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NA2745 Daniel Dixon, interviewed by Adam Lee Cilli

Daniel D. Dixon
University of Maine

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Description: **2745 Daniel Dixon,** interviewed by Adam Lee Cilli, March 27, 2014, in his office in Alumni Hall at the University of Maine, Orono. Dixon talks about his experiences with the Climate Change Institute as a graduate student; conducting research in Antarctica; his role as Sustainability Coordinator at UMaine; and the contributions of the CCI, specifically the dicovery of abrupt climate change.

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Related Collections & Accessions

Restrictions

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Notes

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Narrator: Daniel Dixon

Interviewer: Adam Lee Cilli

Transcriber: Adam Lee Cilli

Date of interview: March 27, 2014

ABSTRACT: This interview took place in Daniel Dixon's office in Alumni Hall, which is located at the University of Maine in Orono. In the first half of the interview, Dixon discussed his experiences as a CCI graduate student and researcher in Antarctica. Later, he reflected upon his role as Sustainability Coordinator at UMaine. Towards the end of the interview, he shared his views on the Institute's most important contribution to climate science, namely the discovery of abrupt climate change.

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

Cilli: This is an interview with Dan Dixon. Today is March 27, 2014, and this is Adam Cilli conducting the interview. One thing I like to ask in the beginning of interviews is, what attracted you to climate science?

Dixon: That's a very good question. Well, really, I kind of fell into it by chance. It's a long story. It goes way back to my undergrad, and I was doing geology and oceanography at the University of South Hampton in England. And originally I had planned to join the British Royal Navy, as an oceanography, going out on their research vessel and scanning the ocean—seeing the world that way. So, one of my real goals was to see the world. So, one of my courses in oceanography was paleo-oceanography with Elko Rowling, and he happened to be a good friend of Paul Mayewski. So towards the end of my undergrad (I was in my third year, doing my finals), I went to the three-day interview with the Royal Navy. And it ended up that the first day of interview I turned 26 (on that day). So I went through the interview all three days, then on the last day they took me into this office. We had this sort of face to face with an admiral, a captain, and someone from secret service or something, and they basically asked me a whole series of questions and sent me out of the room. So, everyone who was there at the three day testing, we all ended up sitting around waiting to hear the result. My result came back, and it was "I'm sorry, you're not quite what we're looking for." So I had gone through many, many years thinking that's what I was going to do, then all of the sudden I figure out "oh, no, I'm not doing that." Just like that. It changed from one day to the next, literally.

Cilli: So, that must have been a bit of a blow.

Dixon: It was a bit of a blow. Yeah, it turned out I was too old. You're supposed to be under 26 on your day of entry, if you want to join officer training. And I was too old, 'cause I had taken time off after high school. So, I didn't really know what I was doing, but I finished my finals anyway. Then right towards the end of my finals…I got this email from Elko. Not to me personally: he sent it out to his whole class. And it said, "There's this guy in the USA. He's moving to Maine…he's interested in finding grad students who are willing to work and study in

Antarctica. So, I thought, "Wow. Antarctica, USA… it's not quite seeing the whole world, but it's a start." I responded to Paul. We exchanged several emails, had a couple of phone conversations. And the end result was he told me to apply officially to UMaine and plan to come over. So, the whole application process ended up taking over three months. Because I had to take GREs, I had to apply for passport visas, then at that point I could do the grad school application. So I ended up arriving in October 2000 to do a master's. And doing my masters I must have gone to Antarctica at least twice, maybe even three times. And I also went to southern Patagonia. So I got right into the spirit of things. You know, going on expeditions with Paul, and drilling ice cores, and doing my masters. And then of course I was hooked at that point.

Cilli: So, really, a bit of good fortune that the Royal Navy turned you down.

Dixon: Absolutely, cause it wasn't long after that that September 11 happened, Trade Towers were hit, countries around the world went to war in the Middle East, and who knows what might have happened to me at that point.

Cilli: Before your first trip in Antarctica, what did you think it would be like?

Dixon: In Antarctica?

Cilli: Yes.

Dixon: Cold. Windy. And of course, when you read about Antarctica you typically read about Scott of the Antarctic, and Shackleton, Amundsen. And you read about their tales, and how tough it was. You kind of go expecting that, and I remember before I left I sat down with Paul. I said, "Look, I just need to know, what is really like? What am I really, really gonna need?'' And he basically said to me, you're gonna need all your own cloths. That was his gem of advice, and it turned out to be absolutely true. Because the clothing that the Antarctic program provided was probably 20 years old. Yeah, horrible nylon, scratchy stuff that you wouldn't wear if you could help it. Luckily, he was nice enough to pay for some nice Patagonia, base layer stuff for me: some nice socks, decent wind blockers, and things like that, [and a] nice hat and gloves.

Cilli: It's funny that that wouldn't be provided to you.

Dixon: Oh, it is provided. I didn't say it's not provided. I said it's about 20 years old.

