In Conversation with Indigenous Chemistry Alumna Angela Magon

Can you introduce yourself, and tell us a little bit about where you are from?

My name is Angela Magon. I was born in Vancouver and grew up on Vancouver Island. I'm a mixed heritage Indigenous person. I have Métis ancestry on my mother's father's side and my father's mother's side. I have Mohawk ancestry on my mother's mother's side, specifically Tyendinaga Mohawk, and I have settler ancestry too, including Icelandic, Scottish, English, and Irish. I would characterize myself as a learner, leader and a bit of a dreamer.

After graduating from UVic, you went on to co-discover a class of antibiotics (Pacidamycins). Can you tell us about your experience doing this exciting research?

Sure. You have to be careful though, when you ask somebody to talk about their research, they might go on and on and on!

I entered my undergraduate chemistry co-op program at UVic in the summer of 1992, under the excellent leadership of Dr. Rick Reeves. By the time I graduated, I had eight co-op work terms, which at the time I was told it was some kind of record. My husband, who I had met in the program, also had a similar number of chemistry co-op work terms. We found co-op to be a wonderful experience, an experience that allowed us to travel all over the country engaging in fascinating research and lab experiences in every major branch of chemistry. This included research into new environmentally friendly ways of producing pulp lignin in the production of paper at Paprican in Vancouver and finding a new way to create dideoxyinosine using an organo-metallic approach to nucleotide synthesis at BioMega in Laval, Quebec. These experiences gave me an incredibly strong foundation and confidence for entering the post-graduation workforce as a researcher. And, as a result of my work experience, I was recruited by various companies after receiving my Chem degree.

I eventually chose a biotech company in the San Francisco Bay area called Microcide in 1997, which was a startup, and I believe it got bought up a few years ago by a much bigger drug company. I remember when I interviewed for that position, they made me give a talk to the whole staff about the research that I had done. It was a really good thing that I had some to share, and I felt confident going into that process. When I was hired the team was really small. There were two PhDs, each supervising one bachelor's associate each, and then there was one person with a master's degree..

I was given a synthetic target that came from a plant extract taken from the Amazon, and the purified isolated extract showed remarkable activity against antibiotic resistant bacteria. It worked by puncturing the cell wall of the bacteria, and it didn't attack human cells. Through NMR and MS analysis they had already a good idea about what the non-chiral specific structure was, but they hadn’t made it synthetically yet. It was a very large compound with nine chiral centers – and it was the chirality they were most unsure of. My boss had some good guesses based on some uracil chirality, but the other branches were totally a guess. So, first we had to come up with a synthetic technique to build the molecule. As luck would have it, my boss and I were able to synthesize it, even though it was enantiomerically unpure, within a couple of months. It was a 12-step beast of a synthesis with a terrible yield. I remember starting with something like 200 grams of material and ending up with around 40 milligrams of final product, but we had a synthetic pathway. Then the work began to nail down the chirality at every branch, which meant I had to run three to five reactions at a time in parallel to come up with the different chiral options (2^9 possible iterations). They thought it might take two or

three years. Instead, I found it after about three months, which was super exciting, and a really unique experience to have such a great conclusion to that journey.

When they did the biological testing, they officially classified it as a Pacidamycin, and even though I left the field of research chemistry about 25 years ago, I still occasionally have my name crop up on a research paper. Nobody can take away the fact that I was the first one to make it. My lab book is the one that reports its first synthetic iteration, a whole new class of antibiotics that fights gram negative antibiotic resistance bacteria.

Were there any moments when you doubted your place in the field of chemistry or felt like you didn't belong? If so, how did you push through those moments?

I'd say that everyone has moments of doubt, when they feel they're not good enough. I remember when I moved down to California surrounded by my new work colleagues, I felt that I needed to buy a book on “Name Reactions” because everybody was talking about Shapiro and Sharpless Reactions, and I had no idea what those were. So, I felt I had to study up. I had a bit of an “imposter syndrome” reaction.

