

Weird science

Can genome research projects taking place in Atlantic Canada pay big dividends for Canada's mining and oil and gas sectors?

By Darren Campbell



This quartet, (left to right) Weiyin Lin, Xing Song, Helen Zhang and Joy Zhu, are part of Zhang's research team that is on the cutting edge of genome research at St. John's Memorial University.

Innovation comes naturally to Baiyu (Helen) Zhang.

An associate professor at Memorial University's Faculty of Engineering and Applied Science, her desire to be innovative and solve problems is what drew her to a career aimed at solving thorny environmental problems. "As environmental engineers, we call ourselves problem solvers and we try to solve all types of environmental problems," Zhang says. "This is one of the most exciting parts of the research, the innovation. You always enjoy new ideas and seeing if they are good or not. You try not to be a follower."

Zhang is doing exactly that, following her own path as one of the smart minds in Atlantic Canada working in a field that isn't well known or understood – genomics studies. This is the study of genetic material of humans and other species and it has led to technological breakthroughs that have benefited a number of sectors, including

the oil and gas and mining industries. By using genomics to study the living organisms at play in both these sectors – namely bacteria and microbes – researchers like Zhang are able to use these microorganisms to benefit industry and mankind.

Zhang earned her bachelor's and master's degrees at Jilin University in China. She came to Canada in 2001 and completed a doctoral degree in environmental systems engineering at the University of Regina. She joined Memorial University in 2010. As an expert in biotechnology, it's led her down the genomics research rabbit hole. Some bacteria and microbes cause corrosion, but others increase extraction, de-risk exploration and even assist in cleaning up oil spills.

One of Zhang's innovative research projects at Memorial looked at using bacteria to develop environmentally friendly dispersants. When oil spills occur, dispersants are often used to help clean them up. Dispersants are chemical agents that break up an oil slick into dispersed drop-

lets. They don't remove the spilled oil, but the smaller droplets are more easily biodegraded. Finding environmentally friendly and cost-effective dispersants that could be used in the cold and harsh waters of the North Atlantic is of interest to Newfoundland and Labrador's offshore oil industry. That's because other oil spill clean-up techniques such as booms and absorbent sweeps are more effective in calm waters than the rough seas off the coast of the island.

Zhang's research looked into whether bacteria could be used to create compounds called biosurfactants. These compounds could then be used to create biodispersants to help clean up oil spills. The study took three years to complete and it produced some promising results. Zhang and her team tested thousands of different strains of bacteria and were able to narrow it down to five strains capable of producing biosurfactants. She then explored how to increase their yield and effectiveness.

Zhang says the bacterial strains she and her team identified and the associated biosurfactants worked well. But her research is far from reaching a commercial scale where it can be used by oil and gas companies operating in the offshore. "We've successfully produced several types of biosurfactant products," Zhang says. "Then we use those products to conduct some small scale testing in the lab."

In Fredericton, New Brunswick, Crown Corporation RPC has researchers working on genomics research also. A research and technology organization that has been around since 1962, RPC created some buzz in the Atlantic Canada mining sector last year when it went public with a genomics research project at the 2016 Mining Society of Nova Scotia's annual general meeting.

The project uses bacteria found naturally in the ore. A gold mining company asked RPC to treat some of the tailings from an old site it has (RPC couldn't say what company is involved for confidentiality reasons.) The bacteria would accelerate oxidiz-

"A commercial plant, if it's operating in Canada, could change some people's thinking."

Leo Cheung, head of RPC's minerals and industrial services department

ation of the tailings, a way to concentrate minerals, and not only use the bacteria to treat the tailings and make them safer but recover gold and copper from this waste product. "In Canada there are many of these tailings sites," says Leo Cheung, head of RPC's minerals and industrial services department. "Some are abandoned. Some are under government management. We are not only trying to treat the tailings but recover value from them."

Tailings are the waste left over from mining operations, crushed rock and process effluents that are generated in a mine processing plant. They can contain metals, minerals, chemicals,

organics and process water. Cheung and Neri Botha are two of the leads in this research. Miners typically use chemicals like cyanide to "leach" or extract precious metals like gold, copper and other metals from ore or tailings. But RPC's research is seeking to find bacteria that will do this work instead. This would not only be environmentally friendly, as toxic chemicals wouldn't be used, it could be cheaper for miners as well.

Like Zhang's biosurfactant work, Cheung and Botha say their research is at a very early stage and isn't ready for prime time use yet. The project only started in 2016 and Cheung says the research team is trying to find

Personnel Resources, Executive Recruitment
and Staffing for the Mining, Oil and Gas,
and Industrial Sectors.

Levert
Group



- Extensive recruiting and training processes
- Skilled, top-talent, pre-screened industry-ready candidates
- On/off shore personnel and marine crewing
- Underground, plant, and open pit mining personnel

- Skilled trades, maintenance and shutdown personnel
- Complete payroll services such as workers' compensation, CPP, EI, tax deductions, etc.
- Opportunities for candidates to gain valuable experience and form working relationships with our long-standing, diverse client base

- Flexible contract or long-term opportunities
- WHMIS, health and safety orientations
- Exemplary and constant safety record. In 2014, Levert Group had 0 (zero) lost time injuries
- Over 25 years of experience

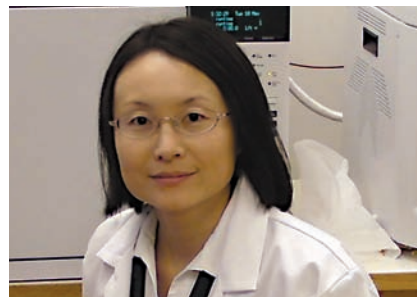
Connecting clients and candidates just like you.



