



MBIM NEWSLETTER

DEPARTMENT OF MICROBIOLOGY & IMMUNOLOGY

2020



CONNECTING WITH OUR COMMUNITY

“Uncertain times,” “we’re in this together,” “wash your hands.” These will be some of the defining phrases of 2020 and are all too familiar for us by now. But they also show how the sentiments of empathy and care can easily spread across the world.

While all of our subjective life experiences may differ, there is an aspect of togetherness that has been felt on a global scale. In the Department of Microbiology and Immunology, like others, we have had to face new territory like never before. Students had to cut lab research short, professors learned how to quickly transfer their courses to an online

format, and new resources were created for a life of working from home. Through this extraordinarily difficult time, we found a way to keep our community (and our research) going.

Keeping in touch through zoom meetings and happy hours with coworkers, labs and friends, and emails or phone calls just to check in – connecting with our community and giving people the resources they need has been the most important thing. We’ve also enjoyed looking back on great moments from this past year as we prepare for an uncertain, but resilient future.



A MESSAGE FROM DEPARTMENT HEAD, DR. MICHAEL MURPHY

When I started my first day as Head last July, I couldn't have imagined that nine months later I would be walking empty hallways and asking people to prepare to leave and work remotely. When I open my laptop, the emails at times can feel overwhelming. But the stream of messages is evidence of a department going about its mission of learning and research wherever we are located. This is a remarkable achievement!

I am slowly accepting my new work routine and I am heartened to see how well we have adapted to the reality of working while living with a pandemic. This new normal is essential to protect our community. Together we have seen the progress made to increase physical distance and flatten the curve.

The need for education and research to understand infectious diseases and the roles microbes play in our changing environment is self-evident. To see our most recent graduates at all levels go forward and meet these global needs more than makes up for the challenges we have faced as a UBC Department. Indeed, we are fortunate for the opportunity to work with engaged students willing to learn and improve their communities.

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These students will soon join our diverse alumni, many of whom are frontline health care workers or researchers looking to better understand and change our world.

Living with the COVID-19 pandemic has shown that staying connected to each other is more important than ever, and that these connections are key to maintaining a healthy work environment and community whether we meet in person or online.

Take care,

Michael

NEW HOME FOR LIFE SCIENCES

On Jan 17, 2020, we celebrated the official opening of the Undergraduate Life Sciences Teaching Laboratories! Formally known as UBC's Biological Sciences Complex, this renovated and expanded space brings together all of the undergrad programs in life and biological sciences at the Vancouver campus into one complex.

Students studying Microbiology and Immunology will not only participate in an authentic lab experience, but also have easier access to research opportunities such as CUREs (Course-based Undergraduate Research Experiences) and published journals like UJEMI (the Undergraduate Journal of Experimental Microbiology and Immunology).

With these opportunities and the collaboration of undergrad life science students all in one place; this new building will allow the continuous sharing of ideas, inspiration and life-changing research.

PLATFORMS FOR CONNECTION

The Department of Microbiology and Immunology has an active community of researchers on Twitter, but now have a new student-facing Instagram as well! Sharing stories and research from students, faculty and staff, these social media platforms aim to spread information and awareness about the department, our research, and all the inspiring individuals that are part of it.

We also have an updated website design, where visitors have easier access to research links, department news and resources, such as student profiles, COVID-19 support, and a helpful page for health and wellbeing.





DR. CAROLINA TROPINI

This past year, we welcomed [Carolina Tropini](#) to the Department of Microbiology and Immunology and the School of Biomedical Engineering as an Assistant Professor.

After moving from Italy to do her undergraduate degree at UBC, she moved to California to finish her PhD and postdoc at Stanford - where she first discovered a fascination with bacteria.

With a passion for and research background in gut health, the [Tropini lab](#) specializes in cutting-edge experimental and computational techniques to study how different physical and chemical properties affect the microbiota and transmission of bacteria between hosts in health and disease.

