

Transcript of “Gina Eosco, Social Science Program Manager at the Weather Program Office within NOAA's Office of Oceanic and Atmospheric Research in Silver Spring, Maryland”

Clear Skies Ahead: Conversations about Careers in Meteorology and Beyond

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Kelly Savoie:

Welcome to the American Meteorological Society podcast series, **Clear Skies Ahead: Conversations about Careers in Meteorology and Beyond**. I'm Kelly Savoie and I'm here with Rex Horner, and we'll be your hosts. We're excited to give you the opportunity to step into the shoes of an expert working in weather, water, and climate sciences.

Rex Horner:

We're happy to introduce today's guest **Gina Eosco**, the Social Science Program Manager in the Weather Program Office within NOAA's Office of Oceanic and Atmospheric Research in Silver Spring, Maryland. Welcome, Gina. Thanks very much for joining us today.

Gina Eosco:

Thank you so much. I'm delighted to be here.

Kelly:

Gina, could you tell us a little bit about what sparked your interest in science and how it influenced your educational path?

Gina:

Of course, yeah. Gosh, what a great question. I think I was always an inquisitive child according to my parents and according to what I can remember. I always had this zest for more information or asking questions. I do remember my whole childhood being while interested in science and interested in people as well. So it comes as no surprise that I ended up finding a way to combine both. My mother was a home daycare provider, which meant that from the time I was three, we had children from zero to five years old in our home. My mother didn't retire until I was in my late 20s. So I was very used to being around children, which made me, again, love people but it also made me love communicating information.

Gina:

I used to come home from junior high and high school and try to explain calculus to these three-year-olds. That was fun. The one memory I remember about doing homework with the kids was I used the phrase, "All right kids. I have to leave snack time. I got to go upstairs. I got to hit the books." And you could hear them ask my mom. They called her Tony, like, "Why is Gina getting her books? That's not nice. We're supposed to treat books with respect." And so we had to explain, "Well, that's an expression." So I learned at a very young age and throughout my teenage and adult years to communicate what I was learning.

Gina:

I think I really brought that experience to college. When I ended up trying to think of a path, I admit first I was more going towards psychology and then I missed doing chemistry and doing some of the science. So then I thought it was going to become a chemistry major. So I actually took two years of chemistry and physics and calculus, but then I missed the people. So ultimately, I went major hunting in undergrad and I ended up getting a degree in environmental science and policy because it really was a combination of both science what drew me to how does this world around us work? And also the world around us has both environment and natural pieces and these human components and I really just wanted to combine the two.

Rex:

So you mentioned you went major hunting after your first two years in undergrad. Were there any other decision points or could you elucidate or expand on how you switched your focus to science communication beyond the background you've already explained, which really does set us up pretty well. And then if you could tell us—part two of the question—what opportunities did you pursue inside or outside of school that you knew or hoped would be beneficial to securing a job in that field of science communication?

Gina:

So, in fact, I think I'm going to reverse them because honestly the interest in science communication, I don't think I knew I had it in undergrad. I think that when I look back on it all makes sense, but I didn't actually go like, "Oh yeah, I want a PhD in science risk communication." It was not on my radar in undergrad. So I actually think it was some of those early inside and outside of school experiences that you just talked about that really got me going on that. One was this: your mentors are everything. Sometimes you find barriers. Sometimes you find people that are clearly not going to mentor you. And to be honest, that was one of those experiences for me on my sophomore year of college.

Gina:

I was taking organic chemistry and I just was like, "All right. I'm going to do this. I'm going to be a chemistry major." And I went to the then undergrad advisor and he wouldn't even talk to me. He said, "Well, have you passed organic chemistry?" And I said, "Well, no, sir, I'm taking it now." And he was like, "Well, don't talk to me until you've passed that class." And that was it and the door was slammed essentially. I was really discouraged, and I admit that sometimes I do wonder, "Wow, what would've happened if that experience had been more positive?" But at the end of the day, I have no regrets because I love where I landed.

Gina:

So I say that as a point of encouragement to people who are listening that you're going to find really positive people along the way, but you may also find some people that may not help you along the way, but all of that helps you become who you are supposed to be if you will. So I kept pursuing policy interests at the time. So some of the internships I did, for example, there was a nonprofit—I think it still exists—called Taxpayers for Common Sense. That was a nonprofit I interned with for a semester and they taught me about policy and advocacy from a nonprofit perspective. Then I also interned for Congress.

Gina:

While I was in school in Maryland, I was from Massachusetts so I actually interned for still Congressman Lynch, who is still I believe in his position. I interned in his DC office and that was enlightening. And that's when I started gathering communication is really important to policy, but I didn't yet have that distinct interest with science yet. I was still trying to find my way, everything I did I focused on environmental science, but it still wasn't there. What really did it for me is when I graduated my first job, as some of you may know, it was just luck. There's this job posting on this career website with the American Meteorological Society. Yes, I know. I was thrilled because I did in high school. I had this interest in meteorology when I went major shopping, actually I should say this, I did look for meteorology, but the University of Maryland at the time now I'm showing my age did not have an undergrad meteorology program. They only had a graduate program. That has since changed, which delights me, but so meteorology wasn't an option when I was major shopping.

Gina:

It was either switch schools or pick a major at Maryland and my parents were much happier if I stayed at Maryland. All is to say, I got this amazing job with the AMS Policy Program as this policy assistant. That's when I started, frankly, I observing scientists and I laugh because my reaction at that time, and as my memory allows me to recall is scientists were excellent at science and some of them were pretty good at communication, but there was this inherent assumption at the time that if you had the ability to talk, you understood the science of communication. I was like, "No, that's not how that works."

Rex:

That's just a vocal chord.

Gina:

Well, right, exactly. And so I started just observing him. I mean, I was just so delighted. Bill Hooke was my first boss, Janina Fisher was there. These are folks that are still very prominent in the community. And they gave me so many wonderful opportunities to attend the AMS annual meeting. I had nowhere to go. At the time, the Social Impact Symposium didn't exist.

Gina:

So there was no home for anyone interested in social science at the time. So I found myself lost in the organization going, "Well, where does someone who's interested in policy or go?" Obviously, I'm really delighted to say since then, so many things have changed and I was involved in some of those early days, but I will tell you what did it. What really did it for me and it was the moment where I was like, I need to get a degree in communication. It really was an aha moment. I'm not just saying this because it's an AMS podcast. I'm saying it because it's true. It was particular features of the AMS community that led me on my journey.

