

OMNIA Podcast | We Haven't Passed the Climate Tipping Point...Yet

Tyne Logan (ABC News Australia):

It is a record you don't want to hold. July 2023 will be Earth's hottest month on record following in the footsteps of an already record-breaking June.

Alex Schein:

This July, global temperature soared to the warmest ever recorded. Ocean surface temperatures hit record highs. Extreme weather related events are becoming ever more common, seen this spring and summer with wildfires in Canada and Hawaii, flooding in Vermont, and a tropical storm in Los Angeles dumping almost three inches of rain in one day. Renowned climate scientist Michael Mann, presidential distinguished professor of Earth and environmental science and director of Penn's Center for Science, Sustainability, and the Media has been following the changing climate for decades. We spoke with him about this summer's weather events and how we can move forward in this climate reality. Welcome to OMNIA, the podcast on all things Penn Arts and Sciences.

Nancy Chen (CBS Mornings):

Welcome back to CBS mornings. The scorching heat wave in this country is part of an alarming global trend.

John Dickerson (CBS Mornings):

Experts say this month is on track to become the hottest month since records started. To help us understand all this, we're joined by climate scientist Michael Mann. Michael Mann is director of the Penn-

Amna Nawaz (PBS NewsHour):

Penn Center for Science, Sustainability, and the Media at the University of Pennsylvania and author of the forthcoming book, *Our Fragile Moment*. Michael Mann, welcome back-

Christian Bryant (Scripps News):

Joined now by Dr. Michael Mann, distinguished professor at the University of Pennsylvania-

Jen Psaki (MSNBC):

So Dr. Mann, thank you so much for taking the time. As you've watched the extreme weather events of this summer, even for many of us walking out of our doors, what does it tell you as a scientist about where we are in the climate crisis right now?

Michael Mann:

Yeah, thanks. It's great to be with you.

Alex Schein:

Professor Mann has been a constant presence in the national media this summer from CBS to MSNBC to CNN, he has been asked to respond to a new climate related crisis almost weekly. He says that a number of factors have converged to contribute to the recent unprecedented heat and extreme weather.

Michael Mann:

We've seen a number of factors come together this summer. The overriding factor is the continued warming of the planet from fossil fuel burning and carbon pollution and the warming of the planet drives fiercer hurricanes, it dries out soils so you get worse drought obviously. You get more long-lasting and more frequent heat waves. The heat and drought combined to give us those epic wildfires that we've seen play out. But at the same time, the warming of the oceans puts more moisture in the atmosphere. So when you get a storm, there's more moisture in that storm. It can produce larger amounts of rainfall and we're seeing that flooding as well.

David Muir (ABC World News Tonight):

We begin tonight with the catastrophic flooding in the northeast Vermont under a state of emergency tonight, some of the worst flooding in nearly a hundred years. The capital of Vermont tonight underwater shut down most of the day, authorities fearing a nearby dam may not hold.

Michael Mann:

In Philadelphia, we experienced the world's worst air quality for a number of days because of these wildfires in central Canada. We have experienced horrible wildfires like what played out in Maui, which is the deadliest wildfire in human history when all is said and done, probably a toll of about a thousand human lives and climate change clearly played a role there. There is an extreme drought over much of the island and that allowed those fires to spread quickly, to cover a larger area to do more damage. At the same time, we're seeing wildfires right now up in the Pacific Northwest, Washington, Oregon, of course California, the western US year after year now, we see these more extensive, more damaging wildfires and at the same time, of course, California and parts of the desert Southwest experienced record flooding with a hurricane in the form of Hillary that made landfall and a warmer ocean, once again means more moisture in the air so when a hurricane like Hillary makes landfall, it packs a greater punch.

It can intensify more, but most importantly here, it's going to produce more flooding rains. As I've commented recently, we're sort of seeing the full arsenal this summer of what climate change has to offer and there's a little bit of an extra boost, a little bit of extra warmth, and therefore a strengthening of the storms. More extreme weather events because of a transition, natural transition we're undergoing right now from a number of years long La Niña event where the tropical Pacific tends to be cooler to an El Niño event where the tropical Pacific warms up and that influences weather patterns around the world. We're seeing that perfect storm of human caused warming combined with the effects of this burgeoning El Niño to give us weather extremes really unlike anything we've seen before. But what makes them unprecedented? We've had El Niños before. What makes them unprecedented is human caused warming from carbon pollution.