At the start of 2020, she began teaching her class on Biomicrofluidics for third year students, which is the study of scaling down complex fluid processes - the fundamentals of slow fluid flows, the advantages and disadvantages of this process, and the biological behaviour at the very small scale of cells.



DR. ELITZA TOCHEVA

Before she was recruited to UBC, [Elitza Tocheva](#) was an Assistant Professor at Université de Montréal and an Associate Director of The Facility for Electron Microscopy Research at McGill University.

For her research, Tocheva uses advanced structure biology techniques such as cryo-electron tomography (cryo-ET) and correlative light and electron microscopy (CLEM). Such approaches produce three-dimensional images of intact cells and help identify proteins within the crowded environment of the cell, which allows scientists to investigate subcellular ultrastructures in the living organism at a macromolecular resolution while minimizing changes to the sample between imaging.

At UBC, she also runs the [Tocheva lab](#) and teaches a Bacterial Pathogenesis class to fourth year students with [Charles Thompson](#), which emphasizes the role of bacteria in everyday life and teaches the many ways bacteria infect and cause disease in a host.



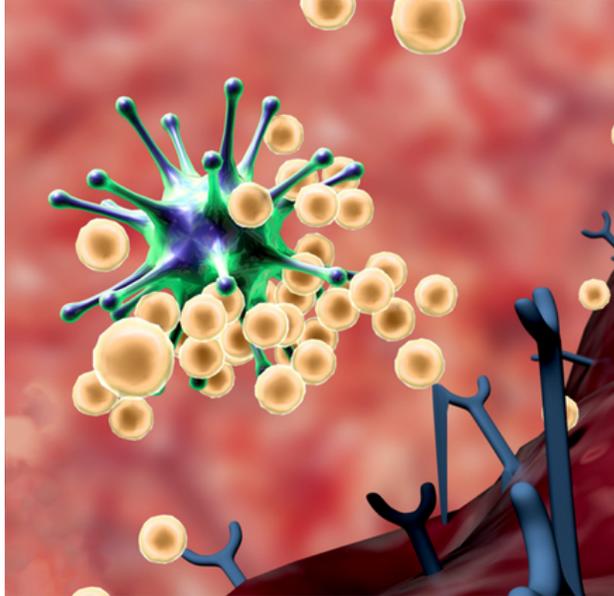
PROF. NINAN ABRAHAM DESCRIBES THE COMPONENTS OF A VACCINE

In a recent episode of the Peter Wall Institute Podcast "[Ways of Knowing](#)," Kalina Christoff and Professor Ninan Abraham discuss how the immune system protects us from pathogens like SARS-CoV-2.

When asked why it takes so long to develop a vaccine, Abraham explained that there are three components to what a vaccine is:

1. The nature of the antigen – picking one or more components of the disease-causing organism in which you want to mount an immune response to.
2. The adjuvant – the danger signals that will fully trigger the immune response to those antigens, and
3. The delivery vehicle for the vaccine, which "is something you have to put some thought into, like lipid vesicle or alternatively in solution or in emulsion."

"Each of these three components has multiple possibilities and when put together they're called a vaccine formulation," says Abraham. "You could have 20 or 30 possible vaccine formulations that we could come up with for SARS CoV-2 and you'd have to, in conventional Health Canada and FDA-approved processes, validate them and test them for efficacy and safety before you could put them into humans."

