

Dr. Kate Marvel ([00:04](#)):

A world begins in its acidic oceans float, the corpses of suffocated sea creatures. The coastlines are swamped by rising waters in between wide swaths of wasteland are a few burning forests. The Mediterranean is almost as dry as the Sahara and the west coast of North America swings wildly between drought and flood. The sky is laden with carbon dioxide and methane and the temperature steadily rises. Terrible things come to pass. I end that world. I start another. It's similar in many ways to the previous nightmare planet. There are heat waves and droughts, a thousand year flood every decade or so, sea levels are still high. But after decades of work, humans have finally ceased to put carbon dioxide and methane into the atmosphere. The temperature still dangerously high, no longer climbs. This is a planet coming to a new equilibrium, slowly adjusting to its new reality, making peace with the way it is now.

([01:03](#)):

Another world exists a better one, maybe the best of all possible worlds. By the middle of the century, human beings not only emit no carbon dioxide, but have learned how to remove a little from the atmosphere. Nearly every structure is covered in solar panels as our roads, canals, parking lots, even some farms. Most people live in pleasant green cities. On the urban outskirts restored forests thrive. The world is far from perfect. It's hotter than now. More dangerous with higher seas. Even in utopia, the climate conditions under which human civilization developed are gone forever. I don't know which of these worlds is more likely. Science says that as long as human beings emit greenhouse gases by cutting down trees and burning fossil fuels, the planet will keep getting warmer. Physics says this will mean higher sea levels heavier, rainfall, worse and longer droughts. It says nothing about how we should feel about this. And it says nothing about what we'll decide to do. The future remains uncertain, but I'm sending my children there and they're never coming back. I think about it every day. And then I feel.

Dr. Leah Stokes ([02:23](#)):

I'm Dr. Leah Stokes.

Dr. Katharine Wilkinson ([02:25](#)):

And I'm Dr. Katharine Wilkinson. And this is A Matter of Degrees. That was climate scientist Kate Marvel opening the episode. She was reading an excerpt from her new book, Human Nature: Nine Ways to Feel About Our Changing Planet.

Dr. Leah Stokes ([02:42](#)):

Kate's day job is at NASA where she builds climate models, basically tiny digital world that tell us about our different potential futures. But she took a break from projecting what will happen to our warming planet to write a book on what this all means.

Dr. Katharine Wilkinson ([02:57](#)):

And it is breathtaking, I laughed, I cried, I scribbled down especially beautiful passages until it felt like I had basically the whole book documented.

Dr. Leah Stokes ([03:09](#)):

So we decided to chat with Kate about her new book. We wanted to talk about the future of our planet, what it's like to be a climate scientist right now, and all the feelings that come up in between.

Dr. Katharine Wilkinson ([03:21](#)):

There is so much here. So let's get into it. Let's start not at the totally beginning of Kate Marvel, which would be another interesting episode to do. But let's start at the beginning of Kate Marvel becoming a climate scientist.

Dr. Kate Marvel ([03:43](#)):

When I was in high school, I wanted to be a writer and I wanted to be a movie star. I thought that that was going to be a really viable career path. And then I got to college and I thought I would major in drama. And that's when I realized that there are a lot of people who want to be actors and a lot of them have talent. And that was not something that I had

Dr. Katharine Wilkinson ([04:08](#)):

Just a gal with a dream,

Dr. Kate Marvel ([04:10](#)):

Just a gal with a dream and not even a well thought through dream. And then I kind of decided that I wanted to do something else with my life and I couldn't figure out what that was until I took a class Introduction to Astronomy. I had never liked science. In high school, I really hated physics because it was all like balls rolling down incline planes and who cares about balls rolling down incline planes. I still don't care about balls rolling down incline planes. This was not for me. But then I took this astronomy class and it blew my mind. I was like, wait, this is physics. Excuse me, where are the incline planes? And it made me fall in love with physics. It made me fall in love with science as kind of a human activity. I was very pretentious and I viewed myself as a creative.

