Transcription
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Episode 12: Scientists and humanists talk timescales and climate change.
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Sound bite: Students' sense of "you guys are just going to keep talking and this research is doing what? What is the point of this. What are you actually doing other than you're just talking to other academics. I'm just trying to get us to think together about the way that the pressure of time is transforming what we think of as both expertise but also the research community itself.

Host intro: When talking about climate change, what do an oceanographer and a literary scholar have in common? How might these distant disciplines begin to speak to each other? *Timescales: Thinking Across Ecological Temporalities* is a volume that includes frictive chit-chats from scholars from far-flung disciplines and explores what they have to teach each other about the timescales of environmental change. Bethany Wiggin is one of three co-editors of this volume, along with Carolyn Fornoff and Patricia Kim. Wiggin is director of the first established academic program in environmental humanities at a major research university: the Penn Program in Environmental Humanities. She is joined here today by oceanographer Frankie Pavia, law student Jason Bell, and geophysicist Jane Dmochowski. This conversation was recorded in November 2020.

Bethany Wiggin: So, this is Bethany talking, Bethany Wiggin. I'm one of three co-editors of the volume, *Timescales,* and I am also the director of the program in environmental humanities, which hosted a conference in 2016, which was the birthplace of this volume. The volume has grown substantially since that conference but it does have its roots there. The program is also an exploration of what it would mean to be inspired by a place as an object but also sort of a co-collaborator in research and the place that the Penn Program in Environmental Humanities takes as its inspiration is the Schuylkill River and particularly, its most industrial parts which have not been restored. The tidal river has for centuries been the home to a refinery which blew up in 2019 and we've been thinking a lot with this river, about what it would mean to make nonextractive research, about research that starts in a university but also addresses and includes communities beyond our campus. I began my academic career as a comparative literary scholar, a Germanist. I also do some French,

English and American literatures. Some time ago, I began working on a book on settler colonialism in the mid-Atlantic, in the Atlantic world more broadly. And it was really that sense of the enduring legacies of settler colonialism that really brought me to think about timescales and the ways that the current crises that we are imbricated in feel at once both fast and slow. That they've been long in the making but their impacts make your head spin with how fast everything is happening and multiplying. It's a real pleasure to be joined for this podcast by three of the authors in the *Timescales* volume. Each of them, actually, are part of duos. Frankie [Pavia] and Jason [Bell] are both here with me, and they'll talk more about their work. And Jane Dmochowski is here as one half of the writing duo that was part of the chapter that Jane and Dave Evans contributed. So, I'm sending it over to Frankie and Jason to introduce themselves next.

Frankie Pavia: I'm Frankie. I'm an isotope geochemist and an oceanographer. I measure radioactive materials in the natural earth to try and figure out how fast things happen in earth processes. Jason and I started working together on our chapter, which is about, ostensibly, bomb radiocarbon and surf punk music. Because we were college roommates and we were friends and we were interested in trying to work on something together while we were both ph.D. students: me in Earth science and him in English literature. So, we started talking and iterating and talking and iterating more, and eventually, we had come into contact with some people from the Penn Program in Environmental Humanities, and we heard about the timescales conference that they were putting on and we put together a presentation for the conference. And then, afterwards, we put together our chapter for the volume, and I think it's been pretty exciting.

Jason Bell: I'm Jason Bell. I'm a third-year law student now. So, almost a lawyer is how I describe myself vocationally. I got my ph.D. in English in 2018. I think that Frankie and I started working on this chapter at least as early as 2016, maybe. It really represents one of the many projects that we did together. It kind of grew out of a podcast that we had been trying to create that was a total failure and then, never went anywhere. But we did end up with this chapter that includes some fragments from podcast episodes that we recorded.

Jane Dmochowski: Hi, I'm Jane Dmochowski. I'm trained as a geophysicist, and I currently teach at Penn in the Earth and environmental science department. I also do research with undergraduates primarily utilizing remote sensing and using satellites and aircraft sensors and the images that they produce

in order to understand mostly how Earth's surface and its vegetation changes primarily due to anthropogenic forcing. But my research, really, is led by my undergraduates' interests. So, it changes every year. I wrote our chapter, as you mentioned, with Dave Evans who is faculty at Yale. Dave and I have been friends for years. We were graduate students together at Caltech. He was a few years older so an excellent mentor to me in my early years there. So, when I heard about the timescales conference, and Bethany, I think it was, who mentioned we were looking for other scientists to come and speak, I immediately thought of Dave. I love to work with him, and he's a really excellent communicator of science and also an excellent listener. So, it was fun to work with him on this chapter. We're both Earth scientists. So, unlike some of the other chapters where there were humanists working with scientists—we're both Earth scientists, and so, we did try to bring that perspective to understanding time—what we did was aim to lay out some basic principles of geologic time and talk a little bit about how this gives insight into how humans have impacted the Earth on the very small timescale of individual human lives and then, our time as Homo sapiens on Earth.

