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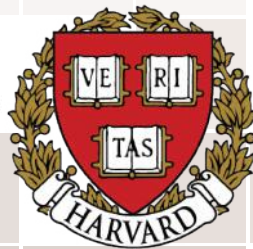
The IBRO Simons
Computational Neuroscience
Imbizo

Noordhoek, South Africa

2022

ISTA · Institute of Science and Technology Austria

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IBRO

im'bi-zo | Xhosa - Zulu
A gathering of the people to share knowledge.

The goal of the Imbizo is to bring together those interested in Neuroscience, Africa, and African Neuroscience to share knowledge and create a pan-continental and international community of scientists. With generous support from the Simons Foundation and the International Brain Research Organisation (IBRO), the Imbizo became a wild success. As a summer school for computational and systems neuroscience, it's now going into its 6th year. Here, we review and assess the 2022 Imbizo, and discuss plans for the future.

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The Imbizo

Theoretical Neuroscience in Africa

Philosophy

Understanding the brain is one of the most challenging scientific problems faced by mankind. The payoffs are huge, not only for mental health, but many scientific spinoffs, like artificial intelligence, brain-computer interfacing and treatment of neurological disease. Consequently developed countries are pouring ever increasing research funds into brain science – witness the BRAIN initiative in the US and the Human Brain Project in Europe.

In this area, as in many areas, developing countries are at a huge disadvantage, simply because research is expensive. In South Africa (and the African continent more generally) experimental neuroscience is a small but energetic field with a proud history; however, running a technologically advanced lab is often financially unsustainable. Theoretical neuroscience, on the other hand, needs little more than a laptop, pencil and paper. And yet, this rapidly emerging discipline is critical for analysing and understanding increasingly complex experimental data and for modelling the brain in its own right. With a rich background in mathematical sciences and similarly good educational programmes in physics and engineering, it should be relatively easy to create world class scientific centres focusing on theoretical neuroscience. These in turn could serve as bridgeheads for the development and strengthening of all aspects of neuroscience in Africa.

Action

To accelerate the development of neuroscience in southern Africa, we organised a 25 day long Imbizo (from Zulu - Xhosa, "gathering to share knowledge") in Noordhoek, South Africa. We brought together 21 world leaders in computational/theoretical neuroscience and machine-learning with 16 African and 12 Intercontinental students. Over 25 days, we lectured and learned, coded, brain-stormed, ate, celebrated, and created a tight knit network of inspired young scientists.

In the century of the brain, African scientists and educators are poised to make important contributions to global neuroscience research. The "IBRO Simons Computational Neuroscience Imbizo" aimed to further this goal, offer insight into the status quo, and enable knowledge transfer from the current leaders of the field. In the following pages we will argue that we were largely successful.

The announcement poster for the first Imbizo in 2017.

Course Structure

The Imbizo is modelled after numerous other neuroscience summer schools in the northern hemisphere, many of which the directors have taken part in (as students, TAs, and even directors). The Imbizo, as the most southern of all summer schools, faces a number of special challenges that come with its location and its diverse student body. Over the past five years we have tweaked lectures, tutorials and projects, and also dining, accommodation and social activities, to deliver the best learning experience for all of our students. The feedback from the students, which we gather at the end of each cycle, is carefully reviewed, and used to constantly improve the Imbizo.

Structure of the Imbizo

The Imbizo took place from 11 August to 4 September in 2022, a (COVID-provoked) deviation from previous schools, which ran for the month of January – the peak of summer in Cape Town. We also increased the number of cycles to four, with each cycle covering a different theme, and headed by a different group of faculty. The cycles last 5 days, broken up by 1 day off for social activities. As in previous Imbizos, days start with 4 hours of lectures, from 9:00 to 13:00. After a common lunch, the afternoons and evenings are dedicated to work, either tutorials (in cycle 1) or project time (in cycle 2, 3 and 4). All dinners are held together, at various locations around Noordhoek. During the second half of the school, each student works with a team of teaching assistants (TAs) on a dedicated mini-research project. On the last day of the Imbizo, students present their results.

Cycle 1: Biophysics, physiology, disease - the fundamentals

The first cycle is an in depth exploration (and tour-de-force) of the fundamentals of neuroscience. In the lectures, we introduced the basic anatomy and physiology of the nervous system, and then quickly focused on the electrical properties of neurons. We described the foundations of biophysics as applied to neurons and explained the basis of membrane potentials, action potentials and synaptic conductances. Next we focused on ion channel function and how channels of all kinds can be studied and modelled using NEURON. By the middle of the week, we began to explore the

relevance of complex dendritic morphologies for understanding neuronal information processing.

Students crowded around the spikerbox amplifiers to record from real neurons (2022)

For the second half of the cycle we introduced the vast, wonderful and heterogeneous world of synapses and their plasticity mechanisms, as well as systems level concepts such as sensory processing. We also switched gears and discussed the nature and origin of various neurological and psychiatric diseases, and finished the cycle with an overview of cutting edge experimental techniques for recording, and manipulating, the nervous system. A special highlight of cycle one was an opportunity for students to record action potentials from live insect neurons using Backyard Brains "spiker boxes". Using two drawing pins (electrodes), wired up to a spikerbox bioamplifier, it's possible to record from cockroach leg nerves. The exposure to a "real experiment" provided valuable insight into how data is collected and the associated difficulties (such a electrical noise). Witnessing a spike 'in the flesh' was an exciting experience!

The afternoons of the first cycle were devoted to hands-on tutorials, organised and run by the TAs. Our TAs play a major role in shaping the syllabus – and the atmosphere – at the Imbizo, and we have been extraordinarily fortunate to have a consistently excellent group of them. Tutorials covered a broad range, including: simple (single compartment) spiking models, biophysically realistic compartmental simulations of neurons built using the NEURON simulation environment, hierarchical sensory processing, the basics of information theory, models of learning and memory, and working memory, and reinforcement learning.

Cycle 2: Network dynamics, spiking systems & memory

After a comprehensive introduction into the biological fundamentals of neuroscience, Cycle 2 moved to the topic of mechanistic modelling of neural networks. Starting with neuronal processing at a cellular level, our lecturers introduced spiking networks, and we discussed the conditions and constraints of neural code. Concepts such as signal propagation in feedforward and recurrent networks and the balance of excitation and inhibition as a fundamental mechanism in neural systems were introduced, followed by lectures on the general principles of information theory, phase plane analysis, and associative and working memory. Finally, we concluded Cycle 2 with a tutorial on how to conceive of models for a given scientific question.

In addition to the academic curriculum, Cycle 2 featured an overview of the business end of science: how to design figures and posters, how to structure papers and grants, and how to present oneself in talks. A very well-received activity of the Imbizo's Cycle 2 was the "Gender in Science Lunch", an informal event in which male and female students and instructors separately discuss the status quo of gender and race relations in science. Discussions were led by faculty, and summaries of the conversations were exchanged between the two groups afterwards. The ability to speak freely and without worry to offend facilitated a lively, far-ranging, and very educational, discussion. With the excep-

Q&A at the end of Cycle one with Dorit Hockman, Tor and Hanne Stensola, Tom Tagoe and Joe Raimondo.

tion of a few tutorials, the afternoons and evenings throughout Cycle 2 are allocated for project time.

Cycle 3: Higher-order brain function

The third cycle of the Imbizo saw the students in full swing, working feverishly on the projects, and interacting among themselves and with the faculty with ease and confidence. The goal of cycle 3 was to provide insight into the difficulty of the problems faced by the brain. Lectures began with a high level view of the computations performed by the brain, divided loosely into sensory processing, action selection and motor control. These topics were revisited in more detail in the following lectures, leading to learning under risk and reinforcement learning.

In addition to the core invited faculty, we had two guest speakers in cycle 3, Tom Mrsic-Flogel and Sonja Hoffer, who stopped by while on a vacation tour through South Africa. They provided additional lectures on their respective fields, and also participated in the soft skills session and discussions. Cycle 3 came to an end with a summary of the big picture of the brain: the problems it faces, and how neuroscientists go about figuring out how it works. Afternoons and evenings throughout cycle 3 were allocated to projects.

Cycle 4: Machine Learning

Increasingly, neuroscientists train artificial neural networks (ANNs) to predict neural activity from stimuli (e.g. images), and treat the ANNs as virtual doubles of the brain, from which they infer principles for the computations performed by the brain. In parallel, a growing body of research has considered the question of how to constrain ANNs using experimental findings from systems neuroscience. Cycle 4 leverages the interplay between machine learning and systems neuroscience to present a perspective of the brain as an inference engine, one that possesses an internal model of "the world". Accompanying this, students learn to use the TensorFlow open source library to perform computations using artificial neural networks.

From an educational perspective, Cycle 4 places a high value on making students active participants in their instruction. The Cycle encourages faculty to use available white/black boards, and to include, at various points during their lecture, short exercises that students can work on in small groups. Often, these exercises form the basis of lively discussions that let students connect with each other and with the material more intimately than in traditional settings.

Extracurricular activities and network building

One of the most important outcomes of the Imbizo is the bonds formed by the students: they become a cohesive, tight-knit group that transcends race, gender, and national boundaries, and they continue to provide support, networking and scientific advice to each other years after the summer school has ended. These bonds and links are crucial for building successful scientific careers, and are especially critical for students from Africa. For this reason we make every effort to ensure that relationships between students were formed early and strengthened throughout the course – through social activities, celebrated rituals such as 'Evening Science Socials', and special dinner outings twice a cycle. Most importantly, we simply ensure that students spend a great deal of time together, both scientifically and socially (for instance, breakfast, lunch and dinner are eaten communally, and it is not unusual for the students to just hang out and chat well into the evening).

Student interaction was amplified by the fact that accommodation, lectures, tutorials and refreshments were all provided in the same venue in Noordhoek. We also placed a large emphasis on

Cycle 3 Faculty at the Team House. Daphné Bavelier, Alyssa Picchini Schaffer, Peter Latham, Evan Schaffer, Jonathan Pillow and Alexandre Pouget

Annik's tutorial class in Cycle 1

fostering interactions between the students and both TAs and faculty. The students interacted with the TAs on a daily basis – to help them digest the contents of the course, and also keep their projects on track. This year the TAs also played a vital role in managing our COVID policy. They ensured that anyone who was in isolation was well taken care of, and comfortable, and they made arrangements to live stream the lectures via Zoom, and they provided food and entertainment. Outside of isolation, our healthy students were given multiple opportunities to interact with the faculty. For example, place settings were used for the majority of our dinners, which allowed students the opportunity to sit with the cycle's faculty at each dinner time. All of our faculty were chosen not based just on scientific quality, but also on their willingness to engage with students. Finally, we enhanced a sense of community through planned social activities and weekend excursions. We wanted our students to work, but we also made sure they enjoyed themselves.

Off-site Dinners

Biweekly off-site dinners were organised at nearby restaurants. The group travelled in coaches to the various dinner locations, which also allowed extra time to chat to each other in an informal setting. Dinners took place at the 'Brass Bell', with the backdrop of False Bay and surrounding mountains, and at the lively "Cafe Roux", located in the nearby Noordhoek Farm Village.

