



BHRC Newsletter Dec 2021

Our Year in Review

Nga mihi nui ki a koutou katoa

And we thought 2020 was tough! I don't know many who will be sad to see the end of the year. Other year of lockdowns, supply chain issues (how do you keep a lab running with limited stocks and slow shipping). This is particularly tough on students and researchers on short-term contracts, with few funders able (or willing) to provide additional resources to extend contracts and allow successful completion of projects. The BHRC have been working on this and recently supported the creation of a new PhD scholarship to support students in their 4th year of study. We welcome other ideas to support or advocate for those in these stressful positions. We are also thrilled to be supported by Roche for another year with a \$10,000 4th year PhD scholarship. The 2021 recipient, Shruthi Sateesh has made great use of this extra funding and is very close to submission. We hope to announce the 2022 BHRC, Roche and Helen Thacker scholarships before Christmas.

Despite all the difficulties, we have had many successes this year. BHRC members were successful in HRC, Marsden and Neurological Foundation funding rounds (details on pg.5). With the support of the Neurological Foundation and Being Brainy, lead outreach activities at the International Science Festival (pg 4), Brain day and participated in school outreach and public talks. Our community engagement is key to our centres objectives and vital in promoting brain health to the wider public and engaging our future neuroscientists. Our annual conference (pg. 3) was well attended and superbly organised by our emerging neuroscientists group (thanks to Oluwatobi Eboda and the ENG team). We are already planning for an even bigger event in 2022, watch this space.

Finally, my personal thanks to the BHRC management team for supporting me through a personally challenging year (Ailsa McGregor, Rosie Brown, Yoram Borak, Narun Pat, Oluwatobi Eboda, Anurag Singh) and the wonderful Ellie Adams, Science Communication extraordinaire for your amazing work. Thanks also to Emily Bisset for admin support and making sure we have all the sensitive expenditure forms in place. And finally, to the Neurological Foundation and Kellie Bain for supporting our passions and outreach goals. Teamwork is awesome!

With that it leaves me to wish you all the best for your summer holidays. Make sure you take time for yourself and your family and stay safe.

Meri Kirihimete 2021 me Tau Hou Hari 2022!

Steph

Director, BHRC

**Brain Health
Research Centre**
Te Pokapū Rakahau Hauora Hinekaro



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Te haerenga o te tangata | Lifespan

If the brain is the centre of our physiological universe, it is studded with roughly the same amount of neurons as there are stars in the Milky way. All humans experience a neurological cycle through their life journey, kua hua te mārama.

86 billion nerve cells, blossoming from the third week of gestation, powering us throughout our entire life. The brain powers intelligence and memory, creativity and emotion, Sight, smell, touch, taste and sound often all at the same time!

With an average 48.6 thoughts a minute, working at a speed 30 times more powerful than the IBM supercomputer, what could possibly grow wrong?

In 2021, the overarching theme 'Lifespan' of the Brain Health Research Centre was announced. Our four sub-themes are Pregnancy and Motherhood; Childhood; Adult; Ageing. Across a lifespan, there are over 700 recognised neurological conditions that combine to make neurological disease and disorders the leading cause of disability in the world.

At the University of Otago, current research projects are investigating neurological conditions such as Alzheimer's disease, ADHD, Batten disease, Stroke, Schizophrenia, Multiple Sclerosis and Autism.

Our brain health affects us throughout our lives from prenatal stages through to the twilight years. As such, BHRC kaupūtaiao investigate, research and explore neuroscience across all life stages.

There are over 240 BHRC researchers working across 65 laboratories, who are working towards developing new treatments and therapies, deeper understanding of the brain -offering hope to individuals, families and Aotearoa.

Scan the QR code under this paragraph to view our theme video that was screened at the annual BHRC conference. Featuring appearances from BHRC members Indranil Basak, Louise Parr-Brownlie, David Bilkey & Elodie Desroziers



**Brain Health
Research Centre**
Te Pokapū Rakahau Hauora Hinekarō



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Hui ā-tau | Annual Conference

On the 7-8th July 2021, BHRC members from across the country convened in Ōtepoti for two jam-packed days of kōrero, networking and fascinating presentations from students, ECR's and keynote speaker Professor Justin O'Sullivan.

After a resounding opening by Mr Peter Williamson, one of the highlights of the event was the keynote lecture "Playing the Inheritance Game" delivered by Professor Justin O'Sullivan (Liggins Institute, Auckland).

In his kōrero, Justin illustrated how scientists are beginning to understand why some psychiatric and cognitive conditions often occur together in individuals, and why some drugs have the side effects they do. Future insights into the approaches Justin outlined in this lecture may hold the key to personalised treatments for neurological conditions.

Attendees were treated to an array of presentations from talented kaupūtaiao, with several awards being given. Prizes were courtesy of sponsors Thermofisher, Lab Supply and Decode Science.

This year, the Emerging Neuroscientists Group had the privilege of organising the entire hui and wanted to achieve 3 main goals. To showcase the wealth of talent amongst BHRC early career researchers; to highlight BHRC research that embodies Te Ao Māori principles; and to hold a hybrid conference to allow all to attend.

Our ECR session chairs did a great job of keeping the hui on schedule and participants clearly enjoyed discussing the newest research produced by the BHRC.

- Top down R-L 1. Peter Williamson 2. BHRC Director Stephanie Hughes
3. Ben Halliday (Joint winner Student Speaker Prize) 4. Xiao-Wen Yu from ENG & Owen Jones (ECR prize)
5. Justin O'Sullivan 6. Sophie Mathiesen (Joint winner Student Speaker Prize)

Not pictured - Bicknell Lab (ARF Prize Winners)



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He whakawhitiwhiti kōrero mō te roro | Taking neuroscience into our community

Across 2021, the BHRC has been involved with multiple outreach events and public lectures with the support of the Neurological Foundation and Being Brainy. Engaging with our communities is crucial to fostering a wider understanding of neurological issues and to nurture the knowledge of the next generation.

