MEET THE CLASS OF 2017

Victoria Avanzato
Adriano Bellotti
Steven Castellano
Charles Coomer
Mindaugas Jonikas*

Bridget Larman
Jonathan Liang
Connie MacKenzie-Scott*
Hannah Mason
Allison Meadows

Michael Metrick
Nicole Mihelson
Ruairi O'Sullivan*
Laura Palmieri*
Jyothi Purushotham

Ramiro Ramirez-Valdez
Darren Walsh*
Zinan Zhang

SPECIAL THANKS

Thank you to the many PIs who volunteered their time to participate in the interview panels and assist in the selection of this outstanding new class:

Chris Baker
David Bodine
Christopher Buck
Jeff Diamond
Simon Draper
Kenneth Fischbeck
BJ Fowlkes
Thomas Friedman

Robert Gilbert
John Hammer
John Hanover
Jenny Hinshaw
Kent Hunter
Brian Kelsall
David Margulies
Brian Oliver

Paul Pharoah
Daniel Reich
Antonina Roll-Mecak
Pam Schwartzberg
Julie Segre
Phillip Shaw
Richard Siegel
Peter St George-Hyslop

Andy Baxevanis
William Figg
Pam Guerrero

Vanja Lazarevic
Ariel Levine
Elaine Ostrander

Robert Seder
Shyam Sharan
Ilyas Singeç

Antonina Roll-Mecak
Justin Taraska
Roger Woodgate

THE OXCAM PROGRAM IN PRINT

As a part of a series in “Training the Next Generation”, Trends in Immunology featured the NIH OxCam program in a recently published article, “Breaking the Mold: Partnering with the National Institutes of Health Intramural Research Training Program to Accelerate PhD Training” (Soucy et al., 2016). The OxCam program was recognized for its unique structure that drives international collaboration and cultivates scientific independence at an early age.

Alumnus Geoffrey Lynn described his experience in the program and his initiation of a new collaboration between Dr. Robert Seder (Vaccine Research Center/NIH) and Prof. Len Seymour (University of Oxford). His project to develop and characterize a novel vaccine adjuvant took him through five laboratories and three countries before publishing his work in Nature Biotechnology. Geoffrey credits his success to the flexible structure of the OxCam program and the opportunities that developed organically as his project progressed.

In a time when leaders in the biomedical research community search for ways to support young, independent researchers, the OxCam program stands out among graduate programs with the success of its young alumni. The NIH R01 grant is a traditional marker of research independence, and those OxCam alumni who have achieved this milestone, did so by the average age of 33. By comparison, the average age for receiving an R01 grant for the first time is 42, and fewer than 2% of all R01 grants were awarded to investigators under the age of 35 (https://grants.nih.gov/policy/new_investigators/index.htm#doni).

This early career success may be attributed to the shortened duration of PhD training and the leadership skills attained in bridging two laboratories. OxCam alumni have graduated in a median of 4.3 years, well below the median of 6.5 years for graduates of American biomedical PhD programs. The innovative structure of the OxCam program allows scholars to build connections between institutions, mentors, and scientific fields of knowledge on an accelerated path to independence.
SCIENTIST SPOTLIGHT

In 2016, we invited Dr. Sonja Best, to share her research with prospective students during our interview event. Dr. Best is Chief of the Innate Immunity and Pathogenesis Unit in the Laboratory of Virology for the National Institute of Allergy and Infectious Diseases (NIAID) out at Rocky Mountain Laboratories in Hamilton, Montana. After earning her PhD from the Australian National University, Dr. Best came to the NIH as a postdoctoral fellow at RML and stayed on as a Research Fellow and Staff Scientist before establishing an independent laboratory as a tenure-track investigator.

We had the opportunity to catch up with Dr. Best for an update on her current research (below):

For new viruses to emerge into human populations from a zoonotic source, the virus must overcome several significant barriers to infection. One of the most potent barriers is the host’s ability to recognize infection and mount an antiviral innate response. Our laboratory focuses on understanding these early host responses following infection with pathogenic RNA viruses and how they can determine host susceptibility. Using emerging flaviviruses (Zika virus, West Nile virus, dengue virus and tick-borne encephalitis virus), or most recently Ebola virus, we examine how the host type I interferon response is induced and evaded by viruses. This work includes 1) understanding how the intrinsic responses of cells are regulated, 2) identifying genes that function to directly interact with viruses and suppress their replication (called restriction factors), and 3) identifying molecular mechanisms that the viruses use to antagonize or evade interferon responses. We are currently using this information to build better animal models of virus pathogenesis in instances where the virus cannot overcome the mouse type I interferon response to cause disease. We are also examining the role of polymorphisms in critical innate immune genes in determining human susceptibility to emerging RNA viruses. The end goal is to understand and even predict which viruses have emergence potential, and to apply the animal models to development of antiviral therapeutics and vaccines.

