

Research Reporter

Scholarly, research and creative activity

Published by the Office of Research Services, Brock University
St. Catharines, Ontario, Canada L2S 3A1



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Issue 6 - October 2002

Welcoming our new colleagues



Dr. Michael Owen

In the two years I have been at Brock University, I have been impressed by the high quality of scholarship of all faculty, but in particular, many of the colleagues who have recently joined the university. Some of these individuals have had outstanding careers elsewhere and have chosen to affiliate with Brock because of the research of existing faculty and our commitment to quality undergraduate and graduate teaching and research. Others are new faculty at the beginning of their careers.

In this issue of *Research Reporter*, Erin Kainpain reports on the research of two colleagues who have recently joined Brock. In the Department of Psychology, Dr. Karen Arnell adds significantly to our strong focus on electrophysiological research. Her ground-breaking research on Attentional Blink Phenomenon holds great promise for expanding our knowledge and understanding of the way in which humans process an increasing number of simultaneous stimuli and identifying practical applications to improve safety in the workplace and home. Her strong commitment to research is complimented by her commitment to and acknowledged expertise in undergraduate education.

Canada has an increasingly mobile population who visit and migrate from developing countries in which parasitic diseases are more prevalent. Dr. Anna Sanchez combines her expertise as a microbiologist with her interest in developing strategies for the alleviation and prevention of parasitic diseases such as tape worm in developing countries and monitoring the incidence of such diseases in Canada.

In future issues of *Research Reporter* we will be highlighting some of the remarkable research achievements of our colleagues and will be focusing on new discoveries that have led to patent applications or copyright filings by these researchers with Brock and/or sponsors as well as "spin-out" or "seed" companies being established to transfer these discoveries to the market place.

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The Offices of Research Services and Media Relations seek research stories that are of interest to other scholars and to the community.
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Dr. Karen Arnell

Arnell's Passion for Science is Paralleled only by her Passion for Teaching

Dr. Karen Arnell recently returned to Ontario after spending four years with North Dakota State University. Over the course of her young career, Arnell, of the Department of Psychology, has gained a reputation as a cutting-edge scientist in the area of human attention and processing limitations. She examines behavioural performance as well as neural activity while participants react to multiple stimuli. In addition to making a name for herself as a cognitive psychologist, Arnell has been recognized for her teaching and mentoring of undergraduate students.

Arnell explains that "to understand the mind and the brain is to understand ourselves and our behaviour. Understanding our attentional limitations," she says, "is part of that goal."

With increasing frequency, we are expected to attend to multiple tasks simultaneously. However, as Arnell points out, "despite our desire to do everything at once, the fact remains that there are finite limits on how much information we can attend to and process at any given time. As a result, such attentional limitations can lead to the imminent failure of one or more tasks when they are performed in combination."

Since coming to Brock in July, Arnell has begun work on her project, "Electrophysiological and Behavioural Investigations of Dual-Task Attention Costs," funded by the Natural Sciences and Engineering Research Council (NSERC). Through this research, Arnell seeks to understand why certain tasks are easier to perform in combination than others. In many jobs, she explains, employees are bombarded with multiple stimuli, particularly the jobs of air traffic controllers or pilots. Arnell's research has the potential to help understand how the mind and brain work when one is asked to attend to multiple tasks. The most effective strategy in fostering successful multitasking, according to Arnell, involves modifying environmental stimuli. For example, she suggests, "We could make travel in automobiles and airplanes safer if we knew how to help the driver or pilot successfully multitask."

"Maximizing performance under dual task conditions is important for many occupations from professional athletes in dynamic sports such as football, to military and civilian airplane pilots who must watch out the window while paying attention to a variety of lights, dials and auditory instructions."

Arnell suggests that performance deficits due

to attentional difficulties may be avoided and human productivity may be increased "through better selection of tasks for combination, by modifying one or more of the critical task requirements, or by modifying environmental stimuli."

Arnell claims her work is more theoretical, but her research has many practical applications. For example, her work has been picked up by NASA in an effort to increase safety in military travel, and by Unilever, a multinational corporation, as a means of boosting profits. Unilever has used the knowledge gained from understanding human attention in product advertising, as it is very interested in capturing and maintaining a consumer's interest, as a means of assuring that the advertiser's entire message is received and processed.

