consequence. They regard most human lives as expandable, and dispose of people however they like. And, because the majority of

the population is so poor, people have little agency over their own lives – and their own bodies (or skins), in many instances.

In *Ready Player One*, large segments of (digital) life inside the OASIS are accessible only to those with real money in the real world. However, since the main characters turn into billionaires overnight by the end of the book, everything is quite different in *Ready Player Two*. Individual will seems to evade their minds altogether, since they choose to make copies of every user (which, in Cline's world, pretty much equals creating a copy of the entirety of humankind), transfer them into a new OASIS and send them into outer space, without the idea of asking people for their permission ever crossing their minds. Worse, they have no near-future intentions of ever telling anyone outside of their circle what they've done.

Each of these economic privilege implications have roots in our current world order. Most of nowadays research on aging (or de-aging, or aging reversing, or rejuvenation) and immortality-ish are done by billionaires or funded by billionaires. Billionaires are, in fact, going about the oddest practices and methods to try to slow aging down, and they have no issues with stepping over everyone else to get there, whether it is taking medication from sick people (who actually need it to survive) or injecting younger people's blood. And, given that even immortal human beings would require a planet to live in if they were to stay organic, the 1% are desperately trying to bypass the collapse of civilization. Whether it comes from climate change-induced chaos, from nuclear extermination or from a space object impact, they will be ready. Over the last years, we've been witnessing a new space race, mostly driven by the super-rich, but an unimaginable number of well-hidden projects have been going on around the globe at the same time. Just like Douglas Rushkoff writes on his recent *Survival of the Richest: Escape Fantasies of the Tech Billionaires*,

> "Taking their cue from Tesla founder Elon Musk colonizing Mars, Palantir's Peter Thiel reversing the aging process, or artificial intelligence developers Sam Altman and Ray Kurzweil uploading their minds into supercomputers, they were preparing for a digital future that had less to do with making the world a better place than it did with transcending the human condition altogether. Their extreme

> wealth and privilege served only to make them obsessed with insulating themselves from the very real and present danger […]. For them, the future of technology is about only one thing: escape from the rest of us. These people once showered the world with madly optimistic business plans for how technology might benefit human society. Now they've reduced technological progress to a video game that one of them wins by finding the escape hatch. Will it be Bezos migrating to space, Thiel to his New Zealand compound, or Zuckerberg to his virtual Metaverse?" (2022: 9–10).

It's somewhat impossible to comprehend how some people are so obsessed with immortality and, yet, can't seem to care about the future of our planet. We, humanity as a whole, have driven – and haven't stopped driving – our world's natural system to its edge with all our extracting and building and consuming. The Earth has been around for some estimated 4.54 billion years, and our species the duration of a mere blink of an eye – and still, we have managed to be the thing that throws the planet off-balance like no other. At present, "These rising social and environmental changes point towards either a new configuration of human society or its collapse" (Lewis & Maslin 2018: 15). We seem to forget how quickly we could be erased, if it came to it, and how much easier the planet would have it without us.

In *What We Owe the Future*, William MacAskill defends his case for longtermism, which essentially means "Future people count. There could be a lot of them. We can make their lives go better" (2022: 16). The idea is simple, and its ethics are strong. Also, if one wants to live forever, even if forever means just a bit longer, one ought to care about both the future of the planet and the future of humanity. Even so, MacAskill believes humanity is at its beginning, since the typical mammalian species has a lifespan of one million years, pointing out that, in that case, some eighty trillion people are still to live their lives. And, following a 'why not?' logic, he argues that, since humanity has far more sophisticated tools than all other species, we could live far beyond that, even beyond our planet's habitability, around five billion years from now. MacAskill, just like Elon

Musk, another longtermism believer, are optimists and, if one were to be straightforward, both tech-dreamers and full of naïvety, because