In the latter half of this year, BHRC attended the International Science Festival held across Ōtepoti. During this 3 day event, hundreds of families and individuals from across the city interacted with our Giant Inflatable Brain, and took the chance to try out some exciting activities and ask questions about the brain to our amazing volunteers.

The day before the official festival started, the BHRC engaged with over 70 taura from different schools across 'Engage with Science'. The students all made their own TikTok videos about the brain, and what they envision a 'Brain Scientist' might do on the daily. We had an enormous amount of fun, with some students even writing original songs to recall different regions in the brain.

After and prior to the festival Giant Brain was shown at the successful 'Slice of Life' exhibit in South Dunedin, where it was seen by over 6000 people.

Our fantastic network of volunteers also visited Balmacewen Intermediate School, where they presented some general facts about the brain, as well as how our brain develops in the teenage years + the positive effect of exercise on the Brain.



Funding News

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He mihi tino nui ki a Te Pūtea Rangahau a Marsden, Health Research Council, Neurological Foundation mo tō rātou tautoko me pukengatanga o tēnei mahi whakahirahira

Thank you to the Marsden Fund, Health Research Council, Neurological Foundation and all our partners for your support and knowledge to help our work continue.

Congratulations to all our kaipūtaiao researchers who received funding this year. The below projects are funded by the Health Research Council.

Professor David Grattan: Visualising and controlling the cause of hot flushes at menopause
& A novel brain pathway involved in pathogenesis of obesity and type-2 diabetes

Dr Laura Gumy: Novel targets to enhance axonal repair after spinal cord injury

Professor Stephen Robertson: Improving genetic diagnosis for tamariki in Aotearoa

Dr Narun Pornpattananankul: Multimodel Neuroimaging Biomarker for Cognitive Deficits in ADHD

**Projects funded by the Royal Society Te Apārangi
Marsden Fund Te Pūtea Rangahau a Marsden.**

Dr Paul Szyszka: The olfactory cocktail party: How animals and humans segregate mixed odours

Dr Rosie Brown: Rewarding Mum: hormones supporting maternal-infant interactions

Associate Professor Stephanie Hughes and Dr Indranil Basak (Co PI): The missing link: LncRNA regulation of lysosome function in brain disease

Dr Sharon Ladyman: Neurons to keep mums cool

Dr Joon Kim: How does stress cause anxiety?

SCAN ME



Use the above QR code to explore Tinnitus with BHRC Researcher and Associate Professor Yiwen Zheng. Yiwen's project was funded in 2021 by the Neurological Foundation.

Another interesting time of change as we celebrate 50 years of funding neurological research across NZ. It was great for Dr Sarah Schonberger and I to get out and meet many scientists and clinicians at the start of August, with the South Island's Donor Relations Specialist, Kellie Bain. Sarah talked about our funding and how to be successful in your applications, if you missed it the info is on our website. We're almost at the end of our 2nd grant round for 2021, and look forward to being able to confirm funding early in December, following our Council meeting.

The lingering effects of COVID-19 have been hard for the research community. The Foundation has been working hard with our grant recipients to ensure they are able to complete their research successfully. The COVID-19 relief funding is still available, so if you haven't been in touch please contact Sarah and the team on research@neurological.org.nz for help. We have been delighted to hear back from many of you about how helpful this is for your vital research.

This year we've missed quite a number of our in person events due to COVID-19 restrictions, and we've learnt from this. Over the last couple of months we have brought researchers to more people across NZ through our online digital events series. And in 2022 we will ensure our big events always have an online part as well, just in case we have to cancel the in person part due to lock down. There is a lot on the work plan in the research space for 2022, looking at how we continue to fund the best initiatives across NZ. Hope you have a relaxing summer.

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Poipoia te kākano kia puawai | Nurture the seed and it will grow

For early career researchers, gaining the opportunity to establish your scientific independence can be difficult to say the least. Last November, the Brain Health Research Centre and the Centre for Neuroendocrinology established the Early Career Accelerator Grant specifically to support the next generation of kaipūtaiao.

The 2021 recipients sponsored were Drs Joon Kim, Teodora Georgescu, Conor Underwood and Elodie Desroziers. We touched base with several of the recipients to see how their research has since progressed.

Dr Joon Kim (mentored by Dr Karl Iremonger) built 5 units of FED3, a new device designed to dispense and monitor how much food mice consume. Joon worked with Honours student Isaac Tripp to test how motivation to seek food is altered by stress states. Data obtained from the FED device helped Joon obtain a successful Marsden Fast-Start grant.

The FED devices will also be used in the future Marsden funded research and Dr Kim says "This hands-off approach is critical for stress neuroscience research and would not have been possible without these devices and the support from BHRC+CNE.

