



Whyte with MIT grad Bob Mumgaard, now CEO of Commonwealth Fusion Systems. (Photo courtesy MIT)

## Practically changing the world

USask alumnus Dennis Whyte (BE'86) is leading efforts at MIT to make clean, economical fusion energy a reality.

By DONELLA HOFFMAN  
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Dennis Whyte (BE'86 Engineering Physics)

As a kid, Dennis Whyte was pretty sure he was going to be a scientist.

“I remember actually reading every science fiction book that was in my elementary school library, like three times. It was fascinating to me.”

When he was in Grade 2 or 3, his father Russell, a longtime SaskTel employee, taught him Ohm's law, a formula used to calculate the relationship between voltage, current and resistance in an electrical circuit.

The older he got, the more Whyte sought to learn about science, math and technology: programming his high school's brand-new Apple computer, finding teachers in his southwest Saskatchewan town who could teach him calculus, and writing a term paper on fusion in Grade 11. (His teacher's comment: "Dennis, I'm giving you an A, but this looks really complicated.")

Once he graduated from Shaunavon High School, Whyte left the town and nearby family farm and headed to the University of Saskatchewan College of Engineering (USask Engineering) where he was immediately drawn to one discipline.

"I always loved the physics and fundamental science part of (engineering), but I also wanted to do something which was applied, that would be practical. I'm pretty sure from the first day that I walked in I wanted to be in engineering physics."

USask describes the discipline of engineering physics as a bridge between pure and applied science.

Today, Whyte is a recognized leader in magnetic fusion research – the **same process that keeps our sun and the stars burning bright**. The magnetic confinement of plasmas is considered a faster path to producing fusion energy, which would help end the world's reliance on fossil fuels.

Whyte says it was USask's engineering physics program and a pivotal 10-minute meeting with a respected prof that put him on the path to where he is today.

"How do you find the thing that you're really great at and that you're passionate about? For me, I can trace that back to the opportunities I was given at the University of Saskatchewan."

Whyte is the director of the Plasma Science and Fusion Center at the Massachusetts Institute of Technology (MIT), a professor in MIT's Department

of Nuclear Science and Engineering and the Hitachi America Professor of Engineering at MIT.

He is one of the leaders of the SPARC project, a collaboration between MIT and Commonwealth Fusion Systems (CFS), an MIT spinoff, to design and build the world's first fusion power plant.

On May 9, Whyte will receive a 2022 USask Alumni Lifetime Achievement Award, recognizing his significant accomplishments since graduating from USask.

One of Whyte's nominators, a classmate at USask, fittingly describes him as "effortlessly brilliant."

"That's very nice of them," Whyte says with a smile, acknowledging that school was easy for him and didn't fully engage him until it got tough. (He loathed his detail-oriented drafting class.)

"The harder the subject matter became, the more interested I was in it," he recalls. "My two favourite classes were thermal hydraulics and relativity. It was like 'Oh my God, this is what I was waiting for!'"

While he recalls getting 100 on the final of "a fluid engineering, thermal hydraulics class or something like that," Whyte also fondly remembers life outside the classroom: living in a dorm, diving into intramural sports and enjoying "all the fun social stuff" that came with being a USask Engineering student.

"I wouldn't have succeeded without actually having that balance and it's something that I've carried throughout my entire career."

USask Engineering Dean Suzanne Kresta was excited to welcome Whyte back to the college, where he delivered the [\*\*Cheriton Lecture, detailing his work at MIT and progress on the SPARC project.\*\*](#)

"As someone who's taught very large classes for much of my career, I can say Dennis Whyte typifies the truly brilliant student," Kresta says. "Quietly booksmart, not overly impressed by their own abilities and a visibly marvelous human being."

When he was nearing the end of his USask degree, Whyte visited the office of one of his profs, Dr. Harvey Skarsgard (BE'49 Engineering Physics), to see if it was possible to continue his academic career. The timing was perfect. Skarsgard knew a colleague in Quebec who was looking for graduate students. Whyte earned his master's and PhD from INRS-Energie, studying at the Varennes campus. The INRS, which stands for Institut national de la recherche scientifique, is the research-oriented university of the Université du Québec system; it offers only graduate studies.