Cilli: Right.

Dixon: And so, it's perfectly adequate, but it's just…uncomfortable. And it's a fairly well-known fact—usually when you're in Antarctica you can tell the people who have never been there before because they're all wearing the standard issue gear. Everyone who's been more than once, wears their own stuff. You could get away with wearing the kinds of thing you would wear if you were walking in the woods in the middle of winter in Maine. You could get away with that. You just need multiple layers. You have more fleece on underneath: really good base layer. You cover up your entire body, cause of the UV. So luckily, Paul, with all his Antarctic experience, gave me enough of a heads up so that I didn't feel like a proper newby. When I was there, even though it was my first year, it was still a shock. I mean it was really, really cold. And it's not just cold, where you go out, get cold, and come back in and warm up. It's always cold. We were working outside for the majority of the day, while we're drilling the cores. So

you really adapt fast. So, the first week was really tough. Second week, tough. Third week, your body sort of clicks into overdrive, starts producing a lot of heat, burning calories super fast, and you just can stand outside in the cold. And it's amazing how fast the body does adapt in those conditions.

Cilli: I'm wondering if you could walk me through the nuts and bolts of ice core drilling.

Dixon: Okay. Well, the premise behind it, the whole reason for doing it, is that as the snow falls through the atmosphere, it picks up the chemistry in the atmosphere. So, actually a bit like a sponge. Then it lands on the ground, and you have the record of the atmosphere when the snow fell. So if the area where the snow fell is super cold, and there's enough snow on a regular basis to cover it up and bury it so it doesn't all get blown away or belated [?] by the sun (so, provided those conditions are met and the accumulation is high enough), you've basically got a record of atmospheric chemistry going back however deep your core is. So, the project I was working on, we were looking at time scales about 200 to 100,000 years, so we were drilling about 250 meters deep. And the drill we were using was solar powered, electromechanical drill that extracts a three-inch diameter core a meter at a time. So you go up and down the same hole 150 times. It takes about a week. And of course you're standing outside that whole time. The core comes out a single meter, you push it out of the barrel, then you measure it, you weigh it, you log it, you pack it, you label it, and you get it into these insulated boxes. 'Cause even though you're in the middle of Antarctica and it's minus 30, the sun is so intense that it has to be protected from the sun. So you put it in these two-inch-thick, foam insulated, bright white boxes so they reflect most of the energy.

Cilli: I see. So, you know where each core is in the depth.

Dixon: Yeah, so generally when we name these things…for instance, if was drilled in the 2001 field season we called it 01. If was site number 2, we called it 2. Then if it was the fifth drill run, just label it 5. So it would be: 01, 2, 5.

Cilli: And so, you would know that that core is five meters deep.

Dixon: Well, in our logbooks we measure each piece as it comes out. It's not exactly a meter. So, perhaps it would have been from 4.6 to 5.4 meters depth, but it was drill run number 5. So that's how we would log it. So we had this log book; each time the drill would go up and down you log it, you measure it, and eventually you reach 150 meters depth. It might take 200 runs.

Cilli: How many people does that typically require, for a job like that?

Dixon: For the ice core drilling, we have one driller and generally two ice core handlers. And then we had the luxury of having a third person to help the driller. That was typically Paul; he would help the driller. And then myself and another fellow grad student would be the ice core handlers. That was typically how we would run it, but we were on an over snow traverse called ITASE, which is short for International Trans-Antarctic Scientific Expedition. This was a project thought up and put into action by Paul, who's my boss, [and] director of the Institute. And it involved 21 different countries. So we were just involved in the US effort, and the idea was to drive across the ice sheet, each country driving over a different area, and doing science along the way. Coordinating our science, so we were all drilling cores, we were all doing ground-penetrating radar, we were all doing GPS. So we're turning Antarctica from one of the

lesser-known continents, scientifically, into one of the better known continents. That was the preface behind it, and it was great. I went there five times with ITASE… I drove more than 10,000 kilometers; my top speed was five miles an hour.

Cilli: So the idea was basically to extract cores from every major section of the ice sheet.

Dixon: Yes. And the way we chose where to drill the cores is, our initial goal was to space them out approximately 300 kilometers apart. And then we would take surface snow samples every 30 kilometers between core sites, and then of course in order to figure out where to drill you have to look at your radar, cause you've got to make sure you've got nice internal layers. Nice and straight, and no folding or missing sections or hiatuses, [or] anything like that. So that was typically our routine. We would drive along, and we had to go 5 miles an hour because we were towing the radar. We had three different radars. We had deep radar (which was seeing all the way down to the bedrock), and the ice in some areas is 4,000 meters thick. I mean it's a serious ice sheet in Antarctica. So this low-frequency radar could see all the way through that, see the internal layers, and see the bedrock. Then we had a medium-frequency radar that would see down about 150 meters. That would show up the internal layers near the surface. And then we had a high-frequency radar that was on the lead vehicle, and that was used as a crevasse detector. That would give us data in real time on a screen that we would look at while we were driving, so that we could shout "stop!" if we saw a crevasse.

