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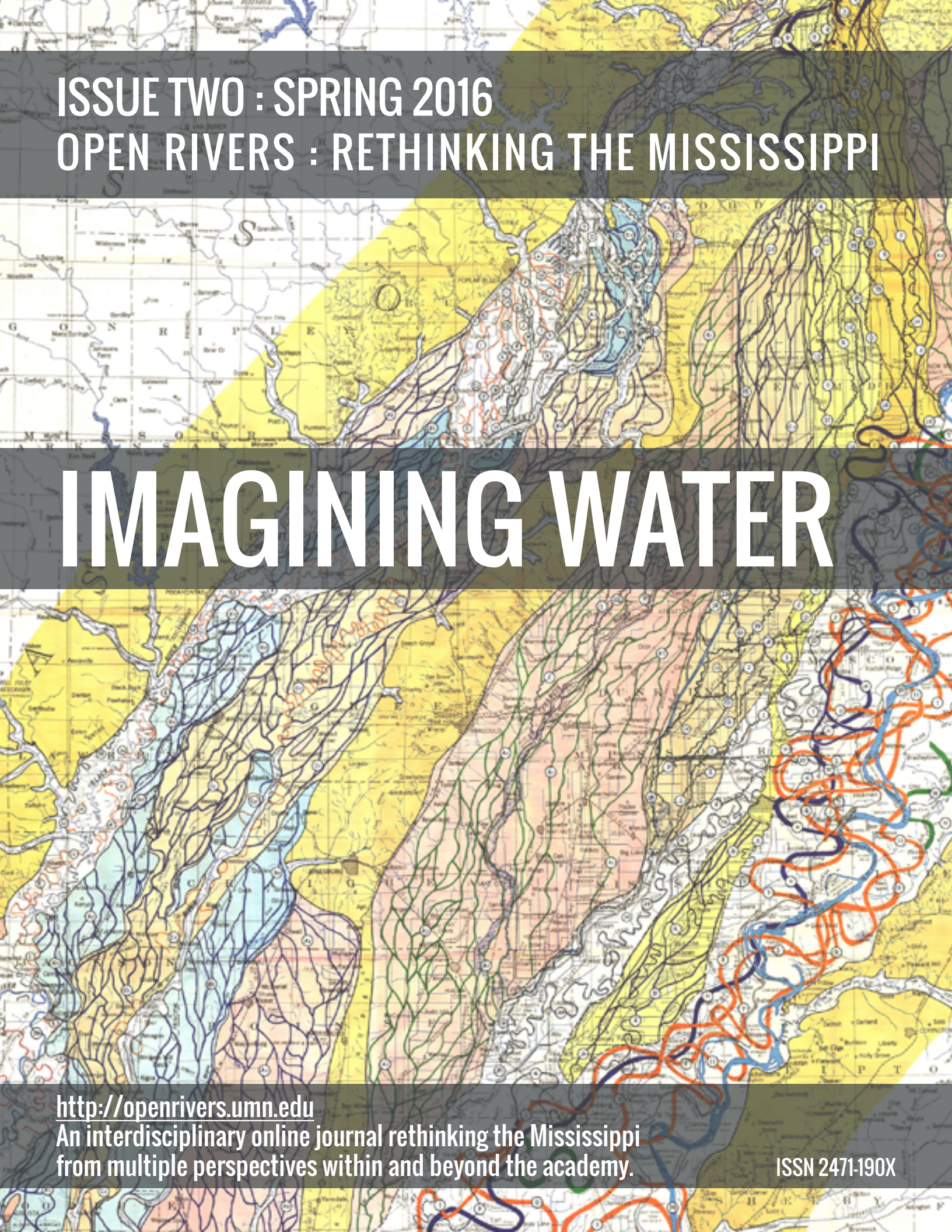
OPEN RIVERS : RETHINKING THE MISSISSIPPI

IMAGINING WATER



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from multiple perspectives within and beyond the academy.

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The cover image is by Harold Fisk, 1944, plate fifteen, sheet one, showing stream courses from *The Alluvial Valley of the Lower Mississippi River*. The map covers sections of Arkansas, Missouri, and Tennessee.

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CLIMATE CHANGE AND RIVERS

By Paul Huttner and Phyllis Mauch Messenger

Open Rivers contacted Paul Huttner [PH], Chief Meteorologist for Minnesota Public Radio (MPR). Huttner writes the Updraft blog and hosts MPR's weekly Climate Cast. We wanted to learn more about the impact climate change is having on rivers and communities and how discussions about environmental issues and water are changing.

