

Im a Mortal Episode 2: Martin Wiener – Time Perception

Speakers: Martin Wiener (Guest), Sufal Deb (Host), Marvin Yan (Host)

[MUSIC - Im a Mortal Theme]

Martin Wiener 0:26

Hi, everyone. I'm Dr. Martin Wiener. I'm a faculty member at George Mason University in the Department of Psychology. I got my PhD [Doctor of Philosophy] in psychology and cognitive neuroscience from the University of Pennsylvania back in 2011. My work focuses on timing and time perception, that is, how the brain and the mind understand intervals of time. I use this work to understand how we use time in everyday life for things like rhythm and music and navigation and making decisions and perceiving things in all kinds of facets that time is crucial for. That's me and that's the kind of kind of work that I do. Happy to be here.

Sufal Deb 1:07

Great to hear that. Thank you, first of all, so much for coming onto Im a Mortal and while we're on the topic of our name, what does the word immortal or immortality mean to you?

Martin Wiener 1:16

Immortality at least to me means living or existing forever. That is, there is no end and to some degree, there is no beginning after a while. To me, immortality is any living being breaking free of that life cycle by which you have to be born, exists, and die, such that you just perpetually exist.

Marvin Yan 1:42

I know we're human but I feel like we've always asked this because there's this whole field of life extension and all of that. Would you want to ever engage in those sorts of therapies or would you maybe want to be one of those beings that is, quote, unquote, immortal?

Martin Wiener 1:55

This might precede some of the things I could talk about later. I would say, I would be all for life extension but probably not for immortality.

Marvin Yan 2:05

No, that makes sense. That makes sense.

Sufal Deb 2:07

You mentioned your field of interest so what what piqued your interest in this? How did you get onto time and space perception?

Martin Wiener 2:14

Oh, gosh. It's one of those things that I think I'd like to give you a story that there was some pivotal event in my history where I looked at the stars and I said, "It just keeps going and I need to figure out why." But my life kind of just went from one thing to the next, right? From one opportunity to the next where I thought I was going to be good at something and it turned out I wasn't and then I

moved on to the next thing. I always did have an interest and a love for psychology and understanding the mind, understanding mental processes, how people think, and understanding how others think to a degree.

I knew I wanted to do something in that field but I didn't know what so after college, where I graduated with an undergraduate degree in psychology, I went on to work for a year in a mental health hospital. That was an opportunity to see patients who were suffering from all kinds of psychiatric disorders from schizophrenia, to some people with Parkinson's disease, others with severe depression. It was a humbling experience but that's when I realized I really just was not good at being a clinician. I probably just did not have the knack for it.

I still was interested in why people were having all these different disorders so I went on to do a master's degree in psychology. It just so happened that there was somebody there who studied timing and time perception. This was at Villanova University in Pennsylvania. It just so happened that he needed a graduate research assistant and I offered to work with him. We talked and he said, "Sure, come on in." I started learning about the work that he was doing which is about timing in animals. It was very cool. It was fascinating. I did the degree and when I was done, I said, "Well now what?"

Again, it just so happened that over at the University of Pennsylvania at their hospital, there was a neurologist there who also was looking for someone to come in and help him do research but this was on stroke patients. He was specifically interested in timing so how patients with strokes in different parts of the brain got disruptions in their perception of time. Because I had done this work already, I was sort of a perfect fit for the position. I came in. I did work there and that led to me doing a PhD which led to me doing more work, which eventually led to me going on and doing several postdocs, a brief detour where I worked for the federal government, and then finally coming back to my position here at George Mason University where I have my own lab.

I know that I found once an old notebook of mine from college, where I think I was jotting down ideas. One of those things that you just do where you're just writing ideas and I think I found a sentence there asking, where does time come from?

Marvin Yan 5:14

Oh my god.

Martin Wiener 5:14

It was one of those things where I said, "There it is! That was it! That was me..." knowing that this is where I was going to wind up but there was a million things written in that book. It wasn't the only thing there but it was something where I said, "Well, I wouldn't have gotten into it if there wasn't some interest in it to begin with, right?" It's one of those things that I grew to love and grew to become involved in this.

Sufal Deb 5:15

Wow, that was quite an origin story.

Marvin Yan 5:40

Yeah!

Sufal Deb 5:40

Yeah, that was great. Well, let's start off with this question. I think this is a great touch or a great starting question. As we age, our brain obviously change so how does biological aging affect our perception of time?

Martin Wiener 5:57

It's interesting. There's this assumption out there that—there's two assumptions with aging. One is the assumption that as we age, we get slower, that things tend to slow down. I mean, certainly, we see people walking slower and moving slower as they get older. When you examine the evidence, there's not that much evidence suggesting the time slows down in the moment to moment. There had been some work suggesting that they were slow but that that work was on the basis of the fact that older people have slower reaction times. That is, if you ask them to react to something, they do it slower than someone who's younger. The assumption was they process things slower as well. Again, we're starting to see that's not necessarily true.