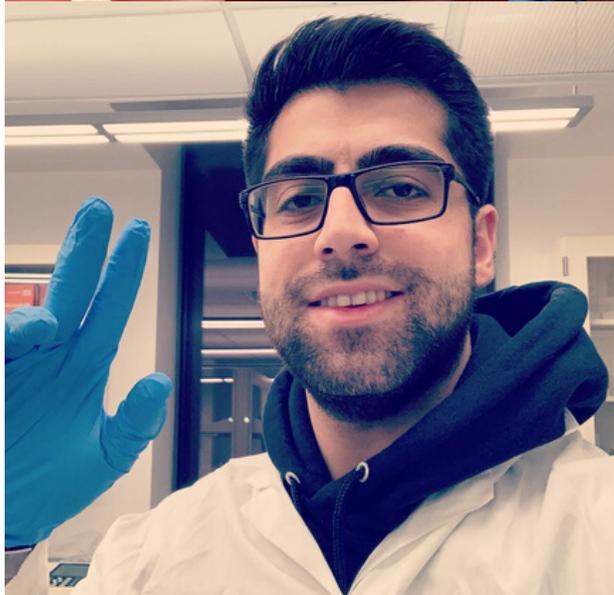


UNDERGRAD STUDENT SHARES EXPERIENCE AND TIPS FOR ISOLATION

In a profile for the M&I department website, fourth-year student [Farhang Ahadzadeh](#) shared his experiences of overcoming life challenges, his Type 1 diabetes research, and advice on how to stay focussed during uncertain times while planning for a successful future.

"Science is not about finding an answer to a question," he shares. "It is about developing more meaningful and deeper questions so that you can keep your curiosity growing."

During this especially isolated time, he suggests sticking to a structured plan and connecting with people in whatever way possible - because we are social beings that *need* human connection.





STORIES ON CAMPUS

IGEM COMPETITION

In the 2019 iGEM (International Genetically Engineered Machine) Competition, UBC's iGEM team won Collegiate Gold status for their development of a shellfish toxin sensor screen.

The team (compromised of students from various departments, including Microbiology & Immunology, Biology, Engineering Physics, Computer Science, Biophysics, Chemical & Biological Engineering and more) developed a method to prevent paralytic shellfish poisoning (PSP), which comes from life-threatening biotoxins caused by harmful algae blooms.

With M&I faculty Steven Hallam (Hallam lab) and David Oliver as Principle Investigators, this project has a meaningful impact on the local community of BC, especially in rural and Indigenous communities where shellfish holds dietary and cultural importance.

06 iGEM Competition

07 Prof. Will Jefferies announced NAI Scholar

Women in Science Campaign

3-Minute Thesis Winner





WILL JEFFERIES ELECTED FELLOW FOR THE NAI

Prof. Wilfred Jefferies – a research immunologist and professor in Microbiology & Immunology (as well as Medical Genetics and the Biomedical Research Centre) – has been elected as a Fellow for the National Academy of Inventors (NAI). Joining a prestigious group of only 13 academic inventors in Canada to be elected, Prof. Jefferies is the first Canadian immunologist to be included and is being recognized for his innovative strategies and outstanding inventions that enable cancer immunotherapies and vaccines.



WOMEN IN SCIENCE CAMPAIGN

For International Day of Women and Girls in Science, which takes place every year on February 11, the Faculty of Science featured ten inspiring women-identifying researchers who are making their mark at UBC and beyond. Spearheaded by the United Nations, this day promotes full and equal access to participation in science, technology and innovation for women and girls. The Department of Microbiology and Immunology featured PhD student Isobel Mouat, who shared her research on how Epstein-Barr virus contributes to multiple sclerosis and rheumatoid arthritis, advice for future scientists, and the many opportunities available to M&I students.



HONOURS STUDENT WINS UNDERGRAD 3MT

Department of Microbiology and Immunology honours student, Laurel Neufeld, made it to the top 10 finalists for the Undergraduate 3-Minute Thesis Competition!

Recently doing her MICB 449 project in the Finlay Lab, Laurel's first draft of the 3MT, which qualified her for finals, is on "Modeling E.coli infections in the gut." But her final presentation, "Following your gut: how the intestinal environment shapes bacterial infections," is what gave her a #1 winning spot!

2020 MBIM UNDERGRADUATE RESEARCH SYMPOSIUM



LIVE ONLINE EVENT

UNDERGRADUATE RESEARCH SYMPOSIUM

The Undergraduate Research Symposium is a student-led initiative supported by faculty and staff. Thanks to a very dedicated organizing committee, speakers, moderators, judges and loyal attendees; this year's URS was held live over Zoom on April 30, 2020, for everyone to participate and attend safely from home!