Free days

The Imbizo features 2 travel days, 20 work days, and 3 free days. We provide activities for the free days, both to facilitate communication, and to prevent the often stark financial inequalities within the student body to affect who can go on trips. On the first free day, we charter a sight-seeing "red" bus for a tour of the Cape Peninsula. We visit Groot Constantia Winery and Signal Hill, touristic highlights of the Cape region. The trip allowed students to see and enjoy Cape Town's natural splendours. On the second free day, students were given a choice between surfing lessons on the world famous Muizenberg beach and a trip to visit the penguins at nearby Boulders beach. On the third free day, adjustments to the planned activity were implemented to accommodate the adverse

Dinner at Brass Bell.

weather conditions. Instead of spending the day at Kirstenbosch Botanical Gardens and doing a scavenger hunt organised by the TAs, the group visited one of the top tourist destinations in Cape Town, the Victoria & Alfred Waterfront.

Evening Science Socials

We hosted an 'Evening Science Social' on most cycles – another way to create shared experiences. Cycle 1 saw the return of Stuart Lightbody, a neuro-inspired sleight of hand magician. Stuart is a great entertainer, and always a hit with the students and Faculty. In Cycle 3 we hosted a pub quiz at the local Aegir brewery. Students and faculty were divided into teams and required to answer questions on a wide range of topics – from African general knowledge to 'how well do you know your classmates?'. During Cycle 4, we hosted a cocktail party and evening lecture at the UCT Neuroscience Institute. Our guest speaker, Zimbabwean born, Dr Rachael Dangarembizi, captivated our students and faculty with her story. A truly remarkable woman in science who, at the age of 16, had to step into the role of mother and father to her four siblings, after her parents died. Rachel was determined to break out from the cycle of poverty, and she did: she graduated with her PhD from the University of Witwatersrand in 2018; in 2019 she entered the University of Cape Town (UCT) Neuroscience Institute as a postdoctoral research fellow; and now, in 2022, has her own lab at UCT. The group was visibly moved by her story. We will invite Rachel back to Imbizo 2023.

Fresh Air activities: Swimming, Runs, Boot Camp

Outside activities during breaks and before/after lectures were possible given the great location of the beach-side suburb of Noordhoek. Lunch breaks were often spent on the balcony of the Team

Imbizo women and Dr Rachel Dangarembizi at the UCT Neuroscience Institute.

House chatting and playing football in the garden, in between rain showers, that is! But Imbizo offers more, right from the start of the Imbizo in 2017, the TAs played a large role in shaping the atmosphere and spirit of the group. It has become a habit that some of our TAs offer early morning sessions ranging from Yoga, neighbourhood runs and boot camp by the beach, for those who seek exercise. Equally exciting – and enthusiastically received by the student s– are swimming lessons in the nearby beach tidal pools. Some of our African students arrive not being able to swim, and they leave not only as better scientists, but also as better swimmers. We are deeply indebted to the drive and motivation of our TAs, who are come without financial compensation and on their own time (and especially Nassi Papoutsi who started this tradition in 2017). It is these impromptu activities through which students build strong relationships with each other, creating a well connected community.

Ending in style: The Gala Dinner

The crowning event of the school is the Gala Dinner on the final evening. This year the dinner was held at 'Jakes on the Common' restaurant followed by a party at The Team House. Students had all put a tremendous amount of work into their projects, which had been presented individually that day. The Imbizo T-shirts are handed out before the dinner, and it has become a tradition for everyone to wear their T-shirt to the dinner for one final group photo. The Gala Dinner gave students the opportunity to enjoy each other's company and that of faculty, and to reflect on all that had been achieved over the prior 4 cycles. The Gala dinner is also a perfect time to make some "Thank you" announcements including to our very dedicated TAs for all of their contributions. The shared experience of this rigorous but rewarding course will result in long-standing relationships and productive international collaborations in the years to come.

The Class of 2022

Origins

For the 2022 Imbizo we received 82 applications. Among them were 40 applicants residing in Africa and 43 applicants indicated they were of African Nationality. We admitted 18 African Nationality students and 10 intercontinental students. Notably, for the first time we had candidates of African Black ethnicity from outside Africa. We had 2 cancellations, but were unable to fill these spots. Despite the disappointment, it turned out to be beneficial to have an extra room for COVID. These students were offered an immediate deferral to the 2023 school. Despite this setback, we achieved a well-balanced student body.
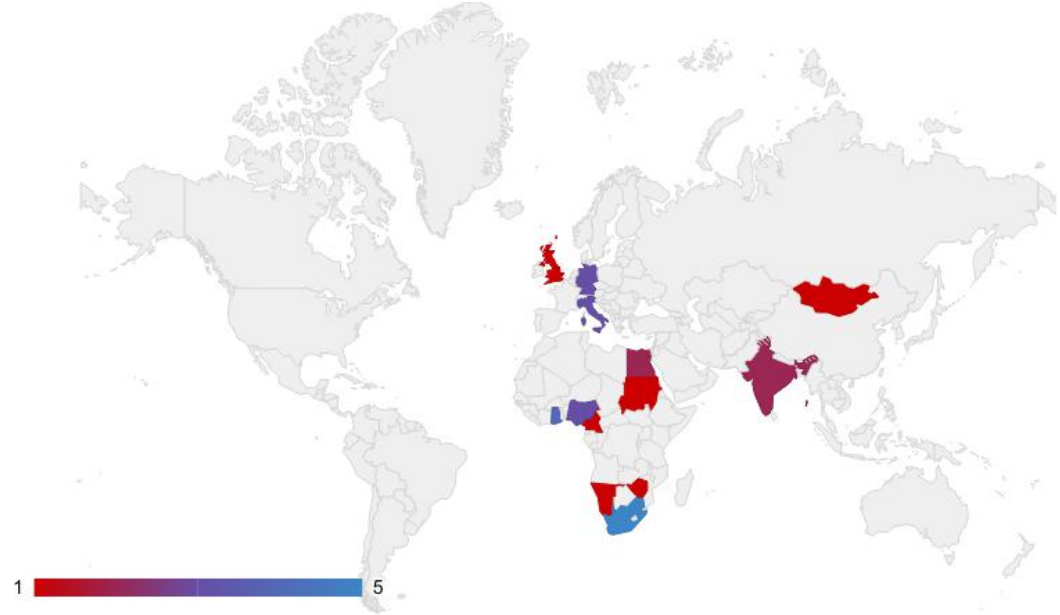
Distribution of gender and ethnicity

As in previous years, we aimed for a diverse student body. We separated the applicant pool along two axes: intercontinental/African and male/female. The applicant pool comprised: 9 (7 black/2 white) African men, 2 intercontinental men, 10 (7 black/3 white) African women, and 7 intercontinental women. We evaluated each group separately, and allotted roughly equal numbers of studentships to these four groups.

Applicants	Women	Men
African (white / black)	14 / 15	65 / 17
International (any complexion)	29	43

Accepted students	Women	Men
African	3 / 3	8 / 5
International	7	5

Success rate	Women	Men
African	21% / 20%	12% / 29%
International	24%	11 %
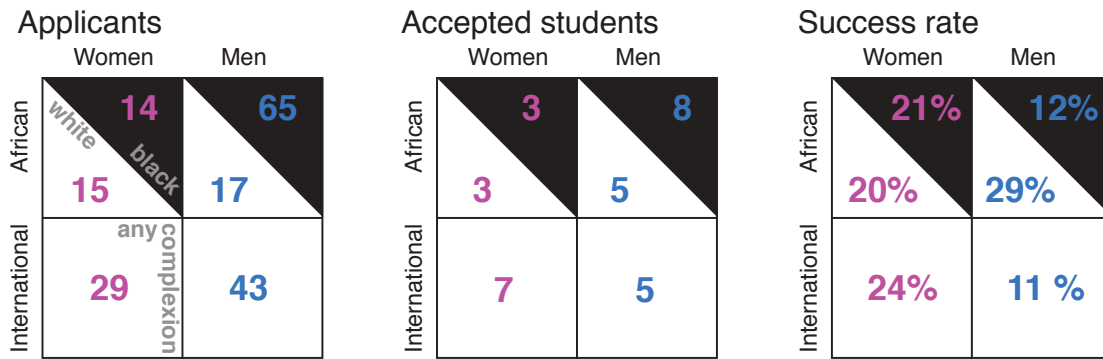
Summary of applicants and acceptance rates.

Levels of education

As in previous years the Imbizo hosted MSc students, entry level and more advanced graduate students, and a few postdocs.

Students helping students.

Student roster

The following two pages contain the complete roster of our students.

Ayoade Adeyemi

Nathaniel Adibuer

Lordstrong Akano

Mona Allaam

Cornell Awuku

Cornelius Bergmann

Isabel Cornacchia

Mahmoud Elmakki

Amr Farahat

Melissa Fasol

Carele Feujio-Wowo

Roxanne Hattingh

Devon Jarvis

Martha Kamkuemah

Elisha Komolafe

Chiara Mastrogiuseppe

Farai Mberi

Rabelani Negota

Abigail Oppong

Sofia Raglio

Jenalea Rajab

Mahalakshmi Ramadas

Rituparna Roy

Marius Schneider

Thomas Soares Mullen

Student case studies - "What did the Imbizo do for you? "

The next section features a closer look at some of our students, and their responses to what they particularly enjoyed at the Imbizo.

Abigail Oppong

Abigail enjoys some Cape Town sunshine at Boulders Beach.

Abigail Oppong is a graduate of Ashesi University, Ghana. She is an aspiring computational neuroscientist/linguist, and she's hoping to bridge the research gap between neuroscience and languages with computing and technology. During her final year in school, caught up with her passion for health and languages, she explored a research project to examine gender bias in Natural Language Processing and deep image reconstruction of brain activity. She is a proud African and loves to explore African cultural richness in her work by ensuring that AI systems built for Africans are transparent, fair,and representative. She is passionate about research and hopes to start her Ph.D. soon. Aside from academics, she loves mentoring other young girls in rural areas about STEM.

"One of the impacts Imbizo had on my academic and career journey was the nature of how science is explored in the real world. For the first time in my life, I felt the real meaning of science as I saw so many applications of how science impacts lives. I got the opportunity to interact with other students from different educational backgrounds and cultures around the world, shaping my thinking. I have changed my mindset about science and maths from the theoretical point of view to the practical. I am happy to say I can now read meanings from numbers to create models to solve a problem. I have made friends across all the countries represented at Imbizo 2022. Before Imbizo, I had more experience in Natural Language Processing and machine learning and wanted to explore the application of Neuroscience in NLP. At the end of the summer school, I worked on a Deep Image Reconstruction project which serves as a stepping stone to my passion for research in language and brain processing. I am currently applying to Ph.D. programs to explore brain modeling and NLP research. I appreciate Imbizo massively for this opportunity."

