PINT OF SCIENCE presents:

Creative REACTIONS

Cambridge UK
May24th & 25th 2019

Welcome to Creative Reactions 2019

St Barnabas Church, Mill Road, Cambridge
24th and 25th May 2019

We are proud to present the fifth Creative Reaction science-art exhibition with works made in a plethora of media, where local creatives have responded to the speakers from the Pint of Science talks.

Pint of Science is a global phenomenon, founded by two scientists, Michael Motskin and Praveen Paul, who wanted to create a platform where the general public could learn about groundbreaking science in a more informal and accessible way, in the pub! Talks happen over three nights in May, all over the UK and internationally.

Creative Reactions was formed when a group of scientists and artists got together and thought it would be amazing if creatives could meet with the scientists from the Pint of Science festival, and make some work in response to their specialism. In the last few years, the brainchild of Armando Carlone, Stan Strawbridge, Karen Jinks and Mandy Knapp has produced some truly innovative work that communicates the beauty of scientific research through the lens of the creatives's visionary mind.

Like Pint of Science, Creative Reactions is only possible thanks to lots of volunteers working tirelessly behind the scenes, recruiting artists and scientists, making the matches come together, fundraising and shaping every edition of the festival with their own creativity. We cannot thank them and the artists & scientists enough for committing their time and effort to this unique collaborative effort between sciences and arts.

Each of the artworks you can enjoy has been made after the scientists have given their time to their appointed creative, who have a steep curve in grasping the content in a short amount of time, and making their own interpretation on it. You will find information next to the artworks, describing each artist's take on the science, in a wonderful range of media.

We hope you enjoy the immediacy and vibrancy of the Creative Reactions.

The Pint of Science Cambridge coordinators:

Domna-Maria Kaimaki

After completing my PhD in Cambridge, I have now moved to Imperial as a postdoc in Bioengineering. I investigate the contact mechanics of complex interfaces; in particular how biological systems can tune their adhesion. I also love dancing, cooking & DIY.

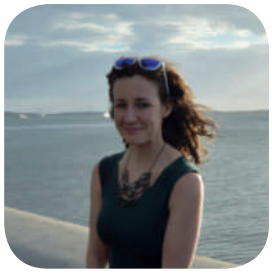
Bao Xiu Tan

I am a PhD student in stem cell biology exploring how physical factors of the extracellular environment affect stem cell behaviour. When I'm not in the lab, I like to sketch, dance, and spend time outdoors.

Creative Reactions team:

Margherita Gallieni

With a background in Environmental Architecture and a keen interest in historic buildings, art and sustainability, I am currently working in the architectural practice in Cambridge. I look forward to explore ways to engage everyone with the art and science relationship!



Lizzie Gill

I am a tissue engineering PhD student researching how to grow cells in a realistic way outside of the body using 3D printing. Science and art thrive off each other. I am looking forward to engage and discuss science from an artistic standpoint.

Colleen Rollins

I'm a PhD student in Psychiatry studying how the structure & function of the brain supports hallucinations in schizophrenia. Academics aside, I practice life drawing, acroyoga & rock climbing. I'm excited to help integrate art & science!

Helen Kenny

I'm a Cambridge based artist specialising in painting and printmaking. It is surprising where creative inspiration can spark from and I value the rich communication between artists and scientists offered by Pint of Science. I am excited to be part of this year's Creative Reactions team.

Chun Hao Wong

I am a postdoc at the MRC Laboratory of Molecular Biology studying the activities of microtubule motor in cells. Very excited to see the crosstalk between science and arts!

Laura Marsh

I moved to Cambridge in October to start my PhD in cognitive neuroscience. I study the dynamics of memory retrival in depression, and how this may contribute to biases in what we remember.

The Artists

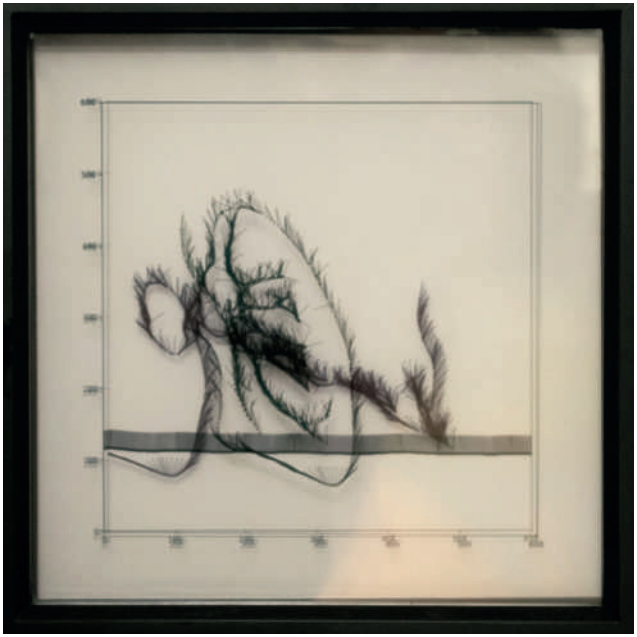
Over 50 artists were paired with local scientists who were taking part in the Pint of Science Festival and covered the following themes:

Creative REACTIONS

PINT OF SCIENCE

www.pintofscience.com

CILIA WAVES IN THE LUNGS
WHERE PHYSICS MEETS BIOLOGY



Metachronal waves *(left)*

Inspired by the idea that interactions between minute individual components result in collective behaviours which are vital for life this piece is based on a simulation of interacting objects. Driven by motion through illustrations of various biological structures which require the beating of cilia - the lungs, the brain, the human - the 'cilia' decorations arrange themselves into patterns and waves according to simple interactions between themselves. The piece is presented as a set of snapshots printed onto acetate, reminiscent of the traditional microscope slide and imaging techniques.

Created by:

Pietro Cicuta

We can breathe in dusty environments, without being infected by the bacteria that we inhale. This is thanks to a carpet of microscopic and active filaments in our airways, the cilia. Some people have diseases that affect this important function but even in healthy people, it is not clear how the cilia manage to coordinate their beating. This feature is key: imagine the difference a good cox can make to a rowing crew. This talk will take you through the physics of synchronisation to figure out how cilia manage to spontaneously coordinate their dynamics to form long range waves of rowers.

Research inspiration:

Andrew Berridge

Andrew worked as a postdoc in theoretical physics before switching to data science. At the same time he has developed his artistic practice. Primarily interested in portraiture and figure drawing he usually works in charcoal and oil paint.

Atoms to galaxies

NEW VIEWS OF THE COSMOS

Shedding Light *(left)*

I was fascinated to find the principles used to understand the universe in a way parallel the processes I use in my own work.
Layers of information are used to build up an overall picture, vast arrays achieve better precision and more detail than a single point of view, the complete spectrum builds up a richer picture and the deeper you look, the further back in time what you are looking at has happened. As in printmaking, what is missing is important, with light being blocked or distorted by materials from gases and dust through to black holes. For this project I decided to work digitally to match modern astronomy, building up layers to show a complete picture.

