

Episode 1: Kate Miller

FULL TRANSCRIPT (with timecode)

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F7: Hello and welcome to the first edition of the Arlington Public Schools podcast. I'm your host Frank Bellavia, the communications coordinator for media relations and online strategies and this podcast just to kind of get the community inside the schools as you know and see what's going on.

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M4: With all schools and students. And our first guest with us is Katie Miller who is a science teacher at Washington Lee High School and recently took a trip to the South Pole. So we thought we talked to her about her trip.

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M5: What she did what she learned how she got there because I know that the trek down there is quite quite a trek in itself but wanted to walk me to our first ever audition. And I'm excited to be here. So first of all tell me a little bit about what you do here in Washington and how long you've been with the school system.

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F3: So I'm a physics teacher here in Washington we teach general physics and IB physics. I have been with Arlington public schools for the last oh just four years now.

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M3: So you recently went to the South Pole with the National Science Foundation and poor track. Tell me a little bit about what that entailed and what you did down there.

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F6: Sure. So Polartec is a program sponsored by the National Science Foundation and they matched teachers with researchers to go on expeditions in polar regions. So last year seven teachers went to the Arctic and did various research projects there and seven people went to the Antarctic and did various research projects there. The idea is that by sending teachers we can bring that experience back to our classroom but also back to our communities. So now that I'm back working on different outreach opportunities I just went to the planetarium got to present there but then communicating my experience with my students as well in the classroom.

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M1: Now I know this is come second or third teacher that has actually gone through this. This to the South Pole. And on this experience what prompted you to decide hey I want to go to the South Pole and take part in this.

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F6: Sure. So as a science teacher I'm trying to prepare my kids for whatever's to come next in their life. And I think for a lot of my students I hope that they're going into physics or engineering or related fields. And honestly even if they're not going into kind of the direction and the direct connection with science they're going into fields that still require skills of critical thinking and problem solving and collaboration.

And so I really wanted to experience what that world is like right now the cutting edge research. What sort of skills does a scientist in the 21st century actually need and so experiencing those skills then can help me be a better teacher in the classroom to prepare those kids for the next generation.

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M1: I know based on some of the stuff that I've been reading and that appeared in two of our publications one of the things you did down there was neutrinos studying neutrinos night. Somebody thinks neutrinos they think of a sci fi TV show or something like that. What are neutrinos and what is it about neutrinos that you have to go down there specifically to study them.

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F7: Sure. So I was assigned to the Ice Cube Neutrino Observatory and indeed we're looking for neutrinos. The most common question that I get is what the heck is a neutrino. So neutrinos are really really tiny particles like we're talking smaller than the nucleus of an atom. So we have never seen these with her eyes or even with a microscope but our theory tells us that they must exist. The theory also tells us that these are really unique particles for a few reasons. The first reason is that they're nearly massless. So this means as they're traveling through space to get here to Earth they aren't Bentler warped by like massive bodies like how our Earth will fall into orbit around the sun a neutrino won't orbit anything. It doesn't have enough mass to second. They are also nearly they are charge lists. That means that they'll pass straight through electric fields and magnetic fields. So wherever these neutrinos are coming from it's pretty much a straight line from their source to us. So that makes them really interesting to study because we don't have to worry about these weird buttons. Neutrinos are coming from really interesting places in our universe. So even though the neutrino itself is super super tiny they're coming from a really large really violent events things like gamma ray burst some of the most violent explosions in our universe when a star dies it'll go supernova and essentially explode or even black holes when they're accelerating mass. These will all output neutrinos. So if we can detect them well this is great news we just point a straight line back in the sky and we figure out where they came from to learn more about it.

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M1: So these aren't necessarily coming from like our sun or anything like that. These are coming from anywhere galaxy in our solar system and there are just come through the atmosphere. Is it a specific thing about the South Pole that it's easier to talk to there.

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F7: Well to be clear there are neutrinos coming from our sun and actually every star so anything undergoing fusion or fission which includes our sun. In fact there's even neutrinos coming from bananas just a natural radioactive decay of bananas will produce neutrinos or you have a brown or you're actually got some neutrinos floating around.

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F3: They say that there's about a billion neutrinos passing through you every second and most of those neutrinos are coming from our sun. Those are lower energy neutrinos. So when I'm talking like black holes and supernova and really cool events we're looking in the higher energy range and that's really what Ice Cube the project is focusing on Ice Cube of course is at the South Pole and there's a few reasons why the South Pole is an ideal location for a project like Ice Cube.