I also struggled with the sameness of chemistry. The fact that I would come to work and mix a bunch of chemicals together and let them react, and then it would be evaporation, purification, re-evaporation, set up the next reaction, and repeat. The day-to-day life was a bit monotonous, and as a person with ADHD I struggled with that. I also struggled with the loneliness of synthetic organic chemistry. Even though I worked in a lab with others, conversations (more often than not) were between me and the round bottom flasks. I even put faces on them to give them a bit of a personality.

As time went on, I began craving more human connections in my work life, and it was hard to find. As a researcher, I really wanted to make a difference in people's life and see the impact directly. But you don't get the ‘warm fuzzies’ working with your head in a fume hood all day. I started feeling lonely and isolated and having lottery dreams, thinking this career was a mistake. I did love chemistry, but I needed more human interactions. So, I was seeking something that would combine the two.

Was it this missing “human element” that inspired you to return to school to become a BC Chemistry Teacher? How has your career since involved?

Yeah, exactly. I always had teaching in the back of my mind as a possibility. As a child, I always loved showing my classmates how to do things. I had been known to get up and do spontaneous teaching when I was in school, sometimes to the chagrin of my teachers. I enjoy breaking down complex topics into simpler nuggets. I saw teaching as a great way to accommodate my ADHD, and my desire to fuel some of my other passions. I love musical theater for example. I could see being a teacher and being in a school would allow me to do a lot of different things.

The plan had been to work for four or five years before going back to school to become a chemistry teacher but unfortunately my husband's father passed away unexpectedly. So, we moved back to Victoria to support his mom; he's an only child. So, we were only down in California for a year and a half doing research, and then when we returned, we entered UVic's teaching internship program. Both of us became chemistry teachers. He had wanted to become a doctor for a long time, but I kept

talking about how I was going to take off in the summers on vacations, and that he'd be really lonely. So, I sort of demotivated him and he also decided to become a teacher.

After becoming a teacher, I spent four years teaching high school chemistry, math, and First Nations Studies in Port McNeil, which is on the north end of Vancouver Island, located on Kwakwaka'wakw territorial lands. I spent a year in Quebec after that, and then returned to the island to teach chemistry, physics and math for seven years at an all-girl school in Duncan, getting my master's in education and leadership along the way. An opportunity came my way at that point to take on my first principalship, so I moved north to the Yukon into Dene Kaska territory, to become a teaching principal of a small K-12 northern school. I was there for four years, followed by a year in Hong Kong at an international school, and then I spent two years as a high school principal in Manitoba. As with all of my moves, I soon missed family and my BC roots, so I came back to BC. Starting in 2019 I spent five years as an elementary school principal in Abbotsford, and then the recent opportunity came up for me to move into a district role, across the bridge from Abbotsford in Mission School District. This allowed me to follow my passion for supporting Indigenous learners and working with indigenized curriculum, becoming the Mission School District Vice Principal for Indigenous Education.

During your time working with the Kwakwaka'wakw of Alert Bay, and the Dene Kaska in the Yukon, you were able to integrate Indigenous Knowledge and traditional teaching into your work. How has that experienced shaped your understanding of Indigenous education, and the importance of Indigenous Knowledge in academic settings?

I had the tremendous opportunity to pioneer the new BC First Nations Studies 12 course in my first year of teaching in Vancouver Island North. Despite being Indigenous myself, I didn't really have a strong cultural background or much knowledge of Indigenous issues in BC. In many ways, I'm a product of a colonialized education system. My family background is one where we were separated from our culture, and things were swept under the rug. So, wanting to support me in creating suitable content for this course, the district connected me with local Elders from the Kwakwaka'wakw Nation, and hired a culturally strong Indigenous Education Assistant to support the class.