Lordstrong Akano

Lordstrong after a successful hike to the top of Silvermine Reserve

Lordstrong Akanois a final year Medical Student at the University of Ibadan, Nigeria. His desire to understand the human brain and its cognitive processes at the finest level of granularity possible lead him to the field of Computational Neuroscience. He hopes to acquire more insight into the workings of the brain through a Masters degree in Computational Neuroscience following his Medical degree. His ultimate goal is to have an extensive (its bounds being without limits) understanding of Neuroscience at all levels, and to translate that into better patient outcome as a Surgeon-Scientist.

"Attending Ibro-Simons Computational Neuroscience Imbizo Summer school is the highlight of 2022 for me. Especially as it was on a full scholarship (I wouldn't have been able to attend otherwise). The collaborative environment, the rich intellectual discourses, the interesting and exciting ideas passed in lectures, the random conversations, the relationships, the contacts, the overall experience. These are things I am definitely grateful for. The entire experience strengthened my resolve for Computational Neuroscience, and that I do not take for granted."

Running to clear the mind.

Melissa Fasol

Melissa and Sofia share a joke.

Melissa Fasol is a third year PhD student at the University of Edinburgh. Her undergraduate degree was in Biomedical Sciences with an honours in Neuroscience. She thoroughly enjoyed the theoretical aspects of her undergraduate studies, which inspired her to pursue graduate studies in Computational Neuroscience. Her PhD is a cross-disciplinary project between the school of Neuroscience and the school of Engineering; she uses a combination of signal processing and machine learning techniques to look for quantitative EEG biomarkers for monogenic forms of autism spectrum disorder. Melissa grew up in Nairobi, Kenya and Cape Town, South Africa, and is passionate about increasing access to education throughout Africa.

"The imbizo was an invaluable experience that helped me develop both my personal and professional aspirations. It consolidated the quantitative foundational knowledge required to pursue neuroscience from a theoretical point of view and gave me a broad overview of the work being done at the forefront of the field (directly from the incredible faculty and teaching assistants doing the work)! The imbizo also helped me to think about tangible ways I can make a meaningful contribution to increasing access to education. Dr Rachel Dangarembizi's journey was particularly inspiring and gave me greater insight into the obstacles children face to obtain an education and has helped me to think of ways to minimise these. I am incredibly grateful to have been given the opportunity to attend and be part of the imbizo community."

Ayoade Adeyemi

Ayoade on board the City Sightseeing Bus.

Ayoade Adeyemi completed his undergraduate in Mechanical Engineering and pursued his Masters Degree in the University of Ibadan Nigeria where he studied Biomedical Engineering. He's an highly skilled engineer with experience in design, repair and improvement of medical equipment for disease diagnosis, treatment and prevention. He also has experience in research and utilizing microcontrollers for building devices in the biomedical domain (medical image analysis, neuroscience). Currently, he works as a biomedical engineer in a hospital, and will be applying for PhD positions.

"For me, I call the Imbizo a Eureka moment that opened my mind! It was like a rite of passage into the world of possibility to what I can do with computational neuroscience. I had the privilege of not only learning the foundation of Neuroscience but also meeting an amazing set of talented and intelligent individuals that created a safe zone for me to be able to express myself. The lectures and interactions with the faculty members of the summer school were highly impactful and resourceful helping me to align my future goals in the right direction. To buttress the Eureka moment, Imbizo helped me see things I never saw in myself, I was able to see how I could motivate myself with the help of fantastic TAs to resolve the projects we were given. I can boldly say that Imbizo has laid the path for me to follow as I apply for PhD and I will be forever grateful that I was selected to attend this summer school."

Nathaniel Adibuer

Nathaniel Adibuer in scenic Noordhoek.

Nathaniel Adibuer is a Biomedical Engineering graduate who graduated from the University of Ghana in 2021; following that, he did year National Service as a teaching and research assistant at his department, Biomedical Engineering. His background is in Internet of Things (IoT), embedded systems, and bioinstrumentation. He has always been fascinated about the idea of merging embedded systems with neuroscience; that's what led him into computational neuroscience and brain machine interfaces. He seeks to use ideas and concepts in computational neuroscience to apply into the world of IoT and embedded systems.

"The Computational Neuroscience Imbizo has been a great exposure for me. It made me realize my deficiencies in some subjects I need to relearn to help me conquer some areas I find challenging in computational neuroscience. Aside from that, I had the opportunity to network with highly experienced people from the field who were ever ready to help me progress to the next stage of my career. The activities we had in between all the lecture weeks made the experience more fun for me. I enjoyed surfing at Muizenberg, visiting two oceans aquariums and going for site seeing and wine tasting. It was a great experience for me as I got to see the world through different lenses of culture. The faculty and teaching assistants are also amazing! I could see they really had both practical and theoretical knowledge in their field and were well versed with the necessary knowledge and tools to make the whole program a success. The imbizo is definitely a place for people who are curious-minded about the brain, and I am excited to pursue my PhD in this field."
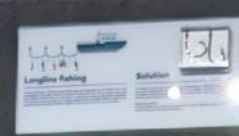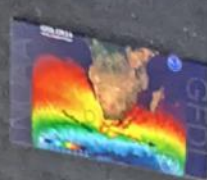
Teaching Assistants

The powerhouse and engine of the Imbizo. Our six TAs, from left to right: Chris Currin, Mohamed Abdelhack, Annik Carson, Marjorie Xie, Nina Kudryashova and Spiros Chavlis.

Mohamed Abdelhack (2022)

Mohamed is a Postdoctoral Fellow at the Krembil Centre for Neuroinformatics with Dr Daniel Felsky. He developed his interest in the human brain while studying electrical engineering at Alexandria University in Egypt. He then moved to Japan for his graduate studies, investigating top-down modulation in the human visual cortex and modelling this process using deep neural networks. He previously worked as a Postdoctoral Researcher at Washington University in St. Louis where he was building machine-learning models to predict post-surgical medical complications. He is currently interested in the interface between machine and deep learning and neuroscience for modelling psychiatric disorders.

Annik Carson (2020, 2022)

Annik is an industry researcher in reinforcement learning at AI Redefined, a Montréal-based startup focused on adaptive human-machine interaction. She has a BSc in neuroscience and mathematics from the University of Toronto, which naturally led to graduate work in computational

neuroscience. Her research has focused on developing models of learning and memory systems at multiple levels. She completed an MSc with Dr. Melanie Woodin, modelling cellular mechanisms involved in inhibitory synaptic plasticity, before going on to do a PhD with Dr. Blake Richards using reinforcement learning as a model for animal behaviour in decision making tasks. She is broadly interested in how our understanding of the brain can be used to make more adaptive AI systems.

Spyridon Chavlis (2022)

Spyridon Chavlis is a postdoctoral research fellow at the Institute of Molecular Biology and Biotechnology (IMBB), Foundation for Research and Technology-Hellas (FORTH), with Dr. Panayiota Poirazi. He is an engineer by training, holding an MEng in Mechanical Engineering with a major in Computational Nuclear Engineering from the National Technical University of Athens. He received his MSc in Biomedical Engineering at Imperial College London, where he interacted with Computational Neuroscience for the first time. Then he moved to the University of Crete for doctoral studies in Computational Neuroscience, where he received his Ph.D. from the Biology Department, focusing on dendritic, multicompartmental models of the hippocampus. His current interest is to exploit Artificial Intelligence using neuro-inspired architectures and algorithms incorporating biologically plausible neurons and learning rules.

Chris Currin(2019-2022)

Christopher Currin is a postdoctoral research fellow at the Institute of Science and Technology Austria. He is a professional problem solver with a diverse background, having completed BSc degrees in biochemistry, computer science, and psychology. Chris started his graduate career as an electrophysiologist but shifted focus to computational modelling, where he has found his passion. Along the way, Chris consulted on industry machine learning projects and founded the Deep Learning IndabaX South Africa, a non-profit company spreading machine learning throughout South Africa and beyond. His current interest is in the analysis and modelling of human neurons derived from induced pluripotent stem cells, whereby he looks at large scale network activity from people with epilepsy and autism spectrum disorder. Chris is deeply curious about how we think and how to make machines learn.
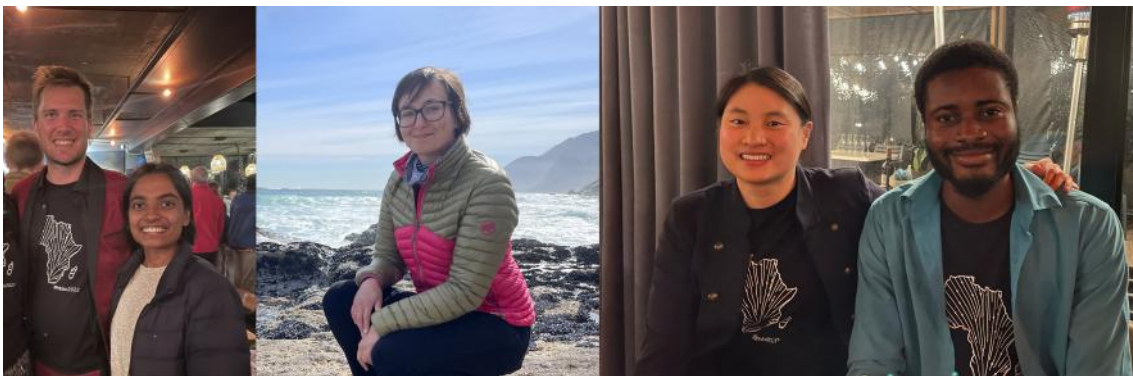
Nina Kudryashova (2022)

Nina Kudryashova is a Research Associate at the School of Informatics, University of Edinburgh. She obtained her BSc/MSc degrees in Applied Mathematics and Physics from Moscow Institute of Physics and Technology (2013/2015) and continued her studies at Ghent University, where she obtained a PhD in Biophysics (2018). After her PhD, Nina proceeded to postdoctoral training in computational neuroscience at the University of Edinburgh. Throughout her research career she developed as an interdisciplinary scientist, with a primary focus on dynamical systems. Her current

interest is in statistical modelling of neural population activity, in particular using latent dynamical models.

Marjorie Xie (2022)

Marjorie Xie is a PhD candidate in Neurobiology and Behavior at Columbia University in New York. In the lab of Ashok Litwin-Kumar she investigates how the cerebellum supports learned behaviors by building and analyzing neural network models. Prior to graduate school, she studied neuroscience and philosophy during her bachelor's at Princeton. She began her research career as an experimentalist studying social behaviors and vision in fruit flies. Marjorie is interested in computational approaches to understanding psychiatric disorders, brain-machine interfaces, and connections between biological and artificial intelligence.

TAs and class of 2022 at the Team House.