On the other hand, while in the moment, their perception of time might be the same, if you ask them to think about the ordering of events in their lives, what you find is that there is this sense of time speeding up as they get older, of the years just slipping by and just saying. how could I suddenly be 50, or 60, or 70 when just the other day, I felt like I was 20. It does happen. There is this sense of that occurring. We're not exactly sure why that happens in terms of brain anatomy and brain processing. The general idea has been, when you were 16 years old, one year is a much smaller chunk of your life than when you're 20 years old. One year has a far more pivotal outsized effect on you.

That's true to a certain degree because when you're younger, think about how a year can change everything about your life. There are so many amazing and insane events that could occur in your teens and 20s that define who you are. But once you're who you are, at that point, once you're 50 or 60, there's fewer of these events happening that are just going to drastically change everything about you or drastically set you on a totally different path. It does happen but most commonly, things kind of stay the same. That staying the same when you get older leads to kind of as sort of monotony where things just seem to slip by. There is that that change there on the grander scale of time for age, but on the shorter timescale, it seems like someone who's older can perceive an interval of time just as well as someone who's younger.

Marvin Yan 8:33

Okay, I kind of wanted to touch on that because you said when we're younger—right now, Sufal and I we're in university so yay, there's a bunch of cool stuff happening every semester. For people who I guess have—because you're saying time is based on a sort of proportionality. Time perception based on proportionality, plus novel experiences, sort of? So if I did want to have—for people who do have new and fun experiences throughout their 30s 40s not that they're boring but they continue, would

they experience—would they still get the same argument that time is slipping away or would they usually say that no, I'm still—it feels like time is just as slow as they were when they were younger?

Martin Wiener 9:15

Yeah. Well, I don't know if this will answer that question but the the experience of time, just to a very large degree is tied to novelty and the novelty and newness of events. You can probably imagine—if you think back to when you first started college and let's say if it was a monumental event in your life of now I'm here in college. Those first few weeks are probably solidified in your mind but they probably fill a bigger chunk of your memory than say what happened in the most recent 2 weeks of your life perhaps.

Marvin Yan 10:01

I don't remember. Yeah.

Martin Wiener 10:02

Right. There is this thing and it's funny because this is something that that people in my field are studying right now in the context of COVID and in the context of pandemics, of people having a warped sense of time under lockdown, right? Because it's one of those things that when we have more new novel experiences, looking back, our memory of those events, they seem to last longer than they actually were. Paradoxically though, in the moment, it feels like they flew by. If you're having a fun exciting time, if a lot of great stuff is happening, all of a sudden, it's 3am. How did that you know that time slip by? Oh, man, we were having so much fun, we didn't even notice that all this time was gone. Yet, if you think back to it, there's so many things that occur, you overestimate how long you were doing that thing for. The in the moment experience of it might feel like it flew by but the retrospective memory of it is stretched out to be longer than it actually was.

Marvin Yan 11:15

Oh, okay. I'm going to go again but you talked about time estimation. When we're talking about questions, one of the things we're talking about was, if you're in a blank room and someone told you, okay, leave when a minute has passed, you can do a pretty good job at it. But if someone said, an hour, a day, a month, then you end up doing quite poorly. I think there's some experiments with people underground and their judgment of time—even the time of day was off. Is there a reason why we're so bad at judging long term time versus a short term time?

Martin Wiener 11:48

Potentially. With isolation experiments, at least if you lose the light cycle, like you no longer know day from night, there is this free running of circadian rhythms that can occur, where you still sleep and wake for the same amount of time, but when you go to sleep and when you wake up starts to slowly shift. Now you're all (??) groggy (??). Every day, it's like you're falling asleep a little bit later and you're waking up a little bit later until if you go long enough, you're basically sleeping during what is actually day and awake during what is actually night because you no longer have these cues. That's our general method in terms of our body awareness of telling us, okay, it's time for me to sleep, it must have been a day now.

Those things rely on these external cues for us to be able to tell us, okay, now it's time for us to wake up or now it's time for us to go to sleep. As far as why we might be bad at those things, in terms of estimating an hour or estimating a much longer timescale is that the brain has sort of adapted to be able to time things in this immediate moment. We're very very good at timing a few seconds. We're very very good at timing a few minutes even. But once you start kind of extending that out, the brain loses these—the method that it was using before for keeping track of that time. Let's imagine, you're just trying to count seconds, right, and you're just going one, two, three, four, that strategy will work just fine for a short interval of time but if you need to count in order to tell yourself when an hour is up, it's just not—it's just going to fail you because you won't be able to maintain it.

It's the same thing in terms of the brain, that the brain starts moving on to other things and starts attending to other things, it starts turning inwards, and you lose track of all the cues that are necessary for you to say, okay, this amount of time has passed. So in fact though, in order for you to actually know when an hour is up without a clock, your mind has to kind of retrieve other memories of things that you were told lasted an hour, and said, well, this is kind of the same as this other thing that I knew was an hour. It feels like that so it must be an hour! This seems similar to that. Actually, in terms of measuring an hour, we're better at measuring an hour than you'd think.