([04:58](#)):

I'm going to be an actor, I'm going to be a writer. I write terrible poetry, but eventually it will get better. And that was the first time I really saw science as a creative pursuit and I kind of fell in love with it. And so I majored in physics, I did a PhD in physics, and then after I finished my PhD, which was on cosmology, I wanted to do something that used science but was more people focused that solved real world problems. And that's how I happened upon climate science. I still do physics, I still use all of the tools that I learned in my physics training. I just study the physics of the earth and that for me is my dream job. This place is phenomenal. This place is beautiful. It's not like all the other planets. All the other planets are garbage planets and this is the only good one. And that's something that I just find beautiful and full of wonder. And it's why despite everything I really doing the work that I do.

Dr. Katharine Wilkinson ([05:59](#)):

What is hard about being a climate scientist at this moment?

Dr. Kate Marvel ([06:05](#)):

It's hard on several levels. First of all, just math and physics are hard, but it can be a struggle day to day to try to understand this really complex planet. But that's the good kind of hard, the bad kind of hard is feeling like you are under attack, feeling like all you have done is try to tell the truth, try to figure out what's happening and to feel really hated by a subset of the population. I am a people pleaser. I want everybody to like me. And that's been really hard for me. It also is infuriating. When you see the uncertainty that's inherent in science, there's still things that we have yet to learn. And it makes me so upset when that uncertainty is weaponized because we don't know everything, but we also don't know nothing. And when the uncertainty is used to argue that well, there's no scientific consensus, or scientists aren't sure what's happening or it's possible that the climate isn't changing or it's possible that it's not humans, that is incredibly frustrating to me because how do we walk this line between being scientifically accurate but also saying no, we do know some stuff.

Dr. Katharine Wilkinson (07:34):

That feeling of being hated for rigorous data-driven human good oriented work is really tough.

Dr. Kate Marvel (07:47):

Yeah, I don't recommend it. It's hard. And it's also sometimes hard to know what to do. But what I realized is that you can't respond with lies, but you can respond with stories and those stories can be true. Those stories can capture how people feel. They can strike a chord in people that data and graphs and equations don't. My first instinct as a scientist is to say, look, we have another equation. Everybody pay attention. We made you a graph. What could be better than a graph? We've put even more stuff on the graph. You can't even read it. The axes are too small and shockingly, that has not convinced people. You have to talk to people in the way that human beings have actually learned how to talk to people for millennia, which is in terms of stories and in terms of emotion. We've all heard facts don't care about your feelings.

(08:43):

And that goes both ways, right? We get the facts right. We know the math, we know the equations, but at the same time we can acknowledge we feel stuff about it. And when you do that, you open yourself up to a two-way dialogue, which is I think the second thing that's really important is it's not just a scientist in a lab coat lecturing from on high and you figure out, okay, what matters to you? Why does what I do scare you or threaten you or make you feel really angry? And I think that's where we have to turn to stories, mythological stories, stories from history, stories that we write as we go along. For me, there is no conflict between the stories and the science, between the facts and the feelings.

Dr. Katharine Wilkinson (09:38):

So let's get into some of the ideas in the book, which is organized into nine different chapters, each with a different feeling as the title. Wonder, anger, guilt, fear, grief, surprise, pride, hope and love. Wonder is where you begin on this journey through the nine feelings. You know this world maybe more intimately than, I don't know all but a small smattering of people because of the work that you do. What blows you away about this planet?

Dr. Kate Marvel (10:14):

One of the things that really blows me away is the water cycle, which we all learn about in third grade. And if you go back to how you were as a little kid, as adults, we're all used to this, but little kids, their minds are blown by something like evaporation where you leave a dish of water out and then it just disappears like as if by magic, where did it go? And then water comes down from the sky. How is it that the sky can hold this water? For me, the immediate question is, well, where did it begin? Where did the water come from? And the answer to that question is the water came from space. It was delivered to the earth in its early years of formation by bombardment from comets and other celestial objects carrying frozen water. And what that means is that when we are done with it, when the earth ceases to exist, when the sun expands and burns us all up, eventually our water will go out into space and maybe end up on another new planet that is yet to be born.