In addition to these diverse applications, Arnell's research has been applied to investigations on the attentional processing limitations in special populations such as those with depression, head injury or chronic alcoholism. Arnell explains that her research career began in 1990, at which time she was "one of three researchers who were the first to discover and publish articles on the attentional blink phenomenon." Her involvement with this research, she explains, kick started her career and since that time, the Attentional Blink Phenomenon has become very popular among other researchers. Arnell continues to pursue leading-edge research projects, and at this early stage of her career, holds great potential for the future. She currently has nine articles published in refereed journals, one book chapter, a review article, five manuscripts currently under review at prestigious journals and has delivered over 20 presentations of her work at various American and other international conferences. As well, in 1999, Arnell was made a Consulting Editor for the *Journal of Experimental Psychology: Human Perception and Performance*.

Arnell's reputation as a scholar is matched only by her reputation as a teacher. In her four years with North Dakota State University, Arnell received three different awards for her mentoring of undergraduate students in her research program on electrophysiology and attention. Arnell was also awarded the James Meier Jr. Professor Award, which recognizes the assistant or associate professor that most exemplifies the successful combination of high quality research and teaching. She now hopes to share her teaching philosophy with

(Continue on Page 2)

(Continued from page 1)

students and faculty at Brock and explains, "I take undergraduate mentoring very seriously."

Arnell explains that through her guidance, students learn how to work with different pieces of equipment as well as learning good analytic skills. Such mentoring programs in Psychology are very important, as there is a pressing need for doctoral-trained psychologists both in academia and in community settings. Arnell adds that, "Working in a lab helps prepare students for careers in cognitive neuropsychology, applied industry, or health care."



Dr. Ana Sanchez

Empowering a Community through Health Education

The research of Assistant Professor Ana Sanchez, of the Department of Community Health Sciences focuses on parasitic diseases in developing countries. More recently, her work has focused specifically on *Taenia solium*, a parasitic tapeworm that causes considerable neurological problems, primarily epilepsy, in people throughout Latin America, Asia and Africa. The impact of the tapeworm is even more devastating to developing countries because it causes huge economic losses due to the contamination of pork meat and the subsequent impact on public health and loss of export markets.

As a result, Sanchez argues that the tapeworm is not only a health problem but it is also a social and economic problem. Much like other developing countries that are afflicted by the tapeworm, economic resources in Honduras are already strained. Traditional intervention methods have not been successful, are not sustainable, and quite often, are simply not feasible. The provision of modern and effective sewage systems, for example, is often unrealistic in rural areas because of its prohibitive cost. In the past, mass treatments of infected populations with anti-parasitic drugs have also been attempted but work only in theory, as three months after the medication is administered, without an effective sanitation infrastructure to control the spread of the tapeworm from human and animal waste, the population become re-infected.

Sanchez researches neurocysticercosis (NCC) and the neurological disorders caused by this tapeworm in Honduras. In an earlier study, she and her colleagues found that the less the population knew about the parasite, the greater the risk they had of being infected by it. This led her research team to conclude that a public health education campaign targeted towards specific groups of a community might be the most feasible solution in controlling the transmission of the parasite.

Sanchez is a trained Microbiologist and she completed her PhD. in Infection Biology at the Karolinska Institute in Sweden. She insists that even the most scientific issues are social problems. While it is well known that *Taenia solium* is a major problem in Honduras and other developing countries, very little research has been done on ways to solve the problem. As Sanchez explains, the research on the parasite addresses not the impact on human health, but rather, focuses on its effect on animals, particularly swine. Conducted

However, while students stand to benefit from this relationship, Arnell explains that as a researcher, the relationship is also quite valuable to her, as students help make important contributions to her work. She hopes to continue her success in research and teaching at Brock, and the new PhD program in Psychology will give Arnell an additional opportunity to mentor students. In regards to research and teaching, she concludes, "I just love teaching people how to be scientists. What interests me the most is the pursuit of the answer."

In addition to her funding from NSERC, Arnell

by veterinarians, tapeworm control programs seek ways to remedy the economic impact caused by the loss of local and export markets due to the contamination of pork meat. Moreover, approaching this issue exclusively from an animal health perspective will never solve the problem, Sanchez explains.

