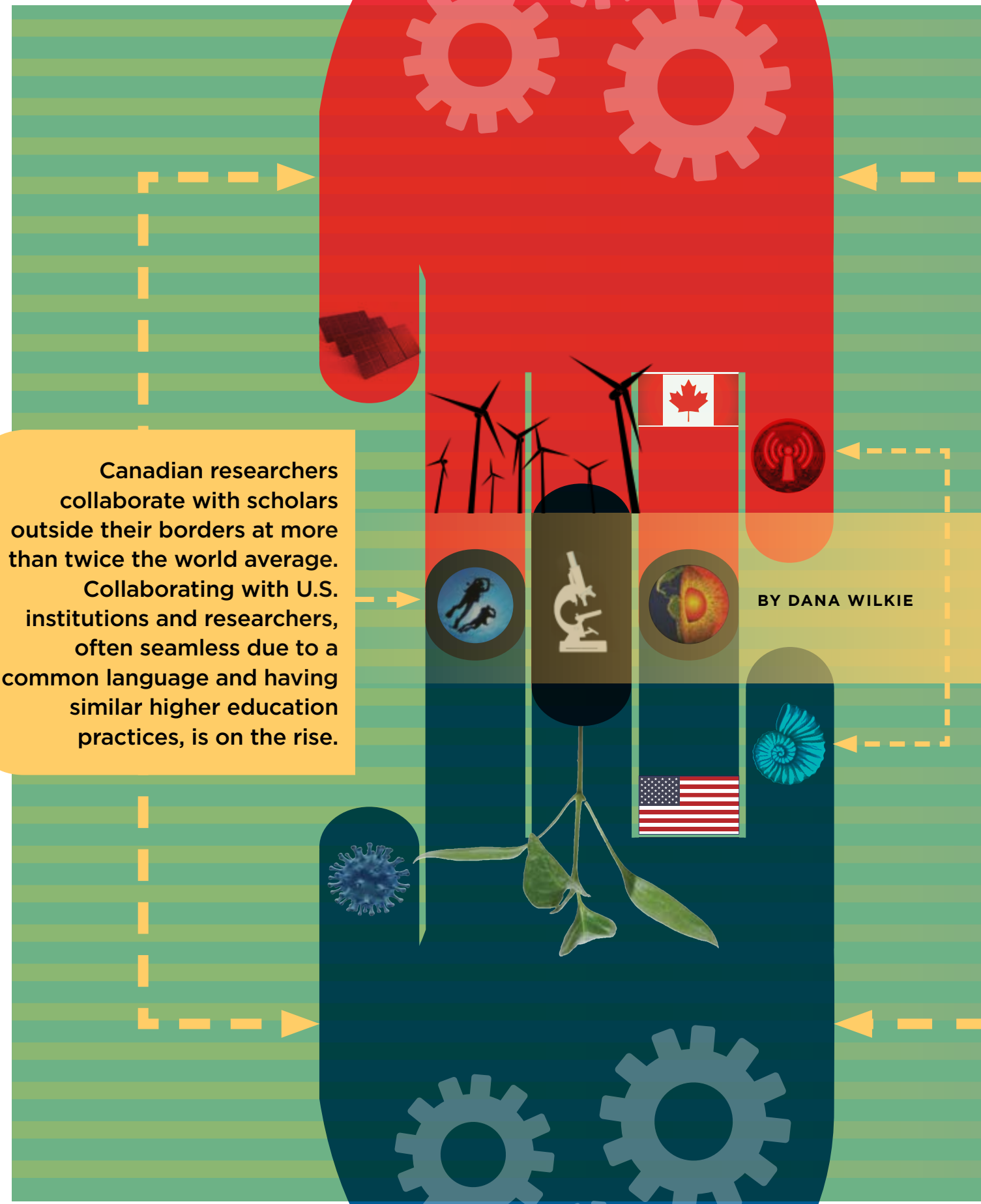


Canadian researchers collaborate with scholars outside their borders at more than twice the world average. Collaborating with U.S. institutions and researchers, often seamless due to a common language and having similar higher education practices, is on the rise.