He spoke by phone with Phyllis Messenger of Open Rivers [OR] in February 2016 from the Huttner Weather Lab in Victoria, Minnesota. The interview has been edited for length and clarity.

[OR] I listen to the weekly Climate Cast on MPR, which focuses on research about climate and its consequences. Tell me how that came about.

[PH] It's going on three years now that we've been doing Climate Cast. Several months before that, I approached the MPR managers with the idea, given all the breaking science on climate that was coming out every week. I said, you know,

View north into Minneapolis up the Mississippi River gorge.
Image from the Metropolitan Design Center Image Bank.

there's not a lot of content coming out regularly on radio, and I believe this is a growing and important topic, both locally and nationwide. And we really should be doing this every week. So I pitched the idea for Climate Cast. They liked it and we began doing it, starting three years ago as a segment in the morning with Kerri Miller (Thursdays at 9:45). It's gotten a great response. Our listeners appreciate the in-depth information that we give. We've expanded it to an hour once a month now, because 15 minutes goes so fast, you really can't dig in as deep as you'd like to and there's plenty of new content, plenty of interesting science. It's grown over time, and continues to be a staple of our programming. I'm happy about that and I'm told by some of my peers in the business that we are the only regular weekly radio show on climate change in the country. I don't know if that is still the case–there are other shows that air periodically. It's a staple for us, a feather in our cap for science coverage at Minnesota Public Radio.

[OR] You have said that at first there were questions of "Is it real?" and now it is more a question of, "Well, what can we do?"

[PH] I sense a big shift in the last three years, and polls show this, too. People's minds have changed. A vast majority of people in the U.S. now believe in human-caused climate change. We're hearing that reflected in our audience, and I'm seeing that anecdotally in the people I meet on the street every day. It's encouraging. It's good to see that the science is gaining greater acceptance, and I'm optimistic that we will find a way to fix this.

[OR] I want to step back to your early years, which were spent around water in Minnesota. How did that inform your choice of a profession?

[PH] One of my early mentors was Dick Gray from the Freshwater Society. He used to write a column called "Passwords" in the newspaper every week, and did a collection of those in his book, Passwords, back in the '70s. I was given that as a gift at a critical time in my life—I suppose I was 13 or 14 years old. I just went through that with glee. And growing up near Lake Minnetonka certainly piqued my interest in water and its importance. So I began to connect the dots on how water and weather and, eventually, climate are related. So I may not have understood at the time how it was all connected. But growing up near a body of water like Lake Minnetonka, and Minnehaha Creek, and the Mississippi River was an early influence on my career path.

Dick Gray at the Gray Freshwater Lakeside Laboratory. Image courtesy of the Freshwater Society.

[OR] How does living near the Mississippi River shape you today?

[PH] Our rivers and lakes are a barometer of climate change. We're seeing much higher volatility in our river systems and our hydrologic cycle. It's well documented that it's not raining as often in Minnesota, but when it does, it's raining harder. That fits with the shift in climate. You increase the vapor in the atmosphere by roughly four or five percent, and you get exponential increases in rainfall when it does rain. I'll give you an example. In 2013 the Mississippi River level at St. Cloud went from the seventh highest reading to

the third lowest reading in just over two months. So we've seen this trend toward wetter springs and early summers in Minnesota, toward an increase in early warm season precipitation. And then it shuts off later in the summer. So we're getting a trend toward these high variabilities in our river levels, where we're getting record floods in early spring and summer, and then a record drop to low water levels in late summer and early fall. That doesn't happen every year, but we're seeing a trend. There is higher volatility in our river systems, and the Mississippi is part of that.

[OR] So that causes some challenges for cities and urban planning and so forth, doesn't it?

[PH] Indeed it does. City managers around the state are scrambling to deal with that. Our urban infrastructure was built around a certain set of climate assumptions from more than a hundred years ago. Those climate assumptions are no longer valid, especially when it comes to precipitation intensity. The 2012 Duluth flood is a great example of a city being overwhelmed by the kind of extreme weather we've been having. We have had four major 1000-year rainfall events

DULUTH, Minn. – An aircrew from Coast Guard Air Station Traverse City, Mich., conducts a damage-assessment overflight of severely flooded areas of Fond du Lac, June 24, 2012. Coast Guard Air Station Traverse City's flights provided search and rescue assistance as well as key witness to the extent of the flooding.
U.S. Coast Guard photo by Petty Officer 1st Class Matthew Schofield.

in Minnesota since 2007. Three of them were in southern Minnesota, one in the Duluth area. That was a $100 million infrastructure damage event in Duluth. Cities all around the area are dealing with these higher water events, where places like Mound, near Lake Minnetonka, were overwhelmed by high water levels. It's Interesting to watch, as climate shifts, even when it seems like our national policy makers are slow to react, our local cities policy makers are well aware of this. They're on the front lines of climate change and they're dealing with it every year.

