



Research Reporter

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Brock University

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Funding Successes

In the 2002-03 fiscal year, Brock University faculty and staff were awarded nearly 200 research grants and contracts for a value of over \$7.7 million.

Brock researchers experienced great success in the SSHRC Standard Grant competition, garnering 14 awards valued at over \$1 million, placing Brock 7th and 17th amongst Ontario and Canadian universities respectively in this competition.

Other SSHRC awards include the renewal of the YLC-CURA, led by Dr. Teena Willoughby of Child and Youth Studies, a CESC-SSHRC Education Research Initiative grant to Dr. Terrence Wade of Community Health Sciences, and a major SSHRC INE, on which Dr. Dan Glenday of Sociology is a co-applicant.

Dr. Hui Di Wang of Community Health Sciences, who holds a New Investigator Award from the Heart and Stroke Foundation of Canada, was given the first competitive CIHR Operating Grant award to study adventitial oxidative stress of blood vessels.

In the 2003 Competition, Brock faculty received 15 new/renewal Discovery Grants awards and 5 Research Tools and Instrument Awards. The total value of these awards is \$1.75 million. While Dr. Vincenzo DeLuca of Biological Sciences is a co-investigator on a new NSERC Strategic Grant.

These research grants will have a significant impact on the opportunities for undergraduate and graduate students to become engaged in the research process as well as contributing to the creation and dissemination of new knowledge for the benefit of Canadians.

Congratulations to these successful grant recipients.



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Holistic Education: Brock professor explores aspects of the “self” in children

Since January 2000, Dr. Sandra Bosacki has been an Assistant Professor with Brock’s Faculty of Education. Most of Bosacki’s past and current research interests involve, as she explains, “the exploration of how self-feelings and self-beliefs influence children’s mental reasoning and social interactions within the school setting.” In other words, “self-concept, social cognition (mental reasoning ability), and social relations” guide all of



“In addition to cognitive competence, there are many more pieces of the puzzle that help to create the overall school experience in middle childhood.”

Dr. Sandra Bosacki

Bosacki’s research interests. Although Bosacki has worked with many ages, including preschoolers and adolescents, most of Bosacki’s current research focuses on middle childhood and the pre-teenage years.

Currently, Bosacki is involved in three separate research projects. Her first project, which has just received funding from the Social Sciences and Humanities Research Council (SSHRC), is linked to Bosacki’s PhD and postdoctoral work, which looked at “the connections among psychological understanding (theory of mind), self concepts, and social relations in preschool and middle childhood.” Taking place over three years, the study will focus on the links between psychological understanding and social behaviour in middle childhood. In particular, the study will investigate children’s ability to understand or make meaning of human thoughts and feelings, and how this relates to their self-concepts, social behaviour, and language competence within the school setting. With the goal to provide some guidelines for a more holistic curriculum for children, the study will explore both age and gender effects. Overall, the project aims to 1) bridge the gap between psychological

understanding and social behaviour in middle childhood, and 2) provide empirical evidence to aid the development of intervention programs and educational materials that aim to promote both sociocognitive and emotional competence in children. In the Spring of 2000, in a study

internally funded by SSHRC to provide support for her SSHRC application, Bosacki conducted a short-term study with over 200 elementary school children (grades 4-6) from Southern Ontario.

In collaboration with fellow Brock University Professor Dr. Zopito Marini, Bosacki’s second research project explores “social cognition and self-esteem, which is often referred to as ‘bullying’ or ‘victimization.’” Marini is a Professor with Brock’s Department of Child and Youth Studies who specializes in the social cognitive factors involved in school bullying among children and adolescents. Bosacki and Marini are working together to explore the links between children who are bullied (or who themselves are bullies) and their self-esteem and ability to understand emotions and thoughts in others. Again, this was piloted in a small study with pre-teens (approximately eighty students) in 2001 in hopes for future funding.

Funded by SSHRC, Bosacki’s third project involves working closely with Dr. Anne Elliott (Education) and other cross-faculty researchers investigating in a longitudinal research study (currently in its second year), “children’s perceptions of popular culture and how their own self-beliefs and value systems play a role in these perceptions.”

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In addition to these three main research projects, Bosacki is also involved in two SSHRC-funded large-scale, multidisciplinary, collaborative research teams (the Youth Lifestyle Choices, Community-University Research Alliance and the Centre of Excellence – Youth Engagement) that explore resilience and lifestyle choices among Canadian youth. Bosacki is also a member of the Brock Research Institute for Youth Studies (BRIYS), which promotes the interdisciplinary research of youth across faculty and students at Brock.