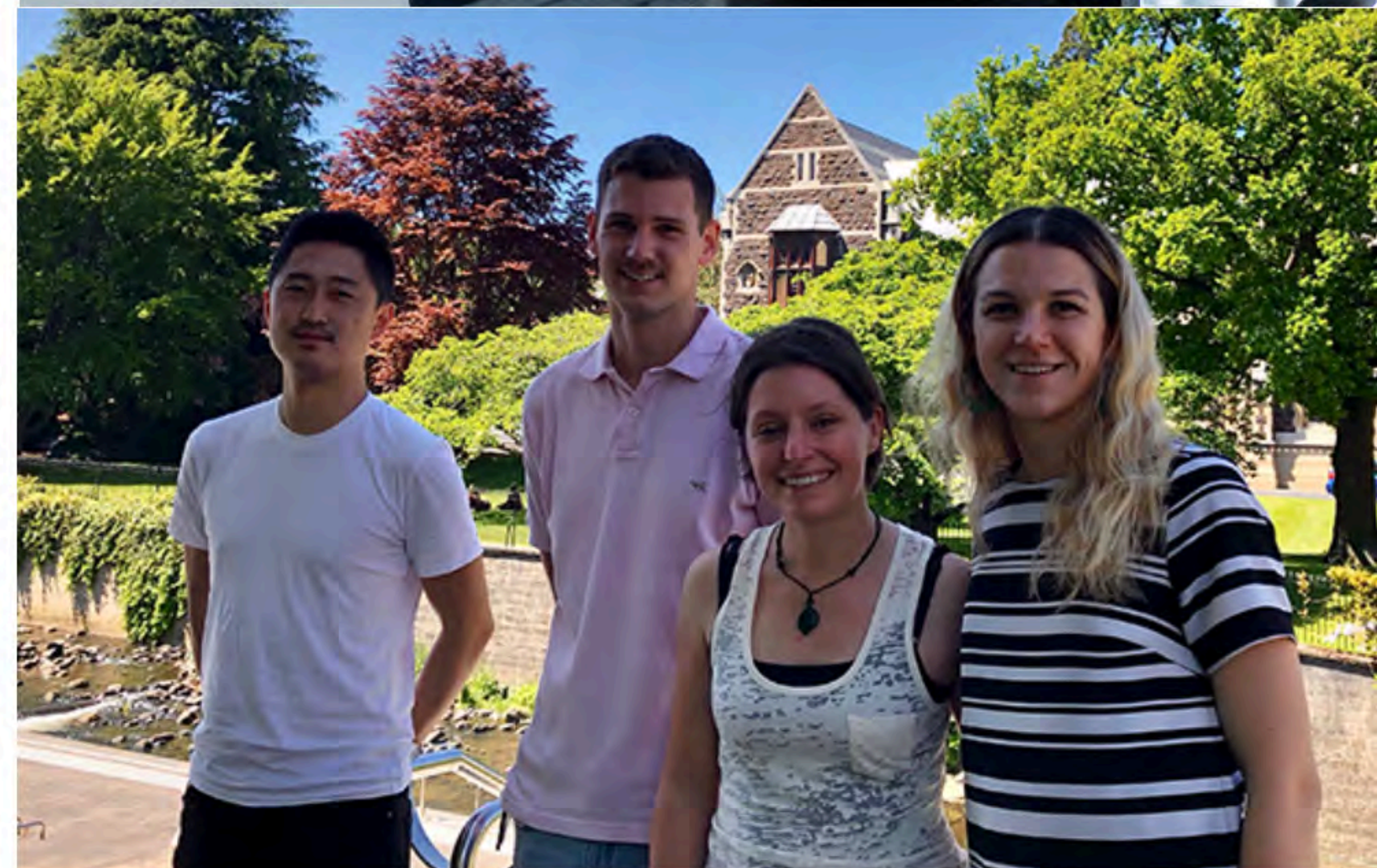
Dr Conor Underwood (mentored by Associate Professor Louise Parr-Brownlie) was able to utilise this grant to cover expenses on a project that characterises the behavioural and histological impact of gut inflammation in Parkinsonian rats.

Conor has completed behavioural analyses and concluded that gut inflammation worsened abnormal forelimb movements in Parkinsonian rats. Conor is currently working to perform a histological assessment of dopamine cell numbers and blood cytokine levels.

Dr Elodie Desroziers (mentored by Professor Rebecca Campbell) used her grant to investigate the role of prenatal androgen (PNA) excess on autism-like behaviour development in mice.

Elodie's study focused on autism-like behaviours in the PNA male and female mice, with the hypothesis that only PNA male would develop autism-like behaviours. Elodie completed 6 months of behavioural experiments and is now in the process of analysing the data she collected.

Dr Teodora Georgescu (mentored by Professor Dave Grattan) used the grant to investigate how the normal fever response is suppressed in pregnancy.



"The BHRC/CNE grant has helped me set-up an independent line of research which is distinct from current themes in the Grattan laboratory and in the Centre for Neuroendocrinology," says Dr Georgescu. She has since obtained further funding for this project from Maurice and Phyllis Paykel Trust and recently a University of Otago Research Grant.

"I have just completed the first experiment establishing the fever model in pregnant mice and will be continuing with these experiments over the next 6 months. The BHRC/CNE Early Career Accelerator Grant was therefore the catalyst for developing a novel and distinctive research path for me to lead and take ownership of."

The Early Career Accelerator Grant provides financial support to postdoctoral and research fellows, enabling them to gather preliminary data to bolster their future chances of obtaining their own research funding.

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Funding & Scholarships Cont.

Supported by the prestigious Cambridge-Rutherford Memorial PhD Scholarship, Jennifer Palmer will be studying the relationship between autophagy and neurodegeneration in Professor David Rubinsztein's lab at Cambridge University in the UK.

Autophagy not only recycles old parts of the cell, it's also important for removing damaged components and aggregated proteins. Aggregated proteins are commonly seen in neurodegenerative diseases, so it's critical to learn how autophagy is regulated. So far, there are no clinically approved drugs that can specifically target autophagy.

Jenni will study how autophagy changes in neurodegenerative disorders. Specifically, she will ask whether the autophagy regulation has gone awry, the steps of autophagy are not happening as they should, or if the components don't get to the right part of the cell.

Jenni studied the trafficking of recycling system compartments in neurons during her Honour's year and is currently extending that work in Associate Professor Stephanie Hughes' lab. She's excited to be moving across the globe for her next science adventure. "By understanding how the autophagy is regulated and how it changes in neurodegenerative diseases, we can figure out what needs to be fixed."