Gina:

So it was, I think a 2006, maybe 2005 meeting. It was in Atlanta. So whichever one was in Atlanta, there was a session on Hurricane Charley. It was a CNN meteorologist who think his name was Chad Myers. I can literally remember this. I think Chad Myers was on there. I think maybe someone from the weather channel and then a couple government folks. And again, they were all talking about Hurricane Charley

and what happened with the Cone of Uncertainty and the track changed and they were talking about visual communication, science communication, risk communication.

Gina:

And again, they're experts from the point of view from a practitioner perspective, but there was no one on that panel representing the expertise of science communication that the theory and the knowledge behind it. I just in my very early career, very passionate way was like, "Well, that's just totally wrong." And I just remember going, "This isn't right." You can't just talk about meteorology and assume we know everything about communication. There's a science to communication. We need to marry them together. And that was this moment of going, "Oh my gosh, I need a degree in communication."

Gina:

Now, mind you going back to under grad, getting a PhD was not on my agenda. I thought I was going to get a master's in public policy. So hence that policy, the internships in policy Congress, advocacy, being a policy assistant for the policy program. None of these words had communication in it. So this was truly an aha moment for me. I remember going to a Summer Policy Colloquium Alumni Policy event that was organized by the policy program. I met, oh gosh, I should have written down her name. Oh, is it Christine Harper? Oh gosh, I hope that's right because that name just jumped out at me.

Gina:

Chris Harper, she's a historian of meteorology. She has amazing career. She heard me talking amongst a group and I was so nervous because I'm among all these PhDs and here I am this early career, I only have a bachelor's degree.

Gina:

Bill Hooke would say it just like that because that's how I said it out loud. I only have a bachelor's degree, does my opinion really matter? I remember Chris Harper going, "Wow, you have great thoughts. You need to get a PhD." And she told me who I needed to study with. "You need to work with Bruce Lewenstein at Cornell University. I thought she's crazy because I thought there's just no way I'm getting into an Ivy League school. There's no way I'm getting into Cornell. Remember that organic chemistry I told you I took? Well, those were the first Cs I ever got in my life.

Gina:

So I thought there's just no way. I have seasoned my transcript. There's no way I'm getting into grad school. That was the mentor I needed. She put her arm around me. She actually wrote one of my recommendations as did Bill Hooke. I put all my eggs in one basket. I only applied to Cornell and I got in and that really, she changed my trajectory.

Kelly:

So I have a question going back to having your undergraduate degree in environmental science and policy and then the switch to science communication. Now, what is the difference there? So what do people who work in environmental science policy do? What would be some of the career trajectories? Do you work with Congress? Explain a little bit about that and how you found it to be different than some of the things that you're doing now?

Gina:

Sure. Well, I would actually say I'm still using that degree and the things I learned from it. I used that foundational major of environmental science and policy to enable me use it. I still need to understand some of the physical science. I was a bit more applied than some of my colleagues in graduate school because of this deep interest in the environment and when I realized more that I could focus even more on meteorology, I again remember that passion from when I was a kid and in high school. I definitely honed it that I studied basically weather risk communication.

Gina:

I kept narrowing even further, which is typically something you need to do in graduate school. But going back to undergrad, and when I look at some of my other colleagues, oh my gosh, they went everywhere. So yes, some people became, and I actually remember interviewing in my early 20s for environmental legislative aid positions. Those are actually a title position in congressional staff offices. So that is one avenue. A lot of people went to climate change nonprofits. There's so many nonprofits that are looking for really wonderful people. You don't always have to have a PhD for that.

Gina:

There is value for being early career. I know this isn't necessarily solely for early career, but I want to emphasize that because not everything needs a PhD. For what I ended up wanting to do a PhD with necessary, but there were definitely avenues that you could go in different routes. I had friends who ended up at the Department of Energy working in a biomass fuel energy program, doing really NEPA, the National Environmental Policy Act. There's a lot of compliance laws and regulations that are related to environmental areas. So lot of people could go more the policy route, but then you could also go the environmental route.

Gina:

You could do water quality, air quality. So honestly, I could go on for hours because there are so many... The interdisciplinary degree program that I was in, honestly allowed you, it was almost a little overwhelming. It gave you such a foundation that your next step could be in 100 different directions, which honestly was great because I could catch the net very wide for jobs at that early age. I could apply to a lot of different things. It didn't mean I liked them. I didn't want to do water quality regulation at that point, because even though the chemistry side of that is water quality science is cool. Remember that at this point in my career, I was like, no, I need science and people. So I was tending more of that science policy route at that time. I hope that answered your question.

Kelly:

It does. Do you think most of the jobs that you mentioned would require a master's degree or is an undergraduate degree enough for some of those?

Gina:

Great question and I remember feeling this too. When you start applying for jobs out of undergrad, if you don't want to go straight through to graduate school and for the record, I didn't. I took three years off. I graduated in 2003 and I worked for the AMS for three full years before I applied to graduate school. So I started graduate school in the fall of 2006. So I did have three full years off. And oh, I remember my friends at the time, some of them were going to law school and they were like, "But you

didn't take the GRE what are you do?" They thought my world was over. Seriously, they thought I was nuts. Like, "What do you mean you're not going to take the LSATs? What do you mean? Don't you want options?"

Gina:

It was the end of the world to take time off. And yet I hope this will resonate with some. I just couldn't do homework anymore. I just couldn't. I was done. I had been in school for what? If you count kindergarten, 17 years.

Rex:

Gina, that resonates with me. I was done with homework. I'm currently in that interim period between my undergrad and my masters beginning in 2011. We'll see how long that interim period continues.

Gina:

Well, right. In case support, you're doing really well. So, this point, Kelly, back to your question is do you need a master's or a PhD? I think it really depends what you want to do in undergrad. I think gets you a stepping stone. One of the frustrating things is when you start looking for positions, it's like, sure a bachelors degree, plus three years experience. It's like, okay well. I just got out of an undergrad. Where am I supposed to get that experience?