"Professor Skarsgard, God bless him. That's the 10 minutes that changed my entire life," Whyte says of the meeting.

In his own career as a professor, Whyte says he has never refused a meeting with a student. "Being able to pay it forward is very satisfying to me."

He is also quick to credit the role that students have played in advancing his fusion research, as he has been deeply involved in student design courses for fusion energy systems, according to his MIT bio. "The core of the SPARC project was formed over eight years ago during a design course led by Whyte to challenge assumptions in fusion," the bio states.

Whyte explains that collaboration with his students has often spurred him to look at his research with fresh eyes.

"The impact that I've had is not just through what my students have done, but through my engagement with them. It's made me ask fundamental questions – 'Why are we doing things like this?' – and asking these questions to myself has put me where I am."

Progress on SPARC, the experimental fusion reactor that MIT and the startup CFS are collaborating on, took a giant leap forward last fall.

"On Sept. 5, for the first time, a large high-temperature superconducting electromagnet was ramped up to a field strength of 20 tesla, the most powerful magnetic field of its kind ever created on Earth," states a [news post on the Plasma Science and Fusion Center website](#).

Developing the new magnet was seen as the greatest technological hurdle in developing a viable fusion power plant. "Its successful operation now opens the

door to demonstrating fusion in a lab on Earth, which has been pursued for decades with limited progress,” the post continues. “With the magnet technology now successfully demonstrated, the MIT-CFS collaboration is on track to build the world’s first fusion device that can create and confine a plasma that produces more energy than it consumes. That demonstration device, called SPARC, is targeted for completion in 2025.”

Whyte and others working on the project believe that getting a fusion plant up and running is equivalent to the Wright brothers achieving sustained flight with their Kitty Hawk Flyer aircraft in 1903.

“You could argue this moment changes the trajectory of humanity, because it's the ultimate energy source that we've never been able to realize,” Whyte says. “It sounds a little overly poetic but it's actually an arc that you could argue started with fire.”

But the transformative discovery itself – creating a star on earth – is not enough, according to Whyte.

“What you actually have to have is a practical energy system that takes that and puts watts on the grid for everyone in the world.”

Whyte says the scale up and the commercialization of the technology will use skills he first developed while studying at USask. “That’s exactly what engineering physics is. It's got deep physics but it's got practical aspects of applying this to the real world.”

College roommate Rick Hughes, also from Shaunavon, noted in his letter of support for Whyte's alumni award nomination that his friend is one of the lucky people who has found their true calling.

“That calling has taken him far from Saskatchewan, but his feet remain firmly on the ground and his character rooted in the values learned there: perseverance, community service, and humility – hallmarks of a stoicism often projected on us prairie folk, but seldom truly earned.”

Whyte clearly appreciates his Saskatchewan roots – “I had incredible parents and family and good teachers” – and the unique combination of self-reliance and sense of community that the province fosters. He’s also grateful it provided

a path from his family's farm to USask and from there, to a meaningful career he loves.

"My grandfather ploughed a field with horses to feed his family. I get to go do fusion science."

### **University of Saskatchewan**

*The University of Saskatchewan's main campus is situated on Treaty 6 Territory and the Homeland of the Métis.*

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See a progression? Saskatchewan settler grandfather, one son becomes Sask Tel employee (electricity, electronics) in the local town (Shaunavon), grandson studies Engineering Physics at the University of Saskatchewan. Before long, this "farm boy" from rural Saskatchewan is leading the "fusion" campaign at MIT. In my own bailiwick on the southeastern side of the province, a young boy I grew up with, while visiting farm neighbor cousins, lay the kitchen linoleum while the parents were out for the evening. He completed a Ph.D. in Physics/Engineering/Electronics at Texas Tech and disappeared (to my knowledge) into Silicon Valley. Places like Saskatchewan are replete with such stories.

Daunting as the challenges and questions are with fusion, the real telling question is why so little effort and money has been devoted to it while we plowed myopically down the execrable fission and fossil fuel routes? Interests become vested and then use the resources and power accumulated to serve their self-centred purposes.

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