BY DANA WILKIE

THINKSTOCK/ SHUTTERSTOCK

More than 100 million people in the United States and Canada rely on the Great Lakes Basin for their livelihoods—in agriculture, manufacturing, boating, and tourism, to name just a few industries. Anchored by two of the world's largest cities—Chicago and Toronto—the Basin is home to more than one-fifth of the globe's fresh surface water and generates $5 trillion a year in gross domestic product. If it were a country, it would be the fourth largest economy on the planet.

But invasive species, climate change, contaminants, and a manufacturing industry that largely fled in the 1970s and 1980s have all put pressure on one of North America's greatest natural resources, threatening to destabilize the region's economy in years to come.

SEAMLESS

Enter the Transborder Research University Network for Water Stewardship—an international partnership of more than 20 Canadian and U.S. research institutions trying to envision how those pressures might affect the basin 20, 30, even 50 years from now. The network, organized six years ago by the University of Toronto and Michigan's Wayne State University, expects this summer to release best-case and worst-case scenarios for the Basin in coming years and to provide potential remedies for everything from changing weather patterns to economic pressures to biological and chemical pollution.

"University networks have become very popular in recent years in the world of international education," said John Wood, senior associate vice provost for international education at the University at Buffalo, which is a member of the network, called "TRUN" for short. "Everyone sees the value of institutional collaboration, particularly around big research projects. We're among very few research universities that's virtually right on the border" with Canada, and the future of the Great Lakes is a project of obvious interest to people for whom this is a shared resource."

Gail Bowkett, director of international relations for the Association of Universities and Colleges of Canada (AUCC), agrees that U.S.-Canadian collaborations are on the rise.

"Generally speaking, there is an increased tendency for research to be happening across our borders," Bowkett said. "We're increasingly living in a globalized world, and that's as true in the worlds of commerce and trade as it is in the world of research. There's a huge range of issues—whether in the fields of health, physics, communication technologies, historical studies, psychology, physics—where we're collaborating between our two countries. There's a longstanding relationship between

Canada and the U.S. and a longstanding appreciation and respect for the quality of research done in both countries."

Collaborations between U.S. and Canadian universities have had some interesting results: from developing an ultrafast rechargeable battery from non-toxic materials to creating a world-class applied science campus; from strengthening cross-border trading to building a virtual underwater ocean observatory; from introducing cross-border food studies in grade schools to U.S.-Canadian research on how women's directorial styles differ from men's.

A 2009 survey, *International Research Collaboration*, by the AUCC found that if cross-border research collaboration is measured by coauthorship, Canadian researchers collaborate with schools outside their borders at twice the world average. More than 40 percent of academic publications by Canadians have coauthors from other countries—twice the rate of 15 years earlier. Moreover, the proportion of Canadian universities that include an international dimension in their strategic planning processes, including international research collaboration, grew from 84 percent in 2000 to 95 percent in 2006.

The proportion of Canadian universities that include an international dimension in their strategic planning processes, including international research collaboration, grew from 84 percent in 2000 to 95 percent in 2006.

"Recently, Canadian universities have increased their institutional engagement in international research collaboration, for example through international research networks, tech transfer agreements, and other cooperative arrangements," the study found. Some are involved in joint research projects, sharing research facilities and major infrastructure, allowing access to research data and discoveries, and linking of research centers with virtual networks.

What dynamics have contributed to this trend toward increased collaboration? The AUCC study concluded that partnerships are spawned largely because of "the growing complexity and cost of research, especially in disciplines requiring specialized instrumentation or facilities, public expectations about the outcome of research look to more holistic and global approaches to research challenges (and)… issues such as climate change or global pandemic health challenges, which by their nature transcend national borders (and) demand international collaboration."

What are the benefits of such collaboration? The study says they include the development of international networks for joint initiatives and information exchange (91 percent of respondents listed this as among the top three benefits); increased opportunities, funding, partners, and facilities for scholarship and research (82 percent); and professional development through exchanges and sabbaticals abroad (55 percent).