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F5: The first reason is that we needed a whole lot of really clear stuff because what we're actually detecting is this beautiful blue light that comes from a neutrino interaction. And so for us to detect the blue light while we need it not to take like weird bends and curves we need it to go you know just exactly straight from where it was created to the detector. So the ice at the South Pole when you drill down really really deep we're talking like miles deep into the ice. All of the little air molecules have been squeezed out and the ice is so so pure like clearer than the glass in your glasses. And so we said wow there's a lot of pure untouched ice at the South Pole. That makes for a really ideal place for this detector. But then you also have to remember that there's a lot of ice all over Antarctica.

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F3: And so we chose the South Pole because there is a station there you know you can't just go anywhere in the Antarctica you have to have that support. So the Amundson Scott South Pole Station which is one of the three U.S. stations funded by the National Science Foundation. That's where you know you sleep and get warm and can do some data analysis and have your computers inside so they know Fresen wreathing like that. All of that support at the South Pole makes it ideal as well.

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M1: I know this isn't just load typical a 12 hour flight to Europe or something like that to get down there. It took you a couple of days to get down there. Talk about your experience in just getting there.

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F2: Well I have to tell you it's exhausting. So the first thing that you need to do and this is all on commercial airlines at this point is to get yourself to Christchurch New Zealand. And if any of the listeners have ever been to New Zealand or Australia it is exhausting in and of itself you cross the international date line so you technically lose a day as you travel.

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F3: And that's just the beginning. That's the starting point is Christchurch New Zealand. You spend several days in Christchurch I was fortunate enough to be able to kind of tour around New Zealand for a bit before I left for Antarctica. But a few important things happened in Christchurch so you get your extreme cold weather gear you pack all of your bags in very specific ways. You know this is in case the flight turns around halfway and this is you know the actual checked bag and this whole process in order to prepare. And then you get on a flight to is about an eight hour flight in the first place that you go in Antarctica is McMurdo McMurdo station McMurdo is right on the coast. So it's going to be the shortest distance between New Zealand and a U.S. station McMurdo is really interesting. It's a big station. There are like 2000 people there in the summer and it kind of reminds you of like a little almost like a college town like it has one of everything you could ever want. There's you know one big cafeteria and one coffee shop and one movie theater. And it's one of everything you could. Exactly. And so you spend a few days at McMurdo and then from McMurdo if you're lucky enough to go to the South Pole you hop on another flight. This is a three hour flight and it'll take you from McMurdo Station to the South Pole the Amundson Scott South Pole Station. So eventually you get there. And I have to tell you when I stepped off the plane I mean I was just so excited right. Like I had anticipated this for so long. And you step off the plane and you look around and you're like huh. There's not a lot here. There's like a whole lot enough in the South Pole and you finally you know you spot the station you're like OK I can do this. There is support. There's a bed waiting for me and you get acclimated.

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M1: The first thing that went off the point to find the actual cell phone.

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F5: So actually all you have to remember that the South Pole is a really extreme environment. So it a lot of people forget including myself is that the South Pole sits on top of miles and miles of glacier. So it's actually at a really high elevation. So one of the concerns is altitude sickness something I would have thought of.

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F4: Yeah. So you're at about 90 300 feet which is pretty high. You know we have any climbers or hikers listening in. That's a pretty good altitude. So you can take preventative medicine beforehand to kind of combat altitude sickness.

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F7: But the first thing you do is like lay down and watch movies for the first few days and that helps you to get acclimated to you know the lower amount of oxygen in the air but also to get used to like just being in this strange place and the sun never sets and sleep is weird when the sun doesn't set and there's like zero percent humidity. So yeah it takes a lot of adjusting to really start enjoying the experience and going outside and exploring so the first few days like everyone just takes it easy.

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M1: You talked about the altitude of things to get used to how cold was it down on average.

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F3: So when I was there I was in the Antarctic summer I was there in January. So remember that the summer in the north is winter in the south and winter in the north this summer in the south. So when I was there it rains. It was about negative 25 negative 35 degrees Fahrenheit. But what you're really concerned with is the wind chill the wind chill is how it feels and the windchill you get down to like negative 45 negative 50 degrees Fahrenheit and not so great days.