> "The world is increasingly unthinkable – a world of planetary disasters, emerging pandemics, tectonic shifts, strange weather, oil-drenched seascapes, and the furtive, always-looming threat of extinction. In spite of our daily concerns, wants, and desires, it is increasingly difficult to comprehend the world in which we live and of which we are a part" (2011: 1),

like Eugene Thacker writes in his *In the Dust of This Planet* preface. Taking all this into account, "One can, perhaps, understand why a utopian treatment of the immortality theme might be viewed as carelessly, even dangerously idealistic, optimistic, and naïve", wrote Joseph V. Francavilla in 1984, adding "But isn't there an alternative to this pervasive version of the theme, this dystopian version which is necessarily realistic, pessimistic, and cynical?". Both extremes of the spectrum pose interesting reflexions; all the examples given in this text fall mostly into the dystopian version, although most of them could have the potential to reach the utopian level, if it weren't for some humans' greed and lack of empathy.

Transhumanists have been considering and revolving around matters like these for decades. Maybe we can't prevent most natural phenomena, but maybe we could eradicate disease and stop aging altogether. Aubrey de Grey's SENS, or Strategies for Engineered Negligible Senescence, are one of the examples. Cyborg solutions are another possibility, quite common among immortalism enthusiasts like Ray Kurzweil, with the replacement of parts of the body – organs, bones, members, eyes – or even the whole body except for the brain. Cryonics and resurrection are also central to the movement, although neither grant immortality.

Even with the ever-going advances on scientific, medical and engineering research, even if we could use bioengineering to modify part of our DNA to inform as many of our cells as possible to rejuvenate themselves, even if we could train nanorobots to detect and eliminate cancer cells, even if we could develop a machine capable of detecting all maladies on a body through a single exam, even if we could find cures and drugs and answers to most of our diseases, even if we managed to eat

all the right things, even if we could prevent the climate crisis altogether and revert the drastic ecological changes that are affecting our collective health – even if, even if, even if…

If we're thinking on a short-term future, there are tectonic plates' movements (earthquakes, tsunamis, volcanoes' eruptions) to consider, as well as celestial bodies' collisions. On a long-term, deep time future, everything changes. On *Notes From Deep Time*, Helen Gordon reflects that entering a deep time scale "engenders a sort of temporal vertigo" (2021: 9). Later, she writes that

> "deep time is 'foundational to our full understanding of life's origin and diversification, it is a critical concept for understanding geology, physics, and astrophysics'. We need to grapple with deep time if we want to make sense of the world around us, the long march of evolution, the rapidly multiplying challenges of climate change that threaten life as we think we know it. Without deep time we cannot begin to answer the questions 'Why am I here?', 'Where have I come from?' and 'Where am I going?'". (ibid: 13)

There are more than a trillion atoms in a single cell. The human brain has ninety billion neurons that work on a network of one hundred trillion synaptic connections. There are more stars in the universe than grains of sand on our planet (Greene 2020). "If you compressed the whole of Earth's unimaginably long history into a single day, the first humans that look like us would appear at less than four seconds to midnight" (Lewis & Maslin 2018: 7). The universe has existed for 14 billion years, and will still exist for so many more that the number is unimaginable to us. How could we ever conceive of living forever, if our minds can't even hold the digits? What would longer lives do to the human consciousness? One can confidently assume a great ordeal would change. And what about purpose? Finality? Meaning? With indefinitely immortal lives, which is to say, without the single acknowledgement that, according to Greene, keeps us moving forward, how would life look like? Once the novelty run out, life would maybe be just a long, bleak, lonely and bored thing (as many science fiction characters are well aware of).

One could always consider, for the human timescale, that to reach something like a 500th anniversary would be like reaching eternity itself. Should we think of human immortality as a thousand years? A hundred thousand? A million? Even so, to reach that longevity and remain completely biological is still quite unlikely. Scientists predict that "the natural maximum human life span" is between 120 and 125 years (Smith 2022). Some also believe human biology "can be optimized for greater longevity", allowing more people to live longer lives, because very few "get anywhere close" that age (ibid).

So, our best shot at living lives on an upper timescale would be to transition either partially or completely to some sort of synthetic life, like those imagined by Richard K. Morgan and Ken Liu. And even those are tricky, since, as multiple scientists consider, to move the human mind to a digital alike wouldn't necessarily mean a continuation of the human life, but rather a copy of it that continues from that point onward. One thing we can almost know to be sure – even if all the things we don't know yet, and all the things we will never know, are far more than the things we do: human life as we know it will never be immortal. Genetic editing would likely change far more than expected, and synthetic life would be completely alien to the reality we perceive now. We could never be immortal and remain human. We cannot have both, something would have to give.