Cilli: And what was the agreed-upon length of the cores?

Dixon: Our aim was to get between 200 and 100,000 years of record, so depending on the accumulation rate, the depth could vary. So, for instance, 200 years at South Pole is about 30 meters; 200 years at the base of the Antarctic Peninsula, where you get a lot of snow, is about 150 meters. So it's that much different. And there are other areas in East Antarctica where the accumulation is less than 2 centimeters a year, where you can get 200 years of record in ten meters of core. So, it varies. We typically drill cores between 50 and 100 meters on most areas. That was enough. Then occasionally you'd get into these high-accumulation zones and you'd need a deep core: 120, 150 meters to reach a 200-year mark. And the reason why we were going 200 years was because there was a large volcanic eruption in 1815. You may have heard of it—Tambora. It created the "year without the summer," which was the year that Frankenstein was written (Mary Shelley's Frankenstein). That was such a large volcanic eruption that it basically blocked out the sun; it didn't block it out, but it reduced the power of the sun for an entire year, just cause of all the aerosols in the upper atmosphere. So that was why it was called the year without the summer; crops failed, and it was basically like having a year-long winter…. So that shows up as a giant sulfur peak in records, cause what we do after we've drilled the core is look at the chemistry, layer by layer, all the way down. And so, as long as we can go back to the Tambora peak, we then have an isochrome that we can track from site to site. It helps us correlate the cores to one another (cross-correlate). And it allows us to date them more accurately.

Cilli: That sounds like quite an undertaking, to bring so many different nations into that effort.

Dixon: Yeah. Paul and Ian Goodwyn (his good friend) were really the two behind that. I was just focused on the US ITASE, so I was just focused on what we were doing. I did go to the international meetings, but I was just a masters student at the time, so I didn't have a clue who

our international colleagues were and how important they were and how famous they were. But I learned over time.

Cilli: So, you said that before your first trip to Antarctica you read the accounts of some of the earliest expeditions.

Dixon: Yes. Scott in particulary, cause he's the most famous, cause he reached the Pole and died.

Cilli: When you were there in Antarctica, traversing over places that few humans had ever seen, did you ever think of yourself as an explorer?

Dixon: Absolutely, yeah. I mean, I felt like a modern explorer, using all the technology at our disposal to cross Antarctica as efficiently as possible, so we can complete our goals. Because we had a lot of science to do. We had probably five or six different science groups in our traverse team (probably about 15 of us). And so trying to coordinate all that, so that everyone can get their science done successfully, that was really Paul's job. He was the field leader for the science, and really for safety as well. But I think the scientific field leader is…you have to be a bit of a politician. Cause you got all kinds of competing requirements, and you have to make a decision sometimes where one of those may not get done. You know, in the interest of safety, or timing, or something. So I think he was in a very difficult position, and I used to watch with great interest how he would handle everyone, and handle all the requirements. I was lucky because Paul's science was my science, so I didn't have to worry too much about it.

Cilli: Can you think of an example of a difficult situation that he navigated?

Dixon: Yes. There was one point when we began to approach crevasse fields in the drainage basin of Taylor Glacier, on the 2006 traverse. We had looked at the satellite data and planned our route based upon that. Because up to that point everyone had used the satellite data to avoid crevasses. Cause the crevasses show up as bright spots on the radar image. So, Gordon Hamilton, who was also on the traverse with us, and some of his colleagues, had spent days and days looking at these satellite images, getting us a safe route out of a certain site that had crevasses, so we knew where we needed to go. And we started to drive along, and then we began to notice that the ground was very unusual. There was cracks; there was weird, spider web-like patterns on the surface. And when you cracked through them underneath, they were little tiny cracks that got bigger as they went down. And it was very unusual. And no one really knew what they were and we felt like we were really in unknown territory at that point. Normally, the way the traverse works is we have three trains (well, two trains and a third motorized unit). So the first unit is basically like a piston bully…[like you might see] at Sugarloaf or something. It has a 40 foot boom on the front, and then the crevasse-detecting radar's on that. So that would normally go up ahead, and half a kilometer behind (or a kilometer, varying) the second train would follow, cause that was pulling a radar system. So it didn't want to be too near any other metal objects, 'cause it would reflect the signal and mess up the returns. So that's why we would follow that half a K or a K back. And then the third group was towing the deep radar, and they wanted to be a kilometer back, 'cause the deep radar didn't want to get returns off the middle group. So we were basically spaced out a fair distance, and moving along very slowly. And most of the time in West Antarctica we were on ice divides. And these are very safe areas where, there are high points on the ice, so all of the flow is either down or