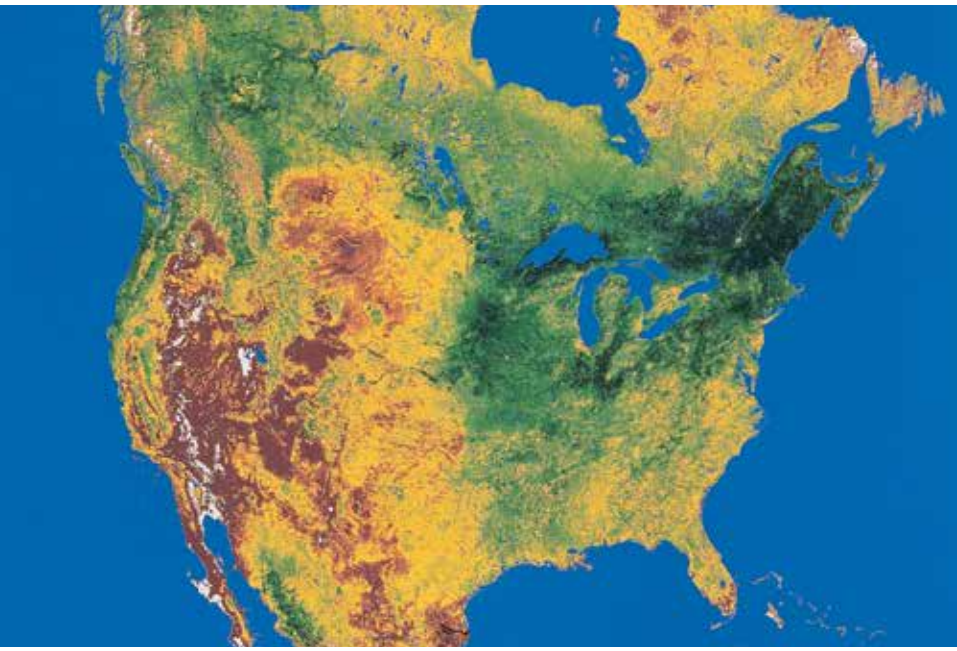
The sharing of resources and expertise were certainly factors when Greg McQueen and Chris Bart decided to study how corporate board directors make moral decisions. About a decade ago, Bart, founder, principal, and lead professor of the Directors' College—a joint venture of Ontario's McMaster University and the Conference Board of Canada—hired McQueen, associate dean at Arizona's A.T. Still University, to lecture at the college.

"Greg had a reputation for helping individuals in different occupations identify their approaches to dealing with moral decisions," Bart recalls. "In Canada, the duty of a board director is to consider the best interests of the corporation as a whole, while also taking what are often competing stakeholders into account, which is different from how it works in the U.S., where I'd say the duty is to act in the best interest of shareholders."

At the time, McQueen was exploring how cognitive moral reasoning can help people become more effective corporate board directors. Bart was impressed by McQueen's expertise in the area. In turn, McQueen saw in Bart's Directors' College a built-in cohort of survey subjects who could help him further his research—25 to 30 new students each semester, all of them active directors in their corporations.

The result was a 10-year study of 600 college members that produced a finding significant enough to make global headlines: Women directors, the two PhD experts found, make better corporate leaders than men because they are more likely to make fair decisions when competing interests are at stake, their study found.

The survey, published this past March in the *International Journal of Business Governance and Ethics*, found that male directors, who made up 75 percent of the survey sample, prefer making decisions using rules, regulations, and tradition. Female directors, by contrast, are less constrained by rules, more prepared



"With Canada, it's almost a seamless relationship. We all speak the same language. We all publish in the same journals. Canada is the U.S.'s largest trading partner, so we already see each other in a very collaborative way."

to "rock the boat," more inclined to see one solution to a problem, and more likely "to use cooperation, collaboration, and consensus building," the survey found.

The study cited research that has found that companies with at least one female director were 20 percent less likely to file bankruptcy, and that those with higher representations of females on their boards had better financial performance.

It was the pairing of McQueen's survey model with the large cohort of board directors at Bart's college that enabled the two researchers to reach their conclusions, the two men say.