(right) **Sifting Light**

Research inspiration:

Carolin Crawford

Astronomers depend on light for their understanding of the Universe beyond the confines of the Solar System. Many of the most exciting discoveries over the last couple of decades were made possible by new generations of cameras and telescopes, both on the ground and in space. Carolin will discuss some of the innovative new facilities coming online over the next ten years or so - how they'll not only change our view of the cosmos, but also alter the way we do Astronomy.

Created by:

Helen Kenny

Helen Kenny, a full-time artist working in a range of media, gained her BA in Fine Art at The Ruskin, Oxford University. Her work explores a balance or tipping point, expressing an unseen harmony or relationship. Her art is held in collections across Europe.

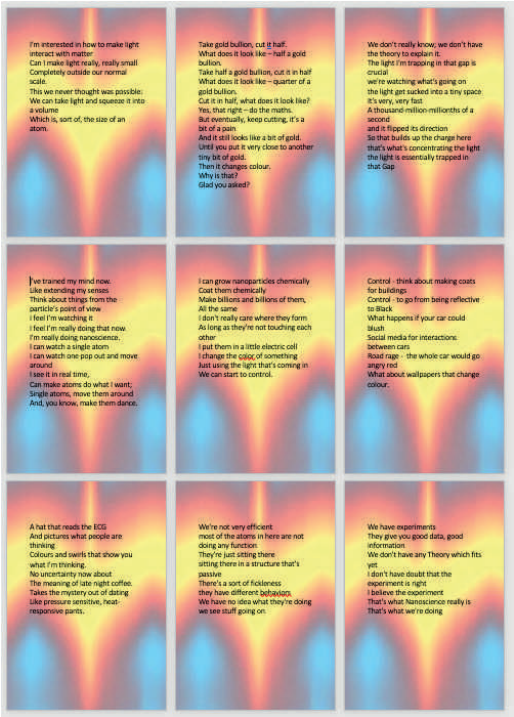
CAN WE SEE A SINGLE ATOM WITH OUR NAKED EYE? IS SEEING BELIEVING?

(right) **Untitled**

Its not science (what we know) that interests me, but how we know it, and how the peculiarities of science practice alter perception of common and uncommon events.

NanoNano is a reaction to meeting Jeremy Baumberg. Jeremy feels he sees atoms, a common delusion among nanoscientists, mediated by the extraordinary instruments which translate their perceptions and communicate with Jeremy through his eyes. He also sees cars that blush, embarrassed at having cut up another vehicle.

Five seconds places the protein-identifying machines being built at Fluid Analytics in the context of our crude acts of democracy. Thanks due to Sophie and Maia who work with Tuomas Knowles.



Created by:

John Hodgson

I draw pictures with words and present science through common experience. Apprenticed in flexible perspective, I get my head inside the jar and lick out the crusty bits. Given time, they re-emerge on paper as poems, spoken thought, audio outlines, and word-based art.

Research inspiration:

Jeremy Baumberg

I'm going to chat about how we believe science at the smallest scales when we often need to use tools that extend our senses. When do we believe and what does seeing mean? I will talk about experiments with light in the world of atomic- and nano-science, and some of the strange and fantastical possibilities opening up.

Atoms to galaxies

BUCKY THE NANO BALL AND OTHER STORIES

Very, very small *(left)*

The work comprises a wooden display case showing a collection of images and words taken from a recent talk by scientist, Dr Ljiljana Fruk, which gave a beginner's guide and historical introduction to Nano-science. The talk was my introduction to Nano-science and I was immediately struck by the visual appeal of nano's - intriguing and often so beautiful. How could I do them justice with an art piece?

'Very, very small' is a playful response to Ljiljana's talk where it is only if you look very, very carefully that you can learn something about nano's. The presentation is reminiscent of a taxonomy collection where the subject displayed is given an accessible platform by being placed in a glass topped cabinet such as was used by early natural scientists. For me, it evokes those pioneers of science of previous eras. Although we have known about nano-particles for some time, it is only relatively recently that the technology has been available to capture them visually and to use them innovatively. As the nano-particles become more apparent to us, the possibilities for their application appear to be only just opening. This piece attempts to contain the rapidly growing subject matter in a manageable collection, which further echoes a curiosity cabinet where tantalising objects may be placed. 'Very, very small' asks you to look very, very carefully, supporting a visual access to those outside the science community to enjoy and appreciate its visual artistic appeal.

Research inspiration:

Ljiljana Fruk

A search for molecular origin of life led to discovery of the ball-shaped molecule that became a poster child for nanotechnology: beautiful, made of carbon, with an ethereal symmetry. But there are other nano-sized materials out there that are slowly changing the face of technology. Not always symmetrical nor made of carbon, they are used to design smarter drugs, detect diseases, improve efficiency of chemical reactions, harvest energy, and make stimuli-responsive materials. This talk will take you on a trip from stardust to the cell with the help of occasional chemical formula.

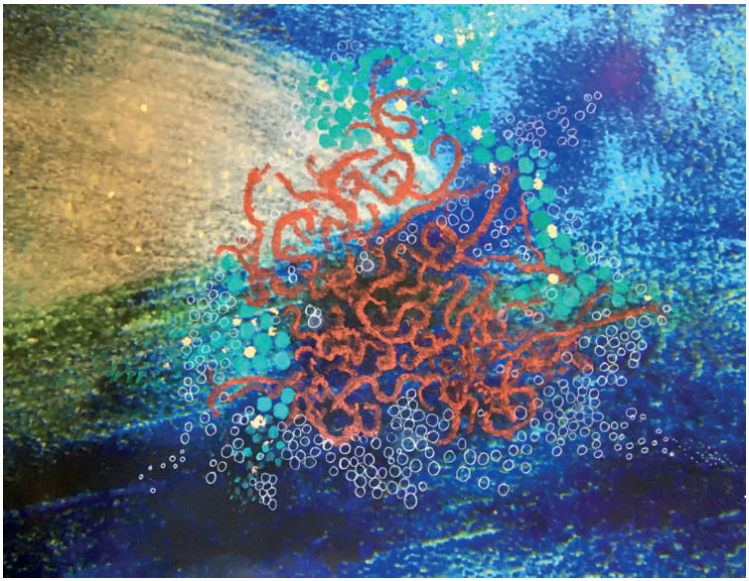
Created by:

Susie Johnson

Her artistic interests are diverse but always circle back to interlink as recognisably belonging to a set at some level. Her works often involve exploring simple elements to create new associations, complexity and dynamism. She revels in dissembling order, diverting paths and offering choices. Exploration of the elemental drawn line has under-pinned many of the works; how we manipulate this artificial device to relay information through readable forms is a key theme. The use of other media, including sculpture and prints, develops simultaneously along parallel paths and her projects often embrace language.