Gina:

So for any earlier career folks that are listening, I completely empathize and I was there. And I laugh because I'm a xennial from an age perspective. I'm in between Gen X and millennial. So I had every technology in my senior apartment. I had the internet, so I was applying to things online, but I also had a fax machine because in the year 2003, we were very much like monster.com was the big job site if I'm totally showing my age. Monster.com and the online papers had really great careers. Like The Boston Globe, I was looking at Boston Globe. I was looking at the Washington Post career sections like LinkedIn. The precursor, like LinkedIn and Facebook, things like that didn't exist.

Gina:

So I literally was faxing my resume, sending my resume online through email. Every technology you can think of, I was utilizing. And so to that I say, for anyone listening, persist. You have to believe that someone is going to interview you. I had such a drought and then I had three interviews, almost simultaneously. One was very science oriented. It was, I think, in a water quality testing company. The other one was to be a legal assistant for a law firm that did environmental law. And then shortly thereafter, it was the AMS Policy Program assistant. Oh my God, I will tell you the water quality one, I walked out going, I really hope they don't offer me the job. I needed a job. I needed it, but I didn't get a vibe in that interview. I'm like, that's not for me.

Gina:

The law one, I haven't heard too many people have this experience. They brought me in for a second interview and they actually brought me in to tell me that they were not going to give me the job, but they wanted to see me. I know, this is crazy, but I thank them for this because they sat me down and they were like, "You are already overqualified for the position." They're like, "You would be so good for this that we'd love to hire you, but you're going to leave because we already know you are that good." It

was oddly humbling to hear that, because I'm like, "How do you know I'm good? I haven't had a job yet. I don't know what I'm good at. How do you know this?"

Rex:

It sounds like this law firm is the polar opposite of your organic chemistry advisor from undergrad in every way, shape and form.

Gina:

Completely. It was like, "Yeah, we're not going to hire you, but it's because frankly, if you had a law degree, you'd already be a lawyer." Not that I did not have enough but their point was I needed more space to advance. They saw abilities in me that frankly at the time, I didn't see in myself. As frustrating as that moment was, I remember calling my mom and being like, "I'm just so confused because I didn't get the job. So I'm still broke." I'm still like, "Oh my God, how many more monster.com jobs can I apply to?" And at the same time, I'm like, "I didn't hear anything overly negative."

Gina:

It was honestly confusing to me, but this is one of the other things that I learned is that you're going to get advice and you're going to have experiences that in that moment, if you try to make sense of them completely, you don't even have the capability to make sense of it then. You have to bookmark that moment and go, "I'm going to come back to that five years from now because this moment is a defining moment, but I'm not sure what it's defining yet." And that has been a theme of my career is, and I still have to work on it. It's something I consciously have to think about. I try not to think of my career in the lens of success. I like to think of it through the lens of progress, and they're related, but success to me is almost too burdensome.

Gina:

Like I have to succeed you. There's something I need to achieve. If I make it too concrete, you could fail. Progress to me is the add, subtractive success and failure. That is to say, I have this big goal. It's going to take five big steps to get there metaphorically, of course, and you are going to hit hurdles. The very nature of life is life. It's not going to be a linear track to get there. So I started real and I had a lot of that. I won't go into too much detail. I had a lot of hurdles in grad school. Nothing was easy, nothing.

Gina:

I had advisors that left. I had department chairs that died. I was sexually assaulted. You name it, it happened. And I say that openly, and I can say it proudly because were those setbacks? You sure bet they were, but I still persisted and I still got my PhD despite all of the hurdles thrown at me, but I don't say I succeeded. I mean, I did when you think of the definition of it, but I see it as I progressed and I persisted because I have passion. Because not everything's going to make sense when you're going through it. What you need to realize, what I needed to realize was I think of it as art or abstract art.

Gina:

And as you go through your career, you start throwing paint at the canvas. And well, it's really abstract art, because guess what? You're going to have multiple layers of paint on this canvas, because life we're going to keep throwing paint. Some of it is going to be brighter days. Some of it might be darker days. Some of it might be swirls of mixture of colors that you're not just a rainbow and that's life. It's going to

be that mixture of all that. And so that's really how I look at the lens of my career and how I got to where I am in science communication. It was the same way.

Gina:

It was the negative chemistry advisor. It was this positive person who did not give me a job, but then it was also the Chris Harpers of the world who were like, "Oh my gosh, you've amazing thoughts. Have you thought about getting a PhD?" And I was like, "No, I hadn't." It's the summation of all of these things that made me who I am.

Kelly:

Yeah. And you had challenges and you overcame them and you had positive people in your life and those that weren't so positive. So you told us about your job at the American Meteorological Society. What was your progression that led you up to your position at NOAA?

Gina:

Yeah. I mean, what a track I'll try to do this succinctly. So first of all, I want to actually go back to my AMS position and what it did for me and why it was an amazing experience. I ended up working part-time for the AMS throughout a good portion of graduate school as well. I do not have any degrees in meteorology and the other not so fun fact about me is I've also never taken a meteorology course. Again, UMD never offered it. I like to say I went to the school of AMS because while I was there, Dick Hallgren, who's a former National Weather Service Director and I believe a former Executive Director of AMS. Is that correct too?

Kelly:

Yes.

Gina:

I believe I have my history right here. Well, Dick Hallgren was coming into the office every day. And let me tell you, you gain pretty good education on meteorology when you're sitting next to a former National Weather Service director. So in many ways I went to like the school of Dick Hallgren. He would tell me things about meteorology. So I learned things from him about the science of meteorology, but I also learned about the science, if you will, of operational meteorology. So, the practice of it and the organizations that are involved and obviously being in the world of Bill Hooke, oh my gosh, he is still my mentor to this day. We still have virtual coffees in the pandemic, just a lens in the experiences I had there.

Gina:

It gave me an education that I'm so thankful for, because I'm not sure you could get it from any other degree. What I mean by that is I got to learn the nuances of the AMS community, public, private academic. Some of the incentives in the ways that these sectors think. And of course, it's not completely generalizable but I got that foundation and having that as an experience. We worked on things like a road weather policy forum. So I got to work with people at Federal Highway Administration and state DOTs, and I got to learn about RWIS, Road Weather Information System. You probably have seen them on the highway. They're inserted in the pavement, but off side to the highway basically looks like there's a weather station there with a solar panel and yeah, that's giving data.

