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Description: **3998 Karl Kreutz,** interviewed by Adam Lee Cilli, August 15, 2013, in his office in Sawyer Hall at the University of Maine, Orono. Kreutz talks about his beginnings in climate science; his graduate studies under Harold Borns at UMaine; his research in the stable isotope laboratory; conducting research in Antarctica; changes in the Climate Change Institute over the years; and the reality of anthropogenic climate change.

Text: 9 pp. transcript
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Related Collections & Accessions

Restrictions

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Notes

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Narrator: Karl Kreutz

Interviewer: Adam Lee Cilli

Transcriber: Adam Lee Cilli

Date of interview: August 15, 2013

ABSTRACT: This interview took place in Karl Kreutz's office in Sawyer Hall at the University of Maine in Orono. In the first half of the interview, Kreutz discussed how he became interested in climate science, his graduate studies under Harold Borns at the University of Maine, and his research in the stable isotope laboratory. He also spoke at length about the scientific and human dimensions of working in Antarctica. Later, he reflected on the way the Institute has changed since he first became involved with it twenty-one years ago. Towards the end of the interview, he shared his views on the so-called climate change debate.

Note: This is the transcriber's best effort to convert audio to text, the audio is the primary material.

Cilli: This is Adam Cilli, PhD candidate in the history department, and I'm here in the office of Karl Kreutz, professor in the Climate Change Institute, and we're here to talk about his experiences with CCI. Can you tell me a little bit about how you came to be interested in climate science?

Kreutz: Well, I think it goes back to just my childhood of being outside and interested in outdoor recreation, growing up in a family that valued the outdoors. I can't say I was that interested in climate or climate science back then, but I was interested in nature and the outdoors and have had a long fascination with winter and winter landscapes, and skiing. So, as an undergraduate I kind of gravitated to that. And when I did my undergraduate degree, I did it at the University of Buffalo, and there happened to be a professor there who I took a class in glacial geology from. And that really opened my eyes to climate, climate change, glaciers in the landscape, not only for a recreational standpoint but also from a science and possibly career standpoint. So as it turns out, that professor (his name was Parker Caulkin) was a colleague of Hal Borns and George Denton. So, when you come in the front door downstairs, there's a picture of some of the members of the Institute. Parker Caulkin is in there with George Denton and Hal Borns. Those three go way back. I took a class in glacial geology with Parker Caulkin, which opened my eyes to this broad field of science as something that interested me a lot. And so one thing led to another and I ended up coming here to the Institute to do my master's degree with Hal Borns. Primarily, again, because of the connection that Parker Caulkin (my undergraduate adviser) had with the Institute. And so, through Hal, I got to work with George Denton, George Jacobson, and sort of the… this was in the early… I did my master's degree from '92 to '94. So, sort of the core group of Institute faculty, that are here today, many of them were here back then, too. So I've got a history with that part of the Institute going back to the early '90s. So I did my master's degree here; I left here, went down to the University of New Hampshire [and] did my PhD down there. I did my master's degree in this lab that we're sitting in now, the stable isotope laboratory, so I learned the geochemical techniques of isotope geochemistry while I was here. I went down to the University of New Hampshire, [and] sort of expanded my use of geochemical techniques

as a way to study climate and climate history. When I was at UNH I got into using ice cores as a tool for studying past climate change. And then from UNH I went and did a postdoc at Woods Hole Oceanographic Institution. And so, ever since I left the Institute I maintained a pretty strong connection with it. So, when I was finishing my postdoc at Woods Hole, it so happened that a faculty position opened up to be in the Institute and also to run the stable isotope laboratory. Long story short, I came back.

Cilli: Then you were a natural pick for them, because they knew you had experience working in that lab?

Kreutz: Well, you'll have to ask them about that. But, yeah, I knew how to work the lab; I've worked here before. Doug Intra, who's the technician who built this laboratory in the late-1980s and who has run it ever since, I have had a long relationship with him as well. So, yeah, in lots of ways I was probably a natural fit to come back and do this.

Cilli: For the listeners who may not be familiar with the technicalities of this, can you explain in simple terms the role stable isotopes plays in your own research?