Marvin Yan 14:12

Really?

Martin Wiener 14:14

We're actually pretty good at being able to measure when an hour has gone like even—

Marvin Yan 14:17

Oh not me then. Okay.

Martin Wiener 14:19

Yeah. I mean if we're tasked to. If you were told you have one hour for this thing to be done, tell me when you think it's up. I mean, most people will undershoot it, or when the hour is but they'll get it fairly fairly close. It's only when you start to get these much longer times, like, tell me when four hours is up? Well now I've lost everything. That becomes far more difficult to indicate...

Sufal Deb 14:48

I know we just touched on this so I'm going to segue here. You mentioned how attention and paying attention to how much time passing is important. Why is it that attention is so closely tied with time perception and say somebody has attentional deficit or some condition, what's the case for them?

Martin Wiener 15:11

I'm going to go big before I go small on that answer. There was a mathematical psychologist named John Gibbon, who back in the 70s, made some of the first, or they weren't the first, but they were some of the most pivotal models of timing and time perception. It wasn't until a little while later that he has this quote, where he said, the reason why he was so interested in time is, he said, "Time is the

primordial context." What he meant by that is time was the first thing that mattered to us as living organisms, that it was the very first thing we had to figure out.

In order for me to get energy, I need to know when the sun is up in order for me to go up there and get energy and I need to know it's night in order to conserve energy. I need to figure that out. Okay, I figured that out. Now, I need to hunt. Well I need to figure out how to be quick and catch something. Okay, well, I'm prey, I need to figure out how to run away from it. Well, we're going to keep getting better and better at each of those things and timing becomes more and more and more important. He said, "Evolution favored organisms that could predict things rather than react to them." If we were only reacting to something eating us, we would be eaten, but if we could predict when something was going to come and attack us, we could get away from it. That's the big part.

In terms of the question of attention, what we have found through a lot of this experimental psychology work is that the more attention you pay to time, the longer it gets, okay? If I'm asking you to time an interval and tell me how long it is, and you're focusing all your attention on this interval—like if I say, "I'm going to flash a light at you", and you tell me how long it is and you focus all your attention on that light, the more attention you focus on it, the longer that light will seem to be on for. If you start diverting your attention away, if you start kind of thinking about something else, or looking at something else, or whatever, the shorter that interval will become.

This is where we get those those sayings, a watched pot never boils or time flies when you're having fun, because in the watched pot example, you are focused entirely on time. The idea again, is that time is that primordial context, because it's that one thing that we focus on there of saying how much time has passed. When you focus on it, it gets longer, but if you're distracted away from it, it gets shorter.

For someone who has ADHD, what we found is that people who cannot maintain attention to time on things, those time intervals obviously all seem to become shortened. If I give someone with ADHD—I ask them to time a five second stimulus, like, "Tell me when five seconds is up," they're going to type it and then say, "Oh, that was three seconds." Because they were focused, they couldn't maintain their attention on this particular thing. That's sort of the connection there and that's how attention gets folded into this in terms of timing.

Sufal Deb 18:18

I can go ahead with the next question.

Marvin Yan 18:20

I can ask—here you go first. I asked three follow ups last time.

Sufal Deb 18:24

This actually is a question more related to getting older. You mentioned time slipping and how as you get older, longer pieces of time feel shorter. Say somebody were to live to a more absurd age such as 500. Would a week seem like a second to them in terms of memory?

Martin Wiener 18:42

Oh, huh. Yeah, it's funny. To some degree, it's ad absurdum. Right? It's like, oh, well, obviously, if someone is living for so much longer, and they have so much time, then, you know, at that point, the passing of time must seem to go by in the blink of an eye, right? Because what does it matter to them? You're kind of getting at this geological timescale thing, right? This whole idea that you have an ancient organism that's so old and so wise like a God, for example and to it, the actions of mortals seem like the actions of mere ants where centuries are passing by in seconds to this being.

I mean, that works in all when you're coming up with fantastic beings, but I think we cannot escape biology to some degree. I think if we were to artificially take a human and find a way to expand its lifespan, even to some long amount, like 500 years, I don't think you would get time quite going so quickly in that case. I think you might just wind up reaching, "Yeah, things just fly by," but they might be like, "Well, what does it matter? Okay, a week has gone by. Oh, whatever, there'll be another week. I can focus on things and do what I need to do then."

Sufal Deb 20:06

it's almost like a loop of procrastination to a certain degree.

Martin Wiener 20:11

Maybe.

Sufal Deb 20:12

Okay, Marvin you can go ahead here.

Marvin Yan 20:13

Yeah, I want to ask because really, we talked about how there's two factors. One of them was novel events being linked to your perception of time. Say you were like Sufal's scenario of 500 years, maybe even 1000, right? I don't know if there's— first of all that kind of relates to, is there a limit to your memory because I was thinking if there is a limit, then you would only be able to keep so many events in your head, right and that's how you perceive time. If time goes on and you can only still perceive a finite number of events, then wouldn't your perception change? How do we deal with that sort of problem?