Furthermore, etymologically (and according to the *Merriam-Webster.com* dictionary), 'immortal' means "exempt from death" or "exempt from oblivion". 'Eternal' means "having infinite duration" or "continued without intermission", and 'timeless' means "having no beginning or end" or "not affected by time". And this brings us to the one thing our minds cannot possibly grasp: there might come a time when time doesn't exist and everything that is will no longer be.

> "What's new in our age is the remarkable power of science to tell a lucid story not only of the past, back to the big bang, but also of the future. Eternity itself may forever lie beyond the reach of our equations, but our analyses have already revealed that the universe we have come to know is transitory. From planets to stars, solar systems to galaxies,

> black holes to swirling nebulae, nothing is everlasting. Indeed, as far as we can tell, not only is each individual life finite, but so too is life itself. Planet earth, which Carl Sagan described as a 'mote of dust suspended on a sunbeam', is an evanescent bloom in an exquisite cosmos that will ultimately be barren. Motes of dust, nearby or distant, dance on sunbeams for merely a moment" (2020: 4–5),

Brian Green writes. As the title suggests – let us recall, *Until the End of Time: Mind, Matter, and Our Search for Meaning in an Evolving Universe* – the physicist's book explores the various paths humanity has followed on the search for meaning, while also explaining how the mind and matter work, how time and space, and the universe and life, came to be, providing the reader with all the essential physics notions to understand his lines of thought along the way. The last chapters, though, are dedicated to the event that motivated all this: the end of time itself. On *Duration and Impermanence* (ibid: 244–279) and *The Twilight of Time* (ibid: 280–309), Greene takes the reader along the theories that try to foresee where the universe is headed and what it all means for life.

We, after all, are nothing but "a living, breathing, thinking, sensing, feeling collection of bone, tissue, and cells" that support "organic processes of energy transformation and waste excretion", and these rely "on atomic and molecular movements honed by billions of years of evolution on a planet forged from the detritus of supernova explosions scattered throughout a realm of space emerging from the big bang" (ibid: 6). There will come a day when the conditions for life won't be met, and this doesn't mean life on Earth only. Yes, life on Earth won't be possible some five billion years from now, when the sun's aging process moves to its final steps, but that's just thinking 'small'. The scientist draws the reader far beyond that, through the breakdown of stars, planets and into realms and timescales absolutely unfathomable to the human mind.

Greene makes the physics of all of it understandable, but it is complex enough to go over on this text, so let us skip to the theoretical big finale: the disintegration of matter itself. Could consciousness exist without matter? Could thought exist without life? Could intelligent life prevent the whole process early-on, directing the long-term fate of the cos-

mos as a whole? Could such intelligence shift entropy, or even have the capacity to create new universes? Could our universe go through seasons instead of a linear-like evolution? Could the universe have no beginning and no end, as Stephen Hawking once (probably humorously) suggested? Could there be other universes already?

Brian Greene asks all these questions and many more. Theoretical physics of this level is still way out of our league when it comes to reaching any kind of sure answers. Even so, since everything we know will eventually cease to exist (and since that is a certainty), it's certain that life cannot be immortal. This far into time, within the next 10^{50} years (and that is already a far-fetched prediction), not even some kind of abstract thought could be possible. And "as we hurtle toward a cold and barren cosmos, we must accept that there is no grand design. Particles are not endowed with purpose" (ibid: 325), he believes, reflecting that

> "We are ephemeral. We are evanescent. Yet our moment is rare and extraordinary, a recognition that allows us to make life's impermanence and the scarcity of self-reflective awareness the basis for value and a foundation for gratitude. While we may long for a perdurable legacy, the clarity we gain from exploring the cosmic timeline reveals that this is out of reach. But that very same clarity underscores how utterly wondrous it is that a small collection of the universe's particles can rise up, examine themselves and the reality they inhabit, determine just how transitory they are, and with a flitting burst of activity create beauty, establish connection, and illuminate mystery." (ibid: 322–323)

