

Fall 2016

ZYGOTE PLUS



A newsletter for alumni of the College of Biological Science

Prof gets \$2-million grant to study drug-resistant pathogens

BATTLING DISEASE-CAUSING BACTERIA – including potentially deadly microbes resistant to current therapies – is the ultimate goal of research by a U of G microbiologist chosen to receive a prestigious \$2-million federal grant.

Prof. Chris Whitfield, Department of Molecular and Cellular Biology, will use his seven-year Foundation Grant from the Canadian Institutes of Health Research (CIHR) for studies of drug-resistant pathogens that increasingly threaten human health.

“This is wonderful news for Prof. Whitfield and the University of Guelph,” said Malcolm Campbell, vice-president (research). “This important investment will provide Chris with the foundation to sustain his innovative and high-impact research, which has both scientific and practical applications. It also recognizes the University’s capacity for doing excellent research across a wide range of disciplines.”

Whitfield and three other U of G researchers,

including kidney disease researcher Prof. Nina Jones (see page 2), received awards in the latest CIHR funding round announced in August.

By learning more about how microbes resist current therapies, Whitfield hopes to help point industry toward better vaccines and antibiotics for specific bacteria causing everything from blood-stream and urinary tract infections to meningitis.

“Many of these bacteria are already resistant to antibiotics and some are becoming resistant to ‘last-resort’ approaches,” said Whitfield.

He studies complex sugar polymers on cell surfaces that enable microbes to outwit the human immune system and to resist many currently available antibiotics.

Now Whitfield plans to expand his studies of how these cell surface structures are made. By learning more how their production is integrated with other cellular systems, he hopes to develop new approaches for combatting disease-causing bacteria.



Prof. Chris Whitfield

UNIVERSITY
of GUELPH

CHANGING LIVES
IMPROVING LIFE

Donor support is vital

HELLO ALUMNI! IT'S been another great year in CBS, and I hope it has been for you as well.

I'm delighted to announce that Prof. Marc Coppelino has taken over as chair of the Department of Molecular and Cellular Biology (MCB). Marc has been a faculty member at Guelph since 2001. Learn more about Marc and his transition into this role on page 7. I would also like to thank Prof. Robert Mullen for his strong leadership as chair of MCB from 2013 to 2016.

On the alumni front, CBS welcomed Taline Artinian to the role of alumni advancement manager. Taline is covering for Annie Benko while she is on secondment in another role within Alumni Affairs and Development. Taline comes to us from Futurpreneur Canada and has been very involved in meeting our CBS alumni.

I'm pleased to announce two new endowed scholarships for the college. Former CBS dean Bruce Sells endowed the Bernice and Bruce Sells Leadership Scholarship. This annual award will be available to undergraduate students registered in any program in the College of Biological Science with a minimum cumulative average of 85 per cent, who have completed 12 or more credits and have demonstrated financial need. Selection of the student recipient will be based on demonstrated leadership qualities through

significant involvement in extracurricular activities.

Emeritus professor Benjamin Lu endowed the Dr. and Mrs. Benjamin Lu Scholarship for a student entering any MCB program with a minimum 75 per cent admission average. Selection of the student recipient will be based on the highest admission average.

I'm also pleased to announce a \$25,000 gift from AMGEN to support



both our human anatomy and our exercise physiology outreach programs for high school students.

I also want to thank all of you who made donations this year to support CBS. With your generous support, we raised \$122,505, which will be used to fund a number of

important activities at CBS, including undergraduate and graduate scholarships, the Guelph Family Health Study and our human anatomy program.

We have enrolled our first class of 16 students in the new master of biotechnology program (www.uoguelph.ca/mbiotech), which offers a "research-based and business-minded" degree.

The college also held five convocation ceremonies in June, adding 619 new members to our alumni family. All five ceremonies featured a wonderful convocation address by the venerable Prof. David Josephy. I'm sure many of you will remember being taught by David!