Dr. Katharine Wilkinson (11:23):

This substance that is so intimately part of our beings and part of the all-ness, I don't know, what do we call the mega bigness that's out there?

Dr. Kate Marvel (11:39):

Exactly. I mean it's ordinary and that makes it extraordinary.

Dr. Katharine Wilkinson ([11:43](#)):

I think that one of your talents is helping us find that which is extraordinary in these seemingly ordinary things around us. Alright, are you ready to do some anger? Nothing like going from the adoration of water to getting real mad.

Dr. Kate Marvel ([12:07](#)):

I got to say the anger chapter was one of the easiest ones to write.

Dr. Leah Stokes ([12:11](#)):

So why was that? What were you channeling when you were writing about anger in the book?

Dr. Kate Marvel ([12:15](#)):

What really stuck out to me was the history of us finding out about climate change and how intricately that history was intertwined with the history of people lying about it. This is not new science. We have known this for a very long time. The fact that greenhouse gases are warming the world and the fact that human activities are releasing those greenhouse gases and the reason that knowledge has not translated into action is definitely due to the fact that there are people who find it in their interest to tell lies about what the science says.

Dr. Leah Stokes ([12:58](#)):

This is Exxon knew, right? You write about this in the book, but basically there were scientists working at the fossil fuel company, Exxon in what, the seventies?

Dr. Kate Marvel ([13:07](#)):

Seventies. Yeah.

Dr. Leah Stokes ([13:09](#)):

They were predicting better than outside scientists the exact projection of how much greenhouse gases would go in the atmosphere and how much the temperature would warm and you can plot what then happened in the following decades. I mean, these were amazing scientists inside Exxon. And all of this information made its way to the executive suite. They knew and they decided to lie about it for the sake of their profits. That's disturbing.

Dr. Kate Marvel ([13:35](#)):

What I wanted to do is really make the case that the opposite of truth is not fiction. The opposite of truth is lies. And so we can engage with stories, we can engage with mythology and literature and the humanities, and that is a fundamentally different thing than engaging with deliberate cynical lies. And that is what I have seen happening. That is one of the major reasons that we have not taken the action on climate change that is necessary in order to maintain a livable climate. And I think we both have the same emotional reaction to that.

Dr. Katharine Wilkinson ([14:21](#)):

Here at A Matter of Degrees. We often say give up your climate guilt, but that's not always an easy thing to do. Tell us about the chapter on guilt, Kate.

Dr. Kate Marvel ([14:32](#)):

What I wanted to do in that chapter was to leverage the multiple meanings of guilt, right? There is legal guilt, who did this and can you prove it? And then there is the moral guilt. How should I feel about having done this? And that was another fairly easy chapter to write because a lot of my scientific work has been in climate change detection and attribution. So what is happening? Is it weird? If it is weird? What caused it? Climate deniers are always saying, oh, don't climate's always changed. And we're like, we know we told you that. And it is true that there have been natural changes to the climate and it is really useful to study those because A) they teach us how unbelievably unprecedented and rapid the climate change that we're currently experiencing is, but B) because it also illustrates the impact on humans.

(15:33):

I talk in the book about witchcraft because I am obsessed with this story, but in early modern Europe, 1500s, 1600s, there was a series of volcanic eruptions which were clustered closely together, and the effect of those was to spray so much gas and dust and particulate matter into the stratosphere that it blocked the sun and it made the world a little bit colder and that was called the little Ice Age. It was particularly pronounced in northern Europe, and as a result, there were storms in the North Sea, there were bigger glaciers, there were harsher winters. At the same time, you start seeing a real spike in people, disproportionately women being accused of witchcraft. If you look at what the witches are accused of doing, it's messing with the weather. It's causing storms, it's ruining crops, it's killing livestock. And that is not deterministic, right? You can't say climate change is bad because it's going to lead to witch hunts. But what you can say is that even this minor, naturally induced climate change had human consequences, which are very difficult to predict and very difficult to contain.

Dr. Katharine Wilkinson (16:52):

Is there a lesson in any of this about directing our attention accurately?