Alex Schein:

In late July, a new report from researchers in Denmark revealed that the Atlantic meridian overturning circulation or AMOC, a major ocean current that circulates water around the planet could significantly slow down or even stop completely in just a few decades. Their models rely on, "the current scenario of future emissions," assuming that greenhouse gases will continue to be released into the atmosphere at the rate that they are today. Professor Mann gives us deeper insight into AMOC and what these findings mean.

Michael Mann:

There's this component of the ocean circulation that we use the technical term AMOC, the Atlantic Meridian overturning circulation. It's known sort of in popular lore as the great ocean conveyor, or sometimes we call it the Gulf Stream, although it's really not quite the Gulf Stream because the Gulf Stream is just the sort of wind-driven current off the coast of the mid-Atlantic, off the coast of North Carolina. And the AMOC or conveyor belt is this sort of continuation that travels on into the higher latitudes of the North Atlantic. It's like a ribbon, it's an overturning circulation. There's a northward current at the surface, and then it returns at depth in the ocean southward. So it's literally like a conveyor that's delivering heat into the higher latitudes of the North Atlantic, Eastern North America, Western Europe, Iceland, Greenland, and it's driven by contrasts in ocean density. The sinking of those waters in the high latitudes of the North Atlantic is driven by the densification of those waters because they're cold and salty.

Salty water's heavier than fresh water, cold water's heavier than warm water. And those two factors combined to produce the sinking that drives that ribbon like current, that overturning circulation. And we know at the end of the last Ice Age, a period known as the Younger Dryas where we were coming out of the last Ice Age, but this huge North American ice sheet, the Laurentide ice sheet as it melted, it sent all of this fresh water into the high latitudes of the North Atlantic, which freshened those waters, lightened them, inhibiting the sinking motion and shut down the conveyor belt. And a large region neighboring the North Atlantic sort returned to Ice Age like conditions for another thousand years before the final meltdown as it were.

I talk about that in some depth in *Our Fragile Moment*, my forthcoming book because it's one of the examples of abrupt climate change that even though we were coming out of the Ice Age due to long-term astronomical factors, changes in the Earth relative to the sun, even those factors were slow we sort of hit a threshold where the ice melted quickly, ran into the North Atlantic, shut down that circulation. We go into this glacial state for another thousand years. So it's an analogy for what could happen today, once again with the melting of ice, not the Laurentide ice sheet, which existed during the last Ice Age, but now we still have ice sheets in Greenland, so the Greenland ice sheet and the Antarctic ice sheet. And as the Greenland ice sheet is melting, it's sending that fresh water into the North Atlantic, lightening those surface waters, inhibiting the sinking motion.

Now here's the thing, climate models predicted that we would see that play out over the next century or so, and back in 2015, we actually had an article in the Journal Nature Climate Change that showed from paleo observations and some modern observations that it's already happening. It's happening about a century earlier than we expected, and that's because we think Greenland is losing ice earlier than we expected. Some of the sort of components of the climate system are sort of reacting even faster than we expected to the increase in carbon pollution, the increase in carbon dioxide concentrations. Now this latest study by some Danish scientists sort of reiterates that point. It sort of reinforces the notion that this could happen earlier than expected, but they tried to provide a specific date and without going into much detail, it's not based on climate models. It's really based on a statistical approach and it has its advocates and its detractors. And so there's uncertainty with all of these sorts of methods. And so these authors said, well, we could see the collapse as soon as a few years from now.

I can tell you most scientists, including myself, don't actually believe that, but we do believe that it could happen within the next several decades, which is much earlier than we... thought it would happen just a decade ago. It reinforces the point that yes, there's uncertainty in the science, but uncertainty isn't our friend. We're getting closer and closer to these tipping points and we don't know exactly where they lie. They are like mines in a minefield, and the only safe approach is to stop walking out onto that minefield, which is what we're doing as we continue to produce carbon pollution and warm the planet.

Alex Schein:

Professor Mann's new book, *Our Fragile Moment: How Lessons From Earth's Past Can Help Us Survive The Climate Crisis* provides a history of Earth's climate. He's been fascinated by the subject since his doctoral work, which focused largely on natural climate variability.