I learned alongside my students about the legacy of Residential Schools, the Indian Act, and the impact of the Potlach Ban, especially on that community in which I was teaching. I remember taking students on a field trip to the Alert Bay U'Mista Cultural Center, and it was a really powerful experience. My students got to participate in wind drying and smoking salmon, dipping it in oolichan oil (also called grease), which is the substance that helped make the Kwakwaka'wakw rich amongst the other BC First Nations. My students learned about how there was a big Potlatch in the 1930s, when it was illegal to Potlatch, and they risked it anyways. When the Indian Agents found out, they rounded everyone up, all the Elders. They were put in jail and forced to make a terrible choice, stay in jail, or give up their ceremonial regalia, so they couldn't Potlatch ever again. It was made more powerful for my students as we learned about this terrible choice from Elders who had known the people who had had to make that decision. We learned that some chose to hide their ceremonial regalia and go to jail, and some gave up their cultural artifacts, which were sent to Ottawa. We know now that some of these artifacts were lost or given away as gifts by Ottawa to others. The Kwakwaka'wakw people were only able to get their objects back from Ottawa by building a museum to house them for the world to see. So, that was an emotional experience to be sitting surrounded by all these beautiful carvings, button blankets, and coppers. Knowing that all these items had been seized, and now they were back in the community, but only sort of, because they had to be held in a museum.

When I was the Principal of a K-12 school in the Yukon, it was a place that had started as a company mining town. In its heyday the town had 3000 people, but due to the mine's closure, it had gone down to about 400. There was a fractured relationship with the nearby Dene Kaska, upon whose stolen lands the town was situated. The fracture wasn't good for the town; it created enmity and othering.

With great care, I created a school culture where teachers began reaching out to the nearby Elders to provide teachings for our youth. Over time we built up a beautiful program that embedded Indigenous pedagogy into our curriculum, seamlessly, not as an "other" or a "one of" kind of deal. We brought in local Knowledge Holders to teach the students to canoe on the river, how to make rabbit snares, and read trails. We did culture camps and archery. We built a Button Blanket to capture our stories, the story of our town, the story of our community, and our kin. We learned ancestral technologies alongside modern ones, and we had community moose meat dinners.

I got approval to hire the first Kaska Language Teacher in the town's history. As a staff, we opted to have the teacher team teach, to embed language into our science and social courses, rather than pulling students out to learn language separately, like they might do for French class. This has become a theme in the Indigenous pedagogical work I do in education. Embedding Indigenous content into teaching is a required practice now, but many educators think that this means doing a lesson now and then, on Totem Poles or some other kind of "one off" offering. My work emphasizes the need to embrace Indigenous Ways of Knowing, as well as exploring cultural practices alongside modern methods. We take steps to decolonize the way we teach when we center on how learning connects to student's kin and community, and to their personal journeys. Teaching and learning are reciprocal and relational, they take patience and time. A holistic approach to understanding and supporting each child's learning is grounded in story and in emotions, as we learn best when we learn what we care about. It honors the sacred teachings from our Elders and our Knowledge Holders.

Looking back at your journey so far, which accomplishments are you most proud of?

Well, there have been a number of milestones. I was recruited to be a Teacher Consultant for Boreal Northwest Science, and also for Toshiba Canada. I have been able to travel a lot, as teachers have long breaks, and that's provided a lot of value for my personal life. In 2008 I won the Prime Minister's Award for Excellence in Teaching from Stephen Harper, and in 2014 I was a national finalist for an award related to the work that I was doing as a Principal in the Yukon. But I think I am most proud of how the work I have done and the experiences I have had helped me to reclaim my Indigenous cultural teachings, that were lost to me because of my family's complex history. Each place that I have lived as an educator has connected me more to the tapestry of identity that is me.

In your current role as the District Vice Principal for Indigenous Education, how do you encourage educators to incorporate Indigenous pedagogical approaches into their teaching, especially in schools where Indigenous students are a minority?

The BC Ministry of Education has helped us out tremendously. There is now a requirement that all BC teachers have to teach Indigenous content and embed Indigenous pedagogy into their approaches. So, there is a desire to learn and do that already for most teachers, but there's an awful lot of teachers that don't know how, and they need a lot of support. That is part of the job that I do. It's a lot of work for a teacher, because they must go on their own personal learning journey to do this in

a right way. They need to ensure Indigenous content they use is authentic, and treat it with respect, while avoiding the pitfalls of cultural appropriation and tokenism. I have also seen teachers use approaches that might harm students such as singling out an Indigenous child to speak on behalf of all Indigenous peoples. I hope to raise awareness so that teachers no longer do culturally inappropriate lessons in an uninformed bid to check off 'the Indigenous requirement box' such as asking students to draw their personal Totem Poles onto toilet paper rolls; Imagine if that was your cultural identity being put on bathroom supplies!