BW: One of the things I really want to talk about are the kind of serendipitous conversations that happened that are at the heart of this book in so many ways. Jason and Frankie asked me about how much chitchats informed the editing process that my co-editors Carolyn and Patricia and I used, like, can the chitchat, actually, be thought of as the method behind this book. I think it is. It's really Frankie and Jason's word though: chitchat. And the types of pessimistic chitchats that you staged so beautifully in your chapter that really made us adopt the term "chitchat." We might have called them conversations before, like Jane and Dave had lots of conversations, and they were probably sometimes chitchats and sometimes conversations. Anyway, I want to talk about the chitchat and ask Jason and Frankie to lead us through. When you were introducing yourself, Jason, about your podcast that was also a place of conversation and maybe chitchats and you talked about it as a total failure. I'm kind of thinking about the ways that chitchats can be total failures but also successes and the ways that outcomes are entirely uncertain and how that's kind of the point of a chitchat, right? That it's not outcome driven, and I wondered if you might just introduce us to the way you're thinking about the chitchat in your chapter and its uses more more broadly.

JB: This is Jason talking. I think that we chose the term chitchat because it seemed very casual and informal. The argument of our chapter, in part, is that interdisciplinarity, too often, is outcome oriented and intended to solve a particular problem, oftentimes, in a particularly synthetic way. And we wanted to think about other models of interdisciplinarity that might be structured around failure or experimentation without a product predetermined before beginning. And so, chitchats, the word is out of currency in a way. I can't remember the last time anyone ever said to me, “Let's have a chitchat.” I'm not sure anyone's ever said that to me in my entire life. Maybe when you're being called into the principal's office and the principal says, “Do you, let's have a chitchat about your behavior,” that would be a a context in which you might be asked to chitchat. The word that you used was “serendipity” or “serendipitous,” and I think chitchats do have that kind of quality of intersection or passing—ephemerality. I think that's what we are trying to capture, the possibility that two people from different parts of a university or parts of the professional world might cross paths and have a conversation that didn't really have any point except sociality or sociability. Whichever word you want to use.

FP: Yeah, I was trying to think about the ways in which that podcast that we tried to make was a total failure, and I think the main way that it was a total failure is that it was just really bad. It was uninteresting. It was rambling. We didn't prepare for it at all, the sound quality was terrible. We didn't think it out very well. The only part that we thought about was using *Ocean Man* by Ween as the intro song because that was the obvious choice. We obviously didn't really plan on it working in any way. We kind of just wanted to do it. I find it amusing that we actually ended up mining it for use in this chapter that we wrote. It was for the purpose of something totally other than what we had originally done it for but that's sort of in the vein of this pessimistic or serendipitous quality that we were looking for in our method. These chitchats could be used in a way that was not necessarily what they were originally designed for but they might eventually hold some prospect for something down the line or for something different or for something other than what you would expect that they might hold value for.

BW: This is Bethany again. Jane, I want to ask a specific question to you to follow up if you don't mind. And it's that what I just heard Frankie talking about in terms of the way that a chitchat years down the line can yield something or create a connection of thought that you're like, “Oh, I didn't even think of that at that time,” but now, like “Oh, this is actually really useful.” That's been my own

experience in collaborating with an atmospheric chemist who I've done some work with around this place of the Schuylkill River and the refinery—Pete deCarlo—conversations that we've had while kayaking on the river or whatever later actually led to fairly substantial investigations that I wouldn't have undertaken had we not had that conversation; they bear fruit later. I'm wondering in the conversations that you have with Dave—your disciplinary training is more similar than mine and a chemist, or Frankie and Jason's—and I'm wondering, does the conversation happen in the same way. I know you talk with humanists a lot, you talk with me a lot and others. I'm wondering what's the texture of that conversation. How is it different to have a conversation with Dave and interdisciplinarily, does it function differently, does it feel differently, does it function in different time, like a different temporal horizon?