Kreutz: Sure. So, if you look at the periodic table of the elements, so all of the different chemical elements that make up matter as we know it, many of those elements that we are familiar with (like carbon, oxygen, and hydrogen), come in different flavors. And when I say flavors, they actually, if you take a particular atom of hydrogen, for example, not all hydrogen atoms are exactly the same. Some of them have different weights. And we call those atoms of hydrogen with different weights isotopes of hydrogen. So there's some hydrogen that has an atomic mass of one; there's some hydrogen that has an atomic mass of two. And so you can, because the same atoms will weigh slightly differently, they behave differently in nature. And so what we do is use that weight difference to our advantage in science. So what we do in the stable isotope laboratory… the material we most often work with is water. So we take water, and in our lab we can look at the individual molecules of H2o, and we can measure the oxygen in those water molecules and essentially tell you how many isotopes of hydrogen and oxygen are in each water molecule. So if you look at water and the way that it moves through the environment, water molecules will get separated when water is evaporating and condensing in the hydrologic cycle. Because water molecules will have different weights because of its isotopes, water will get separated based on its isotopic composition. And so the degree to which water gets separated often is a function of temperature. So what we do in our laboratory is we look at the stable isotope makeup of water and by doing that we can learn something about what the temperature conditions were like as the water moved through the hydrologic cycle. Now, if you look at the Institute, much of the research that goes on at the Institute looks at paleoclimate, so past climate change. So when we go to places like Antarctica and Greenland and we drill cores from the surface of the ice sheet all the way down to the bottom, an ice core record from those places can contain samples of snow and ice that go back hundreds of thousands of years. So we take these ice cores, bring it back here to the laboratory, you melt it, you get water. We measure the water here at the isotope laboratory, so we can learn (based on the isotopic composition of the water) something about what the temperature in the atmosphere was 400,000 years ago. So that's the basis of one of the tools that we use here to look at past climate change.

Cilli: Can you tell me a little bit about some of the different places where you've done research?

Kreutz: Sure, well I got started in my graduate work, actually when I was here in the Institute as a master's student, I did my research here in Maine. So I worked in Down East Maine, again because Hal Borns was my adviser, Hal had done a lot of work on the glacial history of Down East Maine, so looking at the way the last great ice sheet that we here in North America, how it retreated through Down East Maine about 14,000 years ago. So as his student I was working out there, as part of that overall problem, studying the retreat of the last ice sheet through here during the end of the last ice age. So from there, when I went down to the University of New Hampshire, I had the opportunity to go to Antarctica, so I spent several seasons working down in Antarctica, and that's where I started using ice cores as a way of reconstructing past climate change. That started my work in Antarctica, and I've maintained that research thread ever since then. After that, I had a chance to go over and work in Asia quite a bit, so I spent several seasons working in the high mountains that surround the Tibetan Plateau, so Nepal up through Tajikistan, Kirgizstan, sort of the western side of China. That whole area is surrounded by big mountain ranges… [and I was] again looking at ice cores and reconstructing past climate change in that area. I've done the same thing in most of the mountain ranges now that surround the North Pacific, so coastal Alaska, coastal Yukon territories, British Columbia… there are a lot of big mountains up there, many of which are glaciated. So I've worked in that region, mostly drilling ice cores, and doing all the science that goes along with it. I've had the chance to work in Greenland quite a bit, both with the ice cores recovered from Greenland and down in coastal Greenland, looking at the changing ocean conditions. I've worked a little down in South America, not but, but a little bit. I guess that's about it.

Cilli: Yeah, that's about it? [asked jokingly]

Kreutz: Yeah, that's about it. [laughs] Yeah, a lot of work in Antarctica, and now up in Alaska.

Cilli: For example, when you were in Antarctica and traversing over places that few humans had ever seen, did you see yourself as a kind of explorer?