outwards from that point. But it's relatively slow flow, so there's no cracking, no crevasses. So we had gotten very much used to that mode of travel. Then we ended up at Taylor Dome, which is in East Antarctica, and it's also downflow of an area called Megadunes, which are these huge dune features on the ice sheet surface. And there's all kinds of crazy surface processes going on in those dunes. So you get accumulation in one zone and then you get a scour zone where there's no accumulation. Like right next to it, where the surface is like solid glass. The tractors don't even make a mark. And there's thought to be hiatus surfaces hundreds of years old. But that was all upflow of where we were. So we were moving along. We left this place called Taylor Dome; we were moving along, heading south, 'cause we were going back to the Pole. We had our route mapped out, using the radar sat imagery. And then we started to notice these little microcracks in the ground. And the problem with those is that they were giving us crevasse signatures in our lead radar. Cause they're cracks. They're basically tiny little crevasses. And after talking to a whole series of experts, we think that those are formed because of air flow through the snow surface. So the air flows through; it's kind of like electricity; it follows the path of least resistance. So once that path is established the air continues to flow that way, and it belates more and more of the snow from whatever path that is. And it ends up forming these craters with crazy spider-web cracks everywhere. And that's why they get bigger as you go down, cause that's where the air is going in. So snow is basically being moved in the air from down below, coming up to the surface through the cracks, and recrystallizing on the surface and forming these glazed layers, like a giant sheet of glass. So it basically rendered our crevasse detector useless. So at that point Paul made a decision that we needed to travel closer together, because if someone did go into a crevasse, help needed to be there. You couldn't be two kilometers back, moving at five kilometers an hour, arriving 20 minutes later. If someone goes into a crevasse you got to get right over to him and get him out. So he made that decision at that point, and of course the people on the radar weren't too happy. Because it meant that these metal tractors and sleds had to move closer together, which then changed everything. So that was just one example. There were many others as well, I'm sure.

Cilli: Interesting. Were you ever in a situation in which you or someone you were working with almost got injured, or did get injured?

Dixon: There's been minor injuries (there always is, with people hitting their thumbs with hammers or falling in holes). No one's ever gone into a crevasse on any expedition I've been on. No, no severe injuries. You get sprains, of course. When you're hiking in the mountains you sprain your ankle. I, one time on the 2001 traverse, we drove to the base of the Antarctic Peninsula, and there was a giant storm coming, so we decided to drill a core quickly. And then try and pack everything away and get away before the storm hit. So we were operating pretty quickly. Much faster than we normally would. Setting up the core site, lifting these big heavy boxes that were full of drilling equipment. I ended up putting my back out, like really badly. I remember I around, leaned down, grabbed the handle of the box, went to lift, something clicked at the base of my spine, and I just went down at the floor. Couldn't move. Meanwhile everyone's trying to drill the core; I'm useless, lying on the ground. I think actually maybe it was after we drilled the core. Maybe we were backing away at the point, and the storm was approaching. So, I couldn't help pack the sleds; I couldn't get everything packed up so that we could leave quickly. And people were busy trying to straighten me out. People were lifting me up under the arms, like "this usually works [imitates a cracking sound]; here, let me try this [imitates a cracking sound]." And then, of course, all I really needed to do was lie down and

rest. But lying down on your bunk [while] travelling over the ice surface is a nightmare. It's like being on a frozen ocean. So these sleds, they've got four pontoons that all move independently. So as these sleds move over the land, these pontoons are going [imitates a thudding sound] as they go over the different bumps and ruts. So it's like being on a boat, but then the bottom of every wave is hard. So I was lying in my bunk, going [thudding sound].

Cilli: Well, that probably didn't help too much.

Dixon: No, maybe it did. Maybe it sort of jarred my back straight again. But after a couple of days I was O.K. And of course I took it easy, and we drilled a couple more sights on the way back and by that point I was O.K. But yeah, I think that's one of my worst injuries. Oh, there was one time, we were on a volcano in the Andes, and we had just been up there, just drilled a core, were on our way down, and I got a bladder infection.

Cilli: Oh, boy.

Dixon: Yeah. I couldn't pee. Well, I could pee, but only drops would come out. It was like liquid fire; so I basically couldn't pee. And I didn't know what I was going to do. Luckily Paul's been in these situations before, so he always carries a catheter in the medical kit. Like, the first thing he says is make sure there's a catheter in the medical kit. So, I was thinking to myself, "oh my goodness. I'm going to have to use a catheter. I am not looking forward to this. It's going to be a nightmare." And we still had like two days hike to get out of the valley. Just to get to the trailhead where the van could pick us up, where then we were like another day to get to Santiago. So I was panicking, and Paul said to me "wait one more night. If it's not better by morning, then start taking your Sitpro." Cause we all carried antibiotics. And [because] I was thinking about putting this catheter in, I didn't wait. I started taking my Sitpro right away. As soon as he gave me the idea I was like, "yup, that's what I'm going to do." I took it and the next morning I could pee. [indicates relief]

Cilli: Wow. What a story.