JD: Yeah, those are such great questions, and it is something I just kept coming back to as I read the chapter by Frankie and Jason; these conversations and how mine was different with Dave and at the same time, somewhat similar. So, while we went to graduate school together, we did very similar research in the beginning; our career trajectories have taken us to different places and in those we-won't-mention-how-many years—many years—we've both had different types of conversations. I have had probably more conversations with humanists, social scientists across the board, just different disciplines. I teach students who are in the humanities, have done research with students who are in the humanities. I was playing the role, maybe, of the humanist which is not at all my training. I'll come back to this idea of time. I want to maybe come back to this idea of the added time that we might have to put into our efforts in order to really do these, whether it's optimistic or pessimistic interdisciplinary work in order to understand our own disciplines and understand how to have those conversations. It wasn't on our minds that we were chitchatting, of course, when we were talking about the chapter but in a large part, that is what happened. And it was going back, sort of having a touchstone of our shared discipline of Earth science. It was sort of like, go to that and then, go to how does this connect with the humanities. And, of course, Dave added to that conversation as well. It wasn't so different than some of the other conversations. But then, the other thing that their chapter made me think a lot about was going from college where I was very focused on becoming a scientist and got my bachelor's of science. Not a bachelor's of arts in a science. So, very specific, learning the scientific method, really learning the physics, geophysics, etc., and obviously, continuing that in graduate school but at the same time, since then, I would say it's been this expansion of understanding

how other disciplines can add to things that I'm both researching and trying to teach. So, it's like a collection of all those conversations that comes to each conversation we have. So, in terms of this chapter, I would say so many of those conversations and for me—my career primarily focuses on teaching—it's the conversations I've had with students who in our department are often in an INBS major which is interdisciplinary, so, they're coming already with having taken classes and having a strong interest in other disciplines in addition to environmental or Earth science. I've learned so much from them, and what they're interested in and knowledgeable about has shaped even the research that I do. So, I went from really using a tool to look very much at Earth surface in a way that you might think of a geophysicist doing that, to starting to use the same tool but to look at things like vegetation change and things like that. I'm beginning to ramble, sounding more and more like a chitchat. The chapter and the idea of a chitchat really spoke to me. I absolutely loved it. I'm going to have students read that chapter.

FP: This is Frankie. I actually had a follow-up question about the nature of your of your chitchats with Dave. You mentioned that you guys went to graduate school together. Is that right?

JD: Yes.

FP: So, I was thinking about whether or not you think that the casual chitchats you might have had as graduate students about things that were totally separate from science—I sort of think on my own experience as a grad student where every conversation with other grad students was mixed in with conversations about science, conversations about our terrible advisers. I'm just kidding, my adviser was great, but the sort of things that you go through as a graduate student are these more personal things and much more nondisciplinary, casual conversation. I was thinking on me and Jason's experience, most of what we talk about is not environmental humanities. We're talking about *The Eric Andre Show* or whatever food we're eating or all this stuff that you talk about as college roommates that you don't necessarily talk about as collaborators, but that played a huge role in sort of loosening barriers of what we felt comfortable talking about in an interdisciplinary work sort of setting, too, where neither of us were afraid at all to sound like idiots to each other, or, to admit that we had no idea what the other one was talking about or say something that we might have otherwise thought was kind of nuts to say to each other. We had that sort of comfort that

had been gleaned from years of just sort of talking about nothing with each other. I'm wondering if you felt that same thing with Dave, the long, timescale chitchats from long ago might have might have played a role in your comfort talking together about it after.

JD: Yes, absolutely. I think the best chitchats are when we feel comfortable with someone. I'd known Dave for a long time. We spent a lot of time both in the lab and in the field and yeah, you don't talk about science all the time. Absolutely. And then, you get to know each other's families. You have kids to talk about that. That opens up a lot of space throughout a lot of time to really become comfortable and know somebody and be willing to say dumb things or say I don't understand that or I think you're way off there. Yes, absolutely.

BW: This is Bethany talking. You guys have really got me thinking about the conversation that we've been having like in the Google Doc where we were preparing for this conversation together, which is another form of chitchat, pretty casual. Jason, you asked a question that I've really been thinking about quite a bit, which was—you wrote so nicely about the coda that I co-authored with Carolyn and Patricia—in which we really said goodbye to this project and in a very real way also said goodbye to working together. Carolyn and Patricia, when we began this project were graduate students and fellows in the program in environmental humanities and Carolyn is an assistant professor at the University of Illinois and Patricia is at New York University and fabulous careers. A moment of closure, a coda, a bit of a bit of sadness there but also celebratory, and you asked this fantastic question about how much should we value the timescales of the personal during the Anthropocene. It got me really thinking about the ways that the community of researchers that environmental humanists are increasingly talking about—I'm thinking of the work of Joni Adamson and Steven Hartman and others—are really trying to think of the environmental humanities as a community of purpose and that purpose also includes care. The emotional valences that I felt like, Jane you were just pointing to: "Well, I felt really comfortable being able to … like, I know you so well, Dave, we can just talk about these things together," and ideas can be generated because of a different kind of affective relationship than one normally has in a research community if that makes sense. So, I guess what I'm thinking about is the way that the chitchat or the informality and sometimes, the bonds of affection that a chitchat builds, can be baked into a kind of larger research ethos. That was a really long preamble to a question I really wanted to ask about part of the chapter that you wrote. This is