"The research in this field is a challenge because it's difficult to get enough people into a survey pool," McQueen said. "Here, we had an opportunity to get a large cohort—more than 600 people and people who were actually in the field working—there at McMaster University, which has an international reputation for working across borders."

The men did their work with a budget of a little under $100,000—provided mostly by the Conference Board of Canada—an independent, not-for-profit applied research organization—which paid for the research, travel, and other costs.

As technology advanced over the decade, however, travel costs declined.

"Thanks to the Internet and Skype, we were able to accomplish an awful lot and really only had to meet face-to-face occasionally, and rarely at that, because of our ability to trade our ideas and our writing" virtually, said Bart, who is a professor of strategic management at McMaster's DeGroote School of Business.

The administrative and cultural obstacles were few to nonexistent, the researchers said.

"Working with a Canadian university—as opposed to working with some I've worked with in Southeast Asia—tends to be flawless," McQueen said. "In Asia, you've got an inordinate amount of work—visas, paperwork—that you have to finish to get in the country. You have regulations for bringing in materials and books and papers. There tends to be a government presence in everything we do."

"With Canada, it's almost a seamless relationship. We all speak the same language. We all publish in the same journals. Canada is the U.S.'s largest trading partner, so we already see each other in a very collaborative way. There can be a direct relationship between myself, my university, and McMaster University without government oversight."

Bart recently worked on another cross-border project with Ofir Turel, professor of information systems and design sciences at California State University, Fullerton. Bart wanted to examine the role that board directors play in corporate IT governance.

"I didn't have a quantitative research associate (at McMaster) interested in this topic who could help me," Bart said. "Ofir was interested in this and helped design the research questionnaire that we administered to a couple hundred directors over three years."

The two published three articles—the final one in 2011—and were able to precisely articulate the level and nature of oversight that directors should give IT operations at their organizations.

THINKSTOCK

Kent State University researchers earned a grant to do an international bookmaking project between high school art classes in Windsor, Ontario's Walkersville Collegiate School of the Arts and Ohio's Richmond Heights Secondary School District. Here, Richmond Heights student Dillon Taylor uses a deckle to "couch" his handmade paper using the eastern style of papermaking, Dillon wrote a book using ethnic foods to explore the theme of diversity and equity.

"In some types of organizations, where IT is a strategic asset, boards need to give much higher oversight than when it is maybe just part of routine operations," Bart said. "We were even able to identify specific types of questions that directors need to use in each type of situation."

Comparing K-12 Education on Both Sides of the Border

In 2009 Canadian 15-year-olds outranked their U.S. counterparts on international reading scores—with the Canadians averaging a score of 524 and U.S. students averaging 500 on the Programme for International Student Assessment (PISA), which evaluates education systems in more than 70 countries and economies. The Canadians also beat U.S. students in math—527 vs. 487—and in science—529 vs. 502. In fact, Canadian students were ranked "statistically significantly above" the PISA average in all three subjects, while U.S. students were ranked "not statistically different" from the average. Analysis of 2012 test scores is underway.

Researchers at the Gerald H. Read Center for International and Intercultural Education at Ohio's Kent State University wanted to understand what Canadian schools are doing that U.S. schools aren't. Last spring, Kent educators, as well as representatives from northeastern Ohio public grade schools, visited Ontario and met with the Ministry of Education there.

"Ontario, and Canada in general, are always at the top of all international competitive tests," said Gerald H. Read Center director Linda F. Robertson. "They always beat the U.S. We wanted to learn what is it they're doing, especially since their population and economy are similar to ours."

This past fall, Robertson's team also hosted Toronto's deputy assistant secretary for education at a two-day summit to examine why Canada is doing so well at educating its highly diverse immigrant population. Participants learned that "instead of a lot of high-stakes testing and firing people if the students aren't measuring up, their philosophy—and this is true of all countries having success on these international tests—is to examine how they can help those teachers who aren't succeeding," Robertson said. "They spend a lot of money on teacher coaches who go in and work with educators and schools that aren't performing well."