The Neurological Foundation awarded a project grant to Associate Professor Caroline Beck, Dr Paul Szyszka (Department of Zoology), and Professor Lynette Sadlier (Department of Paediatrics and Child Health) to study a group of rare developmental epilepsy disorders using frogs as a model organism.

While frogs don't seem to be that similar to people, most of our genes are actually the same. Importantly, the life cycle of the frog makes it easy to observe their full growth and development, including of the brain. With cutting-edge tools, it is also very feasible to edit their genes to understand which genes might be responsible for certain diseases.

Caroline and the team will recreate gene disruptions found in six Kiwi patients in young tadpoles, to study how these disruptions change the brain and give rise to epilepsy. Medicines that could potentially help with these disorders can also be tested by adding them to the water the tadpoles swim in.

While this work is in its early stages, Caroline is hopeful that they "might develop a system that can help answer some of the questions and bring together more pieces of the puzzle".

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Te marau mātauranga o te roro | Hot Topic & Emerging Researcher Presentations

Earlier this year members were treated to some illuminating discussions with some of our top researchers in our annual 'Hot Topic' and 'Emerging Researcher' seminars, sponsored by the BHRC and Society for Neuroscience.

The emerging researcher presentation 'Emotional stress as a modulator of motor system function in Parkinson's disease' was given by Dr Rebekah Blakemore (School of Physical Education, Sport and Exercise Sciences).

Rebekah is a lecturer and researcher in movement neuroscience at Otago University, who is supported by the Neurological Foundation to investigate emotion-motor interactions.

The Hot Topic lecture 'Disorganised phase coding in a rodent model of schizophrenia risk' was presented in tandem by PhD candidate Lucinda Speers and Professor David Bilkey (Department of Psychology).

Lucinda is currently working as an Assistant Research Fellow in David Bilkey's lab, where she recently submitted her PhD.

Left to Right: Dr Rebekah Blakemore ; Dr Narun Pat ; Lucinda Speers ; Professor David Bilkey



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Te whaikōrero ā-tau | Annual Lecture

For the final event of the year, we were treated to a fascinating presentation by Professor Christine Jasoni for the BHRC 2021 Annual Lecture. A poster session was also held, where BHRC post docs, PhD candidates and students shared their research with us.

Christine's lecture 'How complications of pregnancy affect brain development and function' touched on some of the key findings of the Jasoni lab. Christine's team observed that when gestation takes place within the context of pregnancy complications, a wide range of molecular and cellular changes occur in the foetal brain.

These changes can affect the process of brain development itself, as well as brain function later on in life.

Clockwise top down: Professor Christine Jasoni ; BHRC Director Associate Professor Steph Hughes with poster session winners ; Ruben Vergara Silva (Masters/Hons) ; Sophie Mathiesen (PhD); Kirstin McDonald (PDF/ARF)



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Beautiful Minds Neuroscience & Art Competition

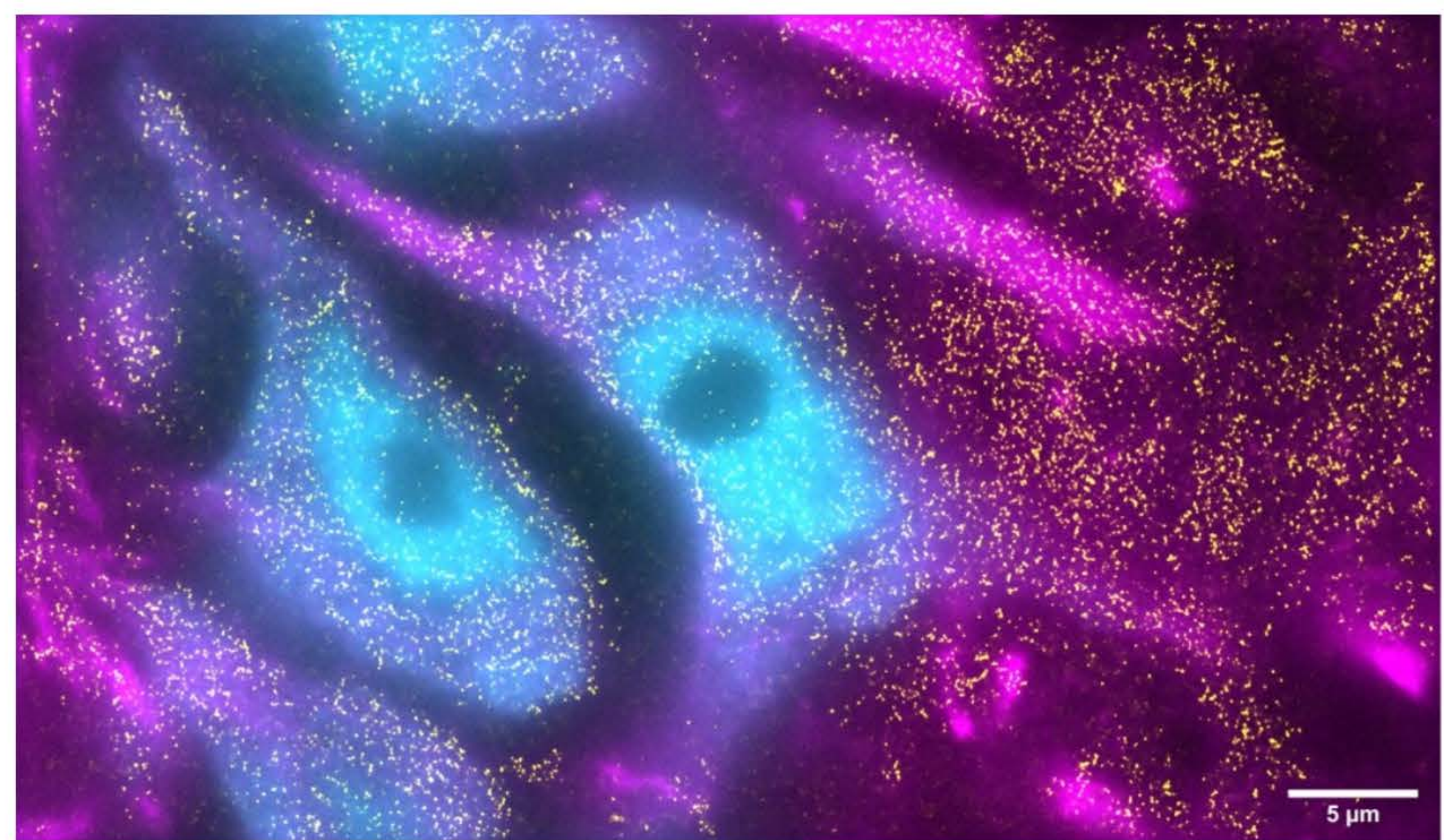
The Beautiful Minds mixed media art competition took place with the top prizes being awarded in December, thanks to the organisation from the ENG Committee and sponsorship from the BHRC.