Faculty

We aimed to recruit 20 lecturers (including four directors) for four cycles, focusing on gender balance and diverse ethnicity, as well as broad expertise. We were successful in recruiting very high quality, well-renowned faculty, but we were unsuccessful in recruiting women and lecturers of colour, although not for the lack of trying. We experienced an unprecedented number of cancellations from faculty with more diverse backgrounds, which we attributed to the well-documented higher impact of COVID on these groups. We will continue to strive for better representation, by including more African lecturers, and bringing in alumni who have advanced in their careers.

Demba Ba, Faculty (2019 - 2020) & Co Director Imbizo (2022)

Demba Ba received the B.Sc. degree in electrical engineering from the University of Maryland, College Park, MD, USA, in 2004, and the M.Sci. and Ph.D. degrees in electrical engineering and computer science with a minor in mathematics from the Massachusetts Institute of Technology, Cambridge, MA, USA, in 2006 and 2011, respectively. In 2006 and 2009, he was a Summer Research Intern with the Communication and Collaboration Systems Group, Microsoft Research, Redmond, WA, USA. From 2011 to 2014, he was a Postdoctoral Associate with the MIT/Harvard Neuroscience Statistics Research Laboratory, where he developed theory and efficient algorithms to assess synchrony among large assemblies of neurons. He is currently an Assistant Professor of electrical engineering and bioengineering with Harvard University, where he directs the CRISP group. His research interests lie at the intersection of high-dimensional statistics, optimization and dynamic modeling, with applications to neuroscience and multimedia signal processing. Recently, he has taken a keen interest in the connection between neural networks, sparse signal processing, and hierarchical representations of sensory signals in the brain, as well as the implications of this connection on the design of data-adaptive digital signal processing hardware. In 2016, he was the recipient of a Research Fellowship in Neuroscience from the Alfred P. Sloan Foundation.

Daphne Bavelier (2022)

Daphne Bavelier is a French cognitive neuroscientist specialized in brain plasticity and learning. She is full Professor at the University of Geneva in the Faculty of Psychology and Educational Sciences. She heads the Brain and Learning lab at Campus Biotech in Geneva, Switzerland. She studies how the brain adapts to changes in experience, either by nature - for example, deafness, or by

Joe Raimondo, Eric Plourde, Xaq Pitkow and Demba Ba celebrating a successful Imbizo at the Gala Dinner

training - for example, playing video games. Her work shows that playing fast-paced, action-packed entertainment video games typically thought to be mind-numbing actually benefits several aspects of behavior. Exploiting this counterintuitive finding, her lab now investigates how new media, such as video games, can be leveraged to foster learning and brain plasticity. Recently, in collaboration with members of the CISA, she is investigating the impact of video games on social and affective skills, in particular emotion processing and emotion regulation.

Beth Buffalo (2022)

Elizabeth Buffalo is a professor at the University of Washington and the chief of the neuroscience division at the Washington National Primate Research Center. She received her PhD in neuroscience from the University of California, San Diego and completed postdoctoral training at the National Institutes of Health. Her research focuses on the neural mechanisms of learning and memory. She uses neurophysiological and spectral analysis techniques to investigate the activity of neurons and neural ensembles in memory formation and retrieval. She has received awards for her research from the NIH and DARPA and was the recipient of the Troland Research Award from the National Academy of Sciences in 2011.

Dorit Hockman(2022)

Dorit Hockman is an Evolutionary Development Researcher, Division of Cell Biology at the University of Cape Town. Research in the Hockman lab focuses on understanding the dynamics of gene regulation during cell development and maturation, as well as exploring the evolution of these processes in order to improve our understanding of human brain maturation, focusing on the pediatric brain and to understand the evolution and development of the neural crest, a vertebrate-specific tissue which gives rise to the peripheral nervous system.

Peter Latham, Co-Director (2017 - 2022)

Peter Latham was a physicist for a large portion of his career (undergrad at UC San Diego, grad at UC Berkeley and postdoc at the University of Maryland), but in 1996 he switched to theoretical neuroscience. After 1.5 years at NIH and 6 at UC Los Angeles, in 2004 he became a faculty member at the Gatsby Computational Neuroscience Unit, UCL, where he has been ever since; he is now a full professor. He uses techniques from physics and machine learning to understand how biologically realistic networks carry out computations, with a focus on probabilistic inference, learning and synaptic plasticity.

Cengiz Pehlevan (2022)

Cengiz Pehlevan (pronounced "Jen·ghiz") is an assistant professor of Applied Mathematics at Harvard SEAS following time at the Flatiron Institute's Center for Computational Biology (CCB), where he was a research scientist in the neuroscience group. Before CCB, Cengiz was a postdoctoral associate at Janelia Research Campus, and before that a Swartz Fellow at Harvard. Cengiz received a doctorate in physics from Brown University and undergraduate degrees in physics and electrical engineering from Bogazici University. He is a native of Tosya, Turkey.

Alyssa Picchini Schaffer (2020-2022)

Alyssa Picchini Schaffer is a senior scientist at the Simons Foundation, where she manages the Simons Collaboration on the Global Brain (SCGB). The SCGB aims to expand our understanding of internal brain processes through computational approaches and cutting-edge experimental technologies in order to discover the nature, role and mechanisms of neural activity that produce cognition. Picchini Schaffer is a neuroscientist and science communicator with an exceptionally diverse background and expertise in neural stem cell biology, pharmacology, policy and media across business, government and academic sectors. She is passionate about fostering collaboration

Xaq and Christina - smiles and matching shirts.

Roxanne, Spiros and Sofia enjoyed visiting the penguins.

among multidisciplinary teams to address significant questions in neuroscience. Before joining the foundation, Picchini Schaffer was scientific director of TEDMED, an independent division of TED focused on science, health and medicine. She earned her Ph.D. from Columbia University and is an alumna of the AAAS Science and Technology Policy Fellowship and Lafayette College.

Jonathan Pillow (2022)

Jonathan Pillow is an assistant professor in the Princeton Neuroscience Institute and the Department of Psychology. Pillow grew up in Phoenix, Arizona, and attended the University of Arizona in Tucson as a Flinn Scholar, where he majored in mathematics and philosophy. After a year as a Fulbright U.S. Student Fellow in Morocco studying North African literature, he attended graduate school at New York University, and received a Ph.D. in neuroscience in 2005 for research on statistical models of information processing in the early visual pathway. Pillow moved to London for a three-year postdoctoral fellowship at the Gatsby Computational Neuroscience Unit at University College London and from 2009-2014 was an assistant professor at the University of Texas at Austin in the departments of Psychology, Neuroscience, and Statistics & Data Science. Pillow's current research sits at the border between neuroscience, statistics and statistical machine learning, focusing on computational and statistical methods for understanding how large populations of neurons transmit and process information.

Xaq Pitkow (2022)

Dr. Pitkow's primary focus is on developing theories of the computational functions of neural networks, especially how they compute properties of the world using ambiguous sensory evidence. He was trained in physics as an undergraduate student at Princeton and went on to study biophysics at Harvard. There he joined the neuroscience lab of Markus Meister, conducting experiments on retinal processing, and developing theory of cortical circuits in collaboration with Haim Sompolinsky. After his Ph.D. he took a postdoctoral position in the Center for Theoretical Neuroscience at Columbia to work with Ken Miller and then moved to the University of Rochester to work as a postdoc with Alex Pouget in the Department of Brain and Cognitive Sciences. In 2013 he moved to Houston to become a faculty member jointly at the Baylor College of Medicine (BCM) and Rice

Surf and Science.

University, in the Departments of Neuroscience and Electrical and Computer Engineering. He is the co-Director of the Center for Neuroscience and Artificial Intelligence at BCM.

Eric Plourde (2022)

Eric Plourde (2022) Eric Plourde received both the B.Ing. degree in electrical engineering and the M.Sc.A. degree in biomedical engineering from the Ecole Polytechnique de Montréal, Canada in 2003. After working 2 years as a biomedical engineer in the field of computer assisted surgery, he completed a Ph.D. degree in electrical engineering from McGill University in 2009. From 2009 to 2011, he was a Postdoctoral Fellow in the Neuroscience Statistics Research Laboratory with joint appointments at the Massachusetts General Hospital, Harvard Medical School and the M.I.T. He joined the Université de Sherbrooke, Canada, in 2011, where he is now a Full Professor within the Department of Electrical and Computer Engineering. His research focuses on applying knowledge of sound processing by the brain to the development of novel speech processing algorithms. He has been the Canadian representative on the IEEE Signal Processing's Bio Imaging and Signal Processing (BISP) Technical Committee from 2019-21.

Alex Pouget (2022)

Alexandre Pouget is currently a full professor in the Neuroscience Center at the University of Geneva, where he leads the computational cognitive neuroscience laboratory. His research focuses on theories of representation and computation in neural circuits with a strong emphasis on neural theories of probabilistic inference. According to this approach, knowledge in the brain takes the form of probability distributions and new knowledge is acquired via probabilistic inferences. This allows robust computations in the presence of uncertainty, a situation that arises in almost all real-life computations. He is currently applying this framework to a wide range of topics including olfactory processing, spatial representations, sensory motor transformations, multisensory integration, perceptual learning, attentional control, decision making, causal reasoning and, more recently, simple arithmetic.
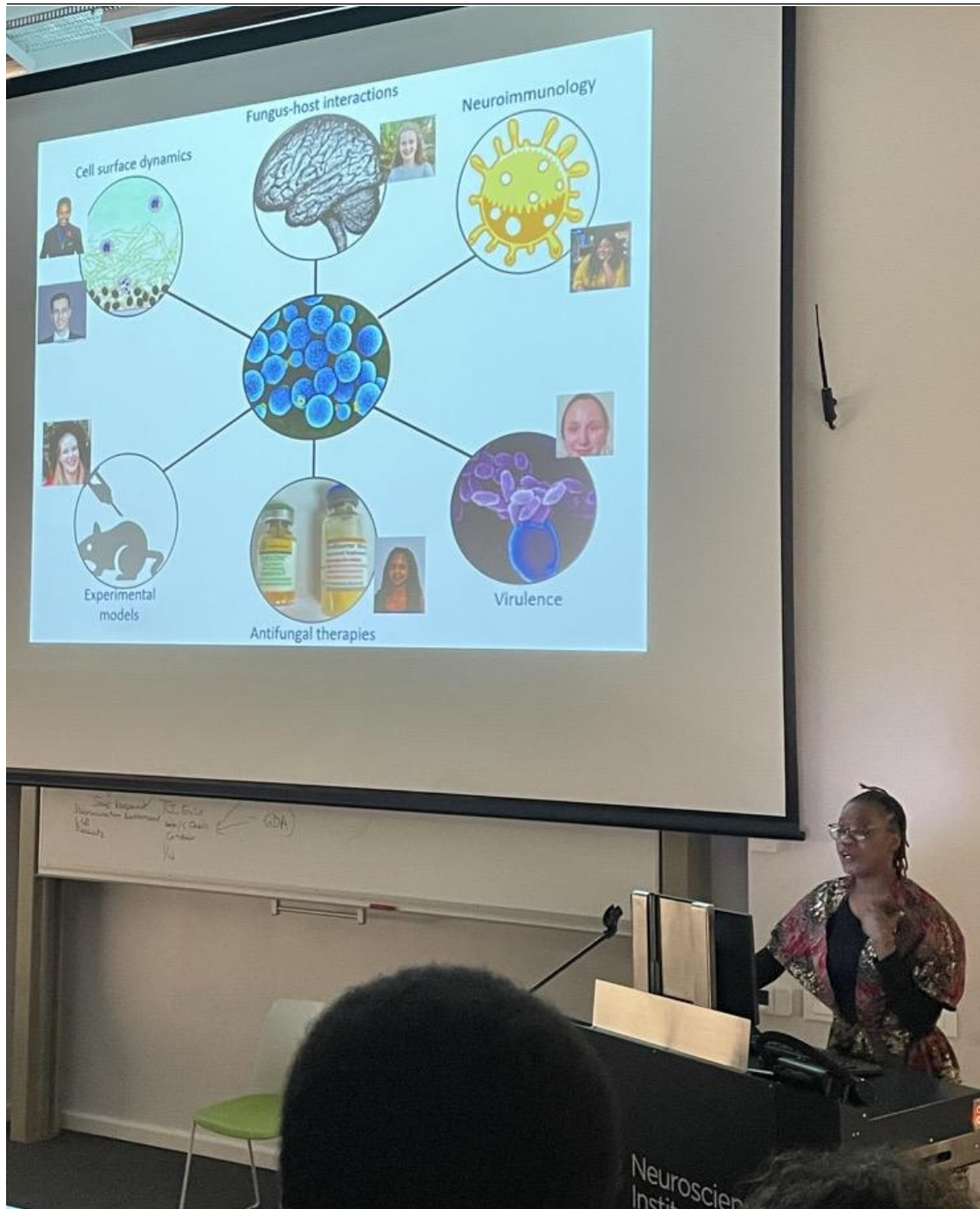
 Dr Rachel Dangarembizi's inspiring guest lecture at the UCT Neuroscience Institute.