Bosacki views herself as a “developmental interventionist,” as her unique approach to research and education is tied to a “psychocultural and holistic

approach.” “When I talk about educational implications, I aim to promote the development of holistic programs that incorporate all aspects of the child, and all aspects of learning. I am fascinated by the complexity of social learning in the middle grades, and the various factors that influence whether or not a child develops various competencies. In addition to cognitive competence, there are many more pieces of the puzzle that help to create the overall school experience in middle childhood. This complexity has inspired me to begin focusing on aspects of development beyond cognition, including emotionality and spirituality. One of the overarching aims of my research program is to provide empirical evidence that may help to develop a guiding framework for

holistic educational programs that are developmentally appropriate for children and adolescents.”

At Brock, Bosacki feels an incredible amount of support for her research: “Brock’s supportive environment plays a crucial role in my ability to conduct research, and I am very fortunate to receive the support from my department, Faculty, and the larger University.” Bosacki appreciates Brock’s innovative research culture as it continues to encourage interdisciplinary collaboration and the creation and sharing of new ideas. As a relatively new member of the Brock community, Bosacki’s dedication to research, teaching and learning is commendable.

~ Julie Ann Elliott

Exploring the human brain at a snail’s pace

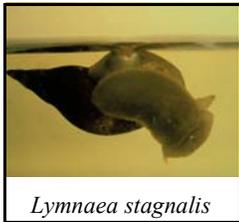
The human brain due to its complexity and inaccessibility is still very much a mystery to scientists. Yet for decades, researchers have employed a simple key in order to unlock the barriers in understanding the human brain – the snail.

From the outside, a human being and a snail seem to have little in common.

However, as Brock University biologist Dr. Gaynor Spencer explains, “At the level of single cells, cells in invertebrates contain many of the same neurotransmitters, signaling molecules, and types of receptors as humans do. Even though the complexity of a human brain is much greater, the snail’s brain offers the same basic building blocks.”

Dr. Spencer works with the Pond Snail *Lymnaea stagnalis*, a fresh water invertebrate that grows up to 3 or 4 centimetres. The large neurons and simple nervous system of this snail give Dr. Spencer an opportunity to examine the cellular and molecular processes of learning and memory. Specifically, she is interested in synaptic plasticity or how the cellular connections in the brain change. One of her many challenges is that the connections that neurons make are constantly altering by being either lost or strengthened, making it difficult for scientists to identify the exact processes involved. However, the brain of the snail offers unique insights, ones that could otherwise not be gained from more complex nervous systems.

In order to determine how a snail learns and remembers, the snail must first be trained. As strange as it sounds, “snails have a very good brain and they learn very fast,” laughs Dr. Spencer. “In our lab, we train the snails respiratory behaviour, by teaching it not to



Lymnaea stagnalis

breathe. This sounds cruel, but it actually isn’t because this snail can survive in very low oxygen environments such as stagnant pond water, for long periods of time.”

Snails can absorb oxygen through their skin or breathe through a primitive lung called a pneumostome, which is a small opening on the snail’s right side, leading to the lung cavity. When living in well-oxygenated water, snails will breathe via the skin. But when the water becomes low in oxygen, the snails will rise to the water’s surface and open the pneumostome for air.

In 30-minute training sessions, snails that normally live in oxygenated tanks are placed into beakers of hypoxic water, or water that has had most of the oxygen removed. Understanding that they are in a low oxygen environment, the snails travel to the surface to

the level of the cells involved in that behaviour. “We can look at the brain and identify individual neurons that actually generate the behaviour. Previous work by others has shown that a three-cell network called the central pattern generator drives this behaviour.” This gives scientists an opportunity to see if the activity levels or connections of individual neurons that generate the behaviour have changed following training.

There are exciting future applications for Dr. Spencer’s work. Scientists believe that many of the cellular mechanisms that underlie the way that connections between neurons change during learning and memory are similar across many different species. “If we can discover how things are occurring at the cellular level in simple systems such as the snail, that gives us an idea about how the cells are

actually changing in more complicated nervous systems, like our own. For example, we may discover a cellular signaling molecule is having an effect in the system. It gives us ideas about what signaling molecules to look at in vertebrate and human brains,” explains Dr. Spencer.

Dr. Spencer and her team are working to recognize the changes that are occurring within single cells and how the entire network could be changing to generate very different behaviours. Ultimately, Dr. Spencer’s goal is to gain an understanding of the kind of cellular processes that are happening during the learning process as

well as the processes that underlie the formation of memory. There are still many questions that have yet to be answered. “Until we uncover the fundamentals of how these processes work and the subsequent application of that information, understanding the brain is a long way off.”

~ Kimberley Lee



“Even though the complexity of a human brain is much greater, the snail’s brain offers the same basic building blocks.”

Dr. Gaynor Spencer

open their lung. When this occurs, the researchers tap the snails near their lung to trigger a withdrawal reflex. The snails then close their lung and retreat into the water. “Eventually, they will stop performing the behaviour, even when they are in a low oxygen environment,” Dr. Spencer explains.

After the snails have been trained, Dr. Spencer tries to determine what is occurring at