JONATHAN NEWMAN, CBS DEAN

Funding boosts kidney research

Prof. Nina Jones teaches one of the same courses she took as an undergrad at U of G.

Now she hopes to inspire her own students as a molecular and cellular biology professor at U of G and Canada Research Chair in Eukaryotic Cellular Signalling. She recently received



Prof. Nina Jones

almost \$750,000 from the Canadian Institutes of Health Research to further her research on kidney disease.

"Once you start to lose kidney function, it's oftentimes progressive," says Jones. "It's a chronic public health issue." Symptoms of kidney disease don't appear until the disease has advanced. A urine test reveals high levels of protein being excreted, which is one of the first signs of kidney failure.

A kidney transplant is currently the best treatment, "but transplant demand outpaces donor availability, and those in need often spend many years on dialysis," she says.

The kidney's blood vessels are wrapped in cells called podocytes. These cells produce nephrin, a protein embedded within the kidney's filter that allows passage

of waste products and keeps essential proteins in the blood.

Conditions such as diabetes, hypertension and obesity can contribute to kidney disease in adults, but it now affects people at younger ages. Some children are born with a DNA mutation that prevents their podocytes from producing nephrin, while adults may lose nephrin or the signalling function of the protein over time. Some medications, bacteria and viruses can also harm the kidneys.

Jones is heavily involved in charitable work that supports kidney research, earning her the Award of Merit for Outstanding Community Partner from the Kidney Foundation of Canada, which also funds her lab. “We’re very grateful for the support,” she says. “It’s positive reinforcement for us that what we’re doing is in the right direction, and we’re reaching people with our research and community involvement.”

She was recently elected into the College of New Scholars, Artists and Scientists, a branch of the Royal Society of Canada, for high achievement in her field.

Jones credits her students and lab staff for making the research possible and for sharing their knowledge with those who have kidney disease. “It’s a great opportunity for them to appreciate first-hand how their research efforts impact people who are living with what we’re studying.”

Career Night

Alumni are invited to share their knowledge and experience with current CBS students at Career Night. Contact Taline Artinian at artinian@uoguelph.ca for more information.



Get involved with CBSAA

FALL 2016 HAS come and gone, and the CBS Alumni Association (CBSAA) is welcoming the class of 2020 to the University of Guelph. Who would have thought that those iconic leather jackets would ever show a “20” on the sleeve?

The CBSAA has been busy planning for an exciting 2016/17 year and hopes to see many new faces at our upcoming events. Our annual day at the Royal Botanical Gardens was well-attended, and we would like to thank Prof. Merritt Turetsky, Integrative Biology, for her fascinating talk on permafrost in the Arctic.

The annual HK5K in October was also a big success, raising \$2,300 for the human anatomy program. More than 130 people ran or walked along the five-kilometre route through the Arboretum.

The CBSAA is excited to resume its Speaker Series, bringing alumni back to the University to share insights into

their current work. This year’s Speaker Series events will be held in November and February.

The CBSAA will also participate in the annual Career Night on Jan. 25. Any alumni who are interested in providing future grads with information about current job opportunities and the challenges of the working world can contact Taline Artinian, CBS alumni advancement manager, at artinian@uoguelph.ca. Keep your eyes open for the e-vite.

We are also excited to get to know the current Science Club presidents and engage with graduate students in our organization. As always, the CBSAA is looking for new members. If you are interested in joining the CBSAA, or want to find out more, please contact me at vsharman@fultonfoodsafety.com.

VALERIE SHARMAN, B.Sc. ’94
PRESIDENT, CBSAA

Mobility challenges change over time

WALKING APPEARS TO be a simple activity — just put one foot in front of the other — but it's much more complicated than that, says Prof. Lori Vallis, Human Health and Nutritional Sciences, who studies the biomechanics of walking.

“Across the lifespan spectrum, it's quite interesting because kids and older adults have challenges with how they execute different movement patterns,” says Vallis.