Joseph Raimondo, Co-Director (2017 - 2022)

Joseph Raimondo is a South African neuroscientist who studied medicine at the University of Cape Town before pursuing a DPhil in Neuroscience at the University of Oxford as a Rhodes Scholar under Colin Akerman. Here he investigated chloride and pH dynamics in the nervous system. He returned to South Africa in 2013 before starting his own group at the University of Cape Town in 2015 as a Royal Society Newton Advanced Fellow and later as a Royal Society Future Leaders in Africa Independent Research (FLAIR) Fellow. His lab uses computational and experimental methods to explore how changes to inhibitory synaptic transmission and neuroinflammatory responses affect the emergence and termination of epileptic seizures. He has recently been awarded a Wellcome Trust International Intermediate Fellowship to explore cestode modulation of host

Hiking to the Shipwreck on Noordhoek Beach.

networks in the human brain. In his spare time Joseph can be found running on table mountain or hunting for crayfish off the cape peninsula.

Evan Schaffer (2020-2022)

Evan Schaffer is a theoretical and experimental neuroscientist who uses both approaches to investigate the function of complete neural circuits. He is driven to understand the underlying computations in complex neural circuits that transform sensory information into intelligent behavior. Dr. Schaffer is currently a postdoctoral fellow in the laboratory of Dr. Richard Axel, where he brings computational approaches to the investigation of neural circuits of Drosophila. Dr. Schaffer graduated from Swarthmore College with honors in 2005, and went on to earn his Ph.D. in neuroscience from Columbia University. As a graduate student working with Dr. Larry Abbott, Dr. Schaffer developed models for how recurrently connected neural networks respond to time-varying stimuli. He believes that neuroscience as a field will increasingly require the study of complex neural networks, necessitating both theoretical and experimental approaches. His career goal is to be able to contribute from both directions, running a lab where theory guides experiments, and the data from these experiments informs theoretical models.

Henning Sprekeler (2020 - 2022

Henning Sprekeler is a computational neuroscientist. The focus of his research is on models of synaptic plasticity and its consequences for network dynamics, sensory representations and behaviour. Recently, the lab has extended its interests towards studying functional consequences of different forms of neuronal inhibition. After obtaining his PhD at the Humboldt-University Berlin, he performed postdoctoral research in the labs of Wulfram Gerstner at the EPFL and Richard Kempter at the HU Berlin. In 2011, he received the Bernstein Award of the German Ministry of Science and Education, which allowed him to start a junior research group at the HU Berlin in 2012. In 2013, he accepted a lecturer position at the University of Cambridge (UK), before returning to Berlin to take on the Bernstein professorship at the TU Berlin in 2014.

Hanne Stensola (2022)

Hanne Stensola was trained as a neuroscientist with a focus on physiology and anatomy. She holds a BSc in neuroscience from the University of Otago, an MSc in neuroscience from the University of Oxford, and a Dr.Philos in neuroscience from the Moser lab at the Norwegian University of Science and Technology. She had two postdoc periods at the Champalimaud Centre for the Unknown. She was recently recruited as an associate professor at the University of Agder, where she and her partner, Tor Stensola, are setting up a lab for experimental neuroscience. Their work focuses on how the brain forms categorical representations, using the olfactory cortex as a model system.

Tor Stensola (2020-2022)

Tor Stensola is a systems neuroscientist who uses electrophysiology and optogenetic manipulation to study the activity of neural ensembles in awake, behaving animals. He received his BSc in Neuroscience from Otago University in New Zealand and his MSc in Neuroscience from Oxford University. He completed a PhD with Edvard and May-Britt Moser in Norway, studying the grid cell system in rats. He did postdoctoral work at the Champalimaud Centre for the Unknown in Portugal, studying the interplay between internally generated activity and sensory signals. Tor is committed to educating new neuroscientists and promoting knowledge transfer and open source mentality.

Thomas Tagoe (2020-2022)

Thomas Tagoe is a lecturer at the Physiology Department of the University of Ghana. His expertise covers various aspects of neuroscience, with special interest in how the brain changes in response to experiences. Thomas holds a PhD in Physiology and Pharmacology from the University of Leicester and has multiple international publications to his name. He is also a science communicator with a passion to share science with others, this has led to features on CNN, BBC, JOY Prime and regular appearances on the StarrFM science based show, The Horizon. Thomas also oversees operations at GhScientific, an organisation he co-founded to help others build capacity in science, technology,

A perfect way to start the day with early morning swims in Glencairn tidal pool.

 Teaching can also happen on a hike to Silvermine Dam.

engineering and math through public engagement and outreach activities.

Daniela Vallentin (2022)

Daniela Valletin studied mathematics in Berlin and did her PhD in neuroscience in Tübingen, where she studied the neural mechanisms of mathematical reasoning in primates. She then did postdoctoral work in New York with songbirds, studying the neural circuits underlying song production and learning. In 2016, she started an Emmy Noether research group at the Freie Universität Berlin, studying the neurobiology of vocal communication. In 2019, she started a Lise Meitner research group at the Max Planck Institute for Ornithology in Seewiesen, where she continues to study the neurobiology of vocal communication.

Emma Vaughan, Local Organiser(2018) & Co Director (2019-2022)

Emma Vaughan is a freelance conference organiser. She brings with her 20 years of local and international experience in the conference and events industry. Emma is a corporal part of the organizing committee, and as one of the longest serving members she handles every aspect of the course, all the way from scheduling through to the final reporting. She is a full voting member of the directorial committee. As a Cape Town resident she is uniquely placed to manage all on the ground logistics before, during and after the Imbizo and ensures every little detail is thought-out, planned and in place long before students and faculty arrive at the Imbizo.

Tim Vogels, Co-Director (2017 - 2022)

Tim Vogels is a Professor at the Institute of Science and Technology Austria. Before he joined ISTA, he was a Professor at the University of Oxford and a Fellow of European FENS Kavli Network of Excellence. After studying physics at Technische Universität Berlin he obtained his PhD in neuroscience at Brandeis University and did postdoctoral work at Columbia University and the École polytechnique fédérale de Lausanne (EPFL). As a computational neuroscientist, he builds conceptual models to understand the fundamentals of neural systems at the cellular level. His lab is interested in the interplay of excitatory and inhibitory activity in neuronal networks and how these dynamics can form reliable sensory perceptions and stable memories. He has contributed to our understanding of how intricate temporal dynamics can emerge from simple excitation-inhibition

balance, and how inhibitory synaptic plasticity can help to shape this balance.
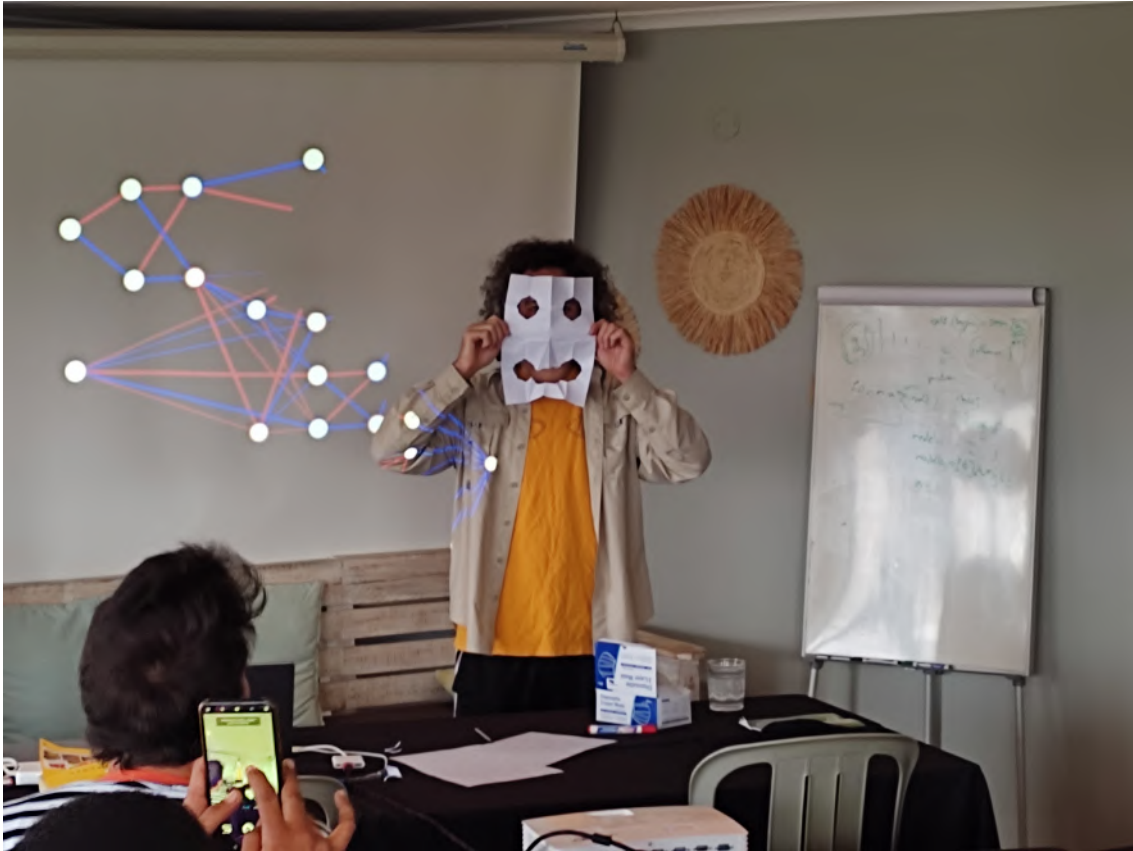
Xaq Pitkow keeping spirits high during Cycle 4.

