# No Half-Measures After Brock Made the Turn Into Research

In less than two decades since Brock University became a comprehensive institution, committing to a complexity of research that invigorates grad studies and attracts top scholars, Brock and its supporters have established nearly 50 graduate programs (including nine PhDs) and spent more than a quarter-billion dollars on world-class infrastructure at its campus in St. Catharines, Ont.

The most conspicuous evidence is the Cairns Family Health and Bioscience Research Complex. Opened in 2012, the $120-million Cairns Complex is a dynamic research and graduate teaching facility created to unlock knowledge and align with economic strategies of regional, provincial and federal governments.

Supporting some 400 students, faculty, scientists and researchers from the Faculties of Applied Health Sciences, Mathematics and Science, and Social Sciences, the 176,530-square-foot Cairns Complex instils transdisciplinary approaches to priorities like the health and biotech sectors, biomanufacturing, business incubation and developing treatments and prevention for the world's most deadly diseases.

For example, Cairns is the only Canadian university facility with an insectiary-equipped Level 3 containment lab. This advantage quickly helped Brock researchers, led by medical entomologist Fiona Hunter, become major global players on such urgent files as Zika and West Nile viruses. Their latest research found what are believed to be the first Aedes aegypti mosquitoes in Canada during surveillance in Windsor, Ont. Commonly known as the yellow fever mosquito, the species is responsible for the majority of human cases of Zika in the Caribbean, South America and Florida.

But scratch deeper into Brock's energetic and youthful research culture and you discover a fascinating pattern of research tools that are cutting-edge, innovative or just plain clever contributors to teaching and learning. Such as a mannequin that tells you he's in pain. A vacuum cleaner that clears debris from an underwater ancient shipwreck. A maze of pipes and pumps measuring 800 million-year-old air.

The High Fidelity Simulation Mannequin – stretched out in a hospital bed in the Department of Nursing – has a heart that pumps, lungs that breathe, eyes that blink and can even answer questions. Attached to the "patient's" head is a GoPro camera, which enables Karyn Taplay and her team to conduct their simulation research.


"The purpose is to capture the care provided by student nurses from the patient's perspective," says Taplay, an associate professor in Nursing. "The students then watch the care they provided and reflect on it, from the patients point of view. This research has the ability to revolutionized reflective practice that is key component of nursing and impact patient-centered care."

Meanwhile, eight metres underwater off the coast of Sicily, archaeologists on the Marzamemi Maritime Heritage Project are diving on a 6th-century shipwreck. They grip the mouth of a machine called a Water Dredge, which looks – and acts – like a vacuum cleaner.

"The Water Dredge allows us to carefully remove thousands of years of accumulated sediment from the wreck, revealing its cargo of marble columns and other archaeological elements destined for the construction of a church," says Elizabeth Greene, associate professor in Brock's Department of Classics.

"Through our research at Marzamemi, we are learning about the mechanics of maritime transport in the changing world of late antiquity and the relationship between state-driven and independent commerce."

Then there's the odd-looking machine that gives Nigel Blamey and his colleagues around the world a "blast from the past" – a Quadrupole Mass Spectrometer. The Earth Sciences professor places a sample of rock salt called halite into the vacuum chamber. As the rock is crushed, 800 million-year-old trapped fossil gas disperses into the highly-sensitive spectrometer, which reads and analyzes the gas content and composition.

It turns out that there was five times as much oxygen 800 million years ago than previously thought, opening the door for a reinterpretation of Earth history.

"Deciphering the oxygenation history of the atmosphere and oceans is critical to understanding weathering processes, sedimentary environments, climate change, mass extinctions, selected ore deposits, and the evolution of Earth's biota," says Blamey.

Beyond individual pieces of equipment, Brock's inventive laboratories include kinesiology professor Stephen Cheung's Environmental Ergonomics Lab (EEL). Its "dunk tank" contains water that can vary from eight to 45 degrees, while Cheung's environmental chamber subjects study participants to prolonged air temperatures from minus 30 to 50 above.

Cairns Research Complex at Brock University.

"It is quite unique to be able to manipulate both temperature and oxygen at the same time," says Cheung, who is Canada Research Chair in Environmental Ergonomics. "We can replicate the altitude of approximately Mexico City (2,300 m) and do that while either in the cold or heat."

Studying the physiological and cognitive impacts of being in extreme conditions, the lab can generate specific heat, cold, humidity and oxygen levels. Cheung and his team take a variety of physical readings from the participants to measure the effects of environmental stress on human physiology and performance. His research has informed the design of products ranging from survival suits for offshore oil workers to athletic competition attire, even consumer outdoor clothing at places like Mark's Work Wearhouse.

"We are thankful to our partners and funders for the cutting edge equipment our researchers use as they learn more about the world around us," says Brock's Vice-President Research, Joffre Mercier.

Brock's major funders include the Natural Sciences and Engineering Research Council (NSERC), the Social Sciences and Humanities Research Council (SSHRC) and the Canada Foundation for Innovation (CFI).

To see a video of some of Brock's distinct research assets, **click here**.