Babies and children often stumble because they're still learning the many complex neuromuscular skills involved in walking, whereas older adults may have sensory problems such as poor eyesight or impaired balance that affect how they walk.

Vision is the most important sensory input for walking, says Vallis, but it can be impaired by distracting activities, such as looking at your phone while walking. We can only look at one thing at a time, she explains, so when your vision is



diverted from your path, it's easier to trip.

A study with Dorelle Hinton, her former M.Sc. student and a CBS Gold Medal winner, looked at how children can balance

an object in one hand while picking up another object on the floor with the other hand.

Another study with PhD student Tim Worden looked at whether training can help young adults and older adults walk over an obstacle while doing a visual or listening task, and how these distractions affect motor patterns.

The researchers found that young adults tailored their steps to the size of the obstacle, taking lower steps over smaller obstacles and higher steps over larger ones. Older adults appeared to be more cautious and stepped higher over every obstacle, regardless of its size. “It seems like they're prioritizing their stability and their safety over a more efficient gait,” says Vallis.

She believes this cautious approach to obstacles may be due to older adults being more aware of their physical limitations.

Vallis is also working with people who have Parkinson's disease in a study with the YMCA-YWCA of Guelph and U of G professors Jamie Burr and Phillip Millar to see how a cycling training program can improve cardiovascular fitness, posture and gait.



Prof. Cezar Khursigara (far right)

Biofilms boost antibacterial resistance in people with cystic fibrosis

Bacteria know there's strength in numbers — that's why they form biofilms. These bacterial communities are more resistant to antibiotics than individual cells, thanks to a protective coating that encases the biofilm “like a tank,” says Prof. Cezar Khursigara, Molecular and Cellular Biology.

His lab is studying how *Pseudomonas aeruginosa* bacteria form antibiotic-resistant biofilms in the lungs of people with cystic fibrosis, causing persistent lung infections. “This is a particularly nasty pathogen in terms of hospital-acquired infections,” he says. Working with researchers at SickKids, they discovered factors that enhance antibiotic resistance in biofilms.

“The biofilm itself provides protection from antibiotics,” says Khursigara. “When they form these biofilms, they encase themselves in a sugar coating, which makes antibiotic penetration very difficult.” The bacteria also produce an enzyme that counteracts antibiotics such as penicillin.

The same antibiotic-resistant strains are found in lab and clinical samples, but the latter appear to have acquired multiple copies of antibiotic-resistant genes. “That tells us that these genes are important to resistance, and that clinical strains have found ways to enhance their resistance to these antibiotics,” he says.

The mucus that forms in the lungs of cystic fibrosis patients also provides an ideal habitat for bacteria. “Given the opportunity, they can colonize pretty much any environment,” says Khursigara.

Microorganism models effects of climate change

THE WATER FLEA is a tiny creature — as its name suggests — and it can have a big impact on freshwater ecosystems.

“Pretty much everything eats *Daphnia* [water fleas],” says Gustavo Betini, a postdoc in integrative biology. He’s working with Prof. John Fryxell to study the effects of climate change on these organisms.

“It’s a very important food source for small fish and other small aquatic organisms, so they’re a key species for the food web,” says Betini. “Any crash you see in the *Daphnia* population is very likely to have an effect on the entire aquatic ecosystem.”

Using the limnotron, a massive six-tank research facility in the Biodiversity Institute of Ontario, he can adjust water temperature and light in each of the tanks to mimic changes in the environment. Each tank is filled with 28,000 litres of water set at temperatures of 15, 20 or 25 C, which are similar to those found in the Great Lakes.

Some of the tanks contain both *Daphnia* and algae (their food source), while others contain only algae.

“These are very good model organisms,” says Betini of water fleas. “We know quite a bit about them and their basic biology. We’re interested in the dynamics of the population, and how the population is going to change with increasing temperatures that are happening as a consequence of climate change.”