(below) **Nanoparticles v TB**

In the lab nano-particles look beautiful but static. We see them under a slide or frozen. I have tried to create a dynamic, cheerful landscape where the Mycobacterium tuberculosis is being engulfed by the nano-particles delivering their life saving cargo. This work began as a basic mono-print. A small section was photographed using a macro lens, I then enlarged that image to 594mm x 841mm. This has created a bright landscape onto which I have continued to print and paint to complete the image. The use of gold leaf is pure artist licence, as Iris creates her nano-particles out of a polymer and not gold, but I could not resist.



Created by:

Georgina Forbes

My practice combines painting and printmaking. I approach creating images as therapeutic play. This helps me be less self-conscious about what I make. Much of my work is about where I am and where the piece takes me through the creative process.

Research inspiration:

Iris Da Luz Batalha

Nanotechnologies find countless applications in the healthcare setting for the diagnosis, monitoring, prevention and treatment of diseases. Despite still facing some technological and regulatory challenges, nanomedicines can provide benefits to patients and have found their way to clinical practice (e.g. for the treatment of cancer, multiple sclerosis, schizophrenia, and so on). In this talk, I will give an overview of the current scenario of this revolutionary technology and present some of my own research in the field of antimicrobial nanomedicine.

Beautiful mind

FORGET ME NOT: NEW WAYS TO IMPROVE MEMORY PROBLEMS IN DEPRESSION

This is only a test *(left)*

People with depression often experience memory problems or difficulties in making decisions. A major challenge is that such problems tend to be persistent and clinicians cannot offer enough help due to a lack of treatment options. In my talk, I will discuss the ways to approach this challenge with a particular focus on Modafinil, a wakefulness-promoting drug that has the potential to improve memory and decision-making in depression.

Research inspiration:

Muzaffer Kaser

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Created by:

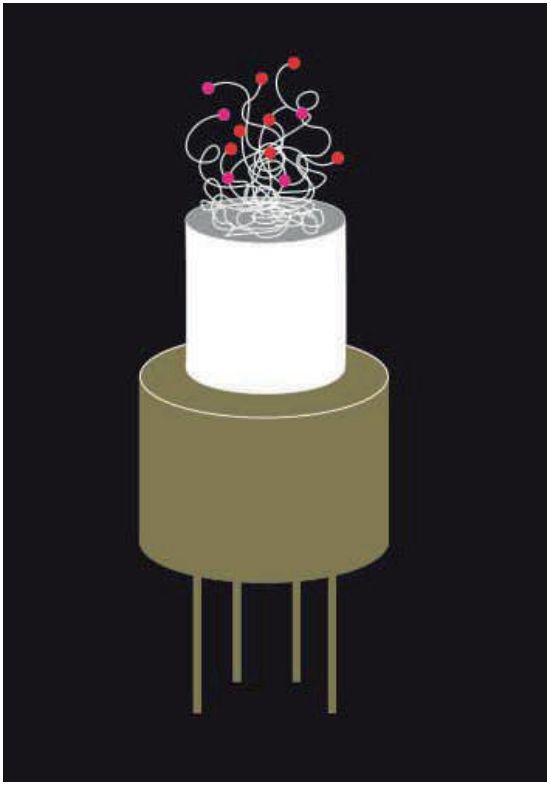
Alan Rogerson

This is my image for the Pint of Science talk and my headshot. It is a real photo.
My bio these days is normaly
“I draw things”
Which is the most accurate description of what I do.

THE HALF-LIFE OF HUMAN ALTRUISM

(right) **A taste of altruism**

Gold represents wealth and power. White, purity, simplicity and the human soul. Red and pink, kindness, love and altruism. The intertwining wires are an expression of viral connectivity. In many cultures and countries, food is an expression of love. In my native country, Spain, food is central to friendships, family and society. It forges relationships and like viral altruism and social media encourages communication and builds stronger communities and relationships. Cake in particular is associated with celebration and is often the centre piece of a gathering. Through work with charities and campaigns, I have experienced first hand the power of social media to spark viral altruism.



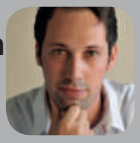
Created by:

Martina Ann

Following graduation from the Superior School of Art and Design in Spain, Anna worked as a fashion & textile designer for well known high street brands. Upon moving to England she reinvented herself as a cake decorator and events organiser. After working for Fitzbillies she set up her own business, Martin Anna, in 2011.

Research inspiration:

Sander Van der Linden



Societal altruism is changing. Increased awareness and use of online social media is providing new ways of inspiring collective action and support for critical societal challenges. What makes some social causes go viral while others never seem to take off? In the era of online social media, network contagion effects allow social causes to reach a large number of interconnected individuals fast, efficiently, and at low cost. Understanding the nature of online altruism and its core behavioural characteristics can help us sustain positive social change.

Beautiful mind

THE MYSTERIOUS LIFE OF MEMORIES

HOW OUR LONG-TERM MEMORY FUNCTIONS AND CHANGES

Recall 2 *(left)*

My print was inspired by the notion of an open or organic mind, challenging the filing cabinet perception. In photographs of synapse in the brain, blue chaotic lines appear and light up. I liked the idea of searching the mind for past events, some of which are vague or changed as time passes and our experiences effect perception, 'the mysterious life of memories'. Images can appear in the mind when recalling images and I wanted to give a lightness and transient feel as in long term half-forgotten past memories. Layering blue inks to produce a misty feel by using organic materials and objects, seeds leave white 'lit' areas and were hand finished to glow as synapse or fireflies? of the mind.

Research inspiration:

Andrea Greve

How come we sometimes forget what we really would like to remember, we remember what we desperately try to forget and sometimes even remember what has never happened, at least not in the way we remember it? To address these questions I will explore the neural and psychological basis of how long-term memory works, which challenges the popular view of a 'filing cabinet' filled with individual memory folders. I will examine different strategies to improve memory and discuss how our prior knowledge can enhance learning of new information throughout life.

Created by:

Linda Bartlett

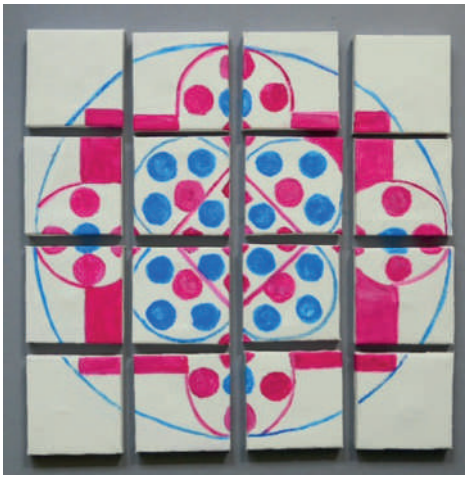
I have always loved art, particularly colour and it's impact in the emotions. Studied Fine-art Printmaking at ARU, became art tutor (challenging and stimulating). Recently refreshing my love of medium of print and also a silversmith/jeweller in the Cambridge Open Studio.