Jason and Frankie again. But it also goes to you, Jane, because I was so moved by you saying so much of your research is driven by student demand and student needs. I want to think about that together with you guys because student-driven research is not usually how top-down research is; they're not the experts, right? So, why should they be driving research agendas. I'm super curious about this fantastic sentence that is in the chapter that Jason and Frankie wrote. You talk about the urgency of responding in a meaningful way to the crisis presented by climate change despite the incredible uncertainty about what that change will entail or is entailing. So, what even are you supposed to do to respond. Then, you have this, in my mind, an incredibly dryly, ironic sentence that says: "Yet the principal response to climate change in the academy is a call for new alliances and collaborations between scientists and humanists to produce social transformation and technological solutions." I don't know if you intended this to be sarcastic, but it really made me laugh because it totally gets at the truth of my experience in the environmental humanities, and also, at Penn, it's very much a student-driven program. And students' sense of "you guys are just going to keep talking and this research is doing what? What is the point of this. What are you actually doing other than you're just talking to other academics. I'm just trying to get us to think together about the way that the pressure of time is transforming what we think of as both expertise but also the research community itself. I'm very curious about your turn to the law, Jason, and if that is also part of looking for more effective or responsive means to address the climate crisis.

JB: I have a rote response to why are you in law school. While you were talking, Bethany, I was thinking about how, when we wrote this chapter in the period in which the book was being produced, some of the trendy keywords at the time in the humanities were "precarity" and there were conferences that had that as the theme. "Solidarity." I feel out of touch now with what is bubbling up, and I don't know whether people are still thinking that precarity is important or that solidarity is important. But when we were writing this chapter, those were terms that meant a lot. I chose to go to law school at a moment when it was becoming apparent that the job market in the humanities wasn't going to recover in a substantial way from what happened after the Great Recession. It was also a period when I was feeling like I wanted to speak to different audiences that I didn't have access to as a literary scholar. I started out as somebody who worked in the 18th century. I remember talking to faculty when I was picking graduate schools. Someone told me that if you work on 18th-century, American literature, the historians will never think that you're sufficiently historical and the literary

scholars will never think that you're sufficiently literary. I think that that's also true about a lot of the work that happens in law and the humanities and maybe, in environmental humanities, as well, that you're never sufficiently legal if you're somebody who wants to write about the law in a humanities department. I couldn't say how the people in law departments feel about producing scholarship that speaks to literary criticism. But I imagine it might run both ways, so, I wanted to speak to a broader audience. I wanted to do work that was more actively outside of the classroom. So, I went to law school not really knowing anything about what the law was. I had an erroneous idea as I think a lot of people who go to law school do and have been fortunate enough to get to work on a lot of environmental law issues, which turn out to, at least in my very limited experience, have little connection with a lot of the literary criticism that has evolved around environmental problems, which I think is unsurprising just because environmental law is such an administrative law field and so technical and technocratic. Most literary criticism or humanities research wouldn't be very interesting to read or exciting if it just talked about how the National Park Service had failed to adequately consider the impacts on local aquifers from hard rock mining in this particular stage of the environmental review process and so, the agency had to go back and redo it. That kind of stuff doesn't grip the pages of PMLA but that's a roundabout way of saying that I don't know whether there is any real connection but I'm OK with that.

BW: It seems to me that what you're also getting at, the environment as an object of study between literary departments and legal disciplines, it's two different things and it's a different thing again for geophysicists. It brings us back to the question of how all these interdisciplinary conversations where the object of what we're even talking about is not certain, and we agree that it's unstable in some ways; a discursive formation in other ways, obviously real bedrock, etc. At the same time, our students are like, you guys, you've got to do something and you're just still talking. Like what the heck. I'm so sympathetic to that. I suppose my question about the law was actually borne of my own envy of lawyers that they have more concrete and actionable tools for—let's put it naively, "going after the bad guys"—and whereas, in the academy, it seems very unclear about what, actually, would constitute progressive research. Or what would research that was restorative look like. I wondered, Jane, you think with your students all the time about what research to be doing. How are you guys tackling this?