Kreutz: Not particularly. Yes, sometimes you stop and think, "Wow, there's a good chance that no one has ever stepped foot here." But when I think of explorers, I tend not to think of scientists. I tend to think of people who are out, pushing the envelope, just because they can or because they want to… I think scientists are usually out there, they have a different purpose in mind. To me, when I'm out there, that's at the forefront. It's a job. That's what we're out there to do. My job is not to be out there trying to be an explorer; my job is to be out there as a scientist. Even thought, yeah, there are places in Antarctica, you do, in pursuit of your science, end up in areas that are incredibly remote and likely never seen by either anyone or surely very few people. So the science does bring you to some really remote and incredible places. But I don't think of myself as being an explorer; I think of myself as a scientist in a remote place.

Cilli: How do you think research in Antarctica has changed from when Hal Borns was your age doing research in Antarctica, and now?

Kreutz: Probably in a lot of important ways it's the same. People have broad ideas about how the climate system impacts the Antarctica and vice versa. So you go down there with big science ideas in mind and they're out there trying to solve them. So in many ways the underlying principles haven't changed at all. Certainly what has changed, even from the time I first went down there in the mid-1990s, technology is vastly different, particularly in communications.

When Hal and his colleagues were going down there in the late ‘50s and ‘60s, once they left here they were out of touch for months probably. Now, when you’re down there you’re in constant contact; even in the most remote places you still have satellite phone and satellite communication. The mode of transport is also different. When you go to Antarctica they can fly you anywhere on the continent, whereas back then it was much more difficult to get around. Now it’s just a matter of pointing to a map and saying, “I want to go there,” and they’ll get you there. So things have definitely changed in that regard. I imagine the bureaucracy of Antarctica has changed quite a bit. Doing research in Antarctica these days involves a lot of… I have this sense that back in the ‘50s and ‘60s it was kind of a Wild West sort of things, a lot of people just making things happen. Where now there’s paper work and agencies and a lot of hoops to jump through. So I think that’s changed dramatically, and what I’ve seen down in Antarctica is I think that the research infrastructure these days promotes (not promotes, but allows) researchers to go down to Antarctica perhaps not as prepared as they would have been a long time ago when the burden of things was on the researcher much more. For example, going off in the middle of nowhere back in Hal’s day, you had to have your stuff together to go out in a very remote place, because you knew nobody was going to come and get you or support you. You were on your own out there. Now, with communications being what they are and transport being what they are, and the ability to move people and material like the Antarctic program can, some researchers have a much different perspective on what it means to be working at a place like that. The perception of how prepared you need to be down there has probably changed. You know, [if you say, “Jeez, I’m out in the middle of nowhere and I forgot a nut and a washer,” you get on the phone and someone brings it to you. It wasn’t like that back in Hal’s day.

Cilli: Besides the improvements and the changed character of Antarctic research, can you think of some major difficulties you encountered during your trips down there?

Kreutz: The weather. The weather’s still the same, in the sense that it still dictates… you know, despite all the advances in technology, the weather is still the weather down there. And it can be very difficult. It doesn’t matter what kind of plane or helicopter you have, if the weather’s bad you can’t do anything. So, yeah, the weather is a big challenge down there; it dictates a lot of what you can and can’t do. And field seasons even today can be made or broken based on the weather for that particular season, particularly if you’re working out in a very remote [location]. Antarctica is a very big continent; and some places are less remote and some are very remote. If you’re working near one of the bases, transportation is easier, but if you’re working way on in what they call the deep field out there, the weather can be a major problem. That still is a big issue and challenge, probably the biggest challenge down there.

Cilli: How many times have you been to Antarctica?

Kreutz: I’ve been down there six times.

Cilli: And what was the longest stint?

Kreutz: Six months.

Cilli: Can you tell me a little bit about everyday life down there, for example your sleeping arrangements?