#MBIMURS2020 included opening remarks from Department Head Michael Murphy and Active Professor Emeriti Julian Davies, an inspiring keynote speech from UBC President, Santa J. Ono, 15 student presentations on topics such as: 1) Clinical Microbiology, 2) Antibiotic Resistance, 3) Gut Microbiome and Biofilms, and 4) Mechanisms of Adaptation, and a company talk from 10X Genomics on their response to COVID-19.

Dr. Murphy shared his regrets that student research was cut short due to the current global outbreak, but that science will always take just a little bit of courage and persistence.

President Ono also shared that science is not only about making discoveries, but the importance of communicating that knowledge to others as well.

We are very grateful to live in a time where sharing knowledge is still possible even though we are currently apart, and we congratulate these students on their hard work and resilience.

Keynote Speech
Professor Santa J. Ono

*Curiosity and a Desire to Help Others:
My Career Path in Immunology*



SPONSORS



ANCIENT MICROBES

UBC Science promoted research from the Crowe lab after publishing their paper in Science Advances titled '[Photoferrotrophy, deposition of banded iron formations, and methane production in Archean oceans.](#)'

"Using modern geomicrobiological techniques, we found that certain bacteria have surfaces which allow them to expel iron minerals, making it possible for them to export these minerals to the seafloor to make ore deposits," said Katharine Thompson, lead author of the study and PhD student in the Department of Microbiology and Immunology.

"Separated from their rusty mineral products, these bacteria then go on to feed other microbes that make methane. That methane is what likely kept Earth's early atmosphere warm, even though the sun was much less bright than today."

ANTIBIOTICS AWARENESS

Prof. B. Brett Finlay released a report (and moderated a talk) titled "[When Antibiotics Fail](#)" just in time for the WHO Antibiotics Awareness Week. The report, published by The Council of Canadian Academies, aims to increase global awareness of antibiotic resistance and to encourage best practices among the general public, health workers and policy makers to avoid further emergence and spread of antibiotic resistance.

TUBERCULOSIS RESEARCH

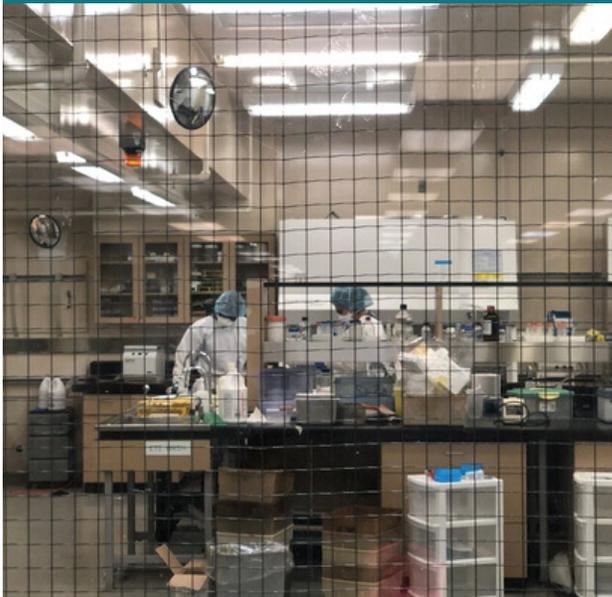
For World Tuberculosis Day, we shared research from M&I professor Yossef Av-Gay - who is currently participating in a [WIPO Re:Search-brokered collaboration on tuberculosis](#) between the University of British Columbia and Takeda Pharmaceutical Company Limited.

"I'm currently working on finding small molecules and natural products that block Mycobacterium tuberculosis within infected macrophages (human immune cells), in order to prevent the spread of the disease," said Dr. Av-Gay.

"I'm also researching mechanisms by which the pathogen interferes with 'normal' host macrophage signaling, to understand better at what step the infection process can be blocked. Lastly, I am currently studying Mycobacterium tuberculosis post-translational modifications."