1.800.461.5934 | levert.ca

“You always enjoy new ideas and seeing if they are good or not. You try not to be a follower.”

Baiyu (Helen) Zhang, associate professor at Memorial University's Faculty of Engineering and Applied Science



the right mix of bacteria culture that will do the best job on the tailings. It's complex work. "Right now we're at the proof of concept stage and proving it can be done," Cheung says.

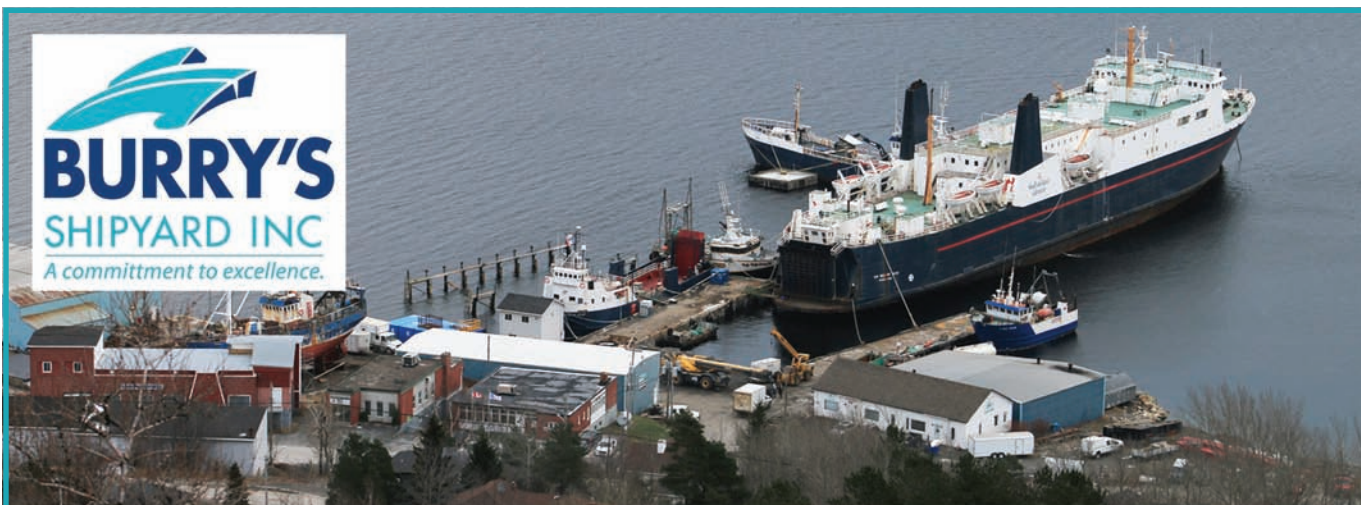
When Botha presented the research project at the Mining Society of Nova Scotia's annual general meeting this past spring, she says the people there were "very excited" about the work. This isn't surprising. Companies are under increasing pressure from the public, governments and regulators to prevent or mitigate negative environmental impacts from their mining operations. Using bacteria to clean up tailings and recover more metals from them instead of using toxic chemicals fits that description.

However, very few mining companies will spend millions of dollars on a technology that isn't proven to work in Canada's environment. That's why Cheung says running a pilot project, and then progressing to a commercial project, is the breakthrough needed to take this biotechnology to the mainstream. "A commercial plant, if it's operating in Canada, could change some people's thinking, perhaps even a government's thinking" Cheung says. "If they see this working at one tailings site, they might see the opportunity to treat other abandoned sites in their provinces. At the end of the day if this isn't economically feasible, people will walk away."

Botha is also excited about the research's potential, and the possibility that through this work, RPC and Atlantic Canada could one day make a significant impact on how mining is carried out in the country. "We feel very good about this, especially these tailings sites that are there. They should be remediated in every case but it hasn't happened. It would be great if they could be treated and remediated. This is such a meaningful thing to be doing," she says.

FEEDBACK

✉ dcampbell@naturalresourcesmagazine.com
🐦 @NRM_Editor; #WeirdScience



The Burry Group

A Commitment to Excellence

Our companies, Norcon Marine Services, Burry's Shipyard and Eastern Foundry support our province's Marine Transportation Industry via cargo and passenger transport, vessel repair and certification. We are the only supplier of marine anodes specially formulated for our waters.

Our Clarenville Shipyard services a wide range of vessels including commercial vessels operating north of the Arctic Circle, Canadian Coast Guard vessels, provincial ferries and fishing vessels. Burry's Marine Railway dry-dock can accommodate vessels up to 680 tons.

Contact us at info@theburrygroup.com

Address: 3 Wharf Road, Clarenville, NL A5A 2B2 • Phone: (709) 466-7725