Kreutz: Well, it's different depending on the situation. So some years in Antarctica I've been in larger, established camps, where there could be anywhere from 30 to 50 people, even though you're in what they call the deep field, it's still a fairly large camp. So in that case day to day living is in large Jamesway Huts, and there's a kitchen staff, and there's logistics folks in addition to scientists, so there's a big sort of group effort going into the camp, so in that case you're sleeping in fairly comfortable quarters and you have hot water and kitchen and meals prepared for you and everything. So for me down there that's been one experience. The other extreme is small camps. You know, four to five people, a much more self-sufficient group, living in Scott tents, which are tents that the design comes right from Captain Scott. It's a pyramid tent, the design of which has proven really well suited for the Antarctic environment. So we still use those Scott tents. And some seasons I've been there, we've had four to five people, two per Scott tent. Living and cooking and doing everything out of those tents, and doing our science in very small camps. That's the situation I prefer. I just like that type of setting much better.

Cilli: It feels less structure? Less controlled?

Kreutz: Just more self-sufficient I think. There's nothing wrong with it. The big cats are comfortable. But, I don't know, something about a small camp makes if feel like a truer Antarctic experience when you're down there. And you look around and pretty much all you see is Antarctica, the ice sheet, the mountains, as opposed to seeing piles of cargo and bulldozers and airplane landing strips. I've always enjoyed the seasons down there when we were in a small camp, doing our science with a small group. And it's not just about the environment; it's also about the people you're working with. You have a small core group of people that you know well, that you spend a month, month and a half with, working on some science project. That's a much different social experience than when you're in a big camp of forty or fifty people. So, if I had my preference that's what I'd do. And mostly that's what I've done, not just in Antarctica, but when we've worked in mountain regions throughout the world, that small camp approach is how I've most often done things.

Cilli: Prior to your trips to Antarctica had you read any of the early accounts of Antarctic explorers?

Kreutz: I don't recall reading them before going down there the first time. But of course when you start going down there [regularly] you can't help but be fascinated by that. And of course when you go to McMurdo station you have the chance to visit some of the tents from Scott and Shackleton's expeditions, and when you see that you can't help but dig into the literature on some of those trips and see what they were up to, see how they were living, and it's fascinating.

Cilli: Do you see yourself as sort of following in their footsteps in a way?

Kreutz: I suppose in a way. When you look at some of the accounts of those early trips and you see people like Edward Wilson out collecting meteorological data and, despite the harsh conditions, and what had to be pretty uncomfortable living, then still going out and collecting data, doing their measurements, day in and day out. That's pretty inspiring stuff. So, yeah, in that regard, even being in Antarctica today is does feel like you're following in their footsteps. Yeah.

Cilli: Earlier we spoke about how Antarctic research has changed over the years since Hal Borns was doing it, till now. How do you see the Climate Change Institute itself? How do you think it has evolved in the past 40 years? And where do you think it is now that maybe it wasn't at one time, and where it might be heading into the future?

Kreutz: It's certainly grown a great deal, even in the 20 years that I've been here, not only in terms of numbers, but also in terms of the range of expertise that's here. One of the hallmarks of the Institute, always since they started it back in the early '70s, is the interdisciplinary nature of it, and that theme I guess has continued, but I think when you look at the Institute now there's more disciplines now involved then there was back when the Institute was founded. And hopefully that trajectory continues to grow. The more we learn about the climate system, the more we understand how interconnected a system it really is. It really requires climatology, glaciology, meteorology, biology, all these different disciplines need to come together in order to understand it. Hopefully the Institute will continue to grow in that respect, not only in terms of numbers and research dollars (which are important), but really grow in terms of the number of disciplines that we include under our umbrella—all sharing this common goal, which is understand the climate system (past, present, and hopefully future). And I think it will, and we continue to maintain some really core strengths that set us apart. One of them being our focus on ice. Ice as a research topic, I think if you look around the country and world, there's not many institutions that have such a collection of expertise on some really… a critical mass of people studying ice and its role in the climate system. And you could say the same thing about the Institute in aspects of biology and somewhere else, but really ice and its role in the climate system is a big strength of the Institute. So, again, I just see that growing into the future.

Cilli: Do you see the growing membership of CCI, has that in any way made it more difficult to maintain a certain level of cohesion?