Beautiful mind

WHAT DID YOU JUST SAY? WHY SHORT TERM MEMORY IS IMPORTANT FOR CLASSROOM LEARNING

(below) **Intui-gration**

This piece is made in response to Dr. Joni Holmes (Head of the Centre for Attention Learning & Memory, MRC Cognition & Brain Sciences Unit) and her work on short term memory in the classroom. Intui-gration is a perfect image taken form a set of mystical cards. Then made into a set of imperfect shapes and brake it down to something completely different from what the image initially looks like. A participatory piece that invites you to recreate the original image, where all images can be the image. Can you remember?



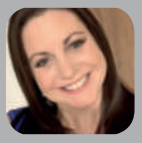
Created by:

Loreto Valenzuela

I am a visual artist I use different mediums depending on the idea, subject of exploration. The main focus of my work is participatory art that respond to moments in movements. Movements

Research inspiration:

Joni Holmes



There are many reasons why children fall behind at school. In this talk I will discuss how problems with short-term memory are often mistaken for problems paying attention and explain how memory problems impact on classroom learning. I will also discuss the importance of moving away from labelling children to understanding why they are struggling.

Beautiful mind

THE BRIGHT LIFE OF FORGETTING

(left)

Memories of Cambridge

A tourist's memories of Cambridge using my urban sketching style. Memories are selected and encoded when taking photos. Undesirable elements, such as the rain, are ignored. And where are the crowds at Kings Parade? When the tourist retrieves the memories later they are put together to create a false recollection of the whole.

Overlapping ideas *(right)*

Thoughts and ideas develop over time, building upon and overlapping each other. Older ones may be pushed to the back and become indistinct. The text is written in Japanese ink and is reminiscent of Japanese script (I hope) but is all invented.

Research inspiration:

Maite Crespo-Garcia

We are commonly concerned about losing mnemonic faculties with aging and are afraid of becoming amnesic as a result of dementia or Alzheimer disease. From this standpoint, forgetting is seen as an unfortunate happening caused by failures in retention and pathologies, or in normal cases, by the passage of time. However, neuroscientists are unearthing active processes in the brain that trim our life memories, with beneficial consequences for mental performance and wellbeing. Some of these mechanisms can be triggered at will, by controlling the content of our awareness.

Created by:

Nick Tischler

I am a sound healer and urban sketcher. Sound healing slows brain waves to induce relaxation and can release painful memories. So Dr Crespo-Garcia's work on motivated forgetting is of great interest and sketching provides a means to interpret it.

BIG DATA OR BIG BROTHER? THE ETHICS OF BIG DATA PSYCHOMETRICS

(below) **Life drawing in a digital age**

Created by:

Roxana de Rond

Roxana de Rond enjoys illustrating the familiar and everyday, making them more than ordinary. Her images are often humorous, set in Cambridge and produced as 3D images, prints and cards.

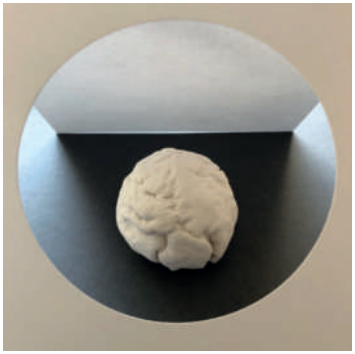
Research inspiration:

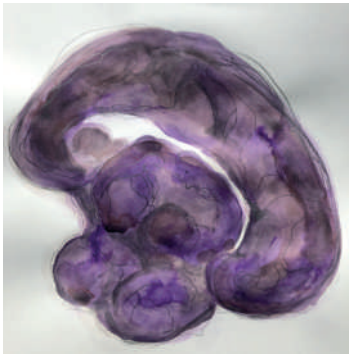
David Stillwell

Many researchers, including myself, have published papers showing that psychological traits like personality and intelligence can be predicted from the digital footprints people leave behind when they use digital services like social media. Should this capability be used in practice, and if so under what conditions? The Facebook Cambridge Analytica scandal clearly demonstrates that the public is uneasy when they feel their data was misused, but on the other hand the public also likes their data to be used to personalise recommendations and services.

Our body

HOW ORGANOIDS ARE SHAPING OUR UNDERSTANDING OF HUMAN DEVELOPMENT





We all want to be something *(left)*

Inspired by the concept of brain organoids, the development of a structure has been explored through art materials and processes.

Neural organoids are unique forms. They are similar to, but not the same as, different parts of the human brain. They are developing structures. Incomplete and seemingly unpredictable. The stem cells which give rise to the structures are embedded with the information required to make a complete structure - if given the right environment.

The images of cerebral organoid from Madeline Lancaster's lab have a fluidity to them. And so does ceramic slip. As does ink on paper. It is this fluidity in relation to structure that is explored in my "making brains".

As an analogy, ceramic pieces develop spontaneously from a small amount of clay. Starting from a blob of indistinct ceramic slip, they are part dried, then gently stretched and moulded until forms resembling brain structures appear. Each one develops differently. The environment of the clay dictates where it stretches and how it bends, where addition, compression and removal can take place. Some of the shapes resemble small brains and others remain in their most primitive state.

In speculative drawings, ink is pushed over paper. As water is added along with graphite and additional colours, forms begin to develop organically with the flow of the ink.

Research inspiration:

Dr Madeline Lancaster

One of the best ways to understand how something works is to figure out how to build it. The same is true in biology, and when it comes to the human body, advances in the budding field of organoids are allowing scientists to build miniature organ-like tissues to study how our organs develop and mature.

Created by:

Charlotte Morrison

Charlotte has a background in both psychology and fine art. Her experience as a therapist regularly informs her visual work. She has an MA in printmaking from ARU and has done post-graduate studies in glass at Central Saint Martins. In recent years she has undertaken art residencies at local institutions, and she has worked in collaboration with a variety of scientists from Cambridge on short projects combining art and science.

FROM ONE TO MANY: HOW YOU DEVELOPED FROM A SINGLE CELL

(below) **Genesis**

Isn't it fascinating how similar all creatures start their life cycle? From one tiny fertilised cell we all develop into an embryonic state, just to be born into this world shortly after as completely different looking and behaving beings. The creation of life is one of the most unbelievable procedures and probably one of the most analysed as well. And there are still so many fundamental questions open!

Based on Dr. Tim Weil's talk and research around "How one cell becomes a trillion celled animal - Life before, and after, fertilisation" I created this artwork showing the diversity of species that all develop from one single origin cell.