Dr. Kate Marvel (17:00):

I think so. I think another thing that I wanted to make very clear in the book is climate change is caused by humans, but climate change is not caused equally by all humans, and it is not felt equally by all humans. We know when we look at national contributions to climate change that the United States has contributed more to climate change than any other country. So understanding that it is the highly developed nations of the world that have caused this problem and the least developed countries are suffering the most from it both because a lot of them are located in the tropics or subtropics where climate change is extremely pronounced, but also because they don't have the resources due to a history of colonialism, extraction, other terrible things. They don't have the resources to adapt to cope. And I think that is a truth that is important to acknowledge and understand and I would argue to feel.

Dr. Katharine Wilkinson (18:08):

And as you say, these losses are playing out unequally, our capacity to cope with them is unequal. But also you say that the loss is everywhere and maybe that means the grief is everywhere. Tell us a bit about the chapter on grief, and I think it's, would you say the most personal of the chapters in the book in some way?

Dr. Kate Marvel (18:33):

I think it's one of the most personal, and that was actually a chapter that was hard to write. I was afraid to write it because the grief that I talk about is not the greatest grief I have ever experienced. There are things that have happened in my life that I wanted to protect that I did not necessarily want to put on the page, and I was worried that I would be accused of not being allowed to talk about grief having not revealed my greatest grief. But what I wanted to talk about was a feeling of love for a place which is changing. I was born in California. I will always consider myself a Californian. I love the landscape, I

love the weather, I love the climate, I love everything about Northern California and circumstances have brought me away from there. Circumstances have landed me on the east coast and I look back west and I see it changing.

(19:38):

I see the wildfires, I see the skies full of smoke, and I feel myself powerless to help and powerless to even be there to bear witness. Then on the other hand, realizing that climate change is not just happening to California. Climate change is coming for us here in New York as well. I remember when the Canadian wildfires made our skies here turn orange and you couldn't go outside and you couldn't breathe the air. We have had downpours, which have been completely unprecedented and have drowned people in their basement apartments. So understanding that climate change does affect everywhere and we will lose things. We are not going to meet the 1.5 degrees Celsius target even if we miraculously were able to make it. We have still caused 1.4 degrees Celsius of warming and the impacts of that will be felt for generations to come. I think about my children and I think about the fact that I am sending them into the future where they will live on a foreign planet and I think some grief is an appropriate response to that.

Dr. Katharine Wilkinson (20:59):

I knew that you had this attachment to California, but I didn't know the kind of depth of it. And I think it's an invitation to us to be more aware of the places that we love because I think almost all of us have somewhere, right? If you ask someone to close their eyes and go to a place where they feel grounded and alive, usually that's some physical space in the world, and I think letting ourselves feel that attachment and feel the grief not to get stuck in it, but to actually let it move through us can be really powerful fuel actually for this work.

Dr. Kate Marvel (21:41):

I think that's a beautiful way to put it.

Dr. Katharine Wilkinson (21:44):

A lot of people write about climate grief, but I thought these sentences were just exquisite, Kate. The planet like us has lost much before, but never quite like this. This loss is everywhere. It's fast, it's inevitable, it's sad in a way. I can't describe. An inaudible crack in an invisible surface. The breaking of billions of hearts all at once. It was one of the places in the book that you brought me to tears.

Dr. Kate Marvel (22:12):

Oh, that's amazing to hear. Very moved.

Dr. Leah Stokes (22:17):

I thought the chapter on pride was particularly interesting. This is the chapter where you get into geoengineering and unpack solar radiation management, direct air capture, and these are of course, really thorny and challenging subjects that can bring up a lot of opposition, including from within the climate and environmental justice movements. So I would just love to hear how did you approach this really tricky topic of geoengineering in the book?

Dr. Kate Marvel (22:45):

What I wanted to do in that chapter is play with the multiple meanings of pride to start in a place of hubris or arrogance and end up inspired, I think by a lot of your work, Leah, in the simple pride of a job well done. The fact that this is not going to be over. We are not going to reach a safe climate without emissions reductions. We know what is heating the planet up and we know how to stop it. And that is not a silver

bullet, that is not a techno solution, that is a patchwork of thousands of different solutions advanced by millions of different people, and I wanted to go from this, oh, there's a techno fix. We just need to block the sun. What could go wrong? Through oh, all we need to do is hack the carbon cycle, and I think there are ways to partially do that.