When Antibiotics Fail





LAB SPOTLIGHT - THE HALLAM LAB

Steven Hallam (PI), Tom Pfeifer, Stephan Koenig, Brandon Kieft, Jennifer Bonderoff

Over the past several years, activities in the Hallam Lab have been gradually transitioning from environmental monitoring and metagenomic sequencing to more applied projects in waste water treatment, microplastics and cyanobacterial metabolism. At the same time, increasing emphasis has been placed on the development of high-throughput screening and computing capabilities and integrated teaching and training initiatives. These initiatives include the new Biofactorial high-throughput biology facility operating in the LSI, the Ecosystem Services, Commercialization Platforms and Entrepreneurship (ECOSCOPE) NSERC CREATE program, and Experiential Data Science for Undergraduate Cross-disciplinary Education (EDUCE), collectively working at the interface of microbial ecology, biological engineering and bioinformatics.

The lab increasingly works at these disciplinary interfaces to explore microbial community structure and function in natural and engineered environments with an eye toward converting basic science insights into biotechnology innovations. When social distancing requirements began for SARS-CoV-2 ultimately sending people home for work it was not entirely clear how an accelerated transition away from field and laboratory settings would play out among individuals or how the lab community would maintain continuity of effort.

For some people, the transition to remote work didn't change much at all, as most of their research involved computational work. But for others, the transition felt like both a big step back from their original plan of action and an opportunity to reflect on the bigger picture.

"I don't feel like I've been hindered a lot working from home because that's sort of what I've been doing the whole time I've been here," shares Brandon Kieft, a Postdoctoral Fellow in the Hallam Lab who started last July to work on microbial community metabolism in anaerobic digester (AD) systems. "But I am derailed in the sense that my transition into doing hypothesis driven experimental work was paused."

Brandon was just in the process of setting up stable isotope labeling experiments based on extensive computational work on AD microbiomes when the transition occurred. Instead, he shifted his perspective on productivity and got to take a more active role in writing grants, organizing and processing datasets and developing manuscripts.

The Hallam Lab may be somewhat unique lab in this way, environmental monitoring efforts have led to the creation of massive sample and data archives that many trainee projects are based on. These projects are increasing data-driven using high-performance computing resources in the cloud making them less reliant on lab access to complete.

Active Learning from a Distance

Not only did the pandemic hasten the transition to more computational work for many trainees, it also challenged the normal teaching and training dynamics of the lab. From a practical teaching perspective this led to a rapid uptake of on-line applications like Collaborate Ultra on Canvas and the increased use of digital platforms like Slack, WebEx and Zoom for lab communications and mentoring. Lab meetings became Zoom meetings and one on one remote sessions with trainees increased in frequency. External collaborators were asked to give seminars at lab meeting on papers in progress exposing more people in the lab to a previously cryptic extended research network. The lab even adopted project management software called Jira to assign tasks associated with focal projects.

Most students embraced these changes, although for many the biggest challenge was the loss of spontaneity in day to day interactions. Typical interactions went from random walks to supervised exchanges, and conversations became increasingly structured. As an active learning environment which relies on the importance of unstructured time, shifting to remote interaction remains an ongoing challenge. The lab continues to explore ways to engage people through working groups and collaborative paper writing, but everyone is eager to return to in-person work.

Musing on the work from home experience, Dr. Hallam indicated that, "In some ways, it's been a nice reprieve to allow individuals to catch up with the data they have generated and to reconnect with big ideas that motivate them in the first place. At some point in the near future though we all need to iterate on our design, build, test, learn cycles to move the science forward. This takes more than structured on-line meetings and remote writing sessions."

THE HALLAM LAB ALSO SUPPORTS THESE SELF-ORGANIZED CAMPUS TEAMS



1. [iGEM](#) (International Genetically Engineered Machine) who have decided not to go forward this year due to current circumstances, but have enrolled in a biodesign competition - a marriage of artistic design and function to solve a concept or problem.
2. [BIOMOD](#) (Biomolecular Design) - a chemical and biological engineering heavy-based team who have been working on biomedical problems for the last couple of years
3. [Biodesign](#) - an education program and competition intent on creating a community of collaboration among artists, designers, and biologists, seeding the first generation of biodesigners and building meaningful public dialogue about biotech and its uses.

