TRANSCRIPT

Key Conversations with Phi Beta Kappa

Laurence Smith Knows the Many Stories Rivers Tell Us

The Brown University professor of Environmental Studies shares his lifelong admiration of rivers and how he came to study many kinds of flowing water, including the melting glaciers of the Arctic. He encourages listeners to look for the nearest body of water to them and appreciate how we're taking better care of the planet, in addition to how much more is left to do.

Fred Lawrence: This podcast episode was generously funded by two anonymous donors. If you would like to support the podcast in similar ways, please contact Hadley Kelly at hkelly@pbk.org. Thanks for listening.

Lawrence: Hello, and welcome to Key Conversations with Phi Beta Kappa. I'm Fred Lawrence, Secretary and CEO of the Phi Beta Kappa Society. Since 2018, we've welcomed leading thinkers, visionaries, and artists to our podcast. These individuals have shaped our collective understanding of some of today's most pressing and consequential matters, in addition to sharing stories with us about their scholarly and personal journeys. Many of our guests are Phi Beta Kappa Visiting Scholars who travel the country to our Phi Beta Kappa chapters, where they spend two days on campus and present free public lectures. We invite you to attend. For more information about Visiting Scholar lectures, please visit pbk.org

Lawrence: Today, I'm delighted to welcome Professor Laurence C. Smith. Professor Smith is the John Atwater and Diana Nelson University Professor of Environmental Studies, and Professor of Earth, Environmental, and Planetary Sciences at Brown University. He previously was on the faculty of UCLA for over 20 years in the departments of Geography and Earth and Space Sciences. Professor Smith's research interests include the Arctic, water resources, and satellite remote sensing technologies. He has published over 150 peer-reviewed journal articles, essays and books, and won more than $16 million in research funding from NASA and the National Science Foundation. He has assisted the National Academy of Sciences on abrupt climate changes, NASA, with a new satellite mission to monitor global water resources, and the World Economic Forum with issues of Arctic development. He is a fellow of the American Geophysical Union and of the John S Guggenheim Foundation, and his research has appeared in the New York

Times, the Wall Street Journal, the Economist, and the Washington Post, among others. Welcome, Professor Smith.

Smith: Thank you for having me today.

Lawrence: Do you remember a moment when you first became interested in the environment?

Smith: Well, like most young adults in their early 20s, I really had no idea what I was going to do until I got further along in graduate school, but I can certainly remember some very pivotal moments when I became interested in nature and in the natural world, and in particular flowing water when I traveled with my parents to Alpine field work areas in the Canadian Rockies. My father was also an Earth scientist and an academic. But then, just as a boy growing up in inner city Chicago, in a very urban area, my parents saw fit to send me to my grandmother's house at age 11 for the summer, and there, I spent time exploring a small local river, and fishing, and catching crayfish under rocks, and so forth.

Lawrence: Where was your grandmother's house?

Smith: This was in the foothills of the Adirondack Mountains in northern New York State.

Lawrence: Let's talk a little bit about the broader field of environmental studies at the university level and teaching environmental studies. You've been at this for decades now. How would you say environmental studies as a field has changed over the years in universities?

Smith: Well, it's a great question. My research in the Arctic in particular has dramatically changed over the last 20 years. When I first started studying things like thawing, permafrost, and melting glaciers, I would be presenting my research to a handful of gray beards in one of the smallest rooms of the American Geophysical Union conference each year, and I mean gray beard specifically. I mean, they're a small group of relatively older white men. And now, those same sessions are in some of the biggest rooms of the AGU conference, overflowing with people of all types, including many young scientists, not to mention all the media attention that had been paid to issues of Arctic climate change in the last couple of decades.

Lawrence: So what do you attribute that dramatic change to?

Smith: Well, without question, just the impacts of climate change are most evident, and visible, and tangible in the Arctic. I mean, this is a part of the world that experiences climate changes more than double the global mean, in both directions, I should add. When a world cools during an ice age, for example, the Arctic plunges to colder temperatures at more than double the global rate, and the same is true when the global mean temperature increases. And furthermore, the visible manifestations of that are so much easier to see and easier to understand.