Dixon: Yeah, cause you could die. If you can't pee, you get an infection in your bladder, and it can move into your kidneys, and you get blood poisoning, and that's it. You could be gone within days. I mean, I wasn't that worried, cause we were only a couple days hike out, and a day to Santiago. I mean, we could've always called in a helicopter if it was a real emergency. But it wasn't very comfortable, let's put it that way.

Cilli: No, I cannot imagine that it was.

Dixon: One time in southern Patagonia ([chuckles] I've got loads of these stories). One time in southern Patagonia, we knew we were going to be doing a lot of walking with heavy packs, so Paul recommended that we all buy these insuls. I don't know what they're called, but they're bright red, and you put them in the oven and you warm them up. Then you put them in your shoe and you stand on them for a few hours. They mold to the shape of your foot and they give you perfect arch support. Whatever shape your foot is they mold to it. So I got these things, and I tried it in my boot without putting it in the oven, and I thought, "Well, that feels alright." So I didn't bother ovening them. I didn't bother trying to reshape it. I just thought it was good. It turns out it wasn't good. It was giving me way too much arch support, so it was pushing up in the middle. So once we actually got to this glacier on southern Patagonia, I started walking on

these things. I went up and down once and my feet were swollen. Literally, I could barely walk. And I would have been just an absolute burden on the rest of the group. I mean, it was awful. It's a horrible feeling when, not only are you sick in a remote place, but you feel like you're ruining the expedition. Because everyone has to worry about you, and care for you, and do all that. So it's just a terrible feeling. So, I tried to tough it out. I ended up duct-taping my feet…to try to compress them a bit. Then luckily I had a spare set of hiking boots where the insuls came out. So I took the insoles out of those, put them into my mountain boots, because we had to wear hard plastic mountain boots with crampons and stuff, cause we were walking up solid ice. And it worked. The swelling went down. I wore the duct tape for about two or three days, took some pain killers (took some Ibuprofen that probably helped reduce the swelling), and then managed to keep up with everyone while we were going up and down, carrying gear. 'Cause we had to do multiple trips up and down to get…we had a camera crew with us as well.

Cilli: How many people were involved in that expedition?

Dixon: On that expedition there was Paul, Andre, Eric, and I, we were like the science group, then we had two camera guys with us (one cameraman and one sound guy). Then we were all on a boat, which was being skippered by Charlie Porter, and his first mate, Juan, who was this proper Chilean Indian guy. You know, totally dark-skinned, hoop nose. Just looked like he was from Cape Horn. And he spoke no English, and he was so stoic. He would eat his dinner out on the back of the boat, even if there was a storm going on. That's what he liked, being outside. Really, his skin was like elephant hide. It was amazing; he was a tough guy. Then we had a Swedish couple with us. They were like the cook. They were doing cook's duties on the boat, so on the boat there was the Swedish couple, Charlie Porter, and Juan. Charlie would ferry us to the land, off of the boat (little zodiac). And then there would be six of us on the land, so the four science crew and the two camera crew. And we would do our trips up and down the glacier, our drilling, our filming, then Charlie would come and pick us up and get us back to the boat. That's kind of how that one was operating. That was exciting.

Cilli: It sounds like you've had quite a few adventures.

Dixon: Yeah, so, October of 2012 [I] went to South Georgia with Paul. That was another exciting one. We had to leave in the Falkland Islands, and then sail across the southern ocean, crossing the Antarctic and Virgins, to get to South Georgia. Three and a half days there, with just squalls blowing through every four hours (pretty much). And the boat didn't have roller reefing on the main, so every time a squall came through we had to walk out onto the deck and adjust the main by hand, and these squalls were coming every four hours, so it was constantly in and out, in and out. The boat crew were doing six hour shifts; the science crew were doing four hour shifts. Three and a half days out, I decided not to wear the patch (seasickness patch). I managed to last three days, and then the last half day I got seasick, right before we arrived. So on the way back, I decided I was going to wear the patch; [it's] this skipolomine thing that goes behind your ear and it delivers drugs to your brain. I don't know how safe they are, but apparently everyone uses them. And it worked. I was still a bit seasick for the first three days, and then they only last three days, then you're supposed to put another one on. So, I was fighting off seasickness for the first three days, then it came time to put on the other one. I went to get the old one off and it wasn't there. I was like, "aw, damn, where is it?" And then all of a sudden, knowing it wasn't there (I don't know if my brain fooled me), but all of sudden as soon as I realize it wasn't there I got seasick immediately. So then it was like three and half more

days of seasickness. Cause on the way back it was six and a half days. So the way back was pretty miserable. But it was still great fun. I mean, it was awesome. It was a crazy experience that I wouldn't trade for anything. And then once, we were actually moored up on South Georgia, in Grytviken, the abandoned whaling station, where Shackleton was buried. So we even saw Shackleton's grave. Once you're moored up there, you have the protection of the island. It's such a beautiful place, it's amazing. But also spooky, 'cause there were whale bones coming out of the ground, from 60 years of whaling activities at this place.