Opportunities for the future

ECUCE teaching and learning fellow and sessional instructor Stephan Koenig says he is curious to see if the past few months will promote a more permanent transition to remote learning, and how this will ultimately impact undergraduate education at UBC. "Will this experience diminish the role of active learning in classroom instruction and make it more challenging to engage students, or will it open up new opportunities for education leadership for hybrid courses that integrate tools like Collaborate Ultra in support of group projects?"

In addition to thinking about how the Fall term teaching is going to play out, the lab is prioritizing how to get things up and running again when the LSI reopens. This includes reflecting on how to sustain or modify ongoing research, teaching and training initiatives and working on a new website to better communicate this information and contextualize it within the larger UBC community. The lab has also been able to engage in several projects related to SARS-CoV-2 research.

The Bioinformatics team is working with the Serratus project led by Artem Babian at the BC Cancer Agency on mining the NCBI trace archives for divergent coronavirus genomes and Tom Pfeifer is leading a new NSERC Alliance COVID grant with STEMCELL that leverages Biofactorial infrastructure to develop scalable nucleic acid purification protocols for rapid viral testing. The undergraduate Biodesign team has developed a machine learning algorithm to predict SARS-CoV-2 spike protein evolution and is preparing to present their project remotely in the Biodesign Challenge competition this summer.

In closing Dr. Hallam indicated that, "I have been nothing but impressed with the resilience and creativity of everyone in the lab. Despite the constraints and stresses imposed by remote work we managed to stay together as a team and continued to push our collective research, teaching and training efforts forward. I am excited to see where the new lines of virus research take us, and hopeful that the initiatives that define us will continue to thrive as the university reopens for business in a post-COVID world."



MISA

“As the school year has drawn to a close under different circumstances, microbiology students may find comfort in remembering just how we came together to create a community that brought smiles and laughs over these last two terms.

Beginning at the annual MISA Welcome Back BBQ, students rang in the new school year by meeting their new classmates over delicious hot dogs and chips. Senior students reminisced about the younger years with the newest members of the major, and first year students got a glimpse of what the social side of the major is all about.

This continued more formally with the kick off of the mentorship program in the fall, which saw the highest turnout in three years. Students got to hear from both professors, Co-op students, and their mentors about opportunities in academia and industry.

In the spring to further introduce prospective students to the major, MISA collaborated with other biological student associations to introduce a new event: “Cut the BSc”. This enabled students considering the program to hear presentations and ask questions directly to students in the biological sciences about the perks of each major.

As the end of the year approached and excitement about the traditional celebrations grew, it became clear that the introduction of COVID-19 was going to significantly alter plans not only for MISA but all students and staff. With the cancellation of the year end celebratory event, MISA pivoted to provide just under \$1000 to microbiology students who had become unemployed due to the crisis to provide for essentials such as food and household staples.

MISA would like to thank all students for a fantastic 2019/2020 year, and we can't wait for all the exciting things to come in the year ahead.”



ALUMNI

This past school year, we had a few memorable events that Alumni were excited to attend!

One popular event during the year is Imagine Day (the first day of classes in September) where alumni share advice & direction to current students and how their MBIM major and specialization influenced their career.

Other events include Career Nights – one specifically tailored for our combined major with Computer Science (MBIM/CS) and ones throughout the year for all of our Graduate students & Postdoctoral fellows.

During a career panel in January, the speakers agreed that the best thing to do for a future career is follow your passions.

"There will always be a place for you to do what you love."

KEEP *in touch*

Visit our [Alumni](#) page and share your experience by submitting an alumni profile, attending a career night, mentoring a trainee, or recruiting students and postdocs.

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Want to join us for our virtual Graduation Tea!?

This year, our annual Department of Microbiology and Immunology graduation tea will be held virtually on June 18 at 11am on Zoom!

All students, faculty, staff, family, friends and alumni are welcome to join. [Register now to attend!](#)