Martin Wiener 20:45

Yeah, again, we don't really know, right? I mean, that's a great question. Certainly, you can say that there must be a finite limit to the number of memories that we can hold, that has to be true. You could imagine, though, that after a while, the brain would simply start to lose memories, lose older memories that are no longer relevant or no longer necessary and just replace them with additional memories. You could imagine, perhaps a being that's 500 years old, that no longer remembers what it was like to be 10, or 20, or perhaps just has like a few select choice memories of being 10, 20, and then a few select memories of being 30 and 40, then maybe more memories than closer to whatever is the more relevant memories for it.

On the other hand, it might not be the case. Memory is still one of those things that we have a difficult time untangling in the brain. Certain types of memories are easy for us to study. For example, the

memory of locations, of like, where was something/ Where was this or where was that? Studying memories of events, though, in the brain, that's harder, that is still something to this day that we don't really have a very good handle on, on where these memories are stored and where it is, is likely the wrong question. It's more a matter of how these memories are stored.

Simply because modern neuroscience is pushing us to this network view of the brain where you can say, well, when a particular memory is instantiated, the brain activates itself in a particular pattern. You can imagine, these 15 nodes activate in a very particular pattern or very particular way. We think of the hippocampus is the key to saying, okay, activate pattern, 5037. That's the memory of when I was eight and I tripped while I was running too fast. Okay, now switch these weights. Now, it's this other memory, for example.

If that's the case, if it's this network that's just changing its configuration, you can imagine a system that can store memories for hundreds of years because it's just new configurations that the brain has to be able to achieve. As long as the brain retains the weights of saying, these are the weights for this particular memory, and these are the weights for that memory, then I should have a far greater amount of storage than what we even have in our lifetimes.

I mean, that's how we have those reports of people with eidetic memories, people who have these perfect memories for all kinds of events and sort of super mnemonics, right? Their brains are no different necessarily, then ours. If you examine their neuroanatomy, you don't find like, oh, my gosh, this brain looks so different. The hippocampus might be bigger, perhaps but otherwise, they don't really suffer many losses although that could be argued against. There are some people who claim having eidetic memory is a curse rather than a gift.

Marvin Yan 23:39

I can imagine it. Yeah.

Martin Wiener 23:40

But that at least proves to us that you could have a person who lives for a very long time span and doesn't suffer any problem in being able to remember something.

Marvin Yan 23:49

Oh, okay wait. I had a question because we're talking about the brain and only in the past few years, my frontal lobe has developed sufficiently where I realize, I'm not immortal or invincible at age 18 to 20 or whatever—and start planning less current satisfaction, like, Oh, I'm not going to go watch Netflix now because I need to do my project, you start playing more long term, right?

Martin Wiener 24:10

Sure.

Marvin Yan 24:11

Now I'm like, Okay, what am I doing once I graduate, right? Possibly start investing, because apparently 10 years down the line, it'll make me some money. Living longer and longer, do you anticipate

people would plan even longer term? Would they have like a 50 year plan? A 100 year plan? What do you think?

Martin Wiener 24:27

I mean they could or rather they should.

Marvin Yan 24:32

Should, okay.

Martin Wiener 24:33

People are people. We are creatures of the moment. I mean, achieving the lifespans that we have, like on a longer scale really is one of the great success stories of modern medicine and modern civilization, right, that we all have the opportunity to live as long as we do and that lifespans regardless are still increasing. At this point, I think people still are living longer than they have than at any other point in history. Given that, people should plan ahead, plan long term, but by and large people don't. People are impulsive. People are far more engaged in things of the moment.

For example, there's a basic psychology experiment called temporal discounting, right? Temporal discounting works like this. If I could give you \$5 right now—

Marvin Yan 25:24

Oh this one.

Martin Wiener 25:25

Yeah you know this one. \$5 right now or \$50 tomorrow, which would you pick? Right. You'd say, "\$50," and I said, "Okay, \$5 right now, or \$50 next week?" You'd probably say, "\$50". "Okay, \$5 right now or \$50 a year from now?" You'd probably be like, "Well, you know that's a while to wait just for \$50. I'll take the \$5." Then if you say, "\$5 right now, or \$5 10 years from now," they'll say, "Just give me the \$5 right now." The thing of it is, you should always pick the bigger amount. From an economic standpoint, the bigger amount is better unless the smaller amount is something that you could invest to grow.

Marvin Yan 26:01

I was going to say yeah if you can...

Martin Wiener 26:03

Right, but aside from that particular example, you should generally always pick the bigger one. These timescales I'm saying are excessive but you find people discount the larger reward at fairly small intervals and it varies from person to person. Some people just say, "Nah a week's too long, give me the smaller one." We've seen some cases where people discount an hour or something like that, where they just say, "No, I want this. I'll take the smaller reward now in lieu of getting the bigger reward later, because I want it now." I think people are impulsive even if they live for long lifespans, they probably would still be creatures of the moment because that's how we developed. That's how we evolved.