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M1: And so you are never going to complain about a polar vortex coming down into our area again.

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F3: I mean luckily they prepare you so well like the extreme cold weather gear that they give you is just head to toe really really warm.

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M2: What is it. What is it. What is the eastern shore of Trovatore.

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F4: Yeah. So starting with your feet and working Reya so you put on what's called Bunny boots and there are these big white really heavy boots and on the side there is a little valve. And so when you're inside the station you open the valve you let all of the warm air from the station go into your boots and then you close the valve seal it up and when you go outside the warm in the warm air inside your boots access and insulator around your feet. So you put your Bronnie boots on. You layer you know a few different under

layers and then kind of like overall snow pants over those a few layers on the top you know warm warm under layers and then a big red which is a big red parka. We nickname it. They cried. That thing is really warm and that is your outer coat and it has a hood with fur around it and of that things are a lifesaver. You know a couple pairs of gloves you have liners and then gloves and usually mittens over that and balaclava for your neck and some goggles that are polarized because you have to worry about the sun reflecting off the ice actually makes it more intense and can be really harmful for your eyes.

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F2: I was just going to say I've got to tell you that actually we also had to put on sunscreen quite a lot which seems counterintuitive right. You're not going there to sunbathe. That's for sure.

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M2: But yeah you would get sunburnt really quickly if you weren't diligent about using drugs or the water was once a day once every other day.

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F4: Yeah. Some of her work was outside for example one day we were trying to recover some equipment that we had to send North it just had some broken parts and this equipment is in a box and that box used to be just on the surface you know on top of the snow.

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F5: And although it doesn't snow much in at the South Pole it's a big desert. The wind will pick up the snow and drift it. So it kind of appears like it has snowed in so those docks that used to sit on the surface is now you know four or five six feet below the surface.

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F3: So we did a lot of shoveling to get to that box. You can imagine how exhausting.

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M1: And we didn't shovel that much around here this winter either. So you had all you got to experience people and get this right.

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F4: Oh right. Yeah. When you're shoveling at altitude and with less sleep than you're used to because you don't sleep well with the sun always up and you know wind chill of negative 40 degrees Fahrenheit. And it's an extreme condition to shovel it. It gets really tiring but you know that's my job. While I was there I was an active member of the research team and that's what it takes.

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M1: One of the things you do when you down there is actually communicate with your students. How often did you do that and what were you talking to them about. And I got to imagine they were pretty excited to hear from you.

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F3: Yeah. That was my favorite part was you know doing the outreach component because as a teacher that that's what I really love to do. So every day I would post journals some of those journals were about

the cool science that we were doing other journals were just about you know what is it like to live at the South Pole and other journals I you know interviewed the chef or the electrician who happens to work at the South Pole. So all of those are archived online at least lesz. Miller South Pole and they're open to the public as well as my students at the time. So my students were actively posting comments and I would get back to them and I'd post pictures for them to see just kind of updates of where I was. But then also a really special event we had a polar Connect event where we could video chat into multiple different classrooms my own included. And so we presented to the students you know about Ice Cube the project and then they got to in real time ask us questions. And I mean you can just imagine how much planning goes into things like this because you don't have Internet 24 hours a day when you're at the South Pole. Your internet relies on three different satellites and those satellites come up usually at really inconvenient time in the middle of when you're trying to sleep what you can do because the sun's up right. So yeah it was strange to essentially be teaching my class virtually at Lake 2am but the sun's totally up out the window. And like it's a strange experience. But despite the Internet obstacles which are many at the South Pole you know I was still able to connect in a lot of different ways with the public and my students talk about some of the people that you were down there with that you worked with on a daily basis what kind of experience is a job with them. So we had a research team of I think about five people who were working on Project Ice Cube and we would collaborate on a daily basis of you know what needs to be done today. How can each one of us help with that. What sort of skills what sort of expertise do we bring to each of the tasks. But there were many many other sort of projects going on down there you have for example Noah is launching weather balloons to collect data around. You know what is the strange atmosphere look like over Antarctica. I mean you just have the solar telescope that is trying to look at our sun itself and learn more about her son. Just such a variety of science going on there. But then you have to remember that in order to support this science there's also all of these very usual jobs that we have here. So I got to hang out with firefighters and they just fight fires at the South Pole and you know the people who run the waste management system and the power plant and the cooks and the comms people and you know like we I think sometimes forget that there are normal everyday people who make the South Pole station run and it was really really interesting to meet everyone. There were only about 200 people at the South Pole Station in the summer. And so you get to know everyone pretty quickly and pretty well which is very unique.