Kreutz: Well, in some ways I think. Maybe not cohesion but just, it certainly makes it more difficult to maintain a feeling of closeness. A feeling that you really know and understand what everyone in the Institute is doing. I know these days, if I look at the big chart on the wall with different pictures…. Of course there's some people I know well, then there's some people on there I've probably never met before. Sure, as we grow that's always going to be a challenge. I think that's it's up to the Institute to figure out ways to bring people together, in ways that everybody can connect. Sure, it's a challenge. We're scattered around campus; we've got a lot of people in the Institute that are external to campus. So it can be tough to maintain that close feeling, but I think it's important. It's one of the things, when I first got involved in the Institute back in the early '90s, I still have memories of… I have a sense that the Institute was smaller but it seemed like a tight-knit group back then. You had faculty and staff all together, particularly on field trips, and all these kids were running around, and it just seemed to be more of a family on these field trips. And I saying this, back then, when I was viewing it as a graduate student, but it was almost like a family on a field trip, rather than disparate people on campus that come together for a short period of time. Now, as the Institute has grown, I'm not sure that I would get the same sense from the Institute any more, and maybe because it's much bigger than it used to be. But, you know, things change. Back then the core group of faculty that started the Institute, the Institute wasn't much bigger than that core group back when I first got involved. And now it's bigger and more diffuse, and that's part of the growing process. But I think if the Institute is smart and figures out ways to keep people connected in meaningful ways, then hopefully we can

keep that together, cause that's been a strength of the Institute, that it is a group that has overlapping research interests but also that it's just a good group of people. If you talk to people in other departments, that's not always the case, that you have a cohesive group of people that enjoy each other and get along, but also do good research together. And I think it's important to maintain that.

Cilli: What do you see as the Institute's greatest contribution to climate science?

Kreutz: Probably, in a general sense, the recognition that the climate over the past two million years, there really has been this interaction between physical climate, biology, and people. Nothing has existed in isolation. The climate system as we know it has evolved for a number of different reasons, but there's been all these different interactions along the way that you can't separate out. And so in many ways it's the approach of the Institute that is its most important contribution. In other words approaching the climate system in this interdisciplinary way (biology, climate, people), as one unified thing in the past, and trying to understand it from that perspective. You can go from there and look at more specific examples of the contribution to understanding of abrupt climate change, and abrupt climate change's impact on humans… but it's this overarching theme in the way the Institute has approached the problem is the most important contribution we've made.

Cilli: Would you say that sets it apart from other schools of climate science?

Kreutz: Definitely it does. There are other programs out there… when I think of programs around the U.S. Many people around the U.S. recognize the value of interdisciplinary science, but a lot of places that focus on climate, there are not many that have such an interdisciplinary approach. You know they'll be really strong in meteorology, and that's it. Or oceanography. You know, some more narrow focus. But there aren't many that integrate so many different aspects of climate science in the way that we do here. So, yeah, it's not unique, but we're one of the few who do it this way for sure.

Cilli: Can you think of any others offhand?

Kreutz: Well, you can look at the University of Colorado at Boulder, which as an Institute for Arctic and Alpine Research, which has had strong ties with our institute (going all the way back to Hal and George and those days). They have an interdisciplinary approach. The University of Washington, for example, they have an Institute for Quaternary Research. Same broad ideas, but I think our institute, in terms of integrating the physical, biological, and human elements together. We're one of the few who do it as well as us.

Cilli: What do you see as your own most important contribution to climate research?

Kreutz: Well, I have spent my career (thus far, anyway) really focused on looking at a particular time in the earth's history, and that's the last thousand years. We call it the Late Holocene. It's an interesting time in the earth's climate history because we went through both a warm period, back around a thousand years ago, and then into a cooler time period called the Little Ice Age. And then we came out of the Little Ice Age into the modern climate we have now. We're still grappling with why that happened. Because if you look at things like greenhouse gas concentration in the atmosphere and the amount of energy coming from the sun, none of those changed a great deal over the past thousand years, and yet the earth went through these fairly

significant swings in climate. So we as a community are trying to understand really what has happened over the past thousand years. I've dabble in a lot of different things, but I've maintained my research focus on that time period and really trying to understand the evolution of climate and how and why it changed like it did over the past thousand years. So I think the data and ideas I've been able to contribute to that problem have my most significant contribution to date.