Gina:

So at this very young age, I understood the value of why we need physical observations of our environment. I understood, or at least I wouldn't say I understood, but I had awareness of the intricacies of federal, versus state, versus regional, local governance. I had some observations and experience of watching academic private partners all work together towards this common goal. So when I ended up deciding to get a master's and a PhD in weather risk communication. That was an amazing experience because in order to study communication, you also need to acknowledge that messages come from many sources.

Gina:

And in this case, perhaps not as predominantly academia, although with the rise of social media, I would say they are coming from academia as well. But when you think about dissemination of weather information, yes, they start with the watches and warnings from the Weather Service. But they're also further... That information is completely enhanced and you've got private sector meteorology also giving up forecasts. And then you have the amazing private sector dissemination teams. Our broadcast meteorology, our TV partners, the Weather Channel, Weather Nation, AccuWeather, I could go on.

Gina:

So the fact that I had this really organizational understanding of our community actually, frankly, gave me a leg up from an applied communication standpoint that I could really understand the intricacies of communication in a way that my grad school colleagues could not. I'll never forget. I did Chris Harper told me I needed to work with Bruce Lewenstein. He was indeed on my committee and he was one of the first faculty members TA'd for. Immediately, he was like, "Eosco, you're you're doing a one hour lecture this week." And I'm like, "Oh boy." Talk about throw me in the deep end. I'm like, "I don't know anything about communication yet." And he is like, "But you do." He was already from day one trying to build my confidence. He's like, "You do, and actually the information you have, no one else does." And so my PhD experience was amazing. I studied the Cone of Uncertainty, which as listeners probably know, is the very common hurricane track graphic.

Kelly:

Yeah, exactly.

Gina:

It literally looks a little bit like an ice cream cone. It represents the average track error over the last five years. And those five years change to the track error changes over that time. A Hurricane Center does such a fantastic job and I studied what that meant and how people were perceiving that information. Some people called me Dr. Cone of Uncertainty. Because I have a love, I have a love for the cone. One of the other things that I loved about working for AMS while I was in grad school too, is grad school was heavily theoretical. The theory of risk communication. The theories behind risk perception, but I always had a hand in communicating what I was learning.

Gina:

So I would do talks as a grad student at the broadcast meteorology conference. I would go to tropical meteorology, all these different types of opportunities where I could expose the meteorology community to the science of communication. Because remember, when you go back to that 2006, I think it was 2006 Atlanta meeting. It was like, whoa, people where is the science? This is what we should

be studying. So I always had this passion for both research, but making sure that I married it to practice, which lends me to the primary point of your question is how did I end up where I am?

Gina:

Well, really good mentors, Bruce Lewenstein. I remember having a meeting with him towards the end of my PhD. I had basically been offered a job by a company that I had been consulting with called the Eastern Research Group. I was really excited about it. I really loved consulting with them. They were really great colleagues and they did a lot of National Weather Service work, which was really exciting. But there was this pressure in graduate school that when you get a PhD, you go into academia. I was different. I say that while I think I realize now it's a good thing that I'm different. Isn't that how it felt then? I always felt like I was the dumbest person at Cornell kind of thing. I'm like, "All these people around me. Oh my God. They're so smart. They're so good at theory. They were so good at writing papers and I'm not."

Rex:

That's what they, I think, I don't know when this term started, but now imposter syndrome is what I think we would call that totally.

Gina:

Oh yeah. Totally. Oh yeah, completely looking back on it.

Rex:

At the time was that something that was used, that expression or something similar? What did your mentors that helped you tell you when you said, "Oh my God, I don't feel like I belong."

Gina:

Well, it was mixed. I'll be honest, it was mixed because some of my faculty members were really heavy on the theory side. This person to be very clear was not on my committee and I will not use names to protect them, but they called me a theoretical in a theory class. They flat out mocked me in class and maybe they didn't think they were mocking me, but that's certainly how I felt. It was like I get it. I get that I'm supposed to be learning about theory, but why does your love of theory have to put down the fact that I want to transform a whole community? That's my big goal. I don't know what day I'm going to get there. I'm not even sure I'm there yet because I have so much more I want to do but I think I have. I think I have to admit, I've got to...

Gina:

You always have to reflect on what you've accomplished. I do think I've already made a mark on this community, but I'm totally not done. There's so much energy left in me. But I think having that constructive criticism, I get it. At the time I was, I can look back on it now and be like, wow, like I was a theoretical because I didn't yet understand what a theoretical lens met at the time. It was my first semester. I had come from an environmental science and policy background. I didn't come from a communication background. So that was hard. That the hard transition to do that, but I think the people on my committee, Katherine McComas, Bruce Lewenstein, Cliff Scherer, they were my champions.

Gina:

Yes, I still needed to build my knowledge of theory, but they knew that this young woman had a spark for applications and we need to nurture that and that's what they did. They nurtured me for that. And so when I got this job offer and I went into Bruce's office and I was like, I feel like a failure. I feel like I've let the program down because this is not an academic offer. I'll never forget what Bruce said. He leaned back in his chair and he took a moment to find the words. And he was like, "Gina, if that's how you feel, if you feel like a failure in this moment, because you have a really good job offer, then the only one who has failed is us. Your faculty, this department has failed you if you can't see where your strength are."

Gina:

That was not the response I was expecting. Of course, it was a beautiful one. I was like, wow. Okay. And he was like, "Gina, not everyone needs to go into academia." And he's like, "While I think you would be great if you did, I also think you would be great doing the work that you're doing in a different setting." And he's like, "I absolutely think you should take the job offer." It's not like he made the decision for me, but it certainly helped me come to grips with my own decision of okay, so it's okay to not... And this is something I'll share. This isn't unique to Cornell. It's academia. Traditionally, academia prepares you for an academic track.

Gina:

I've talked to lots of other PhDs in the AMS community who felt the same way that talking about government opportunities or private sector opportunities are not necessarily talk about a lot and so it's just wonderful to see what has bloomed with the student conference, in the early career conference over the last 15 years, because we are nurturing that now. We are making sure people know that there are multiple tracks. There isn't just one track. The student conference had just started. But again, it was still growing.

Gina:

In fact, in those early years, I ended up jumping on the bandwagon. I actually joined the student conference planning committee. I don't know if people know this history of the early career conference. The Board and Early Career Professionals started out as a subcommittee on the AMS membership committee. I was the chair of that group because I was advocating for the things that I was experiencing. I'm like, "The student conference is great, but at the time it was much more geared towards undergrads."

