An Interview with Bob Megginson

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After earning an undergraduate degree in physics, Robert Megginson spent eight years working at the Roper Corporation as a computer systems software specialist before attending graduate school at the University of Illinois, where he finished his PhD in 1984. Since 1991, Bob has been in the mathematics department at the University of Michigan, where he is now an Arthur F. Thurnau Professor and Professor of Mathematics.

In addition to his mathematical research into the geometry of Banach spaces, Bob's efforts to increase the number of students from underrepresented groups, particularly Native Americans, in mathematics and other STEM-related fields has been widely recognized. For example, he developed a summer program for students in the Turtle Mountain Chippewa Nation in North Dakota and led that program for many years. In addition, Bob has served on a number of national committees, through organizations such as the MAA, the American Indian Science and Engineering Society, and the Mathematical Sciences Research Institute, that work to address this problem.

A more complete bibliography is available at

http://www.maa.org/programs/underrepresented-groups/summa/summa-archival-record/robert-eugene-megginson.

Would you describe your Native American background?

> *I am Lakota, through my mother's family, and was raised to be aware of that although I was born and raised in rural Illinois. Though my Native heritage is not the first thing people guess about me, my mother's was far more apparent, and she had to put up with "squaw" cracks from people in the small town in which we lived, particularly from a workman employed by my father, who thought it was just innocent ribbing. With everyone knowing everything about everyone else in a small town, that did get into the school system, and I had to endure the standard taunts that schoolchildren inflict on each other. But I also would stress that there was not all that much of that. American Indians living far outside "Indian Country" are often far less subject to blatant discrimination and racism, and far more often treated as curiosities, than, for example, reservation folks. It was not until I became closely engaged with reservation education, and saw how my Native students were often treated when they were off-rez, that this was really brought home to me. Imagine having students whose parents have entrusted them to you (important for education in Native communities) go into a five-and-dime store just off the edge of the rez to buy some dice to be used in probability*

games in your program, students as honorable and decent as the day is long, and having store staff follow them around to let them know that they were prime suspects for shoplifting. What a message to dump onto fifteen-year-olds (in this case), or anyone at any age!

I have read that you were raised away from your Native community, yet you seem to feel a deep connection to your Native heritage. How did Native culture become a part of who you are?

A bit of it came from my maternal grandfather, who liked to tell stories. He was born in 1882, about halfway in time between what many Lakota would call the struggle of Greasy Grass, and others the battle of Little Big Horn, in 1876, and First Wounded Knee at the end of 1890. But he lived into his 90s, and I knew him well. I guess that without fully realizing it, I was exposed to a set of values coming through my mother's side of the family that just struck me as right and important, and that led me to want to connect more closely with those values. (I have since found that many other Native people who have not grown up directly in their cultures or who have left it for "life in the big city" feel the same tug, sometimes strongly in middle age where they look for ways to engage or re-engage, and return something to their people.)

This took a mathematical bent when I found that although there was highly developed mathematics in the Western Hemisphere before Columbus ran into us on his way to India, there was also a corrosive theory that had been around awhile that we were inherently bad at mathematics for cultural or (shudder) genetic reasons. I went looking for other PhD American Indian mathematicians, and for a long time could not find any. (However, I found out later that I had gone to graduate school with one, who revealed that to me but for reasons I respect has asked that I not give out a name. I also had the honor of having as a colleague in my current department a mathematician who, as nearly as anyone has been able to determine, was the first American Indian to receive a PhD in mathematics. He has since passed on, and out of respect for his own tradition about those who have gone to the camp on the other side of the hill, I am also not mentioning his name.) In any case, my deepest engagement with my Native heritage really came about when I was exploring ways to help get more American Indians involved with mathematics, and responded to a joint request from the MAA, the American Indian Science and Engineering Society (AISES), and the Turtle Mountain Chippewa Nation of North Dakota to work with students on that reservation to improve their mathematical preparedness to engage in STEM careers. I ended up spending most of my summers in the 1990s doing such work, at Turtle Mountain and elsewhere, and when heading off to the rez each summer I really felt like I was going home.

I've received a number of recognitions for the work I've done to help address the underrepresentation of American Indians and other minorities in mathematics, including the MAA's Yueh Gin-Gung and Dr. Charles Y. Hu distinguished service award, but I'll admit that the one that I've treasured the most was the 1999 Ely S. Parker Award, AISES's highest recognition, presented to at most one American Indian scientist, engineer, or mathematician each year for exceptional achievement in a STEM career and

exceptional service to community. That's the one that brought tears to my eyes, because it was a recognition coming from my own community. (And also because AISES at the time had a policy of not telling the honoree ahead of time that s/he had even been nominated, but just pulled the recipient out of the audience in front of a couple thousand people at the honor banquet at the annual national conference!) I do feel a strong connection to community and culture, and though, like a former Executive Director of AISES has said, Native scientists do have to stand with a foot in each of two canoes, that connection remains vital to me.