Next page: Tree of appreciation- a new initiative for 2022. Messages of encouragement and thanks were added to individuals envelopes by their peers.

Organisation, Location, Room & Board

The closure of 'Stoked Backpackers' in Muizenberg during the COVID19 lockdown resulted in the need for a new location for the Imbizo. We wanted to keep the Imbizo close to the beach and away from the hustle and bustle of the Cape Town City Centre. After much research and site visits to various locations, we selected the "Team House" in the Cape Town suburb of Noordhoek for the Imbizo 2022. Noordhoek lies on the Atlantic seaboard, below Chapman's Peak on the west coast of the Peninsula, some 35 kilometres from the City Centre. The change of location (and time of year) came with new challenges, but the new space and suppliers offered a safe and generous environment for learning, networking and friendships to develop. The Organising Committee continues to look for suitable options in Muizenberg, and hopes to return the Imbizo to Muizenberg in the future.

Venue

We were lucky to find a suitable venue, The Team House, in Noordhoek. The 13 bedroom guesthouse met most of the group's needs: Student accommodation, space for lectures, onsite catering and transport infrastructure for group outings.

The Team House is a sea-facing property, with uninterrupted views of Noordhoek beach and beautiful sunsets. The multiple 'chill' areas – 3 dining areas (one being the outdoor terrace) and private grassed garden – meant there was always plenty of space for the students to work, chat, or just enjoy downtime. We found a safe, welcoming, and comfortable base that was the main social hub and learning centre for the Imbizo 2022, and we have decided to return to the venue in 2023.

Lecture Hall

One of the lounges at The Team House was used as the Lecture Hall and study center for tutorials and project time. Thanks to rented tables and chairs, the lecture theater was comfortable, and functional for up to 35 people. The internet was upgraded during the course to allow for live streaming to students in COVID isolation. Added bonuses of this room included natural daylight and a door straight onto the terrace, with sea views.

Accommodations

Students, TAs and faculty were accommodated in 3 different establishments.

Student accommodations

Student stayed at The Team House. They slept in ensuite rooms with no more than 4 people per room. Two TAs stayed at the Team House and acted as the on site contact for any after-hours emergencies. Given the pandemic, we accommodated students at The Team House in as small groups as possible. However, we retained 2 unoccupied "isolation rooms", we used when we had a small COVID cluster in cycle 2.

TA accommodations

The TAs who didn't stay at the Team House were booked in at the Monkey Valley Resort in a self-catering chalet located 1 kilometre from The Team House. The TAs had the use of a hired car to ensure they were at the Team House early each morning for breakfast and available for students until at least 22h00 each night before heading home for some well deserved rest.

Faculty accommodations

Faculty were accommodated at the "Ocean Golf Guesthouse". After enjoying breakfast, faculty had a short and safe 850m walk through quiet streets in the rural suburb of Noordhoek to present their

the Team Hose. Dining together; the lecture Hall Clockwise, The TeamHouse Staff, from L to R. Ramos, Anita, Sami and Oripa wearing their Imbizo swag;

Ball games are always popular during breaks.

lectures, which started at 9:00am, at The Team House. The comfort and view from the guesthouse more than made up for the walk, and we hope this will be one of the many reasons faculty wish to return to the Imbizo.

Daily Catering at The Team House

All breakfasts, most lunches, and dinners were hosted in the three dining areas at The Team House. This very relaxed environment allowed the students and faculty to socialise and enjoy meals together. The in-house catering provided by The Team House offered generous portions of nutritious, flavourful food which everyone enjoyed – including local dishes. Despite the weather we were also able to include a 'braai' (BBQ) during each cycle.

Feedback, improvements and comments.

Feedback

At the end of each cycle, the students were asked to give anonymous feedback via a google form. They reviewed their experiences with faculty members, content and structure of the academic week, food quality and recreational activities, etc. At the end of the Imbizo, they were also asked broader questions on quality of accommodation, lecture venues and school administration. Ratings were between 1 (poor) and 10 (excellent). They were also given the opportunity to specify things they would change / comments on their experience. The feedback gathered in 2022 is summarised below, split into topical sections.

Academic feedback

Students were asked to rate the quality of their academic experience each week. We asked them to rate the overall quality of the scientific content, interactions with speakers, and quality of teaching. Students were also asked to rate individual faculty on their lectures and teaching performance. Figure 1 to 3 provide this data, summarised across the four cycles of the school.

General feedback

Students were also asked to provide anonymous feedback on general properties of the school: structure, social arrangements, venue location, what they liked and disliked, and whether they had any suggestions.

Cycle 1: Biophysics, Plasticity and Neural Recordings
Sample of anonymous student comments on academic content of cycle 1:

[Joseph] *"He is a very good lecturer, super friendly and so willing to help and communicate"*

[Tom] *"Well knitted structure. The content and the lecturer captured attention throughout. "*

[Tor] *"The topic was very interesting to me and I found it fascinating. I love his approach to explaining."*

[Hanne] *"Amazing lectures filled with very resourced materials "*
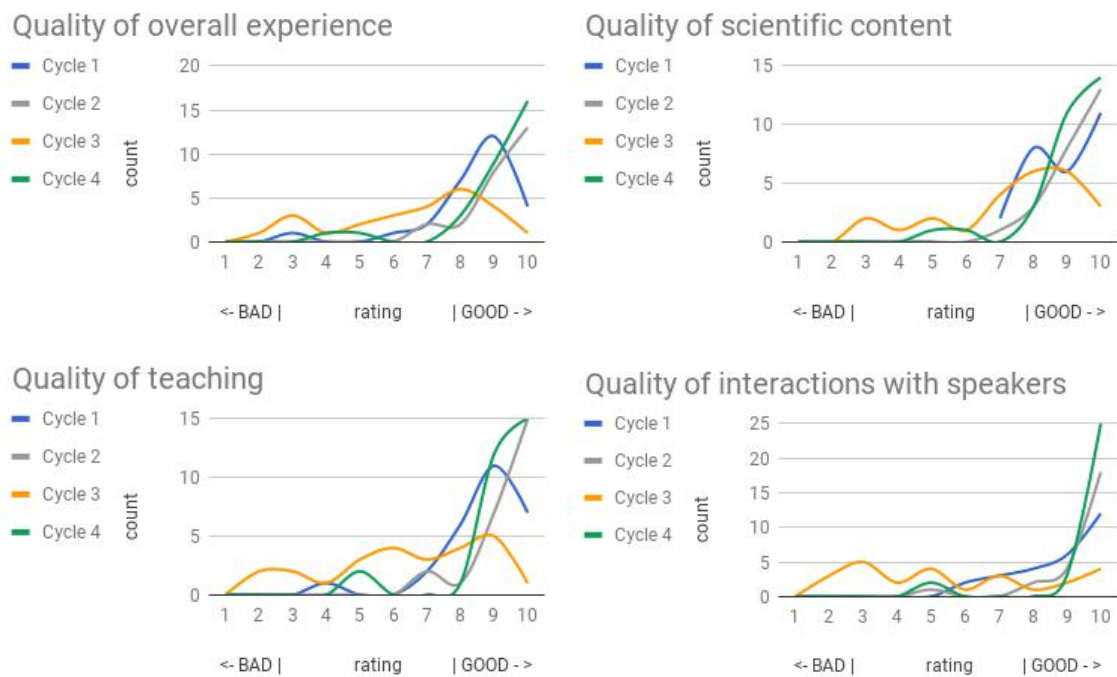
[Dorit] *"It was an amazing techni-*

Figure 1: Summary of 2022 academic experience feedback across weeks.

cal lecture, showing different applications of how to study the brain. It

was extensive and delivered appropriately."

Cycle 2: Network Dynamics
Sample of anonymous student comments on academic content of cycle 2:

[Tim] *"The way of presenting even the more mathematical part was really clear. He was very engaging in the discussion "*

[Henning] *"He was very inspiring in looking even beyond the reasoning of why certain assumptions are made. His talks were definitely what any theorists needed."*

[Beth] *"Amazing lectures, I loved*

the use of videos and case studies of patients the most. It was super engaging"

[Daniella] *"I really love how her presentation went really calmly. It's funny that I had no idea of bird songs but with her lecture, I got a whole lot of information and inspiration to pursue what I really love. "*

Cycle 3: Higher Level Function, Motor Control & Decision Making
Sample of anonymous student comments on academic content of cycle 3:

[Peter] *"So interactive and makes the class lively"*

[Alyssa] *"She is really knowledgeable, and accessible outside of the classroom."*

[Alex] *"Knowing about neural the-*

ories of Bayesian perception is one great thing i really appreciate and decision making"