(23:46):

I support some reforestation, definitely avoided deforestation. Those are great ideas, letting nature help us, but we cannot plant our way out of this crisis. Carbon dioxide removal, there's a whole bunch of different ways to do it, but I don't support relying on it because of the scale of the problem. It just will not scale up. It cannot scale up to counter the 40 billion tons of emissions we put in the atmosphere every year. It's kind of like getting your stomach pumped. You want that option to be available, but you also need to stop eating poison. And so I wanted to take kind of a nuanced view of geoengineering. I support studying it in models. I support understanding how it would affect our planet. I don't support deployment because I don't see a structure capable of governing that. And so all we are left with is the hard work of actually solving the problem.

Dr. Leah Stokes (24:50):

You wrote about this invisible army of people out there. These are people who are devoting their lives and very under the radar ways, like being an electrician and helping electrify a home or working for the government, trying to give out grants on clean energy. Many listeners of our podcast are part of that army, right? That's really where you end up in the hope chapter pointing to all the helpers out there who are part of trying to make the world a better place. I know Katharine and I experience all the time people wanting us to answer that question. What gives you hope? Is there a reason to hope? Are we too late? How did you approach that?

Dr. Kate Marvel (25:32):

Yeah, I think like all climate people, I have a complex relationship with hope. But I don't need it. Who cares what I think of hope? We know what to do, we should just get to work and do it. I talk in the book about all the things that we are going to need to do to address climate change, to not emit so many greenhouse gases, right? We need to shift our electricity production, we need to electrify things. We need to steward our land more wisely, blah, blah, blah. So many verbs and none of them is hope. And so for me, the fact that this is not an asteroid that we're powerless to deflect, this is not something we don't understand. Can you imagine how much more hopeless and terrifying it would be if we had no idea what was causing these changes? We know exactly what is causing climate change and therefore we know what to do about it.

Dr. Leah Stokes (26:36):

I like how you touch on all the different sectors of the economy, electricity, transportation, heavy industry. Sometimes within the climate movement we can have simplistic messaging that this is all easy to do, we just need solar. But the fact is some of these sectors are harder to do. We might need things like geothermal or solar thermal or even places to store some of that carbon if we still have to burn some, even things like hydrogen. We've got to put some of these thornier or trickier options on the table too. And I thought you did a really good job looking at the whole problem and all the possible solutions.

Dr. Kate Marvel (27:14):

Oh, thank you. And a lot of that is due to Katharine's work. A lot of that is due to your work, just really thinking about this as a multifaceted problem that demands a patchwork of different solutions. You've often heard there is no silver bullet for climate. Why are we shooting at things anyway? But there's so much that we can do. And I think that can be an overwhelming message, but it's also a really positive

message, right? Because it means that no matter what you are good at, no matter what your training is, no matter what brings you joy and passion, you can find a place for yourself in fixing this problem. And I think that is something that is actually really hopeful.

Dr. Katharine Wilkinson ([28:07](#)):

There's a love chapter. You've devoted your life to science, Kate, but you also care about art and music and well-written words. And as you say in the book, ordinary acts of kindness and love. What's love got to do with it anyway?

Dr. Kate Marvel ([28:23](#)):

Something that was an inspiration for me was Carl Sagan's work. I love Carl Sagan because he was never afraid to tell you why things mattered. He would show you the beauty of the cosmos and your mind would be blown by how vast and staggering and just unfathomable, unfathomable, big, big

Dr. Katharine Wilkinson ([28:46](#)):

Gosh darn big,

Dr. Kate Marvel ([28:48](#)):

This big honking universe. But he also said, and this is my favorite quote of his, for small creatures such as we, the vastness is bearable only through love. And that was what I carried with me when I was writing this book that ultimately what matters is not my climate models. It's not even the actual increase of the planet's global average temperature or any of the physical consequences of it. The reason that it matters is it affects us. And what I wanted to do in the last chapter was really explore the experience of living on that planet. Are we part of nature? Are we separate from nature? Does it even matter? And one of the things that really hits you in your scientific journey is you start out as an 18-year-old, maybe you smoke a lot of weed, maybe you don't think very deeply about things, and you're like, oh, man, everything is connected.