Lawrence: You said that the Arctic is an example of more dramatic change in both directions, cooling or warming, which brings to mind something that one hears as a critique of environmental science generally, and that is the argument that one should not be concerned about climate change because there's always been climate change. There's

been cooling. There's been heating. This is the nature of the planet, and it will continue to be the nature of the planet. There's no reason to be unduly concerned or perhaps concerned at all.

Smith: Well, yes, I have heard that argument many times, and that actually gives me more reason to be concerned rather than assuaged. The Earth's climate is in fact a delicate system, one that is susceptible to natural, non-human-induced climate changes that would be quite dramatic. In fact, even civilization is destroyed by modern standards. And what we have to understand is that it is a bit of a sleeping giant. And over the last 10,000 years, during the Holocene, which is the time in which humans have evolved, settled civilizations, beginning with our greater agrarian societies, along rivers in the Middle East and the Yellow River, that time period has been remarkably coalescent and calm relative to some of the wild swings that the Earth has experienced in the past. This stability is what has allowed our civilizations to grow.

Smith: Now, the current rate of climate change is definitely absolutely human-induced. There's no serious scientific debate about that whatsoever. It's also happening at a rate much, much faster than these natural swings that happened during the Last Glacial Maximum, for example. So the fact that the Earth is susceptible to these swings actually makes me more nervous rather than less because we are pushing, through human action, a climate system, which has been stable for the last 10,000 years, yet we know can be quite sensitive to triggers naturally. And so, putting these two things together actually makes me more worried, not less.

Lawrence: Let me shift gears a little bit and talk about one of your recent books, Rivers of Power. You look at the history of rivers and how rivers have had a major impact on societies all over the world. First I have to ask, as I love to ask people, both on this podcast and just in general conversation, where the ideas come from? I think you and I would agree that one of the hardest parts sometimes of an academic project is coming up with the idea, the inspiration, and then you executing from there. I'm not going to say it's easy, but a big piece of the work has been done. So how much of this goes back to an 11 year old boy in the Adirondacks who's still working out things that were fascinating, and how much is interest since then?

Smith: Well, a lot of it goes back to that 11 year old boy fishing in a swimming hole and the Indian River and the Adirondacks. I have studied, and enjoyed, and recreated along rivers my whole life. They are amazing, fascinating, natural geographical features, and what makes them really interesting is not just the hydrology and the geomorphology of the rivers themselves, which is fascinating, but if you look at human interactions with rivers, the more you look at it, the more you realize just how closely intertwined humanity is with rivers. I mean, it's absolutely extraordinary.

Smith: We did a global GIS, geographic information systems, analysis of the locations of river channels and humans, populations and cities around the world, and the quantitative results are just extraordinary. Basically, we live where we live because of rivers. Some two thirds of the world’s population lives next to big rivers, and the share would be even more if we looked at the very small ones, which we didn't do in this global analysis.

Virtually all of our great cities exist because of rivers. The origins of some of our most human institutions, not only cities, but also science engineering, the law, they trace back to rivers. The physical Earth's land service looks the way it does because of rivers, and this governs not only where we settle, but also where we farm, where we put our transportation corridors, and so forth. And it's remarkable to me because, really, it's something that most of us still don't even give any thought to.

Lawrence: Well, as you're talking, I'm thinking of my own experiences. I'm sure our listeners are too. I've lived in, most of my life, Washington, New York, and Boston, and so, one is along the Charles. One is an island between the East River and the Hudson River. And right now, where I am in Washington, DC, if I squint out my window, I can make out the Potomac. So I'm a pretty good example of exactly what you're talking about.