Cilli: Wow, that is incredible.

Dixon: Yeah, it looked like they were growing. They were just literally, bone here, bone there, giant skull coming out of there, ribs over there. Can't imagine what that place would have been like when it would've been operating. There would have been carcasses floating, and the water would have been red.

Cilli: So, you stayed at Maine after your masters.

Dixon: Yeah, so I loved the expedition lifestyle. And the research. I felt like investigating climate was a worthwhile occupation, in terms of, "Am I doing good for the planet?" I definitely had an environmental and ecological concern, ever since I was much younger, 'cause my mom was a science teacher, and she taught me in middle school. And her hero was David Attenborough, who does the Life on Earth series in England. So I grew up watching that stuff, and we had huge, thick David Attenborough books on our bookcase, and I used to spend days and days leafing through them. So I definitely was pre-programmed to care about the environment and stuff. I felt like, once I was on these expeditions, not only was it great fun and really exciting (and like adventuring), but I was also gathering data that was helping save the environment. You know, helping to understand climate change and inform policymakers. I felt like that was worthwhile, and I think that's what really convinced me to stay on and do the PhD—was the feeling that I was doing something that was worthwhile, and also the fun of it all. And also I wanted to get my PhD, of course. And Paul was willing to keep me on. So I felt like I had a good relationship going with him, and he was giving me more and more responsibilities, and I enjoyed that. It was nice. I was starting to build equipment, and do a bit of the drilling, and I pretty much ended up being the local drill engineer. If anything would go wrong with the drill I would fix it. And then if people were going to take a drill out on an expedition, I would get it ready for them, make sure it was all working. I said, "bring it back the way I gave it to you." And of course people break stuff, but if they bring it back [and] it's all broken I fix it and get it ready for the next expedition.

Cilli: So, you had developed a certain level of technical expertise as well.

Dixon: Absolutely, yeah. I mean, I had some level of that before, because I used to fix all my old cars and motorcycles. And I was forever taking stuff apart when I was a kid, and fixing VCRs and TVs and stuff. But actually to do that kind of tinkering with real expedition gear was a real thrill to me. I really enjoy it. In fact, I think I'll continue carrying on doing it, once we get a space at CCI that I can do it in again. 'Cause right now we lost our staging space, cause they had to build more offices there (for Gordon Hamilton).

Cilli: Right, cause the Institute is always growing.

Dixon: Always growing. It's grown so much. But we've got a building in the works. I'm working on that. So, I don't know if you know, but right now I'm Sustainability Coordinator for the campus.

Cilli: I did not know that.

Dixon: Yeah, so 80 percent of my time is spent as the Sustainability Coordinator. So part of my job as Sustainability Coordinator is to reduce the environmental footprint of the campus. So that involves energy-efficient technologies, energy retro fits for buildings, but also doing sustainability initiatives all across the board, between everyone on campus: students, faculty, staff, research groups. And it's great. I'm really enjoying it so far. I've only been doing it a year. But one of the projects I'm working on right now is, working with Facilities Management and Climate Change Institute to get this building constructed, which is going to be the new staging space for the Climate Change Institute. So, not only is it going to be great to have that new space to work in, but as Sustainability Coordinator, because I can work closely with facilities, I'm getting this building designed in such a way so that it's going to be super energy efficient. So it's going to use university technology in its design. Have you heard of "bridge in a backpack" technology?

Cilli: I have not.

Dixon: It's these concrete-filled composite arches that are essentially giant fiberglass tubes, twelve to fourteen inch diameter, put them up and then fill them with expanding concrete. And they go rock hard and are super strong. So the structure of this building will be five of those, covered with a stress skin foam panel that will provide great insulation, hopefully over r40. And then on the south-facing side a 40 kilowatt solar array. PV. And then the whole thing will be heated with heat pumps, so hopefully this thing will produce twice as much electricity as it actually uses. That's the idea. So that would be a good showcase for the Institute as well as the university.

Cilli: And that will be constructed where? Near Bryand?

Dixon: It will be off the edge of the Bryand parking lot, yeah.

Cilli: And this will be a place where you could store equipment.

Dixon: Absolutely. We'll store equipment. We'll build equipment. We'll clean [and] fix equipment there. We'll also use it to probably maybe stage some larger-scale experiments that need a lot of floor space, and on science day we will use it to educate the public as well. Cause CCI does this annual science day where we have two to four hundred kids coming through to look at various aspects of what we do. So normally what I do is build the drill, build the drill tent, and then operate the drill, just in the air so they can see it spinning. But I can't do that anymore because my space got taken.

Cilli: Yeah, which is unfortunate.

Dixon: It is. So, 80 percent of my time is Sustainability Coordinator. And currently only 20 percent of my job is Climate Change Institute, still working with Paul and Andre and the rest of the crew there.