([29:54](#)):

And then you think, well, that's ridiculous. We actually understand things and it's much more complicated than everything is connected. And then you get to be very senior in science and you realize, oh my God, everything is connected. And it's true. The earth is a beautiful and complicated place because of the connections, because of the interactions between the air and the ice and the rock and the ocean and the plants and the animals and the things that exist on this planet. We are part of that. We are tied to the planet. If we somehow find another habitable planet and we go live there, the same thing is going to be true. We will all still have to obey the same laws of physics. And understanding the interactions between everything and understanding why those matter, I think leads you to an understanding that science is wonderful and necessary, but physical science is not enough. It's not a good way to take in that beautiful complexity, that interconnectedness and make meaning out of it.

Dr. Katharine Wilkinson ([31:15](#)):

So beautiful, Kate. This is another sort of personal thread that you share in this book about Mitch and I read your book in the aftermath of my dad's passing. And so I was thinking a lot about love and a lot about the fragility of life and the ways that the challenges we face open us into a greater depth of relationship with this planet and the people who we love who happen to live here. This seemingly very unrelated to climate thing, Mitch has maybe had that same kind of role. Who's Mitch? Tell us about Mitch.

Dr. Kate Marvel ([31:54](#)):

Mitch is what I named the blood clot in my brain, which led me to have a stroke back in 2022. I named it Mitch because with apologies to all the Mitch's, I've never personally met a good Mitch. And that was a real jarring thing for me because I have always been very healthy. I have always been able to tolerate pain and recover quickly, and I've never even been sick for any extended period of time. And that was my first real rude awakening, my first confrontation with my own mortality, the fact that, oh my gosh, I will die. And that just led to a different relationship with the earth, but also with just being alive in general. I think it made me a lot more annoying. It made me feel like one of those Jehovah's witnesses who show up at your door and say, excuse me, have you heard the good news about Earth?

Dr. Katharine Wilkinson ([33:00](#)):

Do you have pamphlets?

Dr. Kate Marvel ([33:01](#)):

I should make pamphlets. But it does give me the feeling that this is all bonus life, that I am getting away with something. That the universe wanted me gone, and I kind of pull a fast one on the universe. They don't really know what caused that blood clot. And a subsequent brain scan, they sat me down and they said the words that nobody wants to hear, which is brain tumor. So the brain tumor, which this is not in the book, his name is Kevin, sorry Kevins. He seems to be behaving himself. He seems to be just sitting there hanging out, but who knows when he's going to decide to make mischief. And so I don't know how long I have, none of us knows how long we have. But mostly we don't think about that, or at least I didn't think about that. And I think that is a parallel for living on a changing world is it's all downhill from here.

([33:59](#)):

I'm never going to be young and healthy and sure of myself ever again. Whether it is this long slow decline or something sudden and terrifying, I don't know. But what I do know is that there are more and less stupid things that I can do. I can take care of myself. I don't need to hasten the change. I don't need to ignore scientific advice and lie about it vis-a-vis some of the people that we talked about earlier. But I do need to make my peace with the fact that my reality is going to be very different than I dreamed. And that doesn't mean that there's no space for love and joy in my life going forward.

Dr. Katharine Wilkinson ([34:46](#)):

It's a really, I think, courageous sharing, Kate. And yeah, I mean the best case scenario for any of us is that we get to take part in this wild dance of life that's been playing out on this planet for 3.8 billion years. Really boring life for most of that time, but claim it if you've got it right.

Dr. Kate Marvel ([35:11](#)):

Well you know, the first billion years is actually known in the scientific literature as the boring billion. Because until the Cambrian explosion, basically nothing happens.