Smith: Exactly. Those are great examples, and they are common examples. Virtually every town of any size was built along the banks of river, and human ingenuity has entwined with that. Just think about the bridge, for example, the invention of the bridge. With the invention of the bridge, cities have grown equally at both sides of the river. So you look at the city of Paris, I mean, it was founded on an island in the middle of the Seine. Now crisscross by dozens of bridges, and the city has essentially grown like a growing bullseye with the river running through its core. Furthermore, we tend to use rivers very commonly as political borders, of political jurisdiction. So when a river becomes a border, yet you still have a settlement, this often commonly gives rise to twin cities or twin towns of some form, both at the international level. El Paso and Juarez City across the Rio Grande are also just domestically. Lots of little counties will have a village with one name on one side of the river and a village with another name on the other side of the river. They're economically entwined, but they actually have two political jurisdictions.

Lawrence: Let's shift from rivers in the United States to something a lot more distant for most of us, and that is your on the ground research in Greenland. I saw a piece where you were extensively quoted in the New York Times that had some rather alarming video attached to it of water just cascading through what would otherwise be solid ice in Greenland. What's the outlook of Greenland's ice sheet, and why should we be concerned about this?

Smith: Let me start by reminding everyone that the Greenland ice sheet is a bizarre relative to the last ice age. And what I mean by that, I mean, if you look at a globe or a world map, you'll see that this ice sheet survives at latitudes way south of the Arctic to latitudes where in, both Canada and Europe, there's no ice at all, and it survives by virtue of its own existence. What I mean by that is the ice sheet is almost two miles thick at its center, and because its surface is at such high elevation, own to its own existence, it doesn't melt in the summer at the top. This is what allows this ice sheet to survive because it's high enough at its center, high enough elevation that it stays below freezing all year round, and so, that's precipitation. It falls there; remains in the form of snow, compresses the ice, flows downhill to the edges where it does melt off every summer, but it's always being revitalized and replenished up at the summit from fresh snow. If

we were to play God and snatch that ice sheet off the island of Greenland, it would not reform. The present day climate would not regrow it.

Smith: And when we increase global mean temperatures as we are doing through human-induced greenhouse gas emissions to the atmosphere, we're seeing that shift where mass is now being lost on a net annual basis because there's more melting happening at the down slope toes of the ice sheet than is being replaced by snowfall up at the interior. So over the long term, the mass of this ice sheet is decreasing. Eventually it will disappear. And when that happens, sea level will be six or seven meters higher than it is today, which will remove Florida, for example, from the face of the Earth.

Lawrence: Six or seven meters is an enormous difference in the sea level. Isn't it?

Smith: It's absolutely enormous. Yes. You wouldn't even recognize the map of the United States or Bangladesh. Low lying areas all around the world will be gone.

Lawrence: I wonder what it's like to work in these places, not just to talk about them from places where many of us live in the continental United States. Do you have some memorable field work experiences you could share from actually having been in these places?

Smith: Yes. I've been working in the Northern high latitude since graduate school. I have many, many memorable experiences. But I will tell you, listen, it's the same thing I tell every new graduate student who considers working with me is, "Be careful. Once you get up there and you see that light, especially in the summertime, there's something about the quality of the light, the rawness of the landscape, the frontier feel of the people and the land. Everybody there is resourceful." And then you can have the nerdiest computer programmer in town can also fix a truck and run a generator, no problem. I mean, everyone has to be self-reliant. There's just something about the culture, and the people, and the beauty, and the light that really gets under your skin. So be careful because once you do it once, you may find yourself going back.

Lawrence: Tell us a little bit about the work you're currently doing with NASA on monitoring water resources around the world.

Smith: Yeah. Look, water resources, in particular, water flowing through rivers, because this is a very concentrated, accessible water resource that recycles itself and delivers itself for free, is just super important to human life as we know it, for the water coming out of our sinks, for the processing of our sewage, for the cooling of our power plants, for the irrigation of our food, and increasingly, this is a resource that is wholly and completely tapped by humans. In fact, just less than a year ago, together with my former student and postdoc, we published a paper in nature that used satellite laser measurements to show that for the first time due to quantify for the first time, the extent of human modification of surface water storage, this is the retention and impounding of surface water in lakes, and reservoirs, and rivers, and so forth. And the results just...