Participants also learned that the starting salary for a K–12 teacher in Ontario is $50,000 (Canadian). In the United States, it's closer to $30,000 (which is equivalent to $30,522 Canadian dollars at the current currency exchange rate)

With funding from the Martha Holden Jennings Foundation—a Cleveland-based educational organization—Robertson's program provided grants to three secular grade schools in Ohio to develop global collaborations with Ontario students. The aim: to demonstrate to students the necessity of international connectivity.

"Even though we are a border state, it doesn't feel like it," said Robertson, noting that although Ohio and Ontario are divided by Lake Erie, driving to Canada requires traveling through Michigan or New York. "We're trying to mentally and physically get through those barriers."

One $5,000 grant went to an ESL program at Ohio's Lake County School District, which serves the children of Mexican migrants who labor in the nurseries hugging both sides of Lake Erie. Because of Canada's long history of dual languages—English and French—there tends to be what Robertson calls a "deep respect" in Canada for immigrants working in their country. That respect, she said, is reflected in the many languages accommodated in Canada's grade schools.

"Their ESL program is really better developed than ours," she said. "You go into Ontario schools and if kids speak 10 different languages, you will see evidence of that language throughout the whole school, which gives those students and parents the feeling that they're not outsiders. In the immersion schools there, starting in kindergarten through second grade, all the teachers are bilingual."

Richmond Heights foreign exchange student from China, Doris Huang poses with her classmate Ashley Montanez and Amanda Kha sporting waterproof aprons at the Morgan Art of Papermaking Conservatory and Educational Foundation in Cleveland, Ohio, as they prepare to learn about the eastern style of papermaking. Funds for the project were from the Kent State University researchers' grant for an international bookmaking project between a school in Ohio and a school in Canada.

MARY BRONDFIELD

A $3,000 grant went to an international bookmaking project between high school art classes in Windsor, Ontario's Walkersville Collegiate School of the Arts and Ohio's Richmond Heights Secondary School District. East of Cleveland, the Richmond Heights district lies in a largely African American community that, although outside the urban center, struggles with inner-city challenges such as poverty and domestic troubles. Because few of these children come from families with the money to expose kids to international travel, the program uses Internet technology to explore cross-border diversity and equality.

This past March, Richmond Heights students visited a paper conservatory to learn how paper is made. Collaborating with Windsor students using Skype and other technology, they began last April to assemble their books. In May, the books will be featured at two gallery shows—one in each city.

The goal is to bring together Canadian and U.S. students and faculty, NGOs, and policymakers, geologists, political scientists, lawyers, engineers, and sociologists to propose long-term research and policy plans to protect and restore the Great Lakes and to train the next generation of scientists, attorneys, planners, and policy specialists.

Mary C. Nichols, a visual arts teacher at Richmond Heights, wrote in her grant application that students will share their projects by Skype so they can "learn more about each other's cultures and also gain a greater understanding about their similarities."

A $2,000 grant went to Akron, Ohio's Greater Summit County Early Learning Center for a program called "Project Global Gardens—Food With Friends!" The center plans to use iPads, smartphones, and Skype to create a cookbook with U.S. and Canadian kindergarteners through third graders that relies on garden-grown food.

The project will "increase our international collaboration and learning by allowing opportunities for children to compare and contrast differences within our cultures of the food grown, eaten, and cooked… build stronger communications skills, document their work through digital photography and storytelling, form leadership teams, and learn about each other's cuisines," wrote Teresa Graves, principal at SCOPE Primary School in Akron, which is part of Greater Summit County Early Learning, in her grant application.

"We believe that if we're educating people for the twenty-first century, we need them to be globally aware and competent in their fields and have connections worldwide," Robertson said. "For all those wicked problems not readily solved that will take years of sustained commitments, such as global warming and polluted water, you can't just will those problems to go away. We need global understanding and cooperation to solve them."

Building a Sustainable Economy

The Great Lakes-St. Lawrence River Basin was built on the back of the manufacturing industry. But when businesses began fleeing the area in the 1970s and 1980s and ecological pressures encroached on the Great Lakes, the economic stability of some 104 million people was at stake. Community, regional, and state leaders have struggled to diversify and restructure the economy ever since.