Gina:

And so there was really a gap for people that were in our community that had gotten early career jobs, but then wanted to go back to grad school and there also needed to be more for graduate students. So this sub committee on the membership committee, we ended up being the precursor too and the advocacy for what is now the Board and Early Career Professionals. And under that we started, if people recall, I know it exists in virtual form the last two years, but that big Sunday night, early career reception, yeah. That started with our committee. And so those are the things I look back on where I am proud. I left a mark on AMS, even though I'm no longer involved in those boards. It was time for me to move on and time for new people to come on board.

Gina:

I tried to learn from the challenges I had throughout my career and go, AMS can play a role in helping us fix this for others. So what I experienced doesn't mean someone five years after me or 10 or 15 years. They don't have to experience the same thing. We can find resources to help and I just think, oh, the folks that are leading those efforts now, they are just fantastic. Those conferences have bloomed in a way that I don't think any of us could have even foreshadowed 20 years ago. It's just fantastic.

Kelly:

Completely agree with that for sure.

Gina:

Oh my gosh. It's amazing.

Rex:

We can guarantee that the Board of Early Career Professionals is flourishing. Certainly, I'm sure anyone would acknowledge your contribution and thank you so much for that, and they're doing wonderful things. Now they're extremely active and I encourage anyone who is interested or would seek their advice or guidance or just friendship to find ways to get connected.

Gina:

They have thought of things I never would have thought of 15 years ago. They really made it what it is. I'm happy to have played that early role of fighting for space for that early career space, but really the folks that took it over, oh my gosh, they've really done a fantastic job. I'm so thankful for that because I think there's an impression that there are some, especially in academia, it's like, well, I went through this tough roads, so my students need to experience it too. And my mentality is, well gosh, if we can make the road ahead slightly smoother why wouldn't we take that opportunity?

Gina:

So I'm really glad to see AMS play that role. So to continue on, I went to ERG, did a lot of that work and I'll sum it up as this. I did a lot of applied work on a variety of National Weather Service products and services in which the Hazard Simplification Project was one that looked at evaluating the watch warning advisory system from a social science perspective. I was one of the lead contractors on that. Definitely not in charge from the government side, only from the research side of it. Holistically, working in all these projects gave me a perspective that I don't think I could have ever seen otherwise.

Gina:

What I mean by that is doing product centric work is amazing, but you start seeing holistic problems when you've worked on a lot of things. I have a very concrete example for you that centers should be able to visualize. When we talk to Weather Service partners about graphic design, they love radars and they love rainbows. We're obsessed with rainbows in this community. Whenever we would ask for how do you think this should look? Immediately our partners, our emergency managers go, oh, we'll just use rainbow colors.

Gina:

So we would try a variety of things, but ultimately the top vote of visual design would be the rainbow colored one. Well, here's what's problem with that here. Here's the challenge. When you have a rainbow colored intensity graphic, a rainbow colored timing graphic, a rainbow colored probabilistic graphic. I could go on. Guess what? They all start looking the same. So the challenge here is which one's intensity, which one is timing. Turns out timing has no color. That was something we learned. Fun fact that needed to be color agnostic. It needed to be transparent. But I digress.

Gina:

The point is that I started seeing things across social sciences that started leading to me. I really didn't even know it at the time, but I was building organizational skills for social science. I was beginning to see, we need to coordinate these projects. We really need to push the boundary. We can't do these in isolation. We need to start looking them as a suite of knowledge. What are we learning holistically? And it was through really my wonderful work at ERG.

Gina:

I so enjoyed it that I started developing this great interest in how do we build out social science at a larger scale? How do we nurture research in this area? How do we think about it holistically? How do we transfer knowledge? How do we think about research to operations? And that's what led me to moving to NOAA, into what the Weather Program Office. We were formally called the Office of Weather and Air Quality for listeners that may recall it under that name.

Gina:

We are now the Weather Program Office. I came on as a contractor in, gosh, I think it was the summer of 2017. I became a fed in June of 2019. It's hard work. It's really, really meaningful work. It is hard work. It's different. When you're at this level, it's a lot of what is a day in my world like meetings, all meetings. In a virtual world, my meetings start somewhere between 8:00 to 9:00 AM and somewhere between 5:00 to 6:00 PM and that changes because we've got colleagues in different time zones and you try to adjust your schedule as best you can. That has been hard in the pandemic to not work 10-hour days.

Rex:

So Gina, you've done a wonderful job of segueing yourself right into my next question. So clearly you're a wonderful communicator because you're leading this conversation like a pro. So my question which you began to address was what is a quote-unquote typical day on the job like as the social science and facet program manager? Let's start with the basics. FACETs I'm saying is a acronym, F-A-C-E-T with the lowercase s. Explain that and then continue with what it's like on the job for you.

Gina:

Great question. I'm typically the facilitator. So I'm not used to being facilitated. My apologies.

Rex:

Not needed.

Gina:

Yeah. So FACETs stands for Forecasting a Continuum of Environmental Threats, and it's a framework. There's a really great BAMS paper. I forget what year is it. Is it 2017 or 2018 that it came out on FACETs. Strongly encourage our BAMS readers to go and check that out. It is a framework that is really supposed to marry physical science with technological innovation, with social science. At its core what it's about, let me see if I can do this on one try. It is about using calibrated probabilistic information of the environment in this case, in the weather domain of our atmosphere. So calibrated probabilistic information of our atmosphere to help us produce meaningful information. I'll define that in a moment, meaningful information to help empower protective action response.

Gina:

Now, a lot of those words are vague. Okay, they're ambiguous, but it's on purpose because in some ways, FACETs could be about providing probabilistic information through the lens of actually providing probabilities. And there are tons of users that want raw probabilities. For anyone listening that doesn't believe me, let me please emphasize. There is sound social science research that publics and partners can understand probabilities. And also our communication can be enhanced by using probabilities. And what you're probably thinking is, but they need to communicate it differently.