JD: Yeah, there's so many different ways to approach responding. Of course, I'm not completely free of academic priorities and all of the confines of that but I have the privilege of flexibility being a senior lecturer focused on teaching rather than standing faculty focused on research—while being able to do research. Let me explain what I mean by that. In the chapter that Jason and Frankie wrote, there was a line about the pessimistic interdisciplinary work having less emphasis on research outcome. I would say that I can do that with my students. It's not that we have no emphasis on their research having an outcome, but to me, in my job, the focus is really on their learning outcomes. So, if their research doesn't lead to what some might say is a conclusion or a research outcome, we have still succeeded because they have learned something. So, while I don't know that that solves the problem of—I hear this from many of the same students and some different—of what are we going to do? So, that doesn't solve the problem of what are we going to do but I guess it solves—when I try to enable a student to do a research project that is of their interest, and it at least pertains to something they very much care about, they're gaining some tools that they may be able to go out into the world and affect change. I mentioned that my tools are very often using satellite and aircraft imagery, so, remote sensing to analyze those images. It essentially boils down to writing a computer program. I had a student who was interested in invasive species. I am not a biologist, however, I saw many opportunities for her to learn the tools of remote sensing while also being able to ask a question that related to invasive species and also, in Philadelphia, which allowed us to have our field site right here in our backyard. While her thesis did not provide us with a research outcome that I could then say, "Go to a funding agency and get money to do more research just like it," it did provide an outcome in that she was able to learn something. A tool and also learn more about invasive species and to me, that learning outcome was enough. So, if you apply that to a lot of chitchats, you would say, well, maybe that is also an outcome because each chitchatter learns something. So, is it really no outcome? I don't know.

BW: Yeah, you've caught me really thinking about, one of the things that in working to make work that's not outcome driven legible to tenure and promotions committees is something I've been working hard to do.
I'm wondering, Jason and Frankie, if this is something you guys might want to jump in on, too. But what I've been really thinking about is—as we've been institutionalizing environmental humanities at Penn in the years since this volume began, we have have really thought a lot about, well, how how would you teach transdisciplinarily or how would you teach and co-teach seminars that

would train students to think from two different disciplinary perspectives and think in a third place or generate those types of questions or have those kinds of chitchats that we do really believe that are slow and have uncertain outcomes but are nonetheless really useful although uncertain and hard to measure and hard for tenure and promotions committees to get their heads around. But what we really were thinking of and this was also in response to student demand was to say OK, we need to train our students to increase the types of conversations that they're having. The way that I have really worked to do that is to say we have to teach our students how to become publicly engaged and what it means to work with broader publics beyond those in their lab or those in their seminar. They're incredibly hard. The success of a public engagement or publicly engaged research is really hard to measure; it's really easy to see bad examples. But it's harder to codify what creates success. I'm wondering, Frankie and Jason, you're both just out of grad school. You're several years out of grad school, early on in your careers. I wonder, do you at an early stage see a place or a need for public engaged research in your disparate fields. Is that something that is meaningful as a response to the pressure, the urgency with which the fact that 12% of the planet is now on, average, 2 degrees Celsius warmer than it was in preindustrial ages. I mean that's a lot, 12% is a lot; 1.5 was a long time ago. I'm sort of curious about public engaged research, the ways that it changes the types of questions we ask as well as the things that we create. Like, maybe we aren't going to write another co-edited volume about chitchats. Maybe we're going to make a film or a series of public curriculum for grade schoolers. Is that something, Frankie, public science or community science that is coming up for you.

FP: It's something that I do think about. I will say, where I am right now at Caltech is not especially interested in it, in many ways, which I find a little bit frustrating. But I struggle with it a little bit because there's obviously a lot of public engagement around climate science, and some of it is really good and some of it is pretty bad. I haven't quite figured out my own place in that ecosystem. The way that I've sort of tried to push on it a little bit just in a personal sense has been trying to amp up my willingness to talk about science and climate change. And even the nitty-gritty of what I actually do or measure with my friends and my family; it's not so much that they're a captive audience but they kind of are, right? They get to and have to listen to you ramble on about what the problem is with climate or why you think that this geoengineering solution might be more feasible than the other geoengineering solution. I see it a little bit as a grassrootsish type thing where, hopefully, you can have an

interesting enough conversation with your friends that they can talk to their friends. You can talk to their friends. It's a game of telephone. But I think that public engagement could proceed in a sort of more natural way if scientists were, as you say, and humanists, too, able to have more wide-reaching conversations or their conversations were with a much more diverse set of people and voices and groups than they usually are, which are usually other scientists which usually means the same sort of socioeconomic or demographic type of groups as opposed to reaching out in more organic ways. So, talk about science with your friends but also make more diverse friends would be my ideal way of summing up what I hope public engagement and science could start to look like in a what's-the-value-of-chitchat framework.