"There's a sense that creating sustainable economies and communities is a goal, but people aren't really sure how to get there," said Kathryn Friedman, who is co-principal investigator with TRUN's Great Lakes Futures Project and director of law and policy research at the University at Buffalo's Regional Institute. "Even though the Great Lakes comprise the world's largest resource of fresh surface water, I think policymakers sometimes don't recognize the significance of that, even though there are discussions about water shortages and needing a global vision for water scarcity."

TRUN is an umbrella organization of 14 U.S. and Canadian research institutions from upstate New York, Michigan and Ontario working not only on Great Lakes sustainability, but also on energy and water stewardship. The Great Lakes Project was TRUN's first endeavor, envisioned after 2007 meetings in Niagara Falls between researchers from the University of Toronto and Wayne State University. The project now has the support of 21 Canadian and U.S. research organizations.

The goal is to bring together Canadian and U.S. students and faculty, NGOs, and policymakers, geologists, political scientists, lawyers, engineers, and sociologists to propose long-term research and policy plans to protect and restore the Great Lakes and to train the next generation of scientists, attorneys, planners, and policy specialists who will study this resource.

MARY BRONDFIELD

As part of the international bookmaking project funded by the Kent State University researchers' grant, Cleveland book artist Margaret Bakke visited Richmond Heights High School to show the students how to bind their books. Here Agustin Esperon and Andrew Richards watch the demonstration. Agustin designed a book about equity in sports and Andrew designed a book "busting" stereotypes about Asians.

The institutions are using "scenario analysis" to examine the past and predict the future of the Great Lakes Basin. "Scenario analysis," Friedman explains, are "stories about the future" that envision how all factors—industry, government, invasive species, demographics, societal values, regulations, the economy, climate change, energy, water quantity, and biological and chemical contaminants—might create "best-" and "worst-case" scenarios for the Basin. In other words, if the future unfolds as described in the scenarios, what would policymakers do about it?

The ultimate goal is to recommend governance and policy reforms to leaders in the United States and Canada.

"Probably the worst-case scenario is what we call the 'Planet of the Apes' scenario, where there is really poor governance, a stagnant or declining economy, and environmental degradation that cannot be dealt with," Friedman said. "The opposite is the 'total sustainability' scenario, one where there is good governance, a strong economy, and an environment that is clean and protected. Once the story line plays out, we look at whether current policies would lead us toward or away from each scenario."

So far the project has raised about $265,000 in grants. Its leaders interact weekly by e-mail and phone conferences. The organizers planned four workshops—two have already been held—where participants from all 21 institutions convene to compare notes. Their goal is to develop practical steps to move toward the most-desirable scenario, or to avoid the undesirable ones, and map a way to track progress. Teams of experts and students expect to produce policy papers this June—in time for the third workshop in Buffalo—that should include policy strategies and research agendas to be shared during future workshops with policymakers, research managers, academic colleagues, and other stakeholders. The results will also be published in academic journals and popular publications and announced at public events, Friedman said.

"Part of the attraction for international research is that these researchers understand where those pools of expertise and support structures are, and that's why they work with partners internationally."

"Significant institutions involved in this project on the Canadian side are close—the University of Toronto, the University of Waterloo, McMaster University, the University of Western Ontario, Ryerson University—and it only takes one and a half hours on a good day to get from Buffalo to Toronto by car," Wood said. "If you combine the resources, facilities, and expertise at one campus that may not be available at another, you're going to have more bang for your buck."

AUCC's Bowkett says, "Part of the attraction for international research is that these researchers understand where those pools of expertise and support structures are, and that's why they work with partners internationally."

Challenges of Cross-Border Collaborations

Cross-border collaboration among U.S. and Canadian universities can have its challenges: Travel between the two countries has become more difficult since September 11, 2001, with more stringent passport and visa requirements, for instance. "It's been particularly challenging in light of the hardening of the border since 9/11," Wood said. "Before, it was easier to go back and forth so faculty could access institutions. Now, everyone is a little more reluctant to get involved because there's hassle involved. Border crossings can be quite slow. This has been, I think, a difficult challenge—for people to go back and forth and to interact personally, even when the instances are fairly small."