[OR] You've been to some recent conferences where people have been discussing these issues.

[PH] I have. The Third Minnesota Climate Adaptation Conference was just a few weeks ago, and the mayors of St. Paul, Falcon Heights, Bemidji, and St. Louis Park were all part of a panel about climate change and their communities, and how they are adapting to it. Again, it's something that hits home at the local level and it has a great effect on their operations and their budget.

[OR] So how do we persuade those politicians and those policy makers who aren't yet persuaded?

[PH] That might be the million or billion dollar question for us in the coming decades. I think it's a multi-tiered approach. I think the science is powerful, and it works, but only to a degree. For people who don't believe that climate change is a significant threat, the science doesn't convince them. We are seeing that these extreme events are convincing people, which is unfortunate. We have a crisis mentality at times in this country. We wait for the crisis to react. We wait for the barn door to be open before we see that there is a problem. I think it's science and it's communication, convincing people on a different level. I have found that the economic opportunity persuasion is very effective, too. I don't think we've talked enough about how we are going to grow a new energy economy that's going to create new economic opportunities. It's already creating jobs. There are over 200,000 solar jobs in the United States, with growth at 20 percent a year, and those jobs pay very well. There are over 15,000 green energy jobs in Minnesota now. That's also growing rapidly and those jobs also pay well above state average. So, we're seeing the growth in renewable energies, and that is sort of a transition. I've even called it a moon-shot opportunity in the coming century, and even shorter term than that. I think it's starting to happen faster than a lot of people predicted it would.

[OR] Are there good models around the world that we should be looking at?

[PH] Absolutely. Europe is ahead of us when it comes to renewable energy and policies on renewable energy. Oddly enough, China, which is often tagged as one of the biggest greenhouse gas producers on the planet (which if course it is), is also investing tremendous sums in solar and wind and renewable energy. They're literally choking on their carbon production in China, and they get it. The United States, politically, has been very slow to react to this, but the economic opportunities are there and they're growing. If we go back to the Climate Adaptation Conference, we had General Mills, Best Buy, 3M, all major Fortune 500 Minnesota companies who already are seeing the effects of climate change in their supply chains. Corporate America gets this, and they're acting accordingly, because it's affecting their bottom line. So I think in the United States, we're going to see this coming from the ground up, from the city level higher, from the corporate level higher, and eventually I think this will become politically a more national project.

[OR] Do you see other places where the leadership is coming from?

[PH] Yes, You look at organizations like Climate Minnesota that are out there, trying to do awareness and outreach and education. I think the train is rolling down the tracks. It still has to

gain some momentum. You know, I have teachers at the fifth-grade level who are using content from my Updraft Blog to teach their students. I think the younger generation is more attuned to climate change. Let's face it; they're the ones who are going to inherit the planet that we give them. I think it's reaching critical mass. It's a very large problem; it's very hard to see out your window every day. You know carbon dioxide is invisible to us, but the effects are increasingly apparent.

[OR] What should be on our radar that isn't? What are issues that could be affecting rivers and communities along rivers that maybe we're just not thinking of yet in relation to climate change?

[PH] I go back to the volatility. Look at the record Mississippi floods in Missouri in wintertime in the last several months. I think that we're going to see more unprecedented river events. That's a problem, because a lot of our civilizations have been built on waterways. For good reasons: they're beautiful, they provide a source of freshwater, they offer economic transportation opportunity. As the hydrologic cycle amplifies, we're going to continue to see more of this kind of overwhelming flood and drought events. Don't underestimate drought. We're seeing the effects of arctic amplification, where the arctic is warming faster than the middle latitudes at the equator. That slows the jet stream down, and it tends to produce stuck weather patterns that are prolonged. That tends to produce droughts, like the one in California, that are becoming more extreme, and we're getting into drought faster because water is evaporating more quickly from the surface in a warmer climate. So I think the fluctuation and the extremes that we're seeing on rivers and waterways is only going to continue. And cities and areas will be faced with situations that they haven't seen before. I am concerned about nuclear plants that are on waterways. Obviously they have multiple backup systems. But as we know from Fukushima, it's not a perfect world. Stuff happens, so I think we need to build resilience into what we're doing in the future when it comes to these extreme water levels on rivers.

Winter warming trends since 1970. December, January, February 1970-2014/15. Source: NOAA/NCEI Climate at a Glance.