Betini and his research team collect daily water samples from 18 ports, which are located at different heights on each tank, to measure how the *Daphnia* and algae populations change over time. The relationship between consumers and resources in an ecosystem is constantly changing, he explains, as consumers (in this case, *Daphnia*) eat resources (algae).

Research shows that rising temperatures associated with climate change affect the size of aquatic animals. *Daphnia* and other aquatic species are particularly vulnerable to climate change because they can’t regulate their body temperature, says Betini. When exposed to higher temperatures in the tanks, *Daphnia* grow smaller, but it’s not clear why.

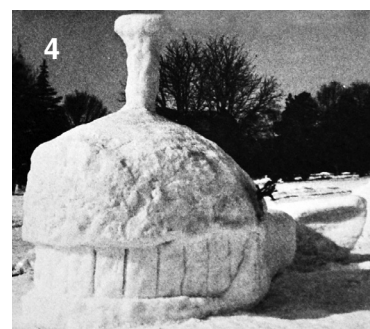
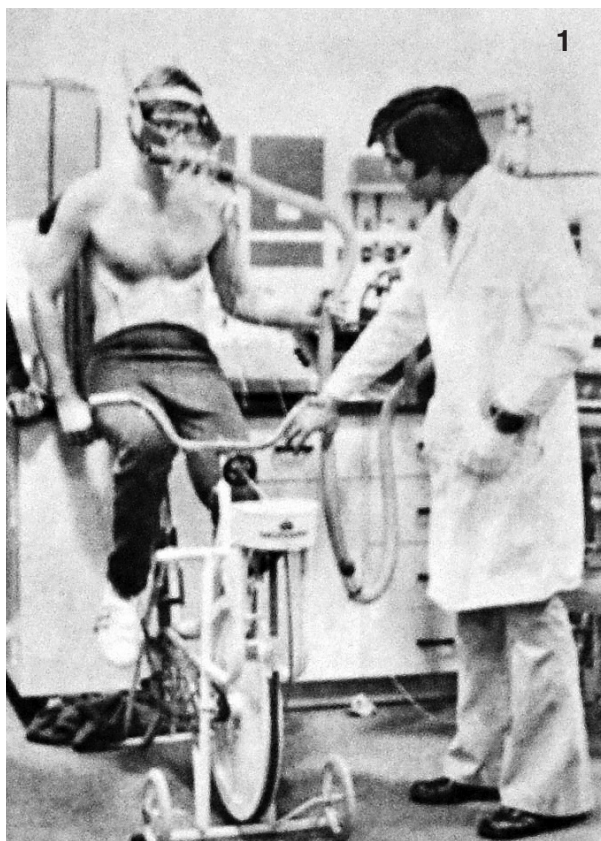
“It’s a great opportunity to measure the effects of climate change on freshwater organisms,” he says.



Water fleas are sensitive to changes in water temperature.



From left, Prof. Alison Duncan, Emma Mussell, Prof. Lori Vallis, Claire Carsjens and Isabel Carsjens participated in the HK5K fundraiser for the human anatomy program in October.



Remember the '70s? Here are some yearbook photos to remind you. 1. A study participant rides a stationary bike. 2. Students collect samples from a stream. 3. Lab work still involves microscopes. 4. Marine biology students build a whale sculpture from snow. 5. The marine biology class of '79.

New chair takes helm of MCB

The Department of Molecular and Cellular Biology welcomed Prof. Marc Coppolino as its new chair in May. He joined U of G in 2001.

“You learn a lot,” he says of his new position. “Getting to know my colleagues better has been rewarding.”

The department’s future plans include revising its curriculum, hiring new faculty, expanding its research and launching a neuroscience major.

Coppolino’s research looks at the molecular mechanisms involved in cell movement, specifically how tumour cells invade other tissues.

The immune system typically attacks migrant cells, but if that fails, they may attack other tissues, causing diseases such as arthritis and cancer.

Understanding how cells move, particularly in disease conditions, may lead to new treatment options, he says.