Marvin Yan 26:41

Oh, there was this—this is a little bit like a sidetrack in terms of a different realm of psychology but I figured out it asked because I remember hearing on this other podcast, there's this marshmallow test for kids. Right? One marshmallow now, two marshmallows later and then they linked it to future success. I forget how they gauged success. I don't know if there's any evidence like, oh, do people who are more willing to take \$50 a week later, two weeks later, or a month later, if there's any evidence that they are better off or better equipped for future something in some way?

Martin Wiener 27:15

I mean, certainly I think there is work linking temporal discounting, like you're describing to different personality traits. The one that tracks most closely to that unsurprisingly is impulsivity. There are impulsivity questionnaires and people who score higher in impulsivity are far more likely to take the smaller (??) reward sooner. Whereas people who score lower on impulsivity are much more likely to take that longer later reward. That is, I think, is by far the biggest, strongest effect in terms of—you can then ask yourself, well, are those people better off who are less impulsive overall?

For example, I remember, anecdotal reports are like, “Well, who are the people that are really impulsive?” I remember talking with somebody and saying, “Oh, well, this one person. He was a professional skydiving coach. This other one, oh, he was always doing extreme sports. This other one, he was always engaging in risky behavior.” These are the different traits that they have so you can say, “Well, are those people worse off because they're engaging in these things or is it just, that's who they are and they're doing what they enjoy?”

But part of that is, from this impulsivity, that they have to engage in these behaviors. I don't know that we have something quite like the marshmallow test here in terms of saying that these people are better off. I mean, the marshmallow test itself has some controversy back and forth as to as to whether or not it actually exists. I mean, whether or not the effects actually track with later success, or with delinquent behavior, and things like that. I mean, it's an open question I think.

Sufal Deb 28:52

I'm going to jump the ship here a little bit. This is a question we have written here that I personally find pretty interesting. Typically, people tend to have a fear of death, it's very common to have a fear of death. People can also have a fear of living forever, the infinite. How can both of these exist in like a lifetime? Is it not a contradiction for somebody who's immortal? They could possibly have both.

Martin Wiener 29:12

You're saying, is it a contradiction for someone to both fear death and immortality at the same time?

Sufal Deb 29:18

Yeah, essentially.

Martin Wiener 29:20

Okay. Yeah. Well, I don't know if it's—is it okay for me to curse on this podcast or is it or not?

Sufal Deb 29:28

Yeah, shouldn't be a problem as long as you're okay with it.

Martin Wiener 29:31

A fear of death and a fear of immortality is basically you're f*cked one way or the other. In one case, you die and that's it, and there's nothing, and that's scary, and that's frightening, and I don't want to face that. In another sense, if you take immortality to its extreme—you say, "I'm just going to keep on existing and existing and existing and existing and nothing will ever end. It will never stop. I will never stop existing." Especially if you're miserable in your existence, you reach this point of saying, "That doesn't sound very great either and there's nothing I can do about it."

I mean, let's imagine pure immortality. You cannot die. You simply will not die, right? The Earth could crumble behind you and you could be floating still in space, and you just would not die. That I know is again, a just as frightening prospect, right? Just this continued endless existence. I think either way, someone would find both of those things, a type of fear. I mean, this connects also to, people who might have a fear of the of infinity could have a fear of an afterlife even, of being like, "Well, I'm afraid of dying and going to an afterlife where I'm just existing forever."

What if there was, say an afterlife, then what if there was a hell where you were just placed in a blank room and that was it? You were told, "This is it, you're going to be here forever. Bye. I'm the last person you're ever going to see. It's never going to end. That's it." You're just now in this room, there's no doors, there's no windows, it's just a blank room, an oubliette of darkness. That's terrifying to me, right?

Again, it's terrifying under the idea that it does not end, right? It's also terrifying, because we are social creatures, where we have to be interacting with other people to some degree in order to maintain our mental health. Again, that why isolation is a type of torture. That's why we need others one way or another to be around us, in order to survive.

Marvin Yan 31:49

If we have life extension therapy, we have to remember, everyone should get it, not just one person, Otherwise, that person will have that conundrum thousands of years later. Do I die? Do I keep going? There's no one around. Right?

Martin Wiener 32:01

Right. Right. Well, I mean, yeah, to some degree, yes.

Sufal Deb 32:06

Martin, can the mind handle living for extended lifespans or even forever? Is it even possible?

Martin Wiener 32:12

So, this is one of those questions that—it's sort of hard to answer. Certainly, we've seen that as life has extended, people are able to exist and behave. We have people living up to 120. Even though there

may be some issues, they still are themselves. You can still have a conversation with someone who's 120. In terms of living to 220 or 520, it's one of those open questions, especially if we could find a way to preserve the body, so that you could still have a relatively healthy, self healthy body. Say, be sort of stuck as you are, but have a mind that exists for a much longer period of time.