For more information, visit https://www.niaid.nih.gov/research/sonja-m-best-phd.

OXCAM BRANCHES OUT TO RML

The Global Doctoral Partnerships Program has scholars all over the NIH campus in Bethesda, but more than that, scholars have now spread out to most of the other NIH campuses as well. Over the years, we have had students at the NIEHS site in North Carolina; the Frederick National Library for Cancer Research in Frederick, Maryland; the Life Science and Translational Research Center at Shady Grove; and the Bayview Research Center in Baltimore, Maryland. In 2017, we can add the Rocky Mountain Laboratories (RML) in Hamilton, Montana to this list.

Just this year, two Track 1 MD/PhD students will be starting their PhD research at RML. Vicky Avanzato and Michael Metrick are joining the labs of Dr. Vincent Munster and Dr. Byron Caughey respectively and Vicky has already begun her research at RML.

RML opened in 1928 and has been a primary location for vector-borne disease research since that time. The site also hosts the new Integrated Research Facility – the first NIH facility of its kind to house BSL-2, BSL-3, and BSL-4 laboratory space in one building along with administrative offices and conference rooms. The facility enables researchers to study priority pathogens in the safest and most secure environment possible.

We are excited to have our students join the outstanding team at RML and are looking forward to the amazing research that Vicky and Michael will do while they are in the program.
Binocular vision is an interesting model system for understanding neuronal computation because we can feed completely separate inputs to the two eyes. Presenting neurons in the brain with left-right image pairs (binocular images) that never occur in natural viewing provides us with a unique opportunity for testing our theories of how neurons compute visual information. If V1 neurons and our model neurons respond similarly to such stimuli, then that provides compelling evidence that our computational models capture some key aspects of neuronal computation. A large number of neurons in primary visual cortex are tuned to the difference in retinal position between the left and right eye, meaning that they are specialised for signalling depth. These neurons, called disparity-selective cells, constitute the foundational units of binocular depth perception, and have been the subject of my PhD research.

The first part of my PhD addressed a series of recent publications that showed that humans can perceive depth in a stimulus where our current models suggest they should not be able to. This led the authors to postulate a striking theory of how depth perception works. At Newcastle, I developed a computational model that showed that the evidence postulated by the authors was consistent with a straightforward extension of our current model. At the NIH, I recorded from neurons in macaque V1 and showed that the responses of these cells agreed well with the theoretical properties we had outlined in our previous paper.

Despite being largely successful, our current models of disparity-selectivity are demonstrably flawed in several ways. However, it is so far unclear whether these failures are the result of using the wrong class of models, or simply the wrong parameters for the correct class of model. For the second part of my PhD, I tested this question by using a machine learning framework to fit a broad class of models to neuronal data I recorded at the NIH. Our results show for the first time that our current models of V1 neurons are fundamentally inadequate descriptions of real cells, and hint at the way in which we might begin to develop a more accurate explanation of V1 neuronal responses.

Being on the Wellcome Trust-NIH programme has been incredibly valuable for a number of reasons. First and foremost is the complementary expertise brought by my UK and US labs. At the NIH, I learned to perform in vivo electrophysiology recordings, and to analyse electrophysiological data. At Newcastle University, I learned to develop computational models, and further developed my abilities as a psychophysical experimenter. The WT-NIH programme is in a unique position to facilitate multidisciplinary PhDs, and for me, the ability to work in labs with different and complementary strengths has had a very positive impact on my research output and on my development as a scientist.

The View
From Across The Pond
By: Prof. Jenny Read

My lab researches several aspects of stereoscopic vision. For example, different team members are working on better clinical vision tests for children, next-generation 3D displays and stereopsis in insects. The Wellcome/NIH scheme has enabled me to continue my longstanding collaboration with a top US neurophysiology lab, examining the neurons that underpin stereopsis in primate brains. Sid has achieved an astonishing amount over his PhD, generating a rich new neurophysiological dataset as well as using advanced machine learning techniques to reveal the underlying computations. It has been particularly helpful to contrast these primate computations with the very different picture which is emerging from our work on insect stereopsis.