Gina:

Well, you're not wrong. There are a variety of ways of communicating that information of which our FACETs community works on. So what's so cool about probabilities on the physical science side, it allows us to see what's possible in our atmosphere. It allows us to see potential anomalies in our data. It allows us to see distributions. It allows us to see what's most likely their worst case scenarios. And there are indeed a lot of different ways to convey that information. So what does that word meaningful information mean? Well, it's ambiguous because it can't just be meaningful to the forecaster, to the meteorologist. It needs to be meaningful, both from a physical science perspective, but meaningful to the user, to the receiver as well.

Gina:

And so what meaningful information means is going to change based on an audience. And so that is why there are a variety of ways of communicating this information. The protective action response, I like to use the phrase empower. Notice what I didn't use. I did not use the right action. I used empower, protective, response because I don't know where everyone is when they're receiving a weather message. So what quote-unquote, the right response would be, I'm using bunny rabbits, ear quotes here. You can't see me do it, but please know I'm doing it. What is the right response? What type of home are they in? What type of structure are they in both for a really strong hurricane or a tornado?

Gina:

I don't know. Are they in a car or in a business? I don't know. Therefore, what is right isn't really up to me. What I want to make sure we're doing is empowering that effective response. So, the FACETs program is really about marrying these features. It's also about thinking about a continuous flow of information. That is to say we have, again, in the National Weather Service products that are issued at certain times and probabilities can help us fill some of the time in there. We could provide more continuous type of information and the way in which we think about that very much differs depending upon the hazards.

Gina:

So there's really no right way to FACETs, if you will. There may very well be some ways that are better than others based on where the valid reliable science is. Calibrated probabilities is obviously science on that. So there are some better approaches for that, if you will, but it's really about the marriage of physical social and technology sciences all together. So they gave me that program because as a social scientist, and because I also oversee the social science program, they felt that is the best place for that program to be because I can help nurture and make sure that social science is integrated in that framework in people's thinking. We're very well covered in NOAA on physical scientists. We have a lot of physical scientists. We are short on the bench where for social scientists. And so I think they saw me as a potential leader in combining both of those programs together.

Kelly:

Gina, communication is your strength. What are some ways meteorologists can more effectively communicate on aspects of weather and climate?

Gina:

Oh gosh, that's a big question. Well, obviously one of the things I would say is there's never a one size fits all. I think in fact, we have so many amazing practitioners in this community that I think we do really well with the practice of communication. I will say, based on my experience and of course, research and expertise, I think that could sum it up in a few concise points. You say what you know, say what you don't know and make sure you let people know how to address the risk you're communicating. At its core, risk communication isn't just about telling people, oh my gosh, there's this scary thing that's going to happen that could impact your life or your home. It's not just the risk part, but it's the risk plus the, "Hey, we're giving you this information in advance because there are things you can do."

Gina:

So you want to make sure that your audience has a sense of efficacy, that they can respond to that risk, that they know how to alleviate it and empower themselves to take protective action. So say what you know, say what you don't know and that includes communicating probabilities. I think we might have talked about that earlier in our conversation a little, but it's worth repeating that the research does show that including probabilistic information does enhance decision making. I know, I know there are probably some listeners going, "But Gina, people don't understand probabilities." And the reality is well, people understand them better than you think.

Gina:

And also though, one of the ways in which you can share probabilities is by communicating it with words. So when we say there's a low chance, well, as a low chance, 10%. So in other words, don't just give them the probability, but also anchor it with a word that goes with it. A word without the probability leaves it up for interpretation and so some people might think a low chance is, well, that's got to be like 2%, not 10%. 10% is huge and that's part of our challenge is that we're all calibrated to different levels of uncertainty. And therefore, we think a certain percent of a risk is riskier than others because we're all different.

Gina:

So say what you know, say what you don't know, and that can include communicating uncertainty in a variety of ways and make sure to communicate the protective actions. How people can respond to that risk, if I had to put it in a nutshell.

Kelly:

In your research, did you find that maybe certain audiences or maybe people from different parts of the country respond better to certain kind of messages than others?

Gina:

Oh, that's a great question. So I couldn't say with utmost certainty, I see this is where the word uncertainty gets in there. However, when you look across all of social science research, there is certainly evidence that there is increased comprehension in some hazards and in some areas. And in fact, I think we were also going to talk eventually about the Hazard Simplification Project. And in fact, it's really fun to answer this question in relation to that. So one of the challenges with thinking of about simplifying our warnings is that we have a variety of warnings, watches and advisory.

Gina:

I think as of just a few years ago, I think there were 124 total watches warnings and advisories of which the National Weather Service is making some major changes there. I can't speak specifically to their efforts now, but when I was involved in the project, one of the things that we really wanted to make sure we gave care to was that there are particular parts of the country by the very nature that they experience particular types of hazards. They're really pretty savvy in some areas.

Gina:

So for example, what we saw was that there could be really decent comprehension of the difference between watch and warning for tornadoes in the Central Southeastern part of the United States because of high levels of experience. Conversely, or I should say, additionally, really great understanding of say winter storm watches and warnings say from where y'all from, right. New England, Boston area. You have a lot of experience in that, but sometimes the definition of those words do change shape based on the hazard, which actually happens by design.

Gina:

For example, when there is a hurricane watch, that means we're very confident or at least fairly confident at a... Let me put a number to that, 75% to 90% level here, something's heading towards the coast. Don't quote me on those numbers, because I'm for the sake of conversation. Please go to the National Hurricane Center for direct information on the definition of a watch. What I mean by that is though is the risk exists and there's very high confidence that it is going to hit a community. So you can see the risk. You can look at it on a satellite. Conversely, though, when you think about a tornado, during a tornado watch, you can't look at the sky and go there it is. You can't see a satellite picture and say, there's the tornado. It's a different type.

Gina:

The tornado watch is basically saying the criteria is present in our atmosphere that something could happen in the next few hours. It's still high confidence because our experts, our meteorologists can see things in the data, but we humans with their own physical eye when we stare at the sky, can't see it. So there are these really qualitative and very substantive difference is between different types of hazards on the way these words mean, and therefore we have different parts of our country that are very well versed in the areas in which they experience those hazards more.

Gina:

So there are definitely challenges with high comprehension and low comprehension, just because a relationship with experience in relation to probabilities, I would say that I can't really put a category on it. What I would say is there's some really neat research that is ongoing on what is called numeracy. So the same way there's literacy abilities to read, numeracy is your ability with numbers. I don't even know if I would put myself at a highly ate category. I work with all these different probabilities. I don't know about you, but when I see probability, sometimes I really need to think about them before I know... I have to spend a good amount of time on them.