Cilli: When's the last time you've gone on an expedition. My last expedition was February 2013, so about a year ago. I went back to the central Chilean Andes for the fourth year running. So, our first expedition there was 2010, we went back in 11 and 12, and finally in 13. And in 13 we had a film crew with us. I don't know if you've heard of the upcoming climate documentary by James Cameron, the famous director, he did Titanic. He's doing this climate documentary called *Years of Living Dangerously*. If you go on Youtube you can see clips for it and stuff. And he's got all kinds of big names for it. Arnold Schwarzenegger, the guy from the *Bourne* series…

Cilli: Matt Damon.

Dixon: Yeah, he's in it. Some other famous movie stars. And he's getting these stars to go around the world and act as hosts, asking questions and being filmed, exploring things that are going on around the world. It's going to be amazing. I think it's going to be an eight-part Showtime series. Something like that. So, our fourth year in Tupungotito, which is the volcano that we've been going up and down the last few years, we took the crew with us, and they filmed us. They mainly filmed Paul, but Mario Bjorn and I, we were like the supporting scientists. We were interviewed and filmed as well, so it was great. So hopefully we'll actually make an appearance in the show; that's what I hope.

Cilli: Wow. That would be pretty wonderful.

Dixon: Yeah, so that was my last trip. I'm hoping I get a chance to go again. The year before, we were out at the field, same place, same time of year, and I had to leave early because my wife was supposed to be giving birth eleven days later. And she did. She ended up giving birth nine days late, and the day she gave birth ended up being the day they all got home. But she wouldn't have forgiven me if I'd missed that.

Cilli: No, I imagine not.

Dixon: It was our first. So, then, the following year, he would have been one, but it was a short trip. Cause it was going there just to take some shallow samples. We weren't drilling a deep core; we could travel light. We had a film crew with us. And so, she let me go the second year. So, I was gone for a month. Plus I was gone for a month at the end of 2012 with the South Georgia trip as well. So my wife's pretty good; she lets me go on these things. So hopefully if some more come up she'll let me go to those as well. But so far they haven't come up, because since then a lot of graduate students have arrived at the Institute, and they are now out and about, up in the mountains and on the ice—doing all the stuff I used to do. So, I'm feeling a bit old these days.

Cilli: So, what had you heard about the Institute before coming?

Dixon: Nothing. Literally I got that email from my paleo-oceanography professor. At that point I started going online and reading about it. It turns out Paul came up from the University of New Hampshire, cause he was at the climate change research center down there. And I think he got head hunted by UMaine.

Cilli: Right, they recruited him.

Dixon: They recruited him. So, he came here to be the director of the Institute back in 2000, and so he's been director ever since. It's slightly unusual, but I think everyone feels he's doing a good job; he's good for the Institute. The Institute's grown a lot and progressed a lot since those early days.

Cilli: What do you think has been the Institute's most important contribution to climate science?

Dixon: It's hard to say what's the most important. I think there are multiple things that combined together form a very important… see, it's a sequence of events, that when they occur in the right order, they ended up being extremely important. I think it's not necessarily just the Institute. I think it goes back to the whole idea of ice ages, these ice age cycles that were originally thought of as being these slow things…..People like Hal Borns, George Denton, these guys were using radiocarbon dates on morraines, using glacial geology, figured out that the end of the last glacial wasn't really drawn out and slow. It was fast. One minute there was a mile of ice here; a couple thousand years later it was gone. That is a fast change. That's a big deal. So that was the beginning. And then you had people like Paul Mayewski. He worked on deep ice coring projects in Greenland that drilled an ice core over three thousand meters deep. And then analyzed it in high-resolution. And then what they essentially saw was that during the last ice age was these abrupt changes in climate, from very cold to warmer, to cold to warm. And the ice age is full of them. I mean there's Dansgaard-Oescher events, there's Borns cycles; there were other, much higher-frequency cycles as well. There are fifteen-hundred year cycles, and so when you look at these records it's frightening. Cause you realize most of the time climate isn't lovely and warm and stable, as we know it. Cause the last ten thousand years of our climate have been warm and stable and safe, but when you look back at the previous 90 thousand before that, it's been hellish. I mean, completely different world. Wind, dust, unpredictable stuff going on. So, when that ice core was first drilled back in the mid-90s, they knew that these changes were faster than we had previously believed. But we didn't know how fast, because the ice core was still analyzed at a fairly low resolution. You know, like maybe 20 centimeter or 60 centimeter, and then we couldn't annually date it at that point. We didn't have annual changes, so we couldn't say, "OK, that change happened in four years." We couldn't do that, but we knew ballpark figures, and we knew that the change was fast. And then more recently, again Paul has developed this (with the help of other people in the Institute) laser system that actually goes down. You can zap it, on the outside of the ice, on a nice clean flat part of the ice. It doesn't melt it or anything. It just zaps along it, it oblates the surface, and then a machine called an ICPMS (which is a giant mass spec) can look at the changes in the chemistry. But the advantages of the laser is… so, I guess I should go back a bit. So, back when they did the Greenland core the maximum resolution was maybe two or three centimeters of resolution. You know, you analyze this much of the core at a time. Then, shortly after that, we developed a melt-system here at UMaine, similar to the ones the Germans were using (a guy called Vagenbach). And the melt system was able to get a resolution of one meter, so it brought out even more detail in the core. And allows you to annually date the core, or sub-annually date the core, further down, as the layers get thinner. But still, one centimeter wasn't enough, cause these cores that go back 90,000 years, they're so compressed [that] their annual layers are tiny, maybe one or two centimeters. So then Paul developed this new laser system, which essentially has a spot size of ten microns. And you can zap that down a meter of core and get a hundred thousand sample levels. So you're essentially measuring chemistry every ten microns, or every 20, down the core. And this is unheard of. This is technology that we only dreamed about five, ten years ago. And