Smith: This was a global analysis where we use a satellite laser called ICESat-2, which is pinging the surface of water levels, measuring water levels all around the planet and water levels are not measured all around the planet. In fact, in many countries, water levels

are a data, may be measured, but are state secrets, and are closely guarded by central governments and water management agencies, and not available to the public. And so using these satellite data, we measured water levels at lakes, and reservoirs, and streams, and rivers all around the planet, and we learned that humans now control some 60% of all water level variability on Earth, on the entire planet. And furthermore, in some areas of intense water use, it's now 100%, places like the Southwestern US, Central Asia, South Africa. There's nothing left to tap. All of the water, every single drop has already been commandeered by humans and is being impounded, and stored, and moved from one base into another. It's just absolutely extraordinary, and we wouldn't know this without the global view and big data provided by satellite observations.

Smith: And the satellite mission that I'm deeply involved with is one called Surface Water and Ocean Topography mission, or SWOT, which will be lodged later this year. It's a joint venture between NASA and the United States and a French Space Agency, as well as smaller roles by the Canadian Space Agency and the United Kingdom, and this technology will, for the first time, use radar imaging to map in three dimensions, all water on the face of the Earth. So it's never been done before. It's going to be a real game changer, and we'll be able to estimate river flows everywhere, water storages, and lakes and reservoirs everywhere, as well as fine scale oceanographic features and suddenly ocean currents and so forth. But the real game changer will be for freshwater resources.

Lawrence: One of my favorite questions to ask my guests on Key Conversations is to contribute to our reading list, Phi Beta Kappa members, our book readers, book buyers. So I wonder if you have a couple of suggestions for us of recent literature in the environmental science field, and I'm thinking of something for somebody with a fair degree of expertise that that person might not be familiar with that has come out, as well as a good point of entry for somebody generally interested in environmental studies, but without a lot of academic background or preparation.

Smith: Oh, sure. No, I'm happy to give some recommendations. I mean, for the readers that are interested in learning about both physical science and social science and history, about rivers and waterways and interactions with societies, I would point out my own book called Rivers of Power. For someone interested more in the physical science, I would recommend a book called River Planet by Martin Gibling. This is a physical science book, and for someone interested more in just the human historical dimensions in the United States, I would recommend The Source by Martin Doyle. All of these examined rivers, but in different ways. Martin Doyle's book is US history, Martin Gibling's book is physical science, and mine would be both, with a global view.

Lawrence: What a pleasure to sit down together and spend some time together talking about something that seems so obvious, which is to focus on water and how it comes to us through rivers. But the fact is it is the essence of our politics. It is the essence of our biology. It is the essence of our lives. It's the essence of our civilization. So you have found your way from the Appalachian Mountains in the Adirondacks into a subject that

is right at the heart of some of the most compelling issues of the 21st century, and we are glad that you have. Thank you so much for joining me today on Key Conversations.

Smith: Well, I've enjoyed it greatly. And if there was just one little takeaway message that I would leave your listeners with is I would wager, I would bet $20 right now that for nearly all of you, somewhere close to where you are right now, there is a river or stream flowing through your community, and the next time you drive over it, I'd encourage you to just think about it a little bit and appreciate the many ways in which it has surely shaped your community. And very likely, within the last 15 to 20 years, there has been one or more parks, or bike paths, or other forms of public access that have been added to it. And furthermore, the water is cleaner than it used to be. Both of these are a big trend in urban rivers that's underway right now. And so, I encourage you to take advantage of it, and get outside, and go down and check it out, and connect with nature a little bit, and appreciate your local river in your own community.

Lawrence: Thanks for being with us today.

Smith: Thank you for your time.

Lawrence: This podcast is produced by LWC. Paulina Velasco is managing producer. Hadley Kelly is the Phi Beta Kappa producer on the show. Our theme song is Back to Back by Yan Perchuk. To learn more about the work of the Phi Beta Kappa society and our visiting scholar program, please visit pbk.org. Thanks for listening. I'm Fred Lawrence. Until next time.

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