The idea for a neuroscience mixed media art competition was hatched by the Department of Physiology's Maddy Williams. It was exciting to see the range of mediums the entrants chose to work in, with some choosing to sculpt out of old lab equipment and some knitting sweaters, digital and photographic art as well as more traditional paint and paper approaches.

The calibre of the submitted artwork was incredibly high and there was a healthy number of entries, including one from the United States.

First prize went to Ruben Vergara Silva for 'Memories of a Starry Night'; 2nd Place to Caitlin Harris for 'Electric Avenue'; 3rd Place to Ruby Weston for 'Neural Connections & Peoples Choice' went to Sophie Mathiesen for 'Celestial Dancer'.

Left to right: Ruben Vergara Silva & Oluwatobi Eboda; Sophie Mathisen. 2nd & 3rd place were presented in absentia.



1st Place 'Memories of a Starry Night' - Super resolution imaging (dSTORM) of Ryanodine Receptor 2 (RyR2) arrangement in hippocampal CA1 neurons. Pyramidal neuron soma are visualised with NeuN (magenta) and neuronal cytoskeleton with MAP2 (cyan). RyR2 is resolved to ~50nm allowing the visualisation of single, and small clusters of proteins, which are distributed throughout the soma and dendrites.



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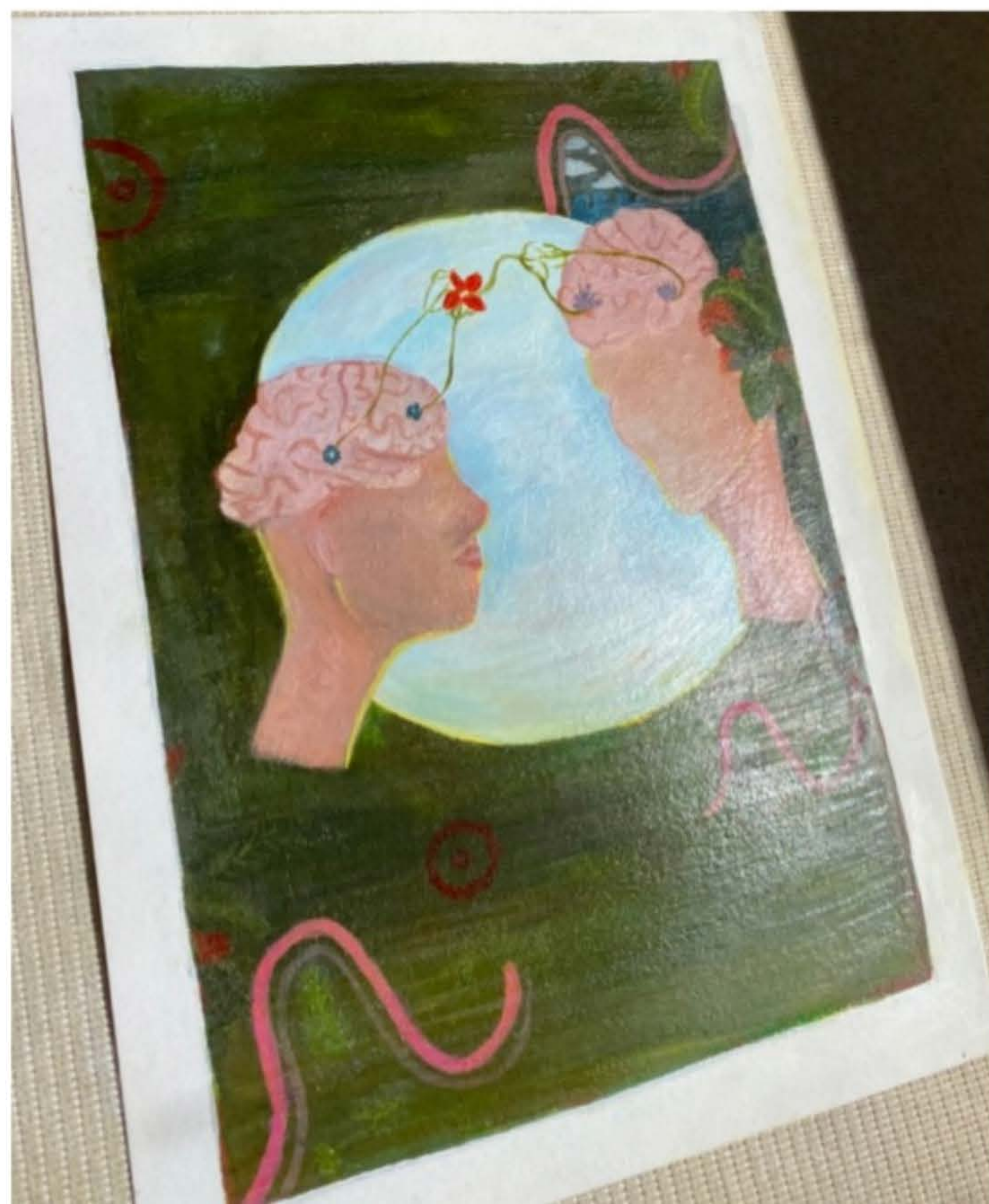
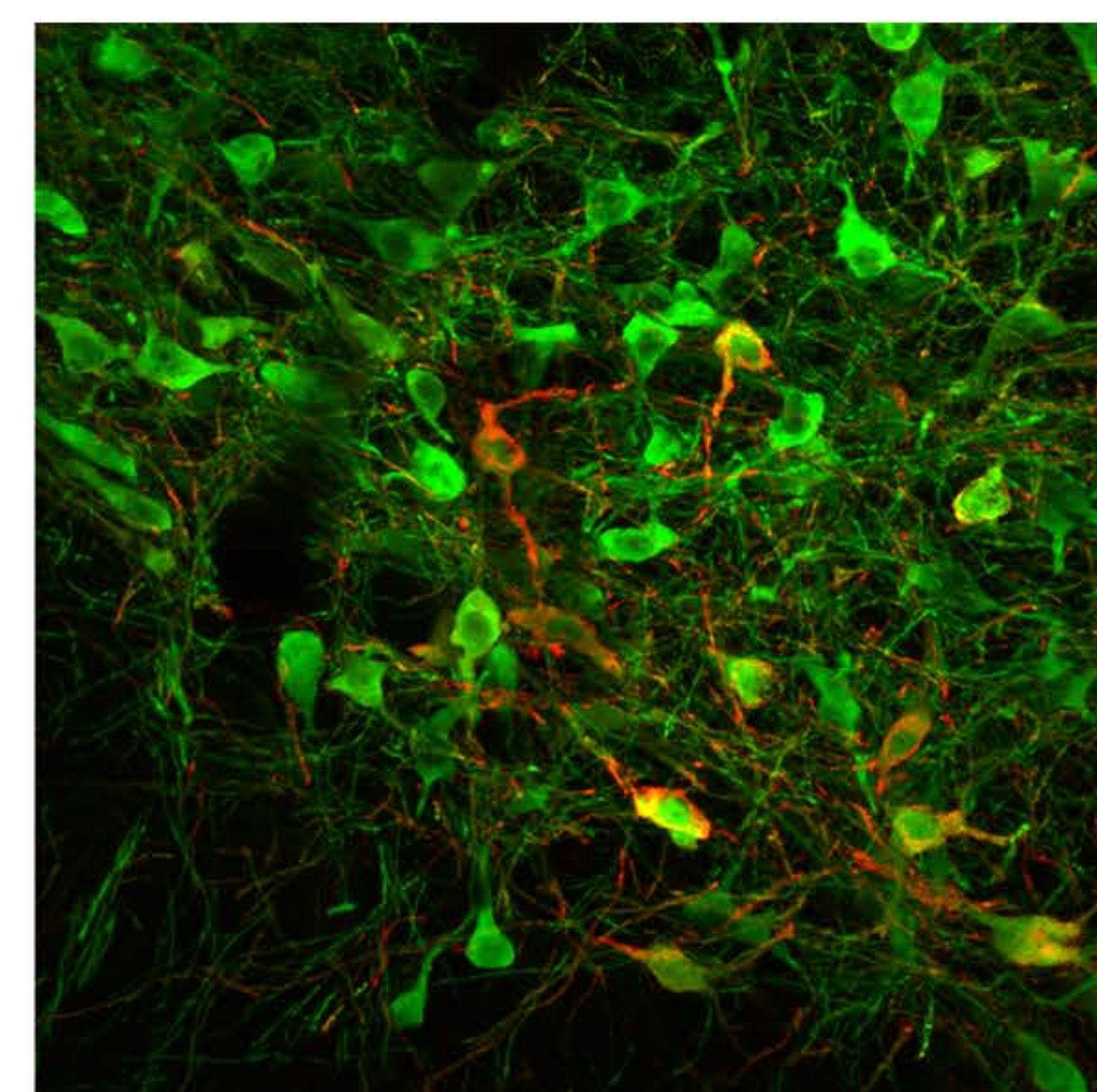
Beautiful Minds Neuroscience & Art Competition cont.



2nd Place 'Electric Avenue' by Caitlin Harris.



Shortlisted. 'Neuron Forest' by Anna Davies and 'You are not alone' by Joe Yip (right)



3rd Place 'Neural Connections' by Ruby Weston. The main ideas I wanted to portray in my artwork was the beauty behind human connections. This is represented by flowers shaped similarly to neurons connecting the two human minds. The placement of the neural flowers is located in the areas of the brain that I believe are important for human connection. The frontal lobe placement is representative of personality, which is a key part of what makes the mind so beautiful. Further, neural flower placement in the limbic area is representative to the emotional system. The pink folds located in the background are symbolic to the folds of the brain (Gyri). Nature is a key part of my piece, as observed by the khaki green tones and discrete placements of leaves. During times where we feel like our minds are not so beautiful, like when we are faced with internal battles, nature begins and aids our healing process. Circles are a common theme in my artwork too, as it reflects unity of love and connection.