Becky Chambers, the author of the (probably) most soothing and feel-good science fiction, writes something interesting and along the same lines. The *Monk & Robot* series – which is a two-part novella, *A Psalm for the Wild-Built* (2021) and *A Prayer for the Crown-Shy* (2022) – is built out of the introspective conversations between a tea monk and a robot, and at on point, by the end of the first book, they reflect on their different understandings of 'purpose'. The monk is confused by how humans respected robots for having transcended their intended industrial purpose and having chosen something different for themselves, but kept insist-

ing on a purpose for themselves, "one which you are desperate to find and miserable without" (2021: 94).

The robot reminds the monk that they are animals and, just like all other animals, they're not meant to have a purpose, adding that "Nothing has a purpose. The world simply is" (ibid: 95). If they "want to do things that are meaningful to others, fine! Good!", but they if they want to simply exist, "that would also be both fine and good" (ibid: 95) – "You keep asking why your work is not enough, and I don't know how to answer that, because it is enough to exist in the world and marvel at it. You don't need to justify that, or earn it. You are allowed to just live. That is all most animals do" (ibid: 96).

They keep going back and forth. The monk says that "Survival alone isn't enough for most people", and that "You can't just reduce something to its base components. We're more than that. We have wants and ambitions beyond physical needs. That's human nature as much as anything else", to which the robot replies with "I have wants and ambitions too, Sibling Dex. But if I fulfill none of them, that's okay" (ibid: 96). This leads to an exchange that fits perfectly in the present reflection:

> "'It doesn't bother you?' Dex said. 'The thought that your life might mean nothing in the end?'
> 'That's true for all life I've observed. Why would it bother me?' Mosscap's eyes glowed brightly. 'Do you not find consciousness alone to be the most exhilarating thing? Here we are, in this incomprehensibly large universe, on this one tiny moon around this one incidental planet, and in all the time this entire scenario has existed, every component has been recycled over and over and over again into infinitely incredible configurations, and sometimes, those configurations are special enough to be able to see the world around them. You and I—we're just atoms that arranged themselves the right way, and we can understand that about ourselves. Is that not amazing?'
> 'Yes, but—but that's what scares me. My life is… it. There's nothing else, on either end of it. […] I don't know what my pieces were before they were me, and I don't know what they'll become after. All I have is right now, and at some point, I'll just end, and I can't predict when that

> will be, and—and if I don't use this time for something, if I don't make the absolute most of it, then I'll have wasted something precious.' Dex rubbed their aching eyes. 'Your kind, you chose death. You didn't have to. You could live forever. But you chose this. You chose to be impermanent. People didn't, and we spend our whole lives trying to come to grips with that.'
>
> 'I didn't choose impermanence', Mosscap said. 'The originals did, but I did not. I had to learn my circumstances just as you did.'
>
> 'Then how', Dex said, 'how does the idea of maybe being meaningless sit well with you?'
>
> Mosscap considered. 'Because I know that no matter what, I'm wonderful', it said. There was nothing arrogant about the statement, nothing flippant or brash. It was merely an acknowledgment, a simple truth shared." (ibid: 96–97)

In 2011, Ali Binazir played with this curious insight. The *The Huffington Post* contributor published an equal parts serious and jester article about the probability of any human being born. Needless to say, the numbers are impossible to comprehend, which could be translated as: humans were hardly ever meant to exist. We may ache for something more, but eternity is, after all, nothing but a second, and the very fact we exist is astonishing on itself. The conditions for conscious, self-aware, intelligent life to form are so unique and special that the odds were never, ever in our favour – and yet, here we are.

That is the real meaning of life for Brian Greene: not to search for the miracle that will grant us eternal life, but to live as the miracles we already are. To appreciate our existence, accept our limits and enjoy every second of being alive. "Life and thought likely populate a minute oasis on the cosmic timeline", and if we "take that in fully, envisioning a future bereft of stars and planets and things that think", our "regard for our era can appreciate toward reverence" (2020: 15).

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