now it's reality. So, Paul has taken sections of that Greenland core, the one that he analyzed originally, he's put it on the laser, zapped it over one of these transitions, from warm to cold, and [discovered that] it happens in roughly two years.

Cilli: Wow.

Dixon: Two to four. Very, very fast. So, to me, that is one of the most important things ever to come out of the Institute. We have shown that climate can change abruptly over very, very short time periods. It's easy to say that, but to a lot of people it just doesn't sink in. The significance of that. When you think about our climate right now, it's super stable, super warm, [and] we're all complacent. And this is how society has managed to prosper, is simply because climate is so stable. You look at what happens when we get these crazy storms, like Sandy, or hurricanes, you know, a couple of ice storms up the coast of Maine, everything is disrupted. And everyone's just holding on, "it'll end soon, and we'll recover." So imagine that those storms just go on continuously. Imagine climate changes over a period of two to four years, and all of a sudden that's what we're living in. I think that is reality. That is gonna happen at some point. I don't know when, but climate can do that.

Cilli: And that's not much time to prepare or adjust.

Dixon: That's no time, when you've got millions of people living within five meters of sea level, billions in fact. Isn't it, one fifth of the population lives within five meters of sea level… But it is frightening, and of course the other thing that I find that is very difficult for the general public to swallow is that global warming isn't necessarily going to be warming. 'Cause there's more heat in the global system, it's circulating more vigorously; it's like boiling a cup of water…. So that's essentially what we're doing to the atmosphere. Putting a lot of energy into it and its going to start circulating more vigorously. So we're gonna start getting more unpredictable things happening that we're not used to. They may be predictable, but we're certainly not going to be used to them. And I think trying to explain climate change, as opposed to global warming, trying to explain the nuances, it doesn't just mean that the climate is going to get hotter. It could get colder, it could get wetter, it could get dryer, it could get windier. Any of these things could happen. And I think that's another big message that's important to keep transmitting to the public. Cause a lot of people I talk to… I gave a talk in the Union the other day to the UMaine Skeptical Society, and they wanted to learn about climate change. And cause they're skeptical they ask a lot of questions; they are not necessarily disbelievers of climate change, but they are naturally skeptical. And I think that's great. That's the essence of science, isn't it? You just keep asking questions. So, I thought that was good. But one of the things that I discovered in there was that, one of the guys who asked me to come talk, he has a brother who just flat out doesn't believe in climate change. And even if you showed them loads and loads of evidence… 97 percent of scientists agree that humans are affecting climate and that we need to do something about it. Even if you show him all of that information, all of that data, he still comes back and says, "well, the models aren't good enough." We shouldn't change how the world uses its energy based upon a model that we don't believe. That's his attitude, and I just don't understand that attitude. Don't you want to create cleaner air? Don't you want fresher water? Don't you want to preserve the millions of species that are predicted to die out if we continue warming the planet? It just drives me mad. So anyway, this guy, he has spirited conversations with his brother on Facebook. Sometimes when he can't retort, he'll send me his brother's quote and ask me for advice about what to say. [laughs] So that started up quite recently; I find that quite

amusing. Those are just a handful of things that I think are really important. Some of them haven't solely come directly from the Institute, but the sheer speed of these significant changes during glacial times, that is definitely something that came directly from the Institute. And I think all of this work all builds upon the work that led up to it, so it's hard to say that one thing's more important than another. I think the whole series of having Hal and George, and then Paul and Gordon and Karl, and now the new batch are coming one: you've got Andre and who knows, maybe me, Nicki, all kinds of new folks. And it's an ongoing process.

Cilli: Well, that's all the questions I have, but I do want to thank you for sharing your thoughts. It was all very fascinating.

Dixon: Anytime, anytime. I love telling stories. As I'm sure you figured out.

Cilli: Well, it sounds like you've got lots of them. It's really wonderful stuff.