Michael Mann:

I got my start in science in paleo climate in the study of Earth's past. The now iconic hockey stick curve that we published back in the late 1990s was an estimate of how temperatures varied in the past using natural sources of information, proxy records, we call them, like tree rings and corals and ice cores. And so scientists can go back even further hundreds of thousands of years with various types of evidence to try to document how climate changed in the past. And we know that there were some fairly abrupt climate episodes in the past. One in particular I talk about in the book happened about 10 million years after the extinction of the dinosaurs 56 million years ago at the end of the so-called Paleocene era and the beginning of the Eocene era, it's called the Paleocene-Eocene Thermal Maximum or PETM.

And it was a period of relatively abrupt warming. There was a large increase in concentrations of greenhouse gases and a warming of several degrees over a fairly short period of time. And geologically, when we say a short period of time, we mean tens of thousands of years. It's not like today where things are happening in tens of years, in decades. Geologically though this is a rapid climate change, a rapid warming that took place over tens of thousands of years. And I've often heard climate doomers, we call them sometimes, these are people who are convinced it's too late to do anything, and we're experiencing a runaway, warming of the Arctic that's releasing all this methane from the permafrost, we've passed that tipping point and there's nothing we can do and it is going to cause our imminent extinction and the extinction of all life on Earth. And I was hearing these sorts of narratives.

I was encountering these narratives as a climate scientist who's advocating for climate action. I was very disturbed by that because it's very paralyzing. In fact, doomism can lead us down that same path of disengagement as denial. And I was hearing the paleo climate record, which I hold dear because first and foremost, I'm sort of a paleoclimatologist and that's where I got my start scientifically. And I was hearing people point to the Paleoclimate record as a reason for these sorts of doomist narratives, these doomist outlooks. And they were misrepresenting the record much in the way that we see climate change deniers misrepresenting the science to deny climate change. So I decided I needed to tackle this, and it was the right time. I felt I'd just written a book, *The New Climate War*, which was really about the politics of climate change and it's about doomism and all these other things.

I wanted to get back to the science, my bread and butter, and here was an opportunity to do that and to address these false narratives of doom. The PTM is one of them. So the doomers will point to the PTM and say that was a runaway warming episode, it was driven by huge amounts of methane. And there was some very tentative evidence that might seem to support the idea that methane, that methane release a natural methane like the one they're arguing is happening today in the permafrost was behind this warming. But it turns out the science does not support that. Science progresses, we have a much better understanding, far more modeling studies, far more observations now of what actually happened during that period. And it turns out, guess what drove the warming? It was carbon dioxide. The same pollutant, CO₂ as a pollutant we're producing today through fossil fuel burning.

This was a natural release of CO₂ from a volcanic outgassing we call it, a natural release of CO₂ from the solid Earth into the atmosphere that played out over tens of thousands of years. And it turns out methane might've amplified the warming by like 10%. There was no runaway methane driven warming. And so I felt like there was an opportunity to go back into the Paleoclimate record. And talk about the lessons and there are many of them, this is just one. There are many lessons from the Paleoclimate

record. And in the end, what we learn sort of reinforces I would say my primary message today, which is there is great urgency in tackling the climate crisis. If we don't act now, really bad things will happen.

There's no question about that. The Paleoclimate record makes that clear, but it also makes clear in addition to urgency there's agency, we are not yet at that point where we will see catastrophic climate impacts, massive coastal inundation, heating that's so great that it will make large parts of the planet unlivable. That's a possible future if we fail to act but if we can keep warming below three degrees Fahrenheit, and it's still possible to do that, we can in all likelihood avert the worst impacts of climate change. So the message of the book in the end is urgency and agency.

Alex Schein:

Professor Mann's New Center for Science, Sustainability, and the Media is a joint initiative of Penn Arts and Sciences and the Annenberg School for Communication. The center aims to communicate climate and environmental sustainability to the public and policymakers in a number of ways. Like in a recent guardian op-ed, Professor Mann penned with Susan Joy Hassol, director of the nonprofit outreach organization, Climate Communication. They write, "If the extremes of this summer fill you with fears of imminent and inevitable climate collapse remember, it's not game over, it's game on."

Michael Mann:

Our future is still in our hands. That was the point that we wanted to end on and it's really another way of saying there's urgency but there's agency as well, and especially young folks today, and we've been doing some work actually within our center, the Penn Center for Science, Sustainability, and the Media. And one of the things that we're studying right now is climate anxiety among young folks in particular. Where does it come from and how can we best address it? And my sense is there are two different things and we sort of need to parse them out. There's this one thing that we just talked about, this sense of doom, and it's based on unfortunately some false messaging that's out there that suggests it's too late to do anything. And that potentially leads, as I said before, towards disengagement and I think that that is impacting young folks. They're hearing these sorts of doomist narratives.