BW: I love what you just said, maybe make more diverse friends. I think that's great advice. I have this pet peeve that I want to float to you guys and just hear what you think about this. I love Greta Thunberg. I think her work has been really important in putting a young face of anger to the climate movement or giving it that face; it's problematic on other levels that maybe we should go into or maybe we won't. She's white. She's from Sweden. There's a question that many have asked about why has her voice been amplified when there are many other activists, youth activists, brown and Black activists who have been saying similarly effective messages. But my pet peeve is actually different in this case. So, my pet peeve is that there seems to be and Greta says this fairly often, is "Listen to the scientists"; just listen to the science. Of course, we should listen to the scientists but I'm not really sure that we need only to listen to the scientists. In fact, the science doesn't actually tell us what to do. It's not at all clear, listen to science. OK, terrible things are happening; predictions models, whichever model you take, the future looks pretty dreadful. OK, now what? That's the conversation starter, perhaps. I'm curious about when you hear, "Listen to the science," what kind of reaction do you have?

JD: Yeah, I think it's really problematic, too. It doesn't get us anywhere, exactly what you said. Of course, you have to listen to the science and part of the scientific process is we gather more information. Then, we know better and part of that gathering more information can't just be concentrations of carbon dioxide or temperatures of the ocean. Or the pH of the ocean. It also has to be information about humans. Some of that is also within the realm of science. But some of it really isn't because the problems we're facing involve an Earth that we can understand and quantify in many ways, but it's also most fundamentally our

interaction with Earth. I think that those have to be conversations, not a one-way listening. I loved hearing some of your thoughts about the community science; this is something I've been thinking more and more about. I'm actually trying to write a little proposal to take a teaching leave to develop more of my student work, work that I've done with my students into a community science project. I'm all ears about how to do that. In a nutshell, I also find that incredibly problematic even though that statement, listen to the scientists, is also very important and I think she's saying that for a reason but that's not the end.

FP: Yeah, it doesn't exist in a vacuum, right? First, you should listen to what the scientists say about what climate change is, and then, you should probably listen to someone else. Also, [regarding] "Listen to the scientists," there's a nontrivial history of scientists having problematic moral views on things that I think, if you apply it in bulk, "Listen to the scientists," all the time, you wouldn't end up in a very happy place. When it comes to climate change, yeah, scientists, I think, have it right that the Earth is warming and we need to reduce CO_2 emissions in order to stop pretty catastrophic global change. But as a blanket statement, "Listen to the scientists," you should probably listen to a lot of other people, too.

JD: Yeah, if I could just jump in and reiterate that coming back to the idea of talk to your friends or listen to your friends but also make more diverse friends. I would say, listen to the scientists but let's also have more diverse scientists. One of the many problems of only listening to scientists is that the many fields of science remain incredibly male and incredibly white, and so, even if we were just listening to the scientists, we have to understand that we're, in large part, listening to a white, male perspective, which in and of itself is problematic.

FP: Yeah, geosciences are the the least diverse of any STEM field, right. Yeah, I agree.

BW: I want to suggest that we turn toward another of the really many fascinating comments and meta comments that we made in our Google Doc in preparation. One of the things that humanists are really good at doing is storytelling, story making, or we're good at least at analyzing them. It seemed to me that one of the most important things that we could do with this volume, *Timescales,* was actually not to make a story but actually to break a story. It was really breaking the story of time as progress that we were after—in introducing and insisting on the importance of multiple timescales and thinking both at the human time and

planetary time, thinking also about different rhythms; musical metaphors run throughout the volume. Not just codas but also etudes but they're not studies or they're not codas that are written in the formal language of European classical music. They are improvised. They're devised. They're the materials we had at hand. They were our best attempts collectively as a group—there are 30 contributors to the volume—of breaking the story of time is progress or maybe the way that progress has colonized much of the human imagination in the last several hundred years, let's just say, maybe since the Enlightenment, maybe since global capitalism. It's really hard to know. But the reason I wanted to to bring this up is that in our Google Doc, there was this great exchange about time feels—it's 2020— like what the hell else is 2020 going to throw at us and it's coming at us faster and faster and faster, and yet, at the same time, where we're headed is increasingly uncertain. Even today is uncertain. We're also speaking, of course, amidst global pandemic, amidst a second wave both of case numbers and also closures. It's really hard to know even what tomorrow is going to bring. So, in this accelerated state of crisis, we also wanted to think about what does it mean to go slow, and can slowness, actually, in some ways be a restorative or reparative tactic. I wanted to ask you guys both, obviously, in that slowness, thinking of the "slow food" movement, which was so important for philosopher Isabelle Stengers and her formulation of slow science or another science is possible, thinking about literary critic Rob Nixon's phrase, "slow violence" thinking about these catastrophic things that have long histories, long origins and multiple origins. I'm wondering, more broadly, about is slowness a response that makes sense to you in your own work?