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M1: Was there something while you were down there that you didn't have that you missed something back here. Certain coffees TV. I know you were down there during the Super Bowl so I don't even know if you got a chance to watch the Super Bowl but yeah I'm not a big Super Bowl fan to admit.

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F3: Oh what did I miss. I mean they really have a lot. Free to keep you entertained. There are I think two or three different rooms just full of movies of every TV show and everything you could ever want. There's tons of videogames there's a gym to work out. You know there's a sauna at the South Pole. There's probably ate better that month than I have in a long time. The food was so good. Everything you could want. New Zealand stripped steak and fajitas and macaroni and cheese and ice cream a lot of ice cream at the South Pole didn't have to worry about it melting anywhere right. Right. I think the thing that I missed most though was probably just like humidity. I didn't realize how hard it is to sleep in like zero percent humidity. And so I would oftentimes kind of just hang out in the greenhouse and try to watch something on my phone or read a book in the greenhouse just feel a little bit of humidity on my skin. So yeah if I could have had anything at the South Pole it would have been just like a really humid room all the time.

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M1: So when you got back what was what was the reaction like to students when they first saw you back that the first day back in your class.

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F3: Oh it was so much fun for me to come back. Especially my IB physics students have been with me for two years now. And so they were with me when I applied to polar when I got it. And then they saw me through the actual trip itself. They were just so excited for me I had so many questions and of course I was excited to talk about it. And a few little surprises here and there they they actually organized giving me a cardboard cut out of me doing a handstand stand at the South Pole. They also organized a bulletin board to keep the school updated of where I was each day and so it was fun to come back and just see how engaged they were even when I wasn't physically here.

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M1: So you've been you've been back for a couple months now what sort of things have you been that you brought back. Are you still talking to students about teaching students about.

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F3: I find that almost every lesson I have legal little piece of Antarctica that I can slip in. But perhaps the most explicit connections was in the IB curriculum when I came back. We were in the middle of particle physics and so neutrinos being in you know the realm of the IB curriculum. It was cool to be able to share with them just like my real world experiences around how how do we detect neutrinos what does this look like in reality instead of just reading it out of a textbook and then right after that was astrophysics unit which then we could talk about where neutrinos came from and it was just like this seamless sort of fit of kind of trying to take the content that's required and make it come alive for students or to students really appreciate that to knowing that something first hand of the applications where you guys are studying this how you guys are looking at it and that you're learning about at the same time they are. I hope they had fun. I had fun. So yeah I think I think the benefits of having a teacher go on a field research experience. There's just so many benefits. And I I could talk for an entire another hour about how it's really influenced me as a teacher how it's influenced my students in both really direct ways and in indirect ways. But yeah it was amazing to be able to bring my experience back and share it with the kids.

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M1: I know you've done a couple of outreach events for the community and for the school you need a couple here at the planetarium. Anything else coming up in the future maybe with summer that you're good planning and so the community can learn more about this new project.

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F3: Yeah absolutely. Well my community extends for a guess more than Arlington so this summer I'll be travelling to the University of Wisconsin at River Falls and I'll be working as an upward bound teacher. And so we're designing projects around the theme of interactions so that high school students in this summer camp will get to do various projects that in some way relate back to ice cube the prod the The Project Ice Cube and my Antarctic experience. But here in Arlington I have a few other things planned. I know that there is there. There are a few professional developments coming up in the fall where I'm hoping to share my experience with other teachers have a broader impact and just kind of different community events as they come up. So I think in a few weeks I'm doing the superintendent seminar which is really exciting to talk to you know rising high school students who are interested in leadership.

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M1: That's great. We'll post some of those events on our Web site in the show notes for this podcast. You guys can see what they are. I appreciate you taking the time and being our first guest I know it was exciting to watch you through the whole thing I keep getting your blog updates and stuff like that. And we were here when you were talking to your students in real time so it's great to see that and I appreciate you taking your time to sit with me today.

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F3: Thank you so much for having me.

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M5: That's wraps up our first episode of the podcast.

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M3: Tune in every couple of weeks we'll have a new episode featuring what's going on with our public schools. Thank you