Gina:

But again, when I see a word associated with a probability that helps me, I can process that faster, because that in that way it helps you comprehend the information. But numeracy is this general skill of how good or comfortable you are with numbers. And what researchers are finding Dr. Joe Ripberger has done some work at this at the University of Oklahoma in the tropical domain. He has been looking at something called weather numeracy. So literally our skills and abilities to understand probabilities in the realm of weather at pretty, pretty straightforward. So probably not at all surprising. Some of this work showed that well, forecasters are pretty weather numerent. They work with all of this. They're really comfortable with that. What was interesting is a general public, a view of that when you look at the curve, if you will, of comprehension when you compare publics to emergency managers, to forecasters, we saw that general public did need some aids, meaning they were lower than forecasters. I'll put it that way.

Gina:

They needed more comprehension aids. Now that doesn't mean they can't understand it, and it doesn't have to do with how intellectual you are either really smart people can not always think very quickly with numbers. And so it has no tie to again, your intelligence. It just has to do with how comfortable you are with those numbers. So we did look at emergency managers as well. And so you'd put emergency managers when we looked at the graphs in between general public and forecasters, but more akin to public. That is to say that group of users also needed some comprehension aids, but some of the subset of folks that are in that community also had skills that aligned with forecasters.

Gina:

So I think what that tells us is that it really depends on how often you work with this information, whether it's part the structure of your job, that you're really using that information in a highway or if you are using it and you're taking information and then you're processing that through other channels of your work. So we've seen that there are ways to help people who may not have high numeracy skills. If you don't have high numeracy skills, there are ways that we can communicate differently. And that's the

type of work we want to work on to make sure that as we provide even more best practices on communicating uncertainty, that we have those types of comprehension aids of what would help people overcome any numeracy challenging and still get high value out of the information.

Kelly:

Oh, there's hope for me. Yeah.

Gina:

Oh, there's so much hope.

Kelly:

I'm not a numbers person.

Rex:

Just to define probability for folks. It's the likelihood of something happening between zero and one, correct? Expressed mathematically.

Kelly:

Oh, so now you want to get into a statistics discussion now. I didn't sign up for that.

Rex:

Probability is a numerical representation of the likelihood of something happening, correct?

Gina:

I believe that's fair. Gosh, don't make me pull out a statistics book.

Rex:

Here's what I'm getting at is you were talking about numeracy as opposed to literacy and combining multiple forms of cues. and so the classic example of probability is a coin flip. Is 50/50 heads or tails. But as soon as you get beyond a coin flip, it becomes increasingly more complex. I found that the color red tends to always mean danger or pay very well attention to me. So I think for instance, seeing something that's more likely to happen in red and something less likely to happen in a pleasing shade of green.

Gina:

Oh, I love that you brought up colors. Okay. So to any of our listeners, I want you to do something I'm going to say, and you all should do it too. I'm going to say a phrase and you tell me what color it is.

Rex:

Okay. Go.

Gina:

Uncertainty.

Kelly:

Yellow.

Rex:

Blue.

Gina:

Interesting. Kelly jumped right. Kelly was like, "I know what I'm thinking."

Kelly:

I'm thinking caution, but it's not red or green.

Rex:

I went for blue because I felt it was a neutral color. It's just all around us, like the sky, but it doesn't really mean anything most of the time.

Gina:

Wow. This is so interesting. Okay, so next activity draw uncertainty.

Rex:

Question mark.

Kelly:

Yes. That would be something good. Yes. Question mark.

Gina:

So I do this with audiences, wherever I go, because it's just a lot of fun. First of all, you all are very different. Typically, my most common color for uncertainty is gray because...

Rex:

Oh, gray area.

Kelly:

Oh, nice. Yeah.

Gina:

But I love, I love what you all said. The most common graphic image that is drawn, picture of that is drawn for uncertainty is indeed question mark. I did have one audience member draw an airplane and I was so intrigued and I asked them why. And they said, "Well, I don't like that I have no control because I'm not the pilot and so I feel very uncertain when I'm on an airplane." I just thought that was fascinating. And so it, first of all, it goes to show that we do all think differently. This was a great example of that, but it also shows that there's no one color for all of these things. And so I think it's

really interesting that you bring up colors here too, because colors relate to the hazard project that we worked on as well.

Gina:

We did some early color work when we were doing that hazard simplification efforts. And it turns out that while there are some similarities across the population for associating color with extreme hazard, like red, it is actually not uniform. Red purple black. And even sometimes white were those top tier colors. It turns out there are also cultural differences and I don't recall which one, so I don't want to misspeak, but there are cultural differences on which colors are harm versus which colors are peaceful. And so it goes to show that there's absolutely nothing simple about simplifying hazard communication.

Gina:

Well, the name is misleading. That is to say there was an effort and there still is an ongoing effort to simplify hazard messages, but to come to the decision for what to simplify, how to simplify simple is not easy. And that could probably sum up all my years on that project that could sum it up. Simple is not easy. And again, it goes back to one size doesn't fit all and it becomes very difficult. And the other thing too, and I can't recall if I gave this example already or not in our discussion, so I'm sorry if I'm repeating it. But one of the other things is that we often use colors to convey lots of different things. So intensity of winds, the chances of experiencing tropical storm force winds.

Gina:

We use color to denote categories of a storm prediction center outlook. So we use to denote increasing something, increasing intensity, increasing amounts. Snow amounts are in colored bins and that's very useful. That's a very nice geographical visual way of showing those different intensities using different shadings. However, when you're looking at multiple items at the same time, if they all use say the rainbow colors, I've got five graphs that I'm looking at and they're all rainbow colors, which one is which. Which one is about the amounts of flooding versus the amount of chance of feeling a wind or the category of our severe weather outlook.

Gina:

And so you end up getting rather, well, you can get confused if things aren't properly labeled. And so sometimes I know this community does love rainbows, but sometimes using those rainbow levels, isn't always the right approach to help comprehension in the decision making environment, if you're looking at many different colors. So it's challenging, not only that when it came to our warning system some people had suggested, and it's a good suggestion. It's not a bad one. It's a great one to use colors instead of words. And the challenge was that is we're not the only one who would be doing that.