Created by:

Karoline Leopold

I'm Karo, I am a freelance graphic designer and illustrator with a passion for animals, people, travel, old buildings and urban sketching - simply creating! After working many years for different agencies in Germany, Spain and England I graduated from a master in children's book illustration at Cambridge School of Art in 2015 and started to work as a freelance artist.

Research inspiration:

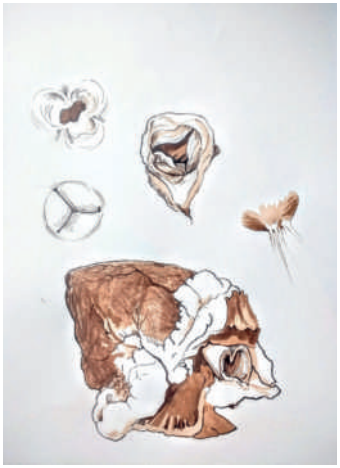
Dr Tim Weil

For centuries people have been pondering and exploring how a single cell can divide, differentiate and eventually develop into a highly organised and fully functioning organism. During early development, when an egg or embryo is first being organised, many signals are expressed in a highly controlled manner. How does the egg break symmetry? How do groups of cells communicate? Why does the head form at the opposite pole as the tail?

Our body

HOW TO MAKE A PROSTHETIC HEART VALVE

Anatomical drawing of an Ox's heart, aortic valve and cordae tendinae



(left)

In my attempt to understand the functioning of the human aortic valve, which inspired the polymeric prosthetic valve developed by Prof. Moggridge and his team, I encountered time and again references to Leonardo Da Vinci's anatomical drawings. Leonardo understood and depicted with astonishing precision the heart and its valves, influencing later studies in anatomy and physiology. He also created a glass model of the aorta by injecting an Ox's heart with wax to study the vortices formed by fluids. A precursor to the modern machines testing the durability of the polymer valves in the Cambridge lab, which I had the privilege to visit.

Starting from where it all began, I secured a couple of Ox's hearts from my local butcher. Using wax injection (referencing the injection moulding of the polymer) did not prove practical, besides the valves would not have been visible. My attempt at using resin failed too, as I could not mimic the pressure and flow of fluid necessary to keep the valve leaflets tightly closed. This experience gave me a new understanding of the genius of Leonardo and of anatomical drawing as the perfect embodiment of scientific observation and artistic draftsmanship.

Research inspiration:

Prof. Geoff Moggridge

NHeart valves allow blood to flow out of the heart when it contracts, but prevent it flowing back in when the heart refills with blood. A million people in Britain suffer from heart valve disease and the only effective treatment for severe valve disease is replacement. Prosthetic heart valves are life-saving, but current models are imperfect. Could a polymeric prosthetic valve provide a better option in the future?

Created by:

Tonka Uzu

I'm an illustrator and children's book author based in North Cambridge. I love observing and drawing people and animals. Probably because of this I have always been very interested in psychology and biology. I love learning new things and alongside my illustration career I have worked as interpreter and translator, in an art gallery and for two academic publishers. Besides book illustration I enjoy devising art workshops, creating postcards and working on private commissions.

IS OBESITY A CHOICE?

(right) **Is obesity a choice?**

In collaboration with Dr. Giles Yeo and his study on the effects of genetics on food intake, I have produced a series of 36 small, visually unique illustrations.

Initially, I used mono and dry-point print methods to explore a range of imagery including; DNA, DNA sequencing, chromosomes, the human form, the brain, healthy and unhealthy food. I then began to layer other relevant imagery and text to the small compositions using photo-screen, Citra-Solv transfer and collage art methods. The intention was to illustrate aspects of Dr. Giles Yeo's research and to encourage the audience to make connections between the subjects presented. Included, are both normal and obese adipose cells, a depiction of a St John's Water dog, noteworthy for carrying a genetic variation which could pre-dispose them to a greedy nature and weight gain. A picture of a naturally occurring obese mouse that eats excessively due to mutations in the gene responsible for the production of leptin and duplications of the human form, symbolising heritability studies carried out on twins.

Created by:

Maria Merridan

Maria Merridan studied Illustration at Kent Institute of Art and Design and more recently completed the Certificate in Printmaking at Curwen Study Press, Cambridge. She now lives and works as an artist in Cambridgeshire and is a part-time Lecturer in Art and Design at a local college. Her fine art works are often inspired by the themes of science, natural history, navigation, weather and journeys. Maria also produces contemporary, hand-made cards and other work under the name 'Coded Storm'.

Research inspiration:

Dr Giles Yeo

The obesity epidemic is a growing healthcare concern in many countries. While this is undoubtedly related to changes in our lifestyle and in the types of food we eat, differences in our genes also play an important role. Our genetic make-up means that some of us are slightly more hungry than others all the time, and therefore tend to eat more. In contrast to prevailing views, obese people are not bad and lazy; they may, in fact, just be fighting their biology.

Our body

HUMAN BLOOD STEM CELLS: DIVERSITY IS GOOD FOR YOUR BLOOD

Future Possibilities *(left)*

My piece was inspired by Dr Elisa Lauranti's complex research into stem cells. Having seen incredibly detailed and beautiful electron microscopy images in her laboratory, I was reminded of structures repeated throughout nature.I have tried to incorporate this in my version of the haemotopoietic stem cell tree. Gold leaf has been used to highlight the elusive and multipotent stem cell, with it's many therapeutic possibilities.

Research inspiration:

Dr Elisa Laurenti

Blood stem cells produce all blood cell types throughout life, including red blood cells that transport oxygen throughout our body and white blood cells that help us fight infections. Blood stem cells are very rare, but they have immense regenerative potential. Not all blood stem cells are equal, and there are different subtypes that contribute differently to daily blood production. In this talk, I will discuss our current understanding of how diversity in blood stem cells maintains blood formation in healthy conditions and under stresses such as inflammation, blood loss or transplantation.

Created by:

Caroline Henricksen

I've had a love of drawing from an early age. I studied graphic design at Middlesex University, specialising in scientific illustration. On graduation I worked on medical and botanical commissions for a number of years, including the British Heart Foundation, Hunterian Museum and was lucky enough to be feature on BBC Countryfile last year painting outdoors. I also teach drawing and painting at the Cambridge University Botanical Garden.

WHEN IT'S 'GOOD' TO BE 'BAD'

The Ketogenic Packed Lunch

(right)

My piece 'The Ketogenic Packed Lunch' is based on the research of Dr Michelle Webster. It aims to illustrate the use of high-fat diets to manage drug-resistant childhood epilepsy. So a typical packed lunch vs a Ketogenic pack up for a child with the condition. Some people may view these Ketogenic foods as unhealthy but in fact they act as medicine for the child to help control the condition. It is digitally painted and already has an owner.

Created by:

Rich Gemmell

Originally from Chester in the Northwest, I currently live with my fiancee and two cats in the Cambridgeshire countryside.
I work as full time Graphic Designer and Digital Artist & have illustrated for The Guardian, Sunday Times, Brussels Airlines, Hodder publishing house and many others.