Prof. Marc Coppolino

Olympic athletes make U of G proud

THE UNIVERSITY OF Guelph sent a team of students, staff and alumni to the Summer Olympics in Rio de Janeiro this year, including:

- Brittany Benn, rugby (won bronze);
- marathoners Krista Duchene and Reid Coolsaet;
- Korey Jarvis, wrestling;
- Amelie Kretz, triathlon;
- Geneviève Lalonde, 3,000-metre steeplechase;
- Evan Van Moerkerke 4x100-metre freestyle relay;
- Cristy Nurse, rowing;
- Lee Parkhill, sailing;
- Anthony Romaniw, 800-metre race; and
- Andrea Seccafien, 5,000-metre race.



Brittany Benn (top row, third from right), won bronze with the women’s rugby sevens team in Rio.

Current student Jason Wilson competed in the triathlon for Barbados, while incoming student Maria Fernanda Far, who has been training at the Gryphon Aquatics Centre, competed for Panama.

Support staff at the Games included track coach Dave Scott-Thomas, physician Margo Mountjoy and sports physiologist Trent Stellingwerff.

Mountjoy, an adjunct professor in Human Health and Nutritional Sciences, and a sports medicine physician at the Health and Performance Centre, has attended the Games eight times.

She was in Rio on behalf of the International Olympic Committee (IOC) and the International Swimming Federation. She oversaw the medical and anti-doping programs and swimming events.

“I love the opportunity this experience offers me to improve my professional skills and to network with other professionals around the world to make the athlete experience more positive and healthy,” said Mountjoy. “Preparation methods may change, but the excitement at these Games doesn’t change, and it is amazing to see athletes so engaged and striving to achieve their best.”



Childhood interest leads to lifelong career

IF YOU'VE EVER attended a CBS Career Night, you probably met George Coker, B.Sc. '86. He has volunteered at the event for more than 20 years and provided career advice to many students and recent grads.

While growing up, — like most children — he enjoyed getting dirty. “I was always known for being interested in what was in ditches and ponds,” he says. His father once said, “Too bad they don’t have a job for that.” It turns out they did.

Coker turned his fascination with aquatic creatures into a career that has taken him across Canada and around the world, including Costa Rica, the Philippines and the Arctic.

When he graduated from community college, one of his professors recommended he apply for a job as a technician in the Department of Ichthyology and Herpetology at the Royal Ontario Museum. “Because it

involved fish, amphibians and reptiles, I knew I’d be interested,” says Coker.

After a few years at the ROM, he decided to go back to school to earn a degree. Following his colleagues’ advice, “they said U of G was the best place to go for wildlife and aquatics,” he says.

Complementing his studies were his summer placements with the Department of Fisheries and Oceans, where he worked on acid rain research projects, studying aquatic invertebrates, fish communities and lake ecosystems.

Coker has spent most of his career as a consultant, providing advice to government agencies and helping developers reduce their environmental impact. His work ranges from simple one-day field visits to complex multi-year projects. “You get to see the results of what you did, what was put in place, and how your advice and recommendations helped protect the environment.”

Upcoming Events

JAN. 25

Career Night

MAY 2017

CBSAA Family Day at Royal Botanical Gardens

JUNE 9 AND 10

Alumni Weekend

Reunite with your classmates and attend events, including the UGAA Awards of Excellence Gala, the President’s Milestone Lunch, tours of the new Gryphons Athletic Centre and more. Visit www.alumni.uoguelph.ca/alumniweekend for more information.

Need help organizing a class reunion? Contact Taline Artinian at artinian@uoguelph.ca.

Zygote Plus

Published by the College of Biological Science

CBS Contact:

Taline Artinian
Alumni Advancement Manager
519-824-4120, Ext. 54568
artinian@uoguelph.ca

Susan Bubak
Editor
519-824-4120, Ext. 56581
s.bubak@exec.uoguelph.ca

Contributors:

McLaughlin Library Archives
U of G News Service