JD: I would say yes, and when we're talking, it made me think about a conversation that Dave and I had as we wrote our chapter. We saw the progression of our chapter go through, in some ways, Earth time, describing as I said those basic principles of a geologic timescale and how they inform what we know about how Earth has changed in the past. Then, you get to this point where many people who have written about this will say, OK, is the next step, on an extreme level, to go—OK, we've ruined this Earth. Do we go colonize Mars, and when we think of time as a progression that's always positive, we can fall into that trap. OK, well, Homo sapiens started in Africa. We went out and throughout the Earth surface and now, the next step is obviously into outer space. I would strongly say pause. I think it is definitely worth taking that time to understand how we can adapt, how we can mitigate before we go to extremes. The progression of time and moving moving forward isn't always better.

JB: One of the great examples of the nonlinear progress or the movement of time forward doesn't always equate with other things moving forward is maybe two essays by the science fiction writer Samuel Delany called *Times Square Red Times Square Blue*; the essays are generally concerned with his relationship as a queer man to the space of Times Square and its different erotic possibilities but in those essays, he also advances a theory of urban sociology. It's very skeptical of urban development and gentrification. He traces the evolution or devolution of Times Square from the 1980s into the late 1990s and looks at how the sterilization of the space really killed off a large number of vibrant, important communities. To connect that to what Bethany had been saying earlier, the conversation that you all were having about listen to the scientists, I think, maybe more broadly, listening to the experts, or to a siloed group of experts sometimes does damage in the name of one particular majoritarian perspective that, ultimately, ends up hurting everyone. I think coming from a science fiction writer like Samuel Delany, that very nuanced specific sociological insight is even more powerful, which is to say that when I practice law—I don't practice law yet because that would be illegal—but when someday, I do practice, I will have Samuel Delaney with me even though I won't be citing *Times Square Red, Times Square Blue* in court filings. Maybe that's a different way of thinking about slowness. To return again to something we were talking about earlier, this idea that something that happened earlier in your life, a chitchat, or earlier in time, can insert itself later in unexpected ways. The kind of flattening out or movement of different parts of your life in unexpected combinations can feel slow in an interesting way. Although other people might experience that as fast. I don't know; maybe the fast-slow metaphor doesn't really work.

FP: Jason, I was just thinking about how my entire experience as an Earth scientist has been how relative the perception of time is. I learned at some point because I said it—that deep time was a dirty word, or a dirty set of words. It varies depending on who is using the phrase. So, to me deep time meant any time in Earth history before the Cenozoic because nobody that I knew cared about anything before the Cenozoic. That's the last 65 million years or so. Then, someone came who was working on something a hundred million years ago, and someone said that what they were working on was deep time and they were deeply offended because most of the people who worked on things at their institution worked on the Archean or things that were billions of years old instead of a hundred million years old. One of the elements that I work with has isotopes

that have half-lives of twenty-four days, one has a half-life of two years and one has a half-life of 75,000 years. So, long lived to the person who measures the twenty-four-day half-life isotope; is any of the other two. Long lived to the person who measures the isotope with the two-year half-life is only the long lived to me; there is only the 75,000-year half-life isotope. Long lived to me who measures the 75,000-year half-life isotope. In that same vein, the practice of slow research, I have a hard time conceptualizing because what it might mean to me might mean something totally different to let's say, a tenured faculty member who has the luxury of conducting things very slowly in a way that maybe a postdoc does not. So, that notion of slowness in practice is hard for me to really wrap my head around.

JD: Frankie, I have a follow-up question or comment about what you just said with deep time. I don't know how much teaching you've been able to do but I always find it really interesting when I talk about or introduce the Earth timescale and deep time to a student who maybe hasn't taken time to really consider the 4.6-billion-year history of our Earth and compared to the time that we, as humans, have spent on Earth. What I find interesting about it is what a different reaction it has on students. I'll tell you, personally, that I was a physics major until I sat in a classroom, and I took a geology class for a general education requirement and my professor took a roll of toilet paper and went around the room getting us to understand Earth time with this role of toilet paper, convincing all of Earth time and this roll of toilet paper. I was just mesmerized by this, and I would say it gave me like this sense of excitement and hope. I don't know why I say hope but that's what's coming to mind. I do a very similar demonstration for my students on the first day of my oceanography class, which is my large lecture sort of introductory class for both scientists and nonscientists. Sometimes, I'll see that in other students; of course, some students are totally bored by it and other students are really disturbed by it and it makes them feel totally insignificant and sad. I'm wondering if either in teaching, or just in conversations you've had with nonscientists or, it doesn’t matter if it’s a new scientist or whatever, if you've seen that polarity of reactions.