After earning an undergraduate degree in physics, you spent several years working in industry. What led you back to mathematics and graduate school?

My undergraduate degree in physics came in 1969, and I quickly found out that there were no jobs available to physics students without graduate training, which at the time I thought was related to the winding down of the Apollo program's developmental phase and resulting release of a bunch of unemployed scientists into the general population. However, that was just a guess. In any case, at that time corporations were really only beginning to have large computer shops and were hiring just about anyone who could score well on some standardized tests designed to ferret out aptitude in that direction, and I guess I did well on one of them. In any case, I rose to the position of lead computer system software specialist for a Fortune 500 company, Roper Corporation (long since gone, though the brand name lives on in some places), and enjoyed my eight years doing that sort of work. However, mathematics had always been attractive, including during the time I was getting that "more practical" physics degree, and while at Roper I found myself spending evenings after work reading math texts. In 1977 I agreed with my fianc Kathy, now my amazing wife of 38 years, that I had to do mathematics or spend the rest of my life growling and grumpy, which led to graduate school at the University of Illinois and ultimately to my current faculty position at the University of Michigan.

How does your experience in industry inform your work in mathematics and teaching?

Though I'm trained as a geometer of Banach spaces, a relatively pure area in analysis, lately I've spent most of my time in the classroom teaching PDE to upper-division undergraduate and graduate engineers who are planning careers in industry. In working with corporate administration during my years at Roper, I learned much about organizational culture and corporate values that help me understand better the needs of my students, particularly the value of being able to work collaboratively and communicate with others.

(An aside about the end of my time in industry: When I was in my last days at Roper, and it was known that my goal was to become an academic mathematician, a corporate vice president with whom I'd done a lot of work called me into his office and told me how much he envied me. When I asked him why, he said the following: "You're going to get to go work at a university, and never again have to face all this corporate politics!")

What areas of mathematics have held particular interest for you? What do you consider some highlights of your research career?

Because of the severe impact climate disruption is already having on indigenous peoples of the Western Hemisphere and the rest of the world (and those who don't think there is already such an impact should Google, e.g., "Shishmaref"), I have become interested in the mathematics of climate science. At this late stage of my career I may not be contributing a bunch to mathematical knowledge in this area, but I have been very actively trying to recruit Native and other minority students to mathematically-based aspects of climate science, e.g., with a keynote address to a few thousand of them at the 2013 annual conference of the Society for the Advancement of Chicanos and Native Americans in Science. (If you have 35 minutes to spare, you might want to grab some popcorn and view the YouTube video of that at http://www.youtube.com/watch?v=-Co4VNEpHcM to see what I hope to accomplish with talks like that.)

I still am deeply interested in the geometry of Banach spaces, particularly in nearest-point properties of sets in such spaces, and there is one particular problem in that area that I hope to see solved in my lifetime. I will not state it here, since I've heard it said, justifiably, that there should be a severe punishment for any mathematician who gets a graduate student interested in that problem, attractive and easily stated, that has frustrated many very good mathematicians who have made little progress on it in over fifty years.

The two major highlights of my career have been the phone call in 1991 from Don Lewis, then mathematics chair at U-M, making me a tenure-track offer to join its mathematics faculty, and another phone call from David Eisenbud in 2001 offering me a two-year term as deputy director of MSRI. Both have been amazing, intellectually vibrant places to work.

Are there ways in which your Native American heritage gives you a unique perspective as a mathematician and a teacher of mathematics?

Though I don't believe Native Americans are evolutionarily programmed to think any differently from anyone else, I do believe that culturally we may be better primed to deal with wicked problems than those trained in traditional Western ways of linear thinking. (I'm using the term wicked problem here in its technical sense; for a working definition and my argument about Natives and wicked problems, see my science policy article accessed by clicking the appropriate link at http://sacnas.org/about/stories/sacnas-news/summer-2014.) Since I believe that 21st century STEM professionals are going to get many opportunities to deal with wicked problems, I try to bring discussions about that into my classrooms.

I have read that you are one of only twelve Native Americans to hold a Ph.D. in mathematics, which leads me to believe you have faced some of the challenges that the students you mentor face. Can you describe your own experience as a Native American entering the mathematical community and how you use that experience in working with students from underrepresented groups?

Actually, that number is an old guess by some sources, and I hope it is larger now, though it's difficult to tell since the NSF is now suppressing small numbers in table cells breaking out degree achievement by ethnicity, due to privacy concerns that many of us interested in the numbers have been challenging. But in any case we can hope that the numbers are now substantially larger than the five that the AAAS could find in a study done in the 1970s about the barriers to Native American participation in mathematics. Also, I credit the AMS for doing its best to report the numbers in its annual reports on the state of the profession, but there may be issues beyond their control in the way that numbers for Native Americans are reported.