Moreover, money for cross-border research can become complicated because funding organizations, especially government agencies, tend to consider only applications from schools within their borders.

"It can be a little hard to work out in practice," Wood said of the collaborations. "How do you fund cross-border research? Usually, you have to apply for and obtain funding from the respective national funding agencies. For instance in the United States—with the National Science Foundation or the National Institutes of Health—the trick is you have to get them to co-fund a common project from both sides. But these agencies typically won't fund activities in other countries. So you have to ask, how do you fund collaborative projects that straddle the border? It's a matter of applying to respective funding agencies and having close collaboration on each side, but it is difficult."

The 2009 AUCC survey notes that "despite the existence of funding programs—like the International Science and Technology Partnerships Canada (ISTPCanada)…the Canada Foundation for Innovation, and other agencies and departments to facilitate international research—collaboration is rather limited and, according to some, is lacking coordination."

The survey concluded that "for Canada to achieve (research collaborations), targeted, sustainable, and predictable funding will be required, coupled with a coordinated effort on behalf of those involved in funding, supporting, and engaging in international research collaboration."

New U.S.-Canadian University Collaborations Grow

The Canada-California Strategic Innovation Partnership (CCSIP), a collaboration between the University of California, Canada's National Science Advisor, and Canada's consul generals in Los Angeles and San Francisco, takes advantage of expertise in the Golden State and Canada to discover commercialization opportunities in both countries.

"Far greater than the sum of its parts, CCSIP is a bilateral collaboration initiative that aims to capitalize on the complementary strengths of Canada and Cali-

THINKSTOCK

fornia, and to build on a well-established trade relationship valued at over $28 billion in 2009," the CCSIP website says. The partnership aims to "launch revolutionary research and development projects that bring new products and services to market, and to deliver economic and social benefits to citizens in both jurisdictions."

Since it was established in 2006, the collaboration has helped to create the Cancer Stem Cell Consortium at the California Institute of Regenerative Medicine, with $100 million in funding from Canada. It was also instrumental in launching 14 bilateral research and development initiatives to address global challenges such as climate change, infectious diseases, and the demand for sustainable energy.

Meanwhile, a team of Stanford University and Canadian Light Source researchers are working together on the Canadian Light Source in Saskatoon project to develop an ultrafast rechargeable battery from non-toxic materials. The battery could be useful in the electric vehicle industry.

While ocean scientists have traditionally relied on infrequent ship cruises or space-based satellites to conduct research, NEPTUNE Canada takes a new approach to ocean science. With the help of several U.S. partners, NEPTUNE Canada is building the world's first regional-scale underwater ocean observatory that plugs directly into the Internet. "People everywhere can 'surf the seafloor,' while ocean scientists run deep-water experiments from labs and universities anywhere around the world," NEPTUNE's website says. Research partners include the U.S. National Oceanic and Atmospheric Administration's Pacific Marine Environmental Laboratory, Woods Hole Oceanographic Institution in Massachusetts, and Monterey Bay Aquarium Research Institute in California.

The Center for Urban Science and Progress (CUSP) tackles urban challenges in hopes of luring people back to metropolitan areas that are "efficient, resilient, sustainable, and provide a high quality of life," according to the organization's website. CUSP was launched in April 2012 after New York City Mayor Michael Bloomberg challenged top institutions around the globe to build an applied science campus to make his city a world capital of science and technology that will tap into metropolitan data to analyze big-city problems—from clean air to transportation to healthcare. The CUSP, according to its website, is "a new kind of academic center that functions in collaboration with the city itself." Partners include New York University, Carnegie Mellon University, the City University of New York, and the University of Toronto, among other schools. **IE**

DANA WILKIE is a freelance writer in Alexandria, Virginia. Her last article for *IE* was "Peace Pathways" in the May/June 2013 issue.