[OR] I've heard you and others talk about climate change as the most serious national security challenge that we're facing.

[PH] Yes, and that's an interesting angle, because it's not some liberal think tank that came up with that idea. It's the national security apparatus and the Pentagon, and the CIA, and the intelligence community, and they've assessed and war-gamed this out. They have discovered that even small climate shifts can have outsized impacts when it comes to social unrest. A lot of people are pointing at the situation in Syria as being triggered or at least exacerbated by the severe drought that they had. Farmers left the land and people moved to cities, which led to social unrest, and the rest is history, as we say. What happens when that occurs in populated areas like India or South Asia, or other parts of the globe, where even a small shift in climate has an outsized impact? So, that's what the national security people are looking at and saying, this is a problem, we need to be ready to deal with it. What happens when our military bases are threatened by flooding? I was in Norfolk, Virginia last year. That's one of those places that is very susceptible to sea level

rise. They've realized that small changes can cause outsized impacts, and they're planning for that accordingly.

[OR] Is it hard to be optimistic?

[PH] It can be, but I'm not a gloom-and-doom person. I realize that along with the magnitude of the problem that we're dealing with for climate change, there are also going to be opportunities. It's going to require a shift in the way we think, a shift in the way we use energy, and a shift in the way we build infrastructure. These are large problems that manifest themselves on the local scale. Humans have an amazing capacity to adapt, and an amazing capacity to change what we're doing. Look at how far we've come. I've heard the saying, "We didn't leave the stone age because we ran out of stones." Right? We have always moved forward as a society, and I have every reason to believe that we're going to do that with regard to energy. It's just a matter of how quickly it's going to happen and what the impacts will be on our climate.

I see a lot of good signs and I see that the pace of awareness and action on climate change has increased more quickly than I thought it would in the last three to five years. If that trend continues, we could be in a lot better shape 10, 20, 30 years down the road. If we don't change as quickly as we need to, we are in for some tumultuous times in the next century, but I'm at least hopeful. That's one of the things that I'm happy about with Climate Cast. We have an opportunity every week to talk about the science and the ground truth about what's happening with climate change. I think as that conversation moves forward, more people are getting in tune with the question: How can we change our lives for the better, and still take care of our planet at the same time?

[OR] Do you think that the agreements that came out of COP21 [the 2015 United Nations Climate Change Conference, held in Paris] will help us move forward?

[PH] Well, it's certainly a step forward. Even before that, the U.S. and China came together and set ambitious goals on carbon. So, yes, I'm optimistic about that. I'm not a Pollyanna about it. I realize there are lots of dominoes that need to get knocked over before eliminating the two-degree Celsius rise in temperature. We're already halfway there globally. Last year was one degree Celsius, hotter than the pre-industrial average. So we only have another degree to go. Two degrees, some people say we could adapt to that, but the higher-end climate models go four to eight degrees. If that happens, it's going to be a very different planet than we have today. To be determined, I guess. Stay tuned.

[OR] What do you want people to understand about our relationship to the river?

[PH] That's a great question and something I need to think more about. I live in my own little world of weather and climate. When I go to the rivers and the lakes, I go there to relax. They're a source of beauty for me. I want to keep them healthy and keep them around. Minnesota is built on water, let's face it, we're not only the land of 10,000 lakes, but the river systems are critical, too. And we're very fortunate in that we sit on a watershed. No water really flows into the state of Minnesota. Water is something we export. Fortunately, we don't have to deal with pollution as one of those things coming from other places. But we have a responsibility to make sure that the water we're sending downstream is as healthy and well managed as it can be reasonably. I ask people not to take water for granted in Minnesota. When they go to their favorite lake or their favorite river, they need to remember that the things we do to the climate and the land use practices that we have all have an impact on that watershed. And I think that is something for all of us to remember.

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About the Authors

Paul Huttner is chief meteorologist for Minnesota Public Radio. An award-winning veteran broadcaster for 30 years, Huttner earned the American Meteorological Society's Certified Broadcast Meteorologist designation in 2008, in recognition of the quality of his weather broadcasts. Paul is a graduate of Macalester College in St. Paul and holds a bachelor's degree in geography with an emphasis in meteorology.

Phyllis Mauch Messenger is grants consultant for the Institute for Advanced Study and administrative editor for Open Rivers. She has edited, co-edited, or co-authored five books on archaeology and heritage, and is currently editing two volumes of essays on the pedagogy of heritage. She has worked on archaeological projects in Mexico, Honduras, and the U.S. and led study abroad programs to Mexico, Peru, and Southeast Asia.