To answer those things, that's funny because science—we can't really answer that. It's sort of an ethical and moral question of, should a person even be allowed to live that long if they were given the ability to? I mean, I think everybody wants life extension of some form or another. It is something that's actually being studied and there are groups out there that want to find a way—we have been able to extend the lives of smaller organisms like mice and other animals to longer periods of time.

If you can scale that up to humans and expand their lives, well, who should be the first one to get it? Should you wait 200 years to see if it worked and to see what this person was like? What is a clinical trial like for a life extension drug? Do we say, “Hey, everybody, there's going to be this life extension drug, we'll let you know if it works in two centuries. If it does, your grandchildren might be able to take it.” I don't know if that's what we want.

There have been, of course, a lot of people who have speculated on this and that gets into the realm of science fiction and fantasy where you can see there's lots of work out there that talks about people living for long periods of time, or certainly people living for infinite periods of time. It's funny because I'm not an expert in science fiction or fantasy. I've read my fair share but at least from what I've seen, they fall into two categories, where you've got a dystopian immortality and utopian immortality on either side.

Dystopian immortality is that type I've talked about where people who live longer than they're supposed to and find the experience to be sort of one of misery and one of being kind of stretched out. Okay. There was a letter that JRR Tolkien wrote to somebody where he was explaining why in the Lord of the Rings, someone getting the ring led to unnaturalness in them and like Gollum living for centuries and centuries or Bilbo being extended out. As you use the metaphor saying, “I feel like butter spread out over too much bread.”

He said, “The idea is that everything has a set lifespan, it's the lifespan it's supposed to live, and when you unnaturally stretch that out, it's this sense of taking what was supposed to occur the right way and making it occur the wrong way.” The mind tries to adapt to this thing that it's not supposed to be doing. There are these dystopian immortals that get affected by it in a negative way, where they get filled with apathy, they get filled with an inability to experience pleasure. That's where we get bad guys in a lot of comic books and movies and stuff like that. I've just been existing for so long and now I torture you mortals because this is who I am and I can't relate to anyone anymore.

On the other side, you've then got utopian immortality, which are other sci fi stories of people given life enhancing drugs that now find themselves with access to great wisdom, a greater awareness of who they are. This is something Marvin, that you kind of mentioned, well, if you're going to live longer, shouldn't you look further ahead? It's funny because I've read some books with stories where someone gets a life enhancing treatment, and then they're like, “Now I know that my life is going to

go on for several hundred years, I don't have to rush anymore. I stopped rushing and everything. I started taking my time and things. I started really stopping to enjoy things in the present moment because I didn't feel this pressure to get things done and to achieve things.”

You lead to this utopia of people experiencing longer lives, leading them overall being happier and more fulfilled. Which one of those things would happen? We don't know. To some degree, it probably depends on the individual, in that there's probably some people who would benefit in some ways. What's interesting about these sci fi fantasy stories is that it seems to happen automatically as a byproduct of living longer. If you're granted long life, it's going to corrupt you. That's just something that's going to happen in the dystopian versions. Whereas in the utopian versions, if you're granted long life, it's just something that's going to make you better. There's no way around it, you're just going to become better as a result. I think those are caricatures of individuals whereas, what would really happen probably would differ from person to person.

Marvin Yan 37:47

Wow, makes me really question if I want that therapy because we were talking—I guess this is a more modern-day example but I feel like everyone's always complaining, “There's not enough time. There's not enough time. I'm too busy.” Right? But once you give them too much time, they're just unproductive, right? Are we going to have a society where everyone's just like, next century?

Martin Wiener 38:05

Right. Right. Exactly. I'll do it later. Right. Yeah. Everybody starts pushing everything off. Yeah, you can imagine it going in that that direction, that everybody—everything just leads to a kind of apathy.

Marvin Yan 38:16

Anyways, jumping to our question, because you mentioned, you do not just time perception, but space as well. I'm going to read this exactly how it's worded because I love this. Physics, at least they talk about space and time often being intermingled but we're talking about psychology and neuroscience here. Is there any sort of connection between the two?

Martin Wiener 38:36

Yes, it's not studied as much. I mean, it's not studied as much as one of the dimensions individually. People tend to study space or they tend to study time but there's not as many people who study space time, that is how you experience both of these dimensions, right. That's more for historical reasons than anything else, that some people just are studying navigation of animals in a maze and others are training animals to judge an interval of time in order to get a reward. Those kind of lead to different literatures.

There are examples of people studying space and time, leading to some interesting results. To my mind, the most interesting one was—this is a paper that came out in science about 40 years ago, back in 1981. It was one of these papers that was interesting but not many people cite it and it's sort of fallen out of favor. It's one of these weird papers. It was by a guy named Alton Delong at the University of Tennessee. He was an architect there, the School of Architecture.

I don't know why he did this study but he did this study where he invited people into a room to play with little scale model environments. Here's a diorama of a room and in this diorama, there's a whole setup or something like that. He asked them to imagine they were in that room. Imagine you're in it and just go ahead and play there in the little room. He brought different people in and made them play with different dioramas of different sizes. Some people got a really tiny little room of a diorama. Other people got a bigger diorama. Other people got a very big diorama. He'd play with them for different sizes.