Dr. Katharine Wilkinson ([35:22](#)):

Yeah, even worse than being named Mitch or Kevin is being the boring, a billion that's boring. I mean, that's rough. What I read in your description of what Mitch's arrival and Kevin's arrival have done is to grow your capacity to make yourself more spacious for all of the things that are true at the same time, because that seems to be what being human is all about. I could feel at different moments in the book, kind of your own shifting perspectives about humans we can change. Humans, we will never change. Humans, maybe we could change. And I'm curious, I'm curious what your take is on that today.

Dr. Leah Stokes (36:09):

Especially because the title of the book is Human Nature, so it's sort of begging this question for the record.

Dr. Katharine Wilkinson (36:13):

Indeed.

Dr. Kate Marvel (36:14):

Yeah. It's kind of ironic that I called the book Human Nature because I don't believe that there is such a thing as human nature. I know that you probably get very frustrated when you hear, well, there's nothing that we can do because it's just human nature. We're just selfish. We're shortsighted. And I think in some cases that is true, but that is an incredibly reductive and I think silly view of humans because I am often shortsighted and selfish and prone to making dumb decisions. But that's not all I am, and that's not the totality of my nature. I make choices, and we as human beings can always make choices. We have agency, and what I really wanted to stress is that I am a physicist and I spend my life studying things that behave themselves. A water droplet, a molecule of air, whatever, they are always going to behave in the same way in response to the same external forces because they have no agency. They do what physics tells them to do. But human beings are hard. They're hard for me to understand. They don't fit in my framework, my scientific framework, because if you shove an item on your desk, if you shove a notebook, it will fall off the desk because F equals ma ,

Dr. Katharine Wilkinson (37:44):

If you roll a ball down a plane,

Dr. Kate Marvel (37:47):

If you roll a ball down an incline plane, that's what it was good for this whole time. We know that F equals ma . You can predict the future position of the ball by knowing the force is acting on it, and human beings aren't like that. If I were to shove you down an incline plane,

Dr. Leah Stokes (38:08):

Very rude, very rude.

Dr. Kate Marvel (38:10):

Well, yeah, would you turn around and be like, Kate, what are you doing? Would you shove me back? Would you just be like, I'm sure she has her reasons and go down the plane.

Dr. Leah Stokes (38:20):

Maybe we're tobogganing.

Dr. Kate Marvel (38:21):

Maybe we're tobogganing, maybe we're sledding. Right? And that is a really frustrating thing about humans, but that is also a expansive and joyful and wonderful thing about humans that we don't fit in equations. If there was such a thing as human nature, we could write down an equation for human behavior, and we absolutely cannot do that. And that means that what the science says is human beings still have agency. The science says that the reason we don't know how hot it's going to get, the reason we don't know how bad climate change is going to be is we don't know what human beings will do. And there's nothing that determines exactly what human beings will do other than our own choices.

Dr. Leah Stokes ([39:20](#)):

A Matter of Degrees is co-hosted by me, Dr. Leah Stokes,

Dr. Katharine Wilkinson ([39:23](#)):

And me, Dr. Katharine Wilkinson.

([39:27](#)):

We are a production made in partnership with the 2035 Initiative at UC Santa Barbara, and The All We Can Save Project. Thanks to our funders and supporters who make this show possible, including the 11th Hour Project and Fossil Free Media. If you'd like to help us make more episodes of a matter of degrees, get in touch.

Dr. Leah Stokes ([39:47](#)):

And if you're digging the show, please hop on Apple Podcasts or Spotify and give us a five star rating or leave us a review.

Dr. Katharine Wilkinson ([39:56](#)):

Script writing, fact-checking, communication and production support are by Lucas Boyd, Quinn Lewis, Christin Palmstrom, and Anusha Singh. Sameer Sengupta is our editor and sound designer.

Dr. Leah Stokes ([40:08](#)):

Rose Wong designed our show art. Sean Marquand composed our theme song. Additional music came from Blue Dot Sessions and Epidemic Sound. You can find us online at [degreespod.com](#) and on YouTube.

Dr. Katharine Wilkinson ([40:22](#)):

And stay tuned for more stories for the climate curious.