Research inspiration:

Dr Michelle Websters

Culturally, certain foods are characterised as 'good' and others as 'bad', and these connotations are often transferred onto the people who consume them. In our culture, we tend to view people as 'bad' for eating high-fat and high-sugar foods, and 'good' for consuming healthier options. For parents, such judgements extend to the food choices made on behalf of their children. So what happens when children need to adopt high-fat diets to manage a drug-resistant disease?

Our body

THERE WILL BE (AN APPROPRIATE AMOUNT OF) BLOOD

On closer inspection *(left)*

The stem cells in our bone marrow produce over 200,000,000,000 new blood cells every day. Regulated by the process of signal transduction, disease will occur if these signals are misread and too many, or too few, blood cells are produced. At first glance, this original, limited edition screenprint appears as a splatter of blood or, perhaps, a mass of microscopic blood cells. On closer inspection, however, one can see a palimpsest of scientific calculations, notes and recordings. The need to look more closely at the work aims to reflect how scientists, themselves, are looking ever deeper into understanding the process of blood production.

Research inspiration:

Dr Stephen Loughran

We each make more than 200,000,000,000 new blood cells every day – and to keep us healthy, we can't make too many or too few. To control this process, our blood-producing cells read signals from the body that instruct them how many cells to create. In some people these signals get misread, which causes blood diseases. Come along to hear how scientists discovered the signals that control blood production by giving hen's eggs the flu and peeing into buckets; and how understanding blood production helps patients.

Created by:

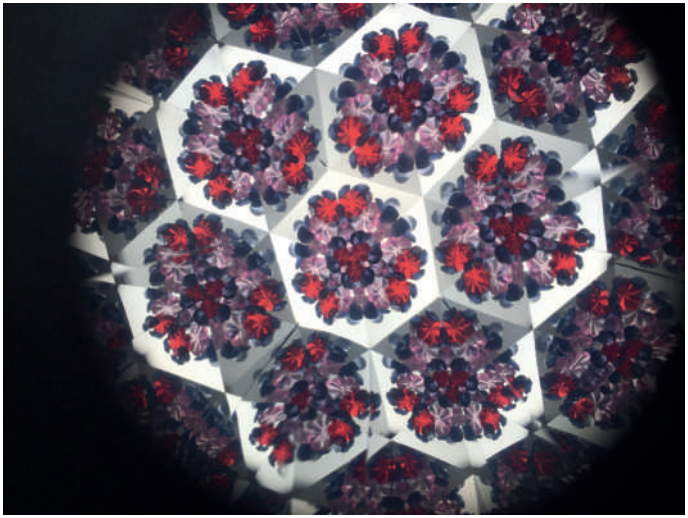
Claire Bennett

Claire has a science degree and a first-class honours in Fine Art and is interested in the parallels between these two disciplines. She combines her art practice alongside her work as a Lecturer in Printmaking and is happy to accept commissions www.clairebennettprints.com

BLOOD CANCER DEVELOPMENT: THE DARK SIDE OF HAEMATOPOIETIC STEM CELLS

(below) **Bad Blood: A visual reaction to the serious nature of blood, cancer and stem cells.**

Liza Read's artwork appears as a set of extra large test tubes, a nod to the extensive hours spent testing in laboratory experiments. Rather than happening in sterile environments behind closed doors, here visitors are encouraged to pick up and peer inside the tubes for themselves. Inside blood cells are represented in a healthy balance of red, white and mauve platelets. As each tube along the row is examined, the balance starts to appear disturbed, the HSC cells are proliferating unchecked, showing more dark blood, bad blood, is taking over multiplying out of control. Can science find ways to stop our blood from turning bad through stem cell research?



Created by:

Liza Read

Liza Read BFA is a contemporary fine artist with a specialty in holograms. She has contributed to Creative Reactions since 2015. When not making holograms, Read makes interactive sculptures. Visitors are encouraged to interact and to explore often complex scientific research through imaginative, thought provoking artworks. Read has exhibited both in the US and UK, her most recent solo exhibition was held at Gallery 286, Earl's Court, London in 2017.

Research inspiration:

Prof. Brian Huntly

Every day we make billions of specialised blood cells from a single cell type: haematopoietic stem cell (HSC). These cells are tightly regulated but are also the origin of the majority of blood cancers. My group takes a multidisciplinary approach, using cell-based, mouse and human systems and functional, biochemical and genomic assays to determine how HSC become corrupted during the evolution of aggressive blood cancers, particularly acute leukaemias and malignant lymphomas. With the aim of identifying therapeutic targets to improve treatment and to possibly prevent these devastating diseases.

Our body

HOW DO OUR LUNGS DEVELOP? STUDYING DEVELOPMENTAL BIOLOGY BY HUMAN FOETAL LUNG ORGANOIDS

Epithelial *(left)*

This is a limited edition digital print with hand-drawn embellishments.
Shuyu Liu researches the development of epithelial cells in the lungs. I have included in my illustration drawings of progenitor cells which produce cells, and also epithelial cells in the background.
The long-term aim of the lab's research is to study embryonic lung cell development in the hope of directing adult cells to repair themselves. To represent this I have placed an embryo at the 'root' of the lungs, a phoenix at the top (representing rebirth/new growth) and the infinity symbol at the centre. The style of the image references Cambridge's stained glass windows.

Research inspiration:

Shuyu Liu

Lungs are delicate structures built as a result of a sequence of multiple events, controlled by complicated signals and factors yet to be fully understood. Until now, developmental biology has relied on model animals. In order to develop substitutes more closely reproducing human processes, human tissues of embryonic and foetal origin are currently being explored. I will introduce how we use human tissues to set up 'organoids' as models for in vitro studies. We will see how important they are for basic research and show that human foetal tissues are valuable resources for science.

Created by:

Abi Stevens

I create colourful and detailed digital illustrations inspired by mythology, chronic illness, and science. I combine elements of historical art, such as stained glass and illuminated books, with modern digital techniques.

HIFs, MITOCHONDRIA AND RENAL CELL CARCINOMA

(right)

What zebra fish and mitochondria have in common?

Many organisms such as zebra fish (depicted in the artwork) have evolved adaptive mechanisms for hypoxic conditions. Changing oxygen levels can result in activation or repression of certain homeostatic regulatory genes, allowing for the survival of tissues and cells despite fluctuating environmental conditions. Genes such as HIF-1, whose activation is prompted by hypoxic conditions, can interact with enzymes and other transcription factors in order to control vascularization and tissue growth. While microenvironments surrounding cancerous tumors are extremely hypoxic, proliferation of such masses often is made possible by HIF-1 activation, which leads to increased angiogenesis and, thus, an increased oxygen supply to the area. Given its prominent function, manipulation of HIF-1 activity within areas of ischemia and tumor masses has become a focus in the effort to develop noninvasive, pharmaceutical treatment options for cancer and heart disease patients.