So, I offer a lot of professional development to help educators learn how to use Indigenous pedagogical approaches with respect. I help them to understand what makes for an authentic resource, and how to approach working with Indigenous content, and support Indigenous learners in their classrooms. I help them to design curriculum and plan for the success of all students, using an Indigenized lens. Having a strong team is also very helpful. In my district we have Indigenous Liaison Workers in every school, who provide cultural supports to students and to teachers. They themselves engage in regular cultural strengthening professional development as well. It is a mistake to think that all Indigenous persons are deeply embedded in their traditional culture. So much was lost due to the Cultural Genocide and systemic racism in this country. It takes work to reclaim our heritage and grow in our cultural learning.

Given your experience as a student and as a professional in academia, what do you think are the most important steps that can be taken to reduce barriers for Indigenous students?

I would say that there are a variety of barriers that prevent Indigenous students from experiencing the same success as other groups of students. That's why I have a job. It's the role of my department to identify those barriers and put supports in place that reduce them. Funding for this is provided by the Ministry, as a result of Truth and Reconciliation Initiatives. I see several things that prevent Indigenous students from entering and succeeding in science, in particular. For instance, the impact of trauma on Indigenous communities cannot be understated. But another barrier could be one of a 'tyranny of low expectations', where the educators can sometimes be so focused on getting students through school that they choose an easier pathway for Indigenous students, rather than pushing them to challenge themselves. Low expectations can really close doors before they're even opened.

Another barrier I feel is a systemic one, perpetuated by academia. I recently re-read the book Braiding Sweet Grass by botanist Robin Wall Kimmerer. I found her words very illuminating. In the book she talks about the dissonance that she felt as both a scientist and an Indigenous person. She stated, "My natural inclination was to see relationships, to seek the threads that connect the world to join instead of divide, but science is rigorous in separating the observer from the observed, and the observed from the observer." I definitely feel that my university classes promoted this separation mindset. I was made to do formulaic formal labs to practice concepts. Set procedures to follow. One way to see the world. It did rather make me feel quite boxed in – and not at all aligned with a holistic way of perceiving the world. However, my co-op work experiences were able to deconstruct the content I had learned in school and give it new life and meaning.
Many K-12 science teachers have begun teaching science through projects and inquiry, such that understanding emerges naturally from experience. They reinforce initial understandings through discussion. Students learn that their voice matters and can shape the direction of learning. I feel approaching science this way makes it more accessible and engaging for all learners – not just Indigenous ones, although it follows an Indigenous pedagogical approach. I would love to see this approach embed itself more into the walls of academia, but I think it would take some restructuring.

What advice can you give to Indigenous students who are considering a chemistry degree, but may feel uncertain or intimidated by the academic environment?

I would say that a Chemistry degree is a great foundation for whatever you want to do. It can be the end goal, but it can also be the beginning for an awful lot of careers. It opens many doors, and if your university offers a co-op program, do it. It is the co-op authentic work experiences that shape you into a real scientist. It also helps connect you to a close-knit community of other students in the program, who will be great supports. Anything you can do to make your world smaller is good at university, which can otherwise make you feel tiny, lost, and insignificant. You look around, there are hundreds of students in your first-year science courses in a big lecture theatre. You hardly know anyone, you don't have a close-knit group, and so you need to make one to survive and help one another. You need that emotional support, at least I did.

Also, it is important to have Indigenous representation in the upper echelons of sciences. This changes perceptions for all. When we have visible successful Indigenous scientists in the field and role models in academia, Indigenous students can’t help but feel more secure and confident that it is a journey they too can take. And as they take this journey with courage, Indigenous students will help reshape the field - changing the way others teach, learn and probe reality.