To be perfectly honest, there are many examples where the mainstream media outlets that we would normally think of as providing objective information have really sort of sold this narrative of doom and oversold this narrative of doom and gloom, and it's impacted young people in particular because they've got the most to lose, their lives are still mostly ahead of them. Old folks, we've got less skin in the game as it were. They've got a lot of skin in the game. And so it's understandable, but to me, we first have to address that. We have to make sure they understand it's not too late to act and the science actually indicates that. The best available science tells us that when we stop polluting the atmosphere with carbon, the planet stops warming up. There is a direct and immediate response to our efforts to decarbonize our civilization.

And so we can still prevent the planet from crossing these truly catastrophic thresholds of warming three degrees Fahrenheit warming where we will see far worse consequences. So let's make sure that folks understand that the science actually does communicate a message of agency. We can still make a difference. The other contributor though, and that's harder to address, I think is cynicism in our politics. Whether we will rise to the occasion, whether we will take the action necessary to avert catastrophic warming, based in part on the disappointments over the past decade or so that we haven't quite seen the international agreements that we would've liked to have seen, end fossil fuel infrastructure to really accelerate the clean energy transition. We're making some progress and that's important for folks to understand because there's also this false notion that we're making no progress at all that leads people to sort of a doomist outlook.

No, we're making real progress, we're not making enough progress. And so I think that that's more complicated issue because it's wrapped up in sort of the fraught nature of our current politics here in North America. And I'll just say yesterday, and this'll air weeks from now, but this is August 24th. Yesterday we saw a presidential debate, a debate of the candidates for president of one of the two major parties, the Republican Party. And the question was asked, and I'll just paraphrase it, raise your hand if you accept that humans are warming the planet, none of them. I forget if there were 10, how many candidates there were on the stage, none of them raised their hand. So that's worrying. And I think a lot of the worry and the anxiety comes from that, comes from the fraught nature of our politics right now. And climate inaction is really a symptom of a deeper problem right now in our politics here in the United States. And you could argue writ large, especially because the decisions we make have such a powerful impact on the rest of the world.

Alex Schein:

Despite the challenges of this work, Professor Mann ends on a hopeful note reinforcing his belief that the way to combat hopelessness around climate change is to take action.

Michael Mann:

One of the things in our center, the Penn Center for Science, Sustainability, and the Media is the study of misinformation and disinformation and how it propagates and how it can best be combated. So that's something that we're really interested in here. And we've got some students, actually some undergraduates, Penn undergraduates, who are working with us on various aspects of that work.

In my latest op-ed and it's about sort of this tussle between sort of the bad news that we hear on almost daily basis and the reasons for cautious optimism that we can still rise to the occasion. And I sort of coined this phrase, "The antidote to doom is doing." When we see others who are willing to make a stand, they're out on the front lines, willing to get arrested, willing to risk life and limb for the sake of preserving the health of our environment for future generations. And whether it's the young folks, indigenous people, Standing Rock who made a stand with regard to the expansion of fossil fuel infrastructure and pipelines into indigenous lands, but writ large, the youth climate movement, it's inspiring to the rest of us. It's infectious. It's one of the main reasons that I am optimistic and I see that at Penn.

In fact, one of the reasons I decided to come to Penn when I was interviewing a couple of years ago, it was Climate Week at Penn, and the College Green was just plastered with tables and groups of students advocating for climate action. To me, it was very inspiring that there was so much activity, that there was so much passion, and it was coming from the ground up. It was coming from the students. That to me, convinced me that Penn was the right place for me to be at this point in my career and I haven't looked back. I'm so excited to be here. I'm so excited to be working with these brilliant students who are literally working to change the world for the better. So yes, it's a time of great peril and worry, but it's also a time of great potential and opportunity, and I think that's what this fragile moment is all about. That's the moment we are in right now.

Alex Schein:

This concludes our episode on this summer's unprecedented weather events and the response to climate change. Special thanks to Professor Michael Mann for sharing his time and expertise. I'm Alex Schein. Thanks for listening. Be sure to subscribe to the OMNIA Podcast by Penn Arts and Sciences on Apple iTunes, or wherever you find your podcasts. To listen to previous episodes, including all four seasons of our award-winning series, *In These Times*.