FP: Yeah, I think that I've seen that polarity of reactions more when it comes to space rather than time, when I've tried to conceptualize, oh yeah, I'm studying how the entire ocean works by measuring the smallest components of matter, right? I'm trying to think about it from a time perspective. The example I'm thinking of is this sort of classic curve that was a model that describes the

geologic fate of fossil fuel, CO_2, and how long it takes for the Earth to naturally buffer that change away. In response to an extremely sharp input of CO_2 on human timescales or even on much-longer-than-human timescales, something like a thousand years longer than any one human would live, the time it takes for the Earth to come back to its previous state, which is slightly perturbed from its previous state but something close to it is on the order of 100,000 years. Even I have a hard time wrapping my head around the idea of a thousand years of fossil fuel CO_2 emissions; a thousand years is even far beyond what we can conceptualize. Although, we can imagine it on a civilization or a historical perspective but a hundred-thousand years is far beyond that and that's just the start of what the end of the human impact actually looks like. And then, you extrapolate that further to say, oh, well, in the 4 1/2-billion-year timescale of the Earth, it's still almost completely insignificant. I'm not sure whether that gives me hope like you say or if it gives me fear or if it gives me both, but I do think that this issue of the inability to conceptualize that time is really fascinating and hard to wrap your head around in so many ways.

BW: I'd love to jump in here with Octavia Butler and not only because we just heard about Samuel Delany but I've been thinking about this—when humans, whether it's students or whoever is faced with a kind of relative insignificance of humans in space and time, I think it can be either, instill a great sense of humility or despair. For some, I think it's very tragic, actually, and they experience it as tragic that historical forces are impinging on their sense of subjectivity and agency. That, actually, I think brings me back to this question that I was having and thinking through, about what are the forms of research that are commensurate with this increasing realization that humans are no longer masters of our own destiny if we ever were; that illusion of progress, etc., has been really shattered. It's hard to know how to represent that; time is notoriously difficult to represent other than if you're Einstein. But I think Octavia Butler actually does that really well and let me just take a second to talk about that. I'm thinking specifically about her novel, *Kindred*, in which the heroine of this story, Dana is, with no control of her own, thrown back 150 years to different times and she doesn't know when she's going to be able to leave that time that she's thrown back into. She's thrown back into conditions of terrible violence in her past. In her past that she's thrown back into, she was an enslaved person. Reading the book is an experience of an utter loss of agency and control over time. I started thinking about, wow, the way that time is being experienced and represented in this book is actually really similar to the ways that humans are coming to terms

with the way that past choices we have made to burn CO_2 at such huge rates is making us no longer the writers of our own stories. I started thinking about how could experimental forms like Butler's be introduced into a scholarly idiom, like could that even happen. I'm writing a book now in which there's time travels; it's a scholarly book but there are time travels. It's a literary environmental history very much indebted to speculative fiction. It's one response that I've been having to how do we work in multiple times and multiple timescales and elevate other stories and break certain stories. I never really thought of this before until we were talking together now. But it's a kind of chitchat that I am introducing; it's a chitchat with past forms that could be useful to us now. But the past forms of experimental novels that actually, may unexpectedly, like a failed podcast really help in finding appropriate responses that at least allow us to try to represent with some degree of accuracy these notoriously difficult—how to represent multiple times at the same time, how do you do that? It's really hard.

JD: I was just going to say, different people may find different ways making sense to them or helping them to consider timescales or it may help them best to read a book like you're describing and also have a conversation with someone else who found insight into timescales by some other mode. When you're talking about that, it made me think of an activity I do with my students. We're learning about plate tectonics. The scale I'm trying to get them to understand is the speed at which plates move because, especially if you're talking to someone in Southern California, and they learn about the San Andreas Fault and the North American-Pacific Plate interact within California and they immediately think, well when is Southern California going to be moved up north right next to San Francisco and then, you go into these conversations about understanding the time that that happens. But anyway, I often ask my students, I'll give them ways to think about the rate of change in plate tectonics—fingernails growing or different things like that. But then, the question that they're asked to provide and talk about with their group is some other way to think about it. And then, they can't just go to a picture that I've drawn for them or some other way I provide; they have to think of a new way. It's also often one of those things like, well, what if you need to go and describe the rate of plate motions to your roommate. How would you describe it? It's always interesting to read the ways that people came up with that I would never, they may not even make sense to me sometimes, but it's their way of describing this scale, this rate, a timescale.

BW: Well, I just really want to thank you guys for joining me and joining together in this really productive chitchat. You've left me with a lot to think about, which is a real gift. Thank you.

JD: Thanks so much for including me.

FP: Thanks for letting me and Jason be part of it, too. This is great.

JB: It was nice to talk after such a long time.

BW: Yeah, for sure who knows what this conversation failed or not failed will yield years to come.

For more information, visit z.umn.edu/timescales.