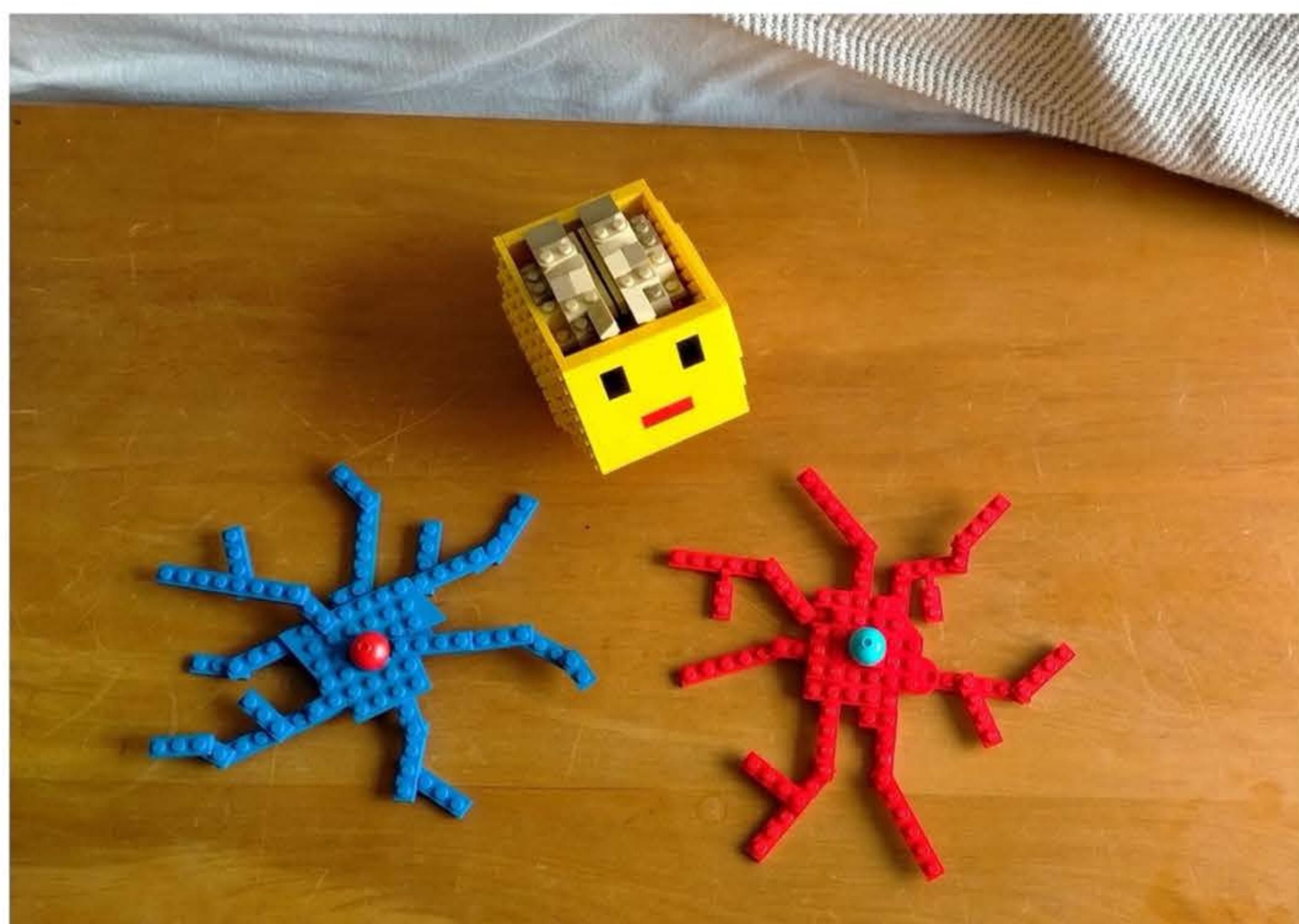
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Beautiful Minds Neuroscience & Art Competition cont.



Peoples Choice 'Celestial Dancer' by Sophie Mathiesen (above). Astrocytes, named after their star-like appearance, are an underappreciated type of support cell in the brain. When studying brain tissue, fluorescent markers can be used to highlight cells so they glow under the microscope. Astrocytes have curving projections (arms) coming from their centres which make them look like radiant star dancers when they're stained gold.