He would let them play with that, and say, "Imagine you're in there," and then he would leave. He would leave for different intervals of time and then come back and ask them how long they've been playing in this diorama for. What he found is that people's reports of time became warped to the size of the environment they were playing in, where if people were playing in a really, really, really tiny environment, they felt that a very short amount of time had passed by. The reports varied widely but they were consistent.

At the most extreme, he let a person play in a tiny little environment and he came back 30 minutes later and said, "How long has gone by?" and the person said, "five minutes." Whereas, as the environments got bigger and bigger and bigger, the amount of time got longer and longer and longer and longer. But they were always shorter than the actual amount of time that people were in there. He came up with—he called this phenomenological space time.

The idea was saying that our sense of time is warped through the environment that we're in. Okay, that is the boundaries of the environment change our sense of time while we're in that environment. He went from there to kind of say, "If you're in a tiny cramped room, you're going to have a different perception of time than if you're in a wide open space like if you're in an arena or airplane hangar or something like that." It's funny because he then wound up suggesting that it's also in relation to the size of the observer.

If you were to be a giant, for example, like a giant person in a relatively smaller environment, your time would wind up going in the opposite direction there, okay, where your time would wind up becoming longer. This is like I said, people become ants and so for them, time would be going faster, but for you time would be going slower. Those people would be like—you'd have a very different perception of events passing by compared to the little people all around you, the little tiny individuals.

There was actually some work that replicated this effect, a couple times in the 80s, and then no one ever followed up on it after that. It kind of just became this footnote. There were some studies that did follow it up in architecture, actually, for designing spaces because this guy was from an architect school. Some people said, you need to keep in mind, people's sense of time, when you're designing an environment, like when you're designing a space for people to walk around. When you have more narrow corridors and narrow, worn like environments, that's going to change people's sense of time in them, and it might stress them out. Likewise, if you have grander, wide open VISTAs, people get this sense of awe there and their sense of time will become expanded in those particular places.

It was this wild thing. Again, not many people have followed up on it but it does suggest that our sense of time and our sense of space are linked to some degree. That is, we use time when navigating just as we use space when navigating, in terms of saying, like, “How far does it take for me to get from here to there?” It's funny, because again, this is this is all anecdotes. There's not been a lot of work on this and we're starting to get into this work. I know that I have seen a difference of people who live in rural environments, their perception of how long it takes to get from like Point A to Point B to Point C, and what is considered a long time or a long distance versus people who live in urban dense environments, of saying, “Oh, I've got to get from here to there.”

I know that if you live in a very dense environment—say you're in downtown Toronto, and it's kind of like, “Oh, we got to get over here to the other side of the city.” It's like, “Oh, I got it.” Let's see if I can do a local reference. “I got to go to Mississauga from Toronto,” and it's like, “Well, I don't want to go all the way over there. It's going to take me forever to get there.” But if you looked at the actual distance, it's probably not that far versus somebody say, who lives like way out in Alberta or something like that who's kind of like, “Oh, that place? Yeah, it's right over there. Just 50 miles away. What, let's go. It's right over there.”

For them, they, you know, they might have a different sense of it, you know, it's like, simply because their experiences of the time intervals for those things has warped their sense of the space. Just as the space itself can warp their sense of the time that it takes to get from one thing to another. You might say, “Oh, 50 miles, that's going to take forever, I don't want to sit in the car for 50 miles,” while we go like just down the road for this thing. Whereas for them traveling to Mississauga might be just a very simple trip, like, “Oh, that wasn't so bad. Why did you get you so worked up about it?”

Sufal Deb 45:37

Yeah, I've heard a lot of those examples, specifically with people in the UK, mentioning how, “Oh, I would never travel 200 kilometers to another country to attend a concert,” but in the US, “Oh, eight hour drive for the concert. Not a big deal.”

Martin Wiener 45:50

There was one time I remember. A Canada story was I was up in Montreal, also going to a show and there was a person there we were hanging out with and he was from the UK. We were done. We were saying, “Okay, well, we're going to drive back tomorrow.” He's like, “Oh, where are you going?” It's like, “Oh, we were actually going to Boston.” He was like, “How long is it going to take you to get there?” It's like, “It's going to take us eight hours.” He was like, “Eight hours!”

I remember he seemed concerned for us. He was like, “Do you need anything? Is there anything that you need in order to make the trip okay? Are you guys going to be all right?” We were like, “Yeah, we're going to be fine. It's not that bad.” But for him, the idea of traveling anywhere by car for eight hours, was just this ordeal, this odyssey of a journey, whereas for us, it was like, “Oh, no, no big deal.”

Sufal Deb 46:42

Yeah. So one more question related to time perceptions. A lot of people, especially students, when the summer comes, and you have nothing to do you get bored very quickly. How exactly is boredom related to time perception and additionally, would boredom change as we live longer?