Cilli: So, the issue of climate change over the last 400 years or so…. What are your thoughts on the so-called climate change debate? In American political culture, the issue of climate change and whether or not humans played a role in that is still up for debate, even though in the scientific community it's not. What might account for that little discrepancy there?

Kreutz: [laughs] Well, that's a good question. I think people… the biggest issue to me is the lack of appreciation for the scientific method that exists. The scientific community has for the better part of 40 or 50 years put a lot of effort into understanding the earth's climate system. Our understanding is not perfect by any stretch, but we've learned a great deal about how the climate system operates. And there's some basic things that we understand quite well, and it's somewhat disconcerting that people are willing to disregard all that knowledge and almost come up with their own (what they think are) facts on the issue. And that stems from a lack of understanding about the way that science works, that what we know is built on ideas, collecting ideas, refining ideas over and over again, until you end up in a place where you have some certain understanding. And you can't just wipe all that away but saying you don't believe that's true. That's not the way science works. It might be the case in politics, where the loudest voice wins people's attention, but that's not the way the scientific method works. To me, it's somewhat disappointing that in this whole debate about the climate system, that that is so easily overlooked. I don't have any immediate ways to solve the problem, but the best thing I can personally do about the problem is to address it through teaching, through education. So, I feel fortunate that my position here at the university, my appointment is not only in research, but also includes a teaching component. So, I teach classes, undergraduate and graduate, in the School of Earth and Climate Sciences, at all levels: 100, 200, 300, and 400-level classes. And that's one of the biggest things that we work on in my classes, is not just data and scientific techniques. Yes, that's all important, but really an appreciation for the scientific method and how it works. And how to use data and scientific evidence as part of our arguments, whether it's the issue of whether global warming is real, or some smaller idea, the idea of using data and evidence in making scientific arguments is the same no matter what you're doing. It seems to me right now that's the most concrete contribution I can make to that issue, to address what I see as the root of the problem, through direct classes and education. How many students do I connect with? My classes are pretty small, [but] it's something. And I know some other members of the Institute go out and give talks. So, I think by coming at if from a number of different angles, we do make a contribution to the issue, hopefully.

Cilli: What in your view actually needs to be done? Assuming everyone in the American public bought into the idea of human-caused climate change, there would still be the issue of needing to do something about it. What do you think needs to be done?

Kreutz: [laughs] Okay, so assuming everybody bought into the idea, I think we're going to need to figure out how to not use carbon. Go to a carbon-free society. That's the root of all our problems, is putting so much carbon into the atmosphere. And so that's transitioning to an

economy based on carbon-free energy. It's easy to say that, but it would be a huge job. But it's where we have to go; there's no question about that. So, even if everybody bought into it, it would still be a major challenge. But there's a lot of encouraging starts being made; we just got to keep going in that direction.

Cilli: Well, thank you. That was all the questions I had, but before we conclude the interview I'd like to give you the opportunity to anything you'd like that I didn't think to ask you about.

Kreutz: I can't think of anything to add, other than the fact that we're celebrating the 40th anniversary of the Institute. I think that's wonderful. The Institute has been a huge part of my life. I started at the Institute 21 years ago as a young graduate student and I've been a part of it ever since then, and I think the legacy of the Institute is not just about where the Institute itself is today and how it's growing. One of the big things about the Institute is the proliferation of the students that have come from here. I'm not a unique here. There are other faculty here today who were graduate students and are now still part of the Institute. But we have lots of colleagues around the country and world who were students here at the Institute. So, the Institute and what Hal and both Georges, the core group that started the Institute, the impact that they have had, if you look at all the different students that have gone out and made an impact in science, it's pretty profound. So, yeah, the 40th anniversary is a great time to celebrate, not only the Institute and what it is today, but also the impact that it's had in other places as well. There's a lot of good CCI students out there who are doing a lot of good work. That should be a great celebration.

Cilli: Alright, well thank you. Before I stop the recording I would like to note that today is August 15, 2013. I forgot to indicate that at the beginning of the interview.