[Daphne] *"Her lecture was very useful and she has been very nice with everybody."*
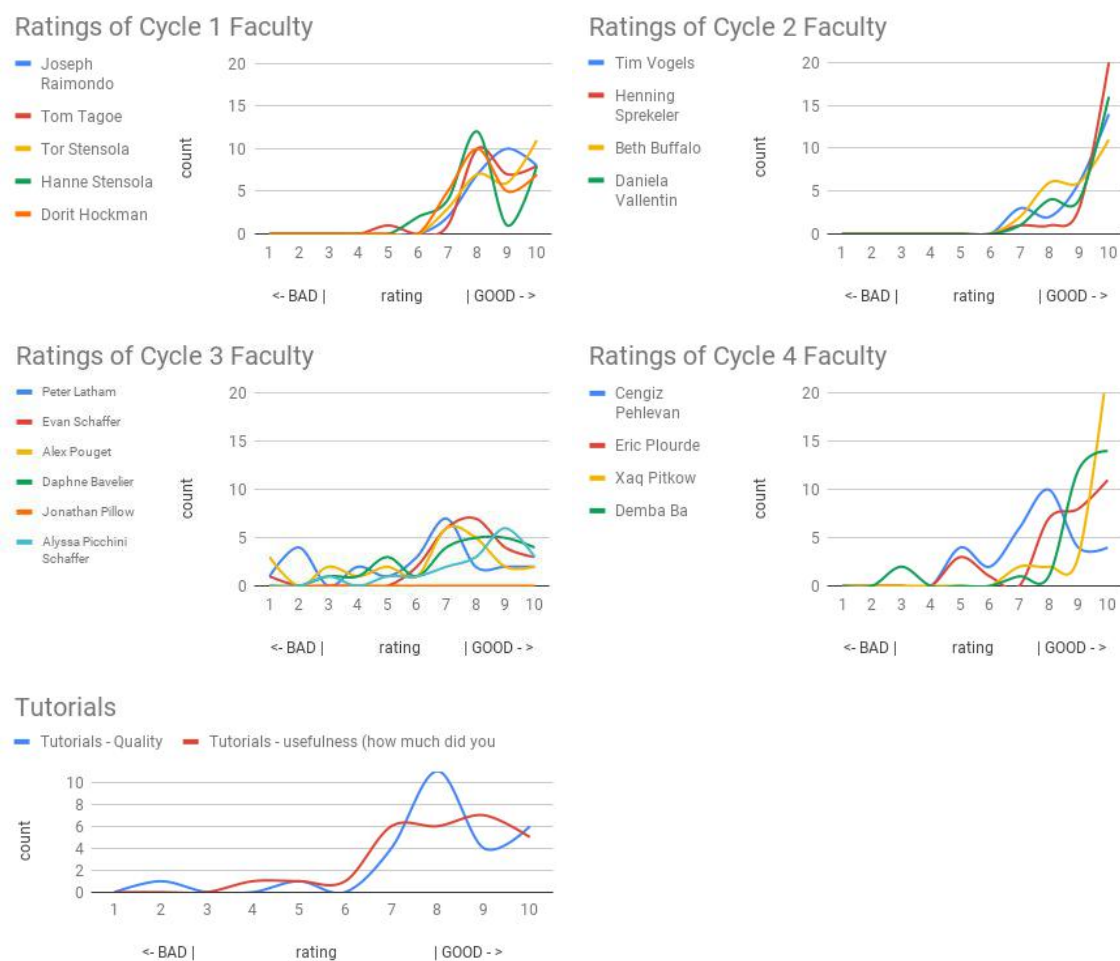
Figure 2: Visual summary 2022 of feedback on faculty.

[Evan] *"The topic was super interesting. He has been very nice with the students."*

[Jonathan] *"Spent time on discussing our projects, helping bounce PhD ideas, generally engage with students"*

Cycle 4: Machine Learning
Sample of anonymous student comments on academic content of cycle 4:

[Cengiz] *"Truly a pity not to have him here, his class was nevertheless amazing and he gave amazing explanations and intuitions about topics that are hardly covered with such a clearness."*

[Eric] *"An interesting and wonderful take on the auditory system. It was a wonderful lecture, it was easy to follow and understand."*

[Xaq] *"I loved the mode of teach-*

ing, it kept us all in tune and we enjoyed his lecture. in and out of the lecture he was a joy to be around. He inspires me a lot in loving neuroscience more and being curious and asking hard questions in neuroscience."

[Demba] *"An amazing class. Definitely one of the best: clear in the basic concepts for everyone and few insights for those who were already*

in the argument. The clearness and the passion of the arguments was

really appreciated."

Administrative and general feedback

Students were asked to provide anonymous feedback on general organisation of the school, with very positive responses.

Sample of anonymous student comments on administration and general school experience:

"Loved all the lectures happening in the morning and tutorial in the afternoon, the elaborate encouragement to interact with other students through sitting plans and tutorial buddies. I also love the addition of activities and planned out activities. We appreciate it all and snacks in between."

"One of the best experiences for years (maybe even of all times), scientific as well as personal. Not one person was less than really cool (except some cycle 3 lecturers). Project will be continued, take a bunch of interesting ideas home. Personally I profited a lot from the spi rit and will spread it in the world. Thank you so much everyone for this! Will mention you during my Nobel Prize lecture ;)"

"I really think the imbizo has been very special. I am very grateful for this opportunity! "

"The idea of having about 4 faculty members per weeks works really well. Week 3 faculty put a little fear in us, but overall we enjoyed every week and having faculty from around the world. They were very enlightening and easy to engage. "

"The experience has been ABSO-LUTELY amazing! Retrospectively looking at its almost impossible to complaint about organization. It is not an exaggeration to say that all the complaints we had were dealt with immediately! The major feedback would be to please hold on to the vibe of IMBIZO. Can't speak for the vibe previous years, but all our TAs this year helped make this experience elevated to another level.."

"I was tired all the time because of the schedule, but the people made everything better. The Imbizo was a one-of-a-kind experience I'll treasure the rest of my life. It showed me what science looks like with compassion and kindness."

"I am super glad I got this experience. I am confident about my interest in neuroscience now"

"I like that almost everything is structured and we only need to focus on the lectures and sharing this experience with the other students, it really makes it easier"
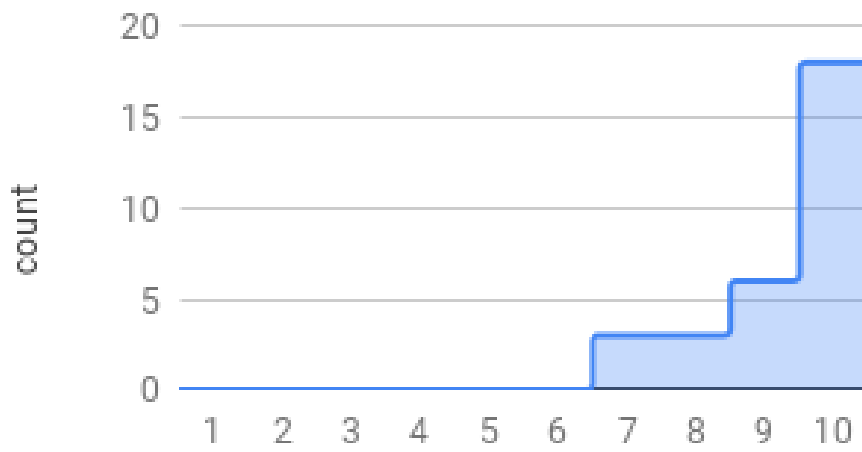
Figure 3: Overall school organisation for 2022 from 0 (bad) to 10 (good)

Logistics Director, Emma Vaughan, and Carele.

The Future: Challenges and Changes

New challenges of the 2022 Imbizo

Despite a year's COVID induced break in 2021, the Imbizo 2022 started and finished with resounding success. We are proud of what we achieved as an organising committee, and continue to be amazed by the students we meet each year. Their dedication to science and eagerness to get to know each other is always wonderful to be part of.

We did encounter some old and new challenges, but all were manageable and resolved swiftly. Most of the challenges stemmed from the change to the date and venue.

The Imbizo took place in the middle of Cape Town's winter. Despite firm warnings, several students did not pack warm enough clothes, and it took about a week to acclimatise to the wet and cold weather. The Imbizo and The Team House quickly organised additional blankets, heaters in the meeting room and other personal items such as beanies, gloves and extra socks to help keep everyone comfortable.

The Team House is not located within walking distance to any local shops, and the students did feel a level of isolation from the outside world. Our weekly shuttle to the local shopping mall was well received, and we plan to run these more frequently in 2023. If our funding allows, we will also aim to provide a welcome pack to each student which, will include some basic toiletries.

There was no laundromat available, so we opted for a centralised weekly laundry service.

2022 saw the rotating in of 4 new Teaching Assistants, only one of which was a previous Imbizo student. This meant a steep learning curve for the new TAs, some of whom were not fully prepared for the emotional support they needed to provide to students (in addition to academic support). Directors of each cycle met with the TAs for a feedback and check-in session, and these were very helpful for everyone. As we prepare for 2023, the TAs and Directors are working on a "handbook" and regular Q&A catch ups. We are very proud of the TAs, who did an excellent job and supported

the students in every way.

Our COVID policy included a vaccine mandate for all students, TAs and faculty. The policy was also revised to be in line with the South African Government policy at the time of the Imbizo. Unfortunately these restrictions were not enough, and we did have a small COVID cluster. One TA and 4 students tested positive within the first 14 days of the Imbizo. Thankfully, each case was mild, and no one required medical attention. We were able to isolate all positive cases, and we encouraged those who were sick to rest. Our onsite COVID policy was continuously revised to fit the situation, and the TAs were instrumental in implementing this policy and ensuring everyone felt safe. The onsite policy is now in place and ready to be used in 2023, if necessary.

The internet at the Team House was initially very slow, but we were able to quickly upgrade it – fast enough to allow live streaming of all lectures and tutorials.

Implemented changes.

(R) Simons Trust Imbizo Follow Up Grant (STIFUG) The 2020 Imbizo saw the establishment of the Simons Trust Imbizo Follow Up Grant (STIFUG), a new funding stream for small grants. Grants are available to alumni to support their future endeavours – benefiting their careers and facilitating their success. In 2020 we awarded 8 grants, totalling approximately USD 7,000; in 2021 we awarded 7 grants totalling approximately USD 8,000. The first round of 2022 applications saw 3 awards totalling approximately USD 2,300. 2022 round 2 applications closed at the end of October, and applicants will be notified by the end of November. We would like to extend our sincere thanks to the Simons Trust for their generous support with this new initiative.

(R) Longevity and sustainability. To maintain Imbizo year after year we have started to organise the founding of a non-profit organisation (NPO). The Imbizo NPO will create the leadership and organisational infrastructure required to maintain and expand our organization. We are actively working on this aspect, including succession planning of directors, lecturers and teaching assistants, and we are expecting the official establishment of the NPO in early 2024.

(R) Scientific skills. Students valued the time spent advising them on how to prepare figures and write journal articles. Following the success of this component, we will devote more time to training and advising students on the core scientific skills of preparing and mastering interviews and applications. This will be particularly useful for African students who wish to apply for academic programs abroad. In the future, we may invite an editor of an academic journal to the imbizo.

(R) Analysis of experimental data. A further component that we would like to improve on is analysis of experimental data. In future Imbizos, we will use publicly available data (e.g. from the Allen Institute) to expose students to the analysis of experimental data sets to test theory-based predictions.

Beyond the science:

(R) Cultural exposure: We noted that amongst students and faculty frequent topics of conversation related to Africa, its place in the world, the challenges it faces, the history of colonialism

and race-relations both on the continent and globally. We continue to work on ways to facilitate these important conversations. In that vein we host speakers (e.g. our Evening Science socials) from outside of computational neuroscience, with backgrounds in social activism, who can explore some of these important topics with students. In the near future we will formalise these additional facets in a more steady, less faculty dependent curriculum with content and formal learning goals.

(R) **Diversity:** To address the issues pertaining to the ongoing imbalance of power and status allocated along lines of gender and ethnicity in neuroscience and at institutions, we created the 'Gender in Science Lunch", and the 'Diversity Lunch'. Both are informal events in cycles 2 & 3. In cycle 2, male and female students and instructors separately discuss the status quo of gender and race based discrimination in science.

Discussions are led by faculty, and summaries of the conversations are recorded and exchanged between the two groups afterwards. The ability to speak freely, and without worry of offending, facilitates a lively and often very educational discussion. In cycle 3 the discussion continued, but as one group. With the help of our trusty TAs, we are calibrating the event to produce the best possible outcome.