Created by:

Crina Samarghitean

Dr Crina Samarghitean has an extensive training and practical experience in medicine, bio-med informatics and entrepreneurship. She has produced more than 80 publications, public lectures, conference presentation and exhibitions, and has received multiple awards. In 2011 she had the honour to represent Finland/Romania in the 61st Nobel Lindau meeting to meet 21 Nobel laureates and 560 best young researchers in the world.

Research inspiration:

Margaret Ashworth

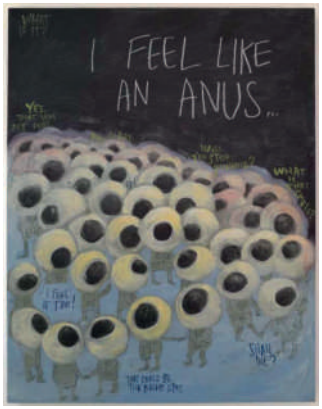
Dysregulated mitochondrial function is associated with the pathology of renal disease and cancer. Renal cell carcinomas exhibit inactivation of the VHL gene, leading to constitutive hypoxia inducible factor (HIF) activation which drives tumour progression and metastasis. I will present how VHL-HIF axis separately controls mitochondrial function and metabolism in renal cell carcinoma and discuss our identification of novel small molecule therapeutic agents that target these processes and exhibit potent anti-tumour activity in renal cell carcinoma.

Our body

THE SHAPE AND DYNAMICS OF CELLS AND TISSUES

Cell mechanics and tissue morphogenesis *(below)*

Alexandre observes cell behaviours. My artistic reaction to Alexander's work, has had many conceptual forms. Initially I thought I would make a ceramic interpretation of Gastrulation (when some cells in the animal pole of the fertilised egg move to form what will eventually become a digestive tract), but realised that this would look at effects and not triggers for cell migration, or movement itself. Yes, those cells move but how and why? Alexandre showed me white blood cells chasing bacteria and unicellular organisms like Slime Moulds, joining forces and behaving like more complex organisms. In multicellular organisms there is constant interaction between cells, structures, forces and chemicals around them, and where they are in space. This interaction between cells within a large group suggested to me a kind of dialogue in a crowd. I changed my reaction then to produce a narrative visual sequence. I wrote a script which evolved into a 12 page comic which brings together both cooperating cell behaviour (as in development) and nonconformist cell behaviour (as in cancer). I turned some of the panels in the comic into an acrylic paintings for the exhibition. Sale of acrylics will fund a print run for the comic.



Research inspiration:

Alexander Kabla

To form an organism, cells divide and eventually differentiate to perform the right function at the right place. But to get there, cells move around and generate forces able to shape tissues. Mechanics is an important aspect of biology. I will introduce some of the key principles involved in cell mechanics and tissue morphogenesis, and present a few techniques recently developed to study the dynamic behaviour of living systems. We will then explore how these observations can shed light on selected processes occurring during embryo development or involved in disease progression.

Created by:

Elena Arevalo Melville

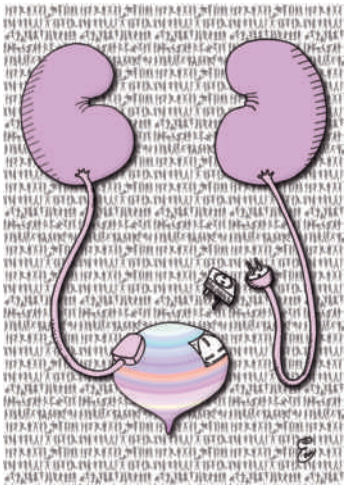
Elena Arevalo Melville is a writer, artist, illustrator and fantastical cartographer. Her approach to artwork is experimental, with great concern for communicating emotion through narrative and colour. Visit her open studio this July!

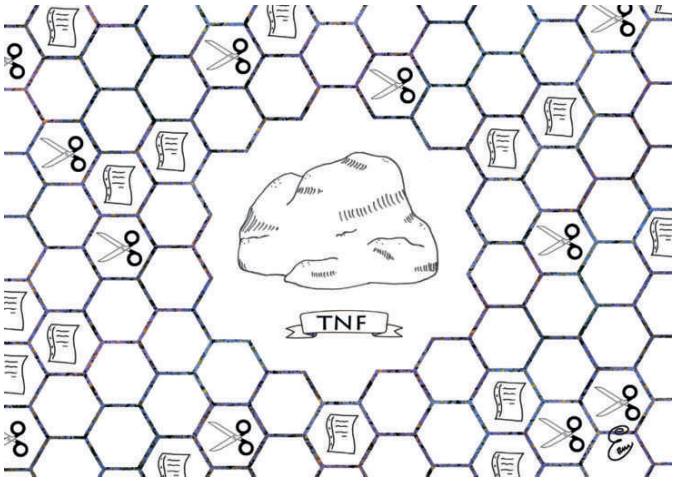
TREATING KIDNEY DISEASE
A MATTER OF LIFE AND DEATH

Rock-Paper-Scissors

Playing with TNF protein so it works on our favour. Either killing cancer cells (scissors) or promoting cell growth (paper).

(right)





Looking for the correct link *(left)*

Can that link be found in our own body? Perhaps should it be imported?

Kidney living transplant, giving the chance to extend life boundaries

Created by:

Elena Rubio Mota

From Spain, a structural engineer working in the civil engineering industry with an artsy soul. I discovered my passion for arts back in school and I have always tried to keep a close contact with them. With a passion for illustration this is my first artwork created with computer aid, I hope you like it!

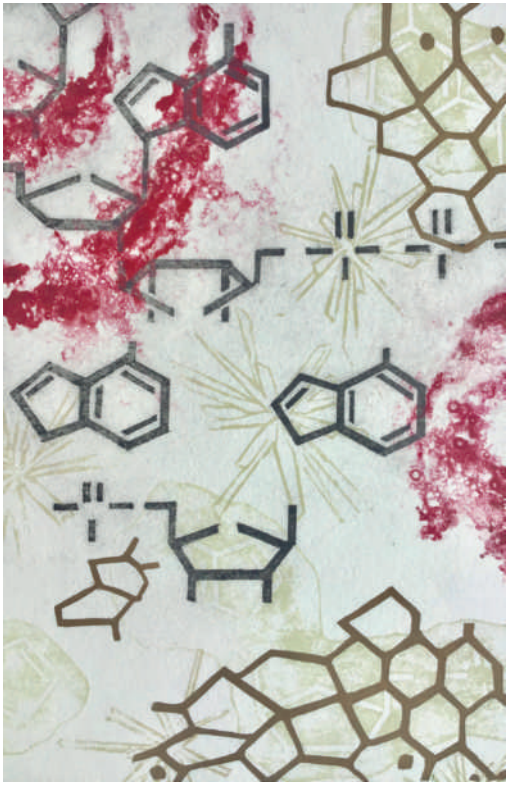
Research inspiration:

John Bradley

Understanding how to promote kidney cell growth to repair injury, or cell death to destroy kidney cancer cells, requires knowledge of the basic biology of the kidney at a cellular level, and how this can be altered by genetic variation in an individual at a population level. The presentation will describe how tools have been developed to understand how tumour necrosis factor (TNF), originally described as a molecule that can kill tumour cells, can promote both kidney injury and repair.