Martin Wiener 46:58

Yeah. Again, this is that time is the primordial context thing that I was talking about. It's the primordial context in the sense that—this is the insidious nature of it, when you don't have anything else left to attend to, if you just don't have anything else to look at, all you have left is time. All you have left to attend to is time. Remember, the more you attend to time, the longer it becomes so it gets worse and worse. If you lose things to look at and lose things to focus on, you just come right back to the passage of time, which makes it go slower, and then you focus more on it, which makes it go slower and slower and slower and slower.

To some degree that's boredom. That is like you becoming bored with the input that you're getting of just, "I don't want to attend to this stuff anymore. What's left?" Even if you don't want to attend that, turn yourself inward to your own thoughts, you don't even want to daydream, you just get tired of that. You just start attending to time. Without even realizing it you are attending to time, and just how, "Gosh, this is taking forever." It's like if you're on a long plane flight, the joke is like if you're taking like a 12 hour plane flight, you watch a movie, and then you watch another movie, and then you still have seven hours up in the plane flight.

It's like, "Well, what do I do now?" It's like that. It can just become agony for all because all you're thinking about is the passage of time. I remember the first time I flew on a plane where I was with a friend talking with them the whole time on the flight and suddenly they were like, "Oh, we're landing now." I'm like, "Oh, we are?" because I was distracted away from the passage of time, I wasn't focused on it anymore. It seemed to go by really quick. That is something that we are seeing in these studies of COVID and lockdown, where there are these large sales studies in the UK, in Brazil, in Japan, showing that people are experiencing a slowing down of time in lockdown, where things are slowing—slowing down the sense that things are becoming stretched out.

It's related to this sense of boredom of, "Well, I watched all my Netflix shows now and I binge watched all the things I want to do. I've crocheted all the things I needed to crochet, cooked all the things I needed to cook. What's left? Well, that's it. Now I'm just thinking about the fact that I'm still here, and nothing is new anymore. I'm just getting bored with it and time is stretching out and I feel that this is taking forever." There was this joke I remember when the pandemic first started that March was endless that it was an endless March because it was the first month of the pandemic. We were so new to being stuck where we were that it just seemed to drag on forever.

Marvin Yan 49:44

Wow. So a way you could technically ex—not extend your time, but feel like time is going slower—It's like if you're in a big blank mansion in the middle of nowhere during a global pandemic, and you're extremely bored, and you have no Netflix. That seems like a pretty good way to maximize your misery here at least.

Martin Wiener 50:00

Yeah, yeah, exactly. If you're put into this space where just nothing is exciting, where everything is old, nothing is new, nothing is exciting... We crave novelty and if you take that away, it just leads to boredom.

Marvin Yan 50:16

Okay, well, do you want me to wrap? Okay. Sure. I have one sort of wrap up question. We've talked about a lot of different things today. But if there's one thing you have— what you want listeners to take away from today with regards to time perception, with regards to life extension possibly, is there a sort of one thing you really want to tell them to hone in on?

Martin Wiener 50:35

If there's one lesson that we've learned from timing, and from the things that I've talked about, it's that time flies when you're having fun, the brain seeks and craves novelty. It does not crave a dark room where nothing happens even though that's the safer alternative. We go out. We experience things. Whether we are living for 200 years or 50 years, experience more things, experiencing more novel events, doing more, involving yourself in more things, is a way to enrich your life and even make it seem to last longer in the time that you have than it actually is.

You could live for 50 years and fill up those 50 years with a ton of experiences, or live for 500 years and have nothing in it and wind up with like an equivalence in terms of the memories that you have, and the lived experience between those two. If I had my choice, I mean, I think I would choose again to have the experience of a life that was more full, rather than a life that was more empty. Time may be the primordial context, but it's not a fun place to be, to just focus on time endlessly. The point is for us to get away from that and experience more novelty as a way of kind of escaping the trap of time, to some degree.

Marvin Yan 52:06

Wow, I realized the phrase, the experience of a lifetime has a way different meaning now after having this interview.

Sufal Deb 52:14

So let's wrap it up with for all the audience listening in where can they find more about your work, support it, or if they're a university student, how can they get involved in this field?

Martin Wiener 52:22

If they want to know more about me, I have a website up through George Mason University. You can Google my name, and that should take you to my webpage at George Mason. My lab has its own website. We're the STAR lab. So Space Time Action Representation. You can Google that and George Mason University.

In terms of getting involved in this work, cognitive neuroscience, that's my area, is a growing field. There's many cognitive neuroscientists at most research universities, and even smaller universities. If you're interested in this, I encourage you to reach out to people at your local university who are

doing exciting and interesting things in this space and chatting with them and seeing if there are opportunities there for doing research. I mean, we are always looking for people who are interested in this field and want to learn more and want to involve themselves in research.

Sufal Deb 53:22

Absolutely. Great. For all of you guys listening, links to Martin's lab, as well as his university website will be below. With that all wrapped up, thank you so much for coming on to our show and being interviewed. We really appreciate it.

Martin Wiener 53:34

Thank you Sufal and Marvin. This has been fantastic. I really appreciate you guys reaching out. Thanks.