Honourable Mentions. 'Labzilla' by Gabi Dachs

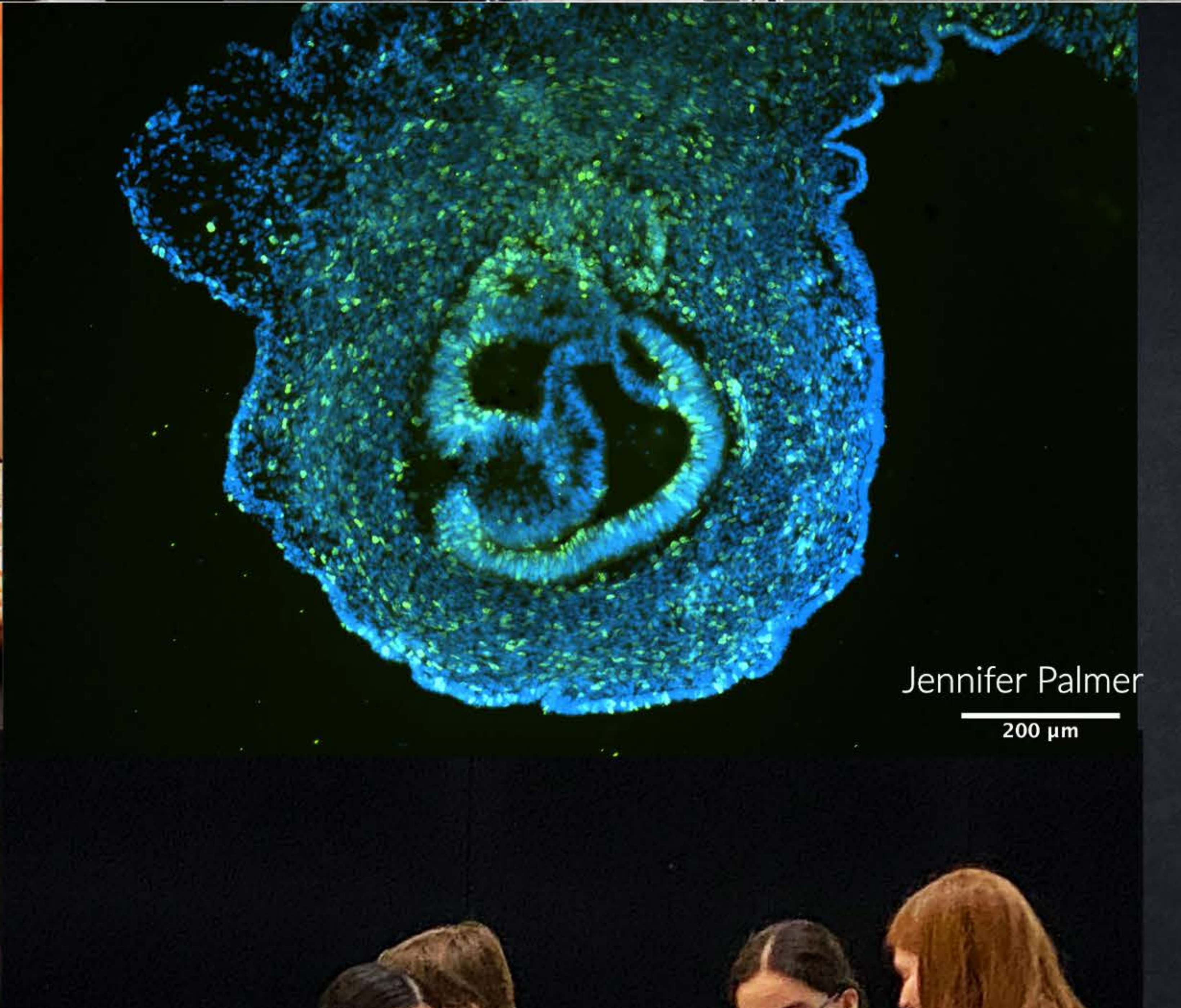
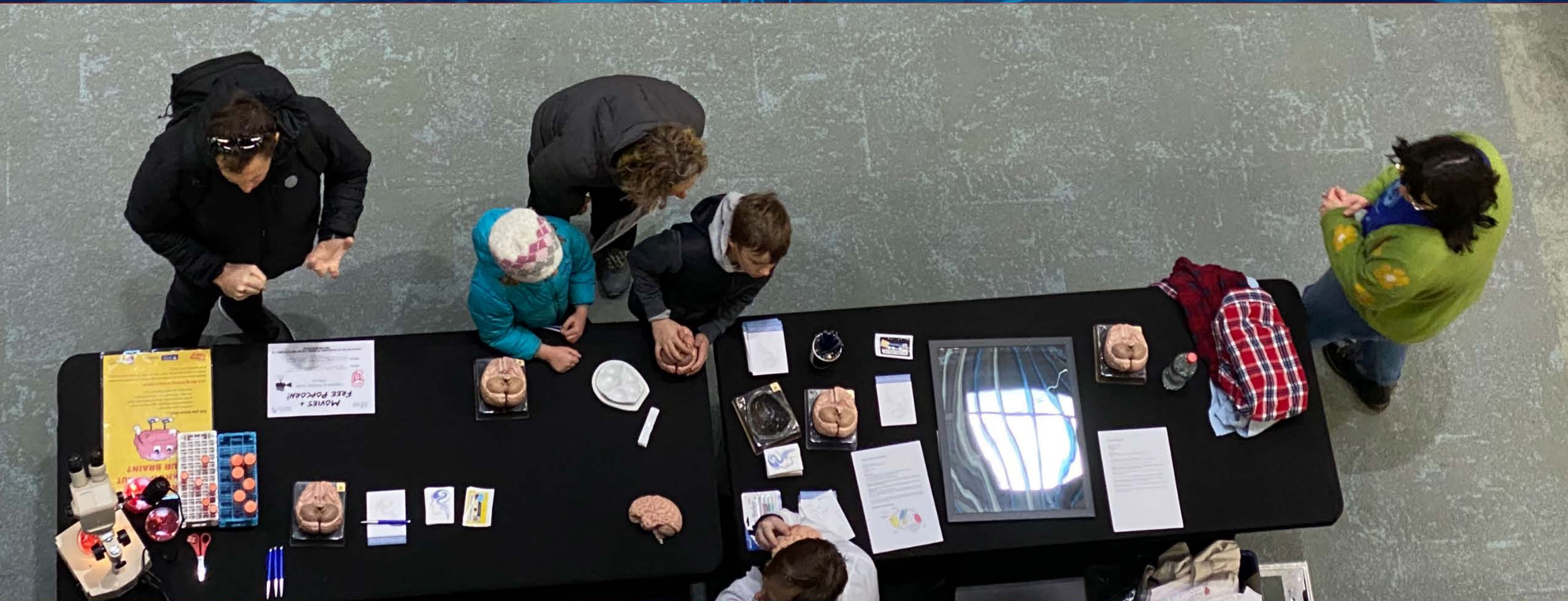


Honourable Mentions. 'The Lego Brain' by Oliver Brown (left) and 'The Neurons that keep us warm' by Sharon Ladyman (below)



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Our year in pictures



TE WIKI O TE REO
MAORI 2021

Roro ikura

STROKE

Brain Health
Research Centre
Te Pokapū Rakahau Hauora Hinekaro

TE WIKI O TE REO
MAORI 2021

Pūnaha ioio

NERVOUS SYSTEM

Brain Health
Research Centre
Te Pokapū Rakahau Hauora Hinekaro



TE WIKI O TE REO
MAORI 2021

Te Roro

BRAIN

Brain Health
Research Centre
Te Pokapū Rakahau Hauora Hinekaro