(R) **Journal club demonstration:** It has been suggested that having 'mini journal club' presentations could push student to improve their scientific reading, reasoning, speaking and analytic skills. We will try this out in future Imbizos.

Long-term future & blue skies.

The Imbizo is here to stay. We believe there is a long term future for the Imbizo and for Computational Neuroscience in Africa. To guarantee the survival and growth of both, we must make long-term plans.

(R) **Director turn-over** We have already had substantial turn-over of faculty and TAs, but we have not shuffled the directors. Once the school has stable funding, we plan to start replacing the directors.

(R) **Additional funding.** We are currently funded through the grace and generosity of IBRO and the Simons Foundation. While there is no sign of waning support from our funders, it would be good to have a broader range of funders – in the case of increasing cost, or other eventualities.

(R) **Administrative Support:** the Imbizo has been running on creative solutions and the energy and goodwill of the organisational team. To make the the Imbizo sustainable, it will be necessary to have a long-term, paid administrator who will take ownership and guarantee stability, especially when the directorship changes.

(R) **A physical home:** We are dreaming of a physical location to give the imbizo a permanent home. This may come in the form of a buy-in into existing infrastructure, like in Woods Hole, USA, or though the establishment of (or incorporation into) an umbrella institute such as AIMS, or the new Neuroscience Institute at UCT.

(R) **A franchise of Imbizos:** To reduce the administrative cost of a single course, and to expand the spectrum of courses, it would be beneficial to create Imbizos for other subjects and species, e.g. a Drosophila Imbizo, an Imaging Imbizo, etc. This is one of our long-term goals.
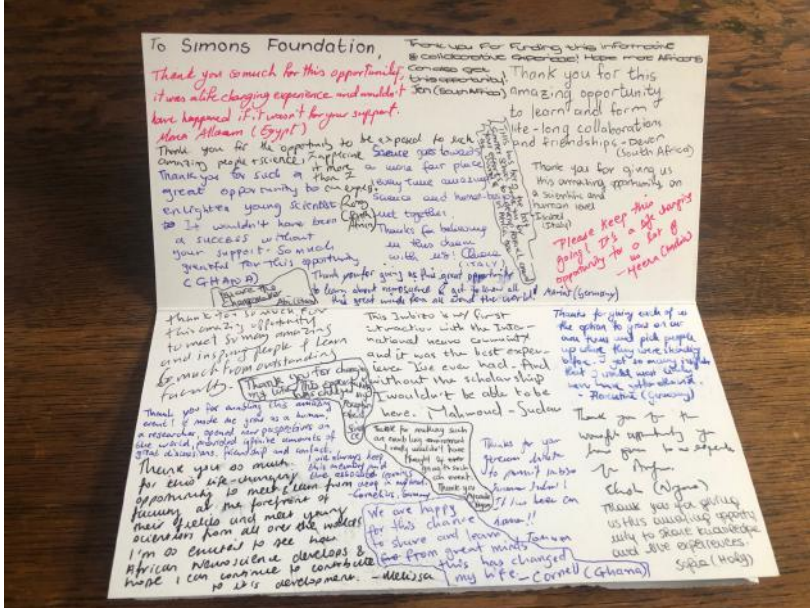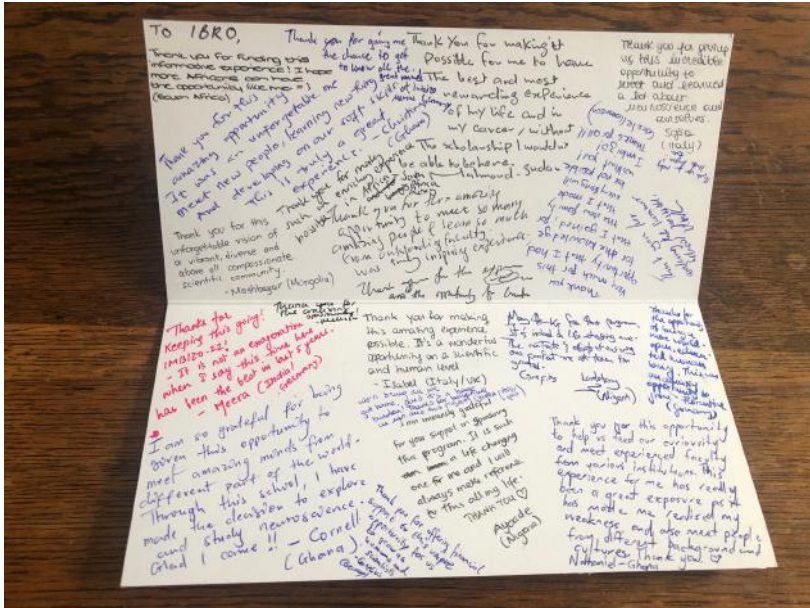
Thanks to the Funders

From the feedback we received, it's fair to assume most students were very happy.

Students' Thank-You card for IBRO & the Simons Foundation 2022.

Social distancing rules applied as laid out in the code of conduct.

Imbizo in the news

As the Imbizo has grown its community and impact over the years, we have had the opportunity to publish pieces in the popular press. Additionally we have received a special mention for inclusiveness and access by the website biaswatchneuro.com.

PLOS Computational Biology

Think: Theory for Africa

In the century of the brain, African scientists and educators are poised to make important contributions to global neuroscience research. We believe that theoretical sciences, and specifically computational and theoretical neuroscience are the ideal discipline for the African continent...
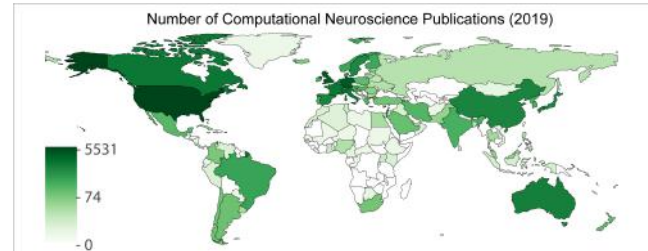
By Christopher B. Currin, Phumlani N. Khoza, Alexander D. Antrobus, Peter E. Latham, Tim P. Vogels, Joseph V. Raimondo on July 11, 2019

Scientific African Magazine

Brains by the sea: Computational neuroscience gains a foothold in Africa

The rich waters of False Bay, near Cape Town in South Africa, have sustained nomadic human tribes for tens of thousands of years. But over the last three years it has also become the starting point of an African journey to answer one of humanity's great unsolved questions:

how does the brain work?

By Alex Antrobus on December 5, 2019

The Simons Collaboration on the Global Brain

A Summer School in Africa Breaks Barriers in Neuroscience

How we facilitate the formation of a cohesive community that transcends race, gender and geographic boundaries in just three weeks...

By Chris Currin on May 27, 2020

The 2020 BiasWatchNeuro Award for Equity and Inclusivity

The Imbizo received an honourable mention. The school did not fall under the 2020 call for nomination, however the programme was acknowledged for it's contribution to increasing diversity in neu- *roscience.*

Summary

In the words of one of our faculty,

> "This Imbizo is like summer schools used to be, some 20 years ago. It feels like something is moving. People come thirsty, motivated, enthusiastic, and maybe a bit naïve. They work hard and they play hard, and they leave with their hearts and minds changed. It feels like this has a large impact on their lives."

This year, the Imbizo went into its 6th year and its consequences can be measured. For example, some of our students have successfully applied for Master's and "smart start" graduate programmes in neuroscience. More than 10 of our African alumni are now PhD students (6), postdocs (3), or faculty (1) at universities across the globe. Two other African students of ours have started working on a computational neuroscience initiative in South Africa, and yet another pair have begun a collaboration between Nigeria and South Africa. International collaborations have also been born, with several collaborations on the way.

In other words, the IBRO Simons Computational Neuroscience Imbizo has made a difference. It's filling a void for African neuroscience and begins to deliver on its promise to serve as the bridgehead and glue for a growing community. We daresay the Imbizo continues to be a tremendous success. We would like to thank everyone who made the Imbizo possible: The faculty, the TAs, and of course the funding agencies whose continued faith in the Imbizo enables us to continue each year.

After three successful years in Muizenberg, and one fresh new start in Noordhoek, we have all the infrastructure in place to settle into a routine, and continue the summer school as an annual event. Many of our faculty are on board and excited to return to Noordhoek next year. We hope our funders will also extend their support to future iterations of the Imbizo for the benefit of neuroscience in Africa and beyond.

Sincerely,

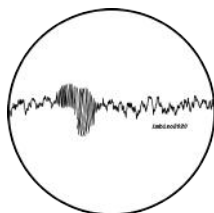Demba Ba   Peter Latham   Joseph Raimondo   Emma Vaughan   Tim Vogels
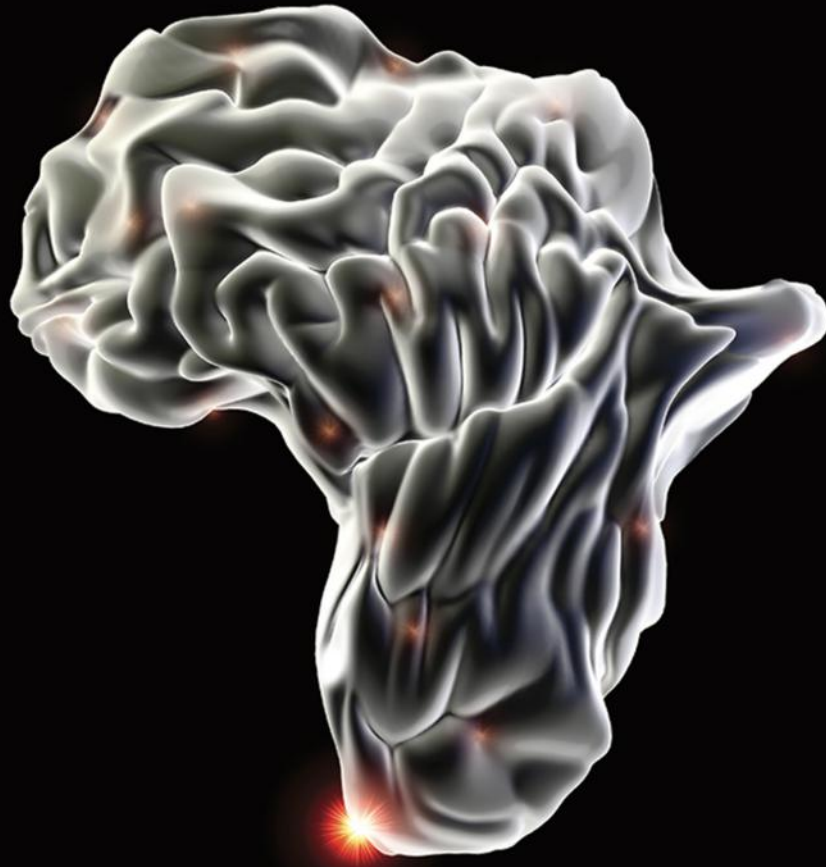
2017

2018

2019

2020

2022

IBRO-SIMONS
IMBIZO