In her previous research, Sanchez and her colleagues found many rural and urban dwellers knew little about the parasite, how it was transmitted and ways to prevent its transmis-

sion. The solution, Sanchez believes, combines public health education, effective use of anti-parasitic treatments for humans and animals, and improved sanitation practices. Public health education campaigns, similar to that proposed by Sanchez, have been successfully implemented in Mexico. Sanchez hopes that her educational methods, which aim to give Hondurans the power to protect their own health, will decrease the transmission of the parasite, and in turn, reduce the incidence of epilepsy.

Sanchez states that, "We have to make people understand that their behaviour leads to the health and economic issues. We want to show them that even though they don't have the expensive infrastructure of the developed world, they can control the spread of this parasite."

Sanchez explains that other researchers who have gone to Honduras have failed to enact positive change because they have not involved the community. These scientists go into the communities to conduct research, but when they leave, the community hears nothing of them again.

"Our group of researchers," Sanchez explains, "is very sensitive to this pattern of treating local peoples as objects of research rather than as active and important participants and agents of their own well-being. We make sure that there is always a benefit to them to take part in our study. Whether this means demonstrating to the local Ministry of Health that they need more personnel and supplies, or informing farmers of better practices, we try to enact positive change. We try to do as much as we can to show our gratitude to them. If they realize there is a benefit to them, then they will be more open to our recommendations."

An important part of Sanchez's work in Honduras is making connections with key community leaders, a step she says is, "fundamental to any field epidemiological study. The researcher really has to know almost each person, each family and as a result, this kind of research relies on a lot of personal interaction."

A successful educational campaign therefore must specifically target different groups within the population and modify its methodology accordingly. Sanchez explains that the educational activities must be delivered in different formats according to factors such as age, occupation and literacy.

Her educational strategies vary depending on her audience. For example, when she works with children, she uses a lot of graphic material as well

has also secured equipment for her project through the Canadian Foundation for Innovation (CFI) and the Ontario Innovation Trust (OIT). While electrophysiological research is a particular strength of Brock University, Arnell hopes that the acquisition of additional equipment will help attract high quality PhD students in Psychology, as well as new researchers and collaborators on other research programmes, with researchers from other institutions. ●

Article by Erin Kaipainen

as games and role-playing to demonstrate things such as the parasite's life cycle. Children, she explains, are often the best communicators of her message.

"They tend to go home and show off. They are really the best disseminators of knowledge because they teach younger children and their parents."

While Sanchez's research in this area is focused on Honduras, it also has implications for other countries where this parasite is a problem. In August, Sanchez attended an international workshop in Tanzania that addressed this problem. Health education programs were discussed as an essential part of control and prevention measures, particularly in Africa, where the extent of poverty prohibits or limits other methods of intervention.

"This is pretty much a problem in the entire world," Sanchez explains. "While North America has nearly eradicated problems of parasitic diseases through improved sanitation, it remains affected by the parasite as people are travelling or migrating with increasing frequency to and from endemic countries."

"Unfortunately, because the prevalence of this parasite in the developed world remains very low, and the causes of epilepsy generally do not include NCC, there is almost no attention on the parasite in Canada."

In a Canadian study, Sanchez is documenting the low frequency of the parasite in this country. As a result, she posits that health-care workers rarely consider the existence of the tapeworm in their differential diagnosis, even though NCC is one of the first things one should look for in an epileptic patient that comes from an endemic area or has travelled to one of them. In studying more than 200 charts from three area hospitals, Sanchez found that because the disease was never once mentioned, it is difficult to know if physicians are even aware of the disease. Canada also has few infectious disease specialists, another factor which might account for the low incidence of reported cases of NCC. However, since many Canadians travel to lesser-developed nations more frequently, and Canada is attracting more immigrants from areas in which NCC is endemic, she concludes that there is a greater need for more information on infectious diseases in Canada in order to ensure proper diagnosis and treatment of the disease.

"Parasitic diseases," Sanchez warns, "are a global problem. They can no longer be seen as local problems." ●

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Published by the Office of Research Services,
Brock University
St. Catharines, Ontario