Wellcome To The NIH
By: Dr. Bruce Cumming

My laboratory attempts to understand how the spiking activity of neurons in the brain gives rise to conscious sensation. We focus on stereopsis, which is an especially tractable model system (the percept can be isolated from other aspects of perception, and it is computationally well understood). The goal is to provide a precise mechanistic description of how relevant signals are generated in a population of neurons, and to show that activity in that population is responsible for the sensation of depth. We record activity from neurons in awake animals trained to report depth. Progress depends on details quantitative modelling, for which I rely on good collaborators. Working with Sid in the Wellcome/NIH scheme was a powerful way to pursue the collaboration, since he came to embody the expertise of both groups.
CAREER EXPLORATION

OxCam and Wellcome Trust scholars had the opportunity to participate in three career development outings this Spring to NASA, Novartis, and MacroGenics supported by the International Biomedical Research Alliance (the Alliance). Scholars engaged with leaders in government and industry to learn about their unique contributions to their institutions and their approaches to overcoming challenges on the path to professional success. GDP scholars lead their own collaborative research projects that bridge two continents, two institutions, with two principal investigators, but on these outings scholars had the opportunity to interact with leaders who manage research enterprises composed of teams of experts on a larger scale.

In January, scholars visited the NASA Goddard Space Flight Center where they met with researchers who design and create the instruments used to collect and analyze samples gathered from space flights. Dr. Jason Dworkin, Chief of the Astrochemical Laboratory, manages analysis of returned material from NASA Goddard missions. Dr. Dworkin spoke about the logistical skills he developed when he organized his laboratory to handle rare samples and efficiently use laboratory equipment. Due to his background in engineering, OxCam scholar Keval Patel was particularly engaged in the discussion about the development of the gas chromatograph mass spectrometer that will function under remote control for more than a year and analyze samples on the asteroid Bennu during NASA’s OSIRIS-REx mission.

A group of scholars was invited to visit and give presentations at the Novartis Institutes for BioMedical Research (NIBR) in Cambridge, MA hosted by Dr. Eric Svensson and Dr. Jang-Ho Cha. The scholar presentations were an opportunity for them to discuss their science and receive feedback from experts outside of their home laboratories. Wellcome Trust scholar Ayesha Sengupta was interested to learn about NIBR’s investment in preclinical research, and the rapid adoption of new methods such as the CRISPR/Cas9 system for genomic editing. Ayesha’s own research in serotonergic amygdala circuits (Sengupta et. al, 2017) contributes to the understanding of the fundamental brain mechanisms behind mood disorders, and is a part of a body of research on which the pharmaceutical industry relies to choose which drug targets to pursue.

Dr. Scott Koenig, CEO of MacroGenics and Chairman of the Board of the the Alliance, invited scholars to the MacroGenics campus in Rockville to give presentations of their research, participate in an interactive career paths panel, and listen to presentations from their hosts about bringing new biotechnology products to market. Dr. Koenig welcomed the group of scholars and spoke of the challenges in running a medium-sized biotechnology company, and about his transition from NIH investigator to biotechnology entrepreneur. Drawing on his own experience of the varied skills he has developed as a rising physician-scientist, OxCam scholar Stewart Humble discussed with Dr. Koenig the different roles he takes on every day as CEO. After presenting their own research and answering questions, scholars participated in afternoon presentations from Dr. Koenig’s colleagues where they learned more about the internal operations and decision-making processes that govern the success of the company.

Scholars of the Global Doctoral Partnerships Program benefit from these and future career development opportunities that broaden their understanding of the skills required to direct complex projects, expose them to the challenges of different career paths, and receive feedback on their research from outside experts.
Greetings from the OxCam Office! We are looking forward to seeing everyone at the upcoming Annual Workshop hosted by the NIH at the Bolger Center in Potomac, MD. Our agenda is packed with student speakers, student-mentor talks, and keynote presentations (Dr. Dan Barry, Dr. Nadia Rosenthal, and Dr. Elaine Ostrander). We will also have poster presentations and an exciting alumni session, welcoming back nine program alumni. The OxCam Class of 2017 and the MD/PhD Class of 2019 will be joining us, so please be sure to welcome them!

Don't forget to mark your calendar for the live performance by the Affordable Rock-n-Roll Act following the Workshop on the evening of June 21st.

Katie Soucy