Gina:

So emergency managers, for example, have their own categories that they take weather information and they have different levels of alert or Department of Homeland Security after 9/11.

Rex:

DEFCON.

Gina:

We had those colored. If we have three different level oranges, but they all mean something different because it's issued by different agencies, well then again, that starts becoming confusing again. Again, it points to simple isn't easy? That's the gist, but it's all useful and it's a matter of finding out where, and when different colors, different words using probabilities. It's all about finding the right fit for your audience. No one size fits all but the most optimal fit maybe is a better way of saying it.

Rex:

Yeah. It's really interesting. I'm going to ask you just a couple more questions about the Hazard Simplification Project. I did want to point out, as you mentioned, the Homeland Security and DEFCON, it's funny, again, just those two systems use different color scales with, I believe DEFCON one is white, Homeland Security Advisory System, Severe is red. And then there was an orange and yellow, blue green, in fact, in DEFCON blue is below green. So there's some differences even there within the same relative group of military terms. But I wanted to ask you on hazard simplification, when did this effort begin briefly? And then when were you first involved with it and what were you proudest about in your contribution to the effort if you could?

Gina:

That's a great question. I mean, it probably precedes my involvement, I think is the honest answer. Okay. The National Weather Service was definitely working on it before I got involved as a contractor. So I got to give kudos to the Weather Service for working on this. My involvement was somewhere in the vicinity of—I think—2013 or 2014.

Rex:

And what were you proudest about?

Gina:

Yeah, so I think the proudest thing that I think back on that was working closely with the Weather Service in giving voice to our audiences. And what I mean by that is really helping to make sure that there was rigorous social science research conducted to back up any decision that the Weather Service... I didn't make decisions, whatever providing them the evidence that they needed to make decisions. Because I think the things that we've talked about as part of this conversation, it's so true, there isn't one size fits all and yet the challenge is, and yet there can only be one system. So that system can have a variety of ways to communicate. But the watch warning system does have to function for all right.

Gina:

Even though we know it may not work for literally everyone, we want to try to optimize that system for as many people as humanly possible. I believe that the research we did to help inform that did just that. I was very proud that we helped them.

Kelly:

Did they actually make any changes due to the outcome of the research?

Gina:

They certainly are. I'm not necessarily privy to all of them, but I know they are making changes. Yes. I would welcome you all to do a podcast with the Weather Service to make sure you get their side of the story because I wouldn't want to misspeak on any of that, but the answer is yes. They definitely are moving forward. These things take time though and probably it's much slower than people would like in large part because these changes have to be hardwired in software systems. If it's something new, we might need training or partnership meetings. And so I believe that while it may be too slow for some, I'm just delighted to see the Weather Service move forward. I'm very proud to have been involved for the years that I were and I know that it's in great hands with the National Weather Service.

Rex:

So I would encourage our listeners to go to weather.gov/hazardsimplification to see a project overview as well as the progress in different areas of that program.

Kelly:

So Gina, thank you so much for all the insight and telling us about your research. But before we end the podcast, we always like to ask our guests one last fun question, unrelated to meteorology. I'd like to ask, what is your favorite movie?

Gina:

Oh, fun question. I hope I don't talk, talk too long about it because I have a lot of favorite movies. I mean obviously I think we all have to say *Twister* because if we don't, we're kicked out of the fun club. So *Twister*, but on a more serious note, there's a really great movie called *The Adjustment Bureau*. For anyone listening, this is not a rom-com, there is some romance in it, but it's not a rom-com. It is high intensity movie. One of the reasons why I like it, I don't want to give it away for people who haven't watched it, but one of the reasons why I love it is I think that the storyline, while it's about love, there's a parallel to it about your career as well.

Gina:

That is to say sometimes we are born into something, expectations around us. Maybe our parents had an idea of what we want or maybe we had an idea of what we wanted starting from age five. For example, I hear some people go, "I wanted to be a meteorologist ever since I was age five, but now that I'm in it, I don't know that it's exactly what I want to do." And sometimes that can be a really hard experience. It's not a lesson per se. It's hard to address yourself and go, but this is what me of all these years has wanted is just what I should be doing. Is it what I want to do? And so sometimes there's a path for you because of opportunities you've experienced. And sometimes there's a path for you because it's what you want. You can change that path at any time and if none of this is making sense to you, watch the movie because-

Kelly:

I will definitely watch this movie. I haven't seen it yet. So I'm intrigued.

Gina:

It gave me goosebumps. Actually, even though I know what happens and I still like, "Oh my God, what's going to happen at this point?" I'm really, really trying not to give away details that would... There are going to be moments in the movie where you're going, "Wait, who's this person?" And it just all magically makes sense at the end. Again, I challenge you to not see a parallel. Yes. The story is about love, but the story can be used to describe so many other things. It's a metaphor for me, a lot for careers. Even my own now, where will I go next? I don't know. Is it written for me? Does someone know it? Is there a crystal ball, but I don't have it or am I drawing my future? The truth is we're all drawing our future, but there are always social influences. There are always things that pressures that we feel that we should go this way or that way.

Gina:

Again, it'll all make sense. Some of you're probably listening and going, oh my God, I've seen that movie and I get exactly what you're saying. And for those who haven't, please go. I don't know if it's on Netflix right it now or not, but go find *The Adjustment Bureau*.

Rex:

Well, Gina, thank you so much for taking us through your start as Dr. Cone of Uncertainty, taking us through your work for AMS policy, your PhD work, your work with NOAA, empowering protective responses and everything else you've described in addition to the Hazard Simplification Program. It has been an absolute honor to speak with you. Thank you so much for your time today.

Gina:

Oh, thank you all so much. It's been an honor to share my story and I hope it inspires others. I look forward to listening to the podcast to hear other people's stories as well.

Kelly:

Well, that's our show for today. Please join us next time rain or shine.

Rex:

Clear Skies Ahead: Conversations about Careers in Meteorology and Beyond is a podcast by the American Meteorological Society. Our show is produced by Brandon Crose and edited by Peter Trepke. Technical direction is provided by Peter Killelea. Our theme music is composed and performed by Steve Savoie and the show is hosted by Rex Horner and Kelly Savoie. You can learn more about the show online at www.ametsoc.org/clearskies and can contact us at skypodcast@ametsoc.org. If you have any feedback or would like to become a future guest.