In any case, we know that the numbers, whatever they are, are too small, and we need to improve them. Though I believe that I've directly helped Native students with significant mentoring toward mathematics-based careers, and am now co-PI on a big AISES grant to try to point more toward mathematics-based careers, I think that one of the biggest things that I and other Native mathematicians can do, by our presence in the profession, is to show that the term "American Indian mathematician" is not an oxymoron.

Are there other challenges currently faced by students in underrepresented groups as they enter the mathematical community?

Many, including a problem common to many first-generation students who like mathematics: convincing family and many others in their communities that there really are good jobs out there awaiting people who are prepared to enter mathematics-based careers. (Though I hasten to add that in the case of Native Americans, the value of having mathematically-capable scientists and engineers who can return to reservations to help their people is well-known to tribal leaders and generally encouraged quite strongly.)

Why is it important for the discipline of mathematics to have underrepresented groups participating more fully in the mathematical community?

First of all, from a practical point of view rooted in the changing demographics of our nation, the discipline of mathematics cannot look for support just from members of the current majority population if it hopes to thrive into a future in which that majority becomes a minority.

In addition, while I recognize that some folks treat as platitude the statement that diverse viewpoints benefit any discipline, I really believe that, and with racial and ethnic diversity comes cultural diversity and diversity of viewpoints and problem-solving approaches. Our discipline needs to offer a big tent if we want to benefit from that diversity.

Mathematics is often thought of as a "universal language." For instance, prime numbers are used by SETI in attempts to communicate with extraterrestial life. At the same time, what we currently think of as mathematics has evolved out of a specific cultural context. I'm wondering if these thoughts enter into your work with students on the Turtle Mountain reservation.

Actually, one of my challenges has been trying to convince the students that while the mathematics we do nowadays has indeed evolved out a specific cultural context, in fact it has also evolved and thrived in other cultural contexts, and indigenous peoples in some parts of the Western Hemisphere were quite good at it before European contact. I have succeeded to varying degrees in making that case, but it's admittedly true that many American Indian students exploring their historical cultural roots are hard to convince of that.

Can you tell us about some activities that you used in working with those students to connect their culture and mathematics?

One that proved quite interesting involved introducing students to Conway's Game of Life, then having them devise a starting configuration they found interesting, beading that and a few succeeding generations into a band or belt, and having an elder tell them what he saw in the evolving patterns.

I have read that you are an avid mountaineer attempting to climb all 53 mountains in Colorado over 14,000 feet. How many 14ers are left for you? What comes after that?

I have about two-thirds of them, and must admit that there are some real suckers among the 17 or so (depending on how you count; interestingly, opinions differ a bit on that) that I may never get. But there are lots of mountains, even in the high Rockies, that are wonderful, beautiful, and challenging, and I certainly don't restrict my attention just to the 14ers.

Here's something that happened to me on a 14er climb that may include a partial answer to "what comes after that". Mount Massive is the second highest mountain in the Rockies, with summit elevation about 14,420 feet that's only a dozen feet or so short of the highest summit, nearby Mount Elbert. (A quick primer on terminology: A high mountain is one with a big number for its summit elevation above sea level, while a tall mountain is one whose summit is vertically a long way from its base. Massive and Elbert both sit on a base plane at about 10,000 feet. Both are somewhat higher mountains that Mauna Loa or Mauna Kea, but both of those monstrous Hawaiian volcanoes are much taller than anything in the Rockies. In fact, Mauna Kea is the tallest mountain in the world, about 4,000 feet taller than Everest although about 15,000 feet less high. Standing on the shoulders of giants does indeed help.) Anyway, Mount Massive is not at all a technically difficult climb by its standard route, though it can be exhausting due to the length of the approach.

I've climbed Massive a number of times by variations on its standard route, but one day I tackled a particularly challenging, nonstandard route on Massive that involved passing over a number of sub-summits that themselves rose over 14,000 feet, some of which involved a little technical work. I reached the last leg in a saddle where the standard route to the summit joins the route I'd taken, mostly exhausted but looking forward to finishing it off. A family of four consisting of parents and teenage daughter and son had made it up the standard route that far and was recuperating in the saddle. The parents were looking up at what remained to be scaled, and it had them

a bit frightened, particularly since none of the four had ever done any real climbing before, but they gave their permission to the pair of teenagers to head on up provided they'd turn around if things got overly dangerous, and provided the daughter phoned from the summit to let them know they were safe and sound. This was fine with the teenagers, believing, as most teenagers do, that they were indestructible. I headed on up ahead of them, but kept an eye behind me to make sure they didn't make an unwise move around the wrong side of a formation or try to take a shortcut along a cornice. They made it just fine, and I overheard the daughter's side of the cell phone call from the summit, which went about like this:

"Yeah, Mom, we're fine. What's it like? Well you're way above everything, and it's kind of scary. But when you look around, you don't just see some of the other mountains, you can see them all at once."

I've never forgotten that beautiful description, and what comes next for me, as long as I'm able, is to keep going places where you don't just see some of the other mountains, but you can see them all at once.