Our body

WHY DO TISSUES AGE?



Molecular Chain Mail *(left)*

My artwork represents Prof. Duer's research on the molecular processes in hardening of the arteries. I loved tying together exciting visual aspects of these molecules, such as the chemical ring structure in PAR (poly ADP ribose) and crystalline calcium phosphate, with the striking red of arterial blood. I have layered PAR over crystal rosettes that peep out from behind the PAR in which they have been entrapped. The reference to blood using loose, red monoprinted inks is alongside arterial shapes and arterial wall strata. The metallic printmaking, where cellular shapes morph into chemical ring structures, ties in with the title of the artwork and the protective role of PAR.

Research inspiration:

Melinda Deur

It is a fundamental fact of life that tissues age, but why? And how? Tissues are made up of cells and the material around cells, the so-called extracellular matrix (ECM). Ageing of the ECM in tissues underlies most of the detrimental effects of getting older – stiffer blood vessels, more fragile bones and less elastic skin. I will discuss the molecules that make up the ECM in our structural tissues and the mechanical structure of the ECM, and then go on to consider what happens to those molecules as we age to formulate an understanding of why our structural tissues lose their youthfulness.

Created by:

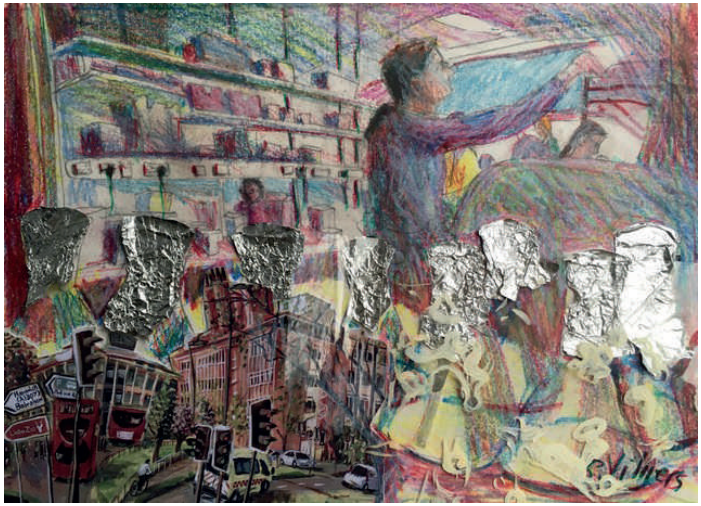
Sherry Rea

Sherry Rea is an artist, printmaker and biologist. She loves overlaying images and working with texture. Sherry opens her studio in Elsworth each July in Cambridge Open Studios and her artwork can be seen at Cambridge Contemporary Art.

CAN WE DEVELOP BLOOD TESTS FOR CANCER EARLY DETECTION AND WHAT MAY THE CONSEQUENCES BE?

(below) **Charlie's Lab**

When visiting Charlie Massie's laboratory I took many photos, but I loved this soft image of scientists working behind me, reflected in the glass cabinet of sterilised glass flasks. Then, as I had not seen anything specific to his research into early diagnosis of prostate cancer, Charlie showed me some prostate cancer cells in a petri dish, through the microscope. The cells were over 30 years old, and had been kept in a fridge at body-temperature. I have painted these cells onto a sheet of acetate, which is in front of the flasks. Bottom left is a section of a painting of Addenbrookes that I did a few years ago, which leads the eye into the painting, as Charlie's lab is to the right of the painting, just out of sight.



Created by:

Sonja Villers

Member of Cambridge Open Studios since 2003 and committee member, Cambridge Drawing Society since 2009 and past committee member, Saffron Walden Art Society since 2014, specialising in lively colourful acrylic and watercolour paintings of local scenes, buzzing with people, bicycles and architecture, I endeavour to capture and enhance the modern world within the fabulous heritage of Cambridgeshire.

Research inspiration:

Charlie Massie

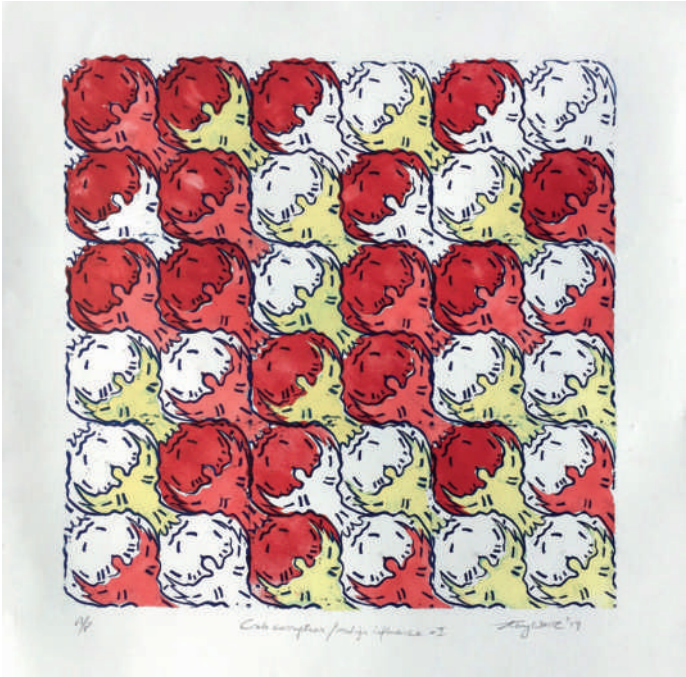
Prostate cancer incidence is predicted to increase by 12% over the next 20 years, with estimates of over 50,000 new cases per year by 2035 in the UK alone. To avoid a rise in healthcare costs, co-morbidities and cancer deaths, we need tools to identify potentially lethal cancers at an early stage and distinguish these from benign or non-painful lesions. In this talk we will describe new genetic (and epigenetic) DNA blood tests that could be used to identify patients with early stage cancers and will discuss the possible consequences for cancer mortality, healthcare systems and society.

Our body

THE TUMOR MICROENVIRONMENT

THE 'OTHER' CELLS IN CANCERS

(below)



Crab Corruption

'Crab Corruption' is a response to the research of Dr Jacqueline Shields and Jake Cridge of the CRC into the microenvironment of cancer cells. The artwork, an interlocking tessellated pattern seeks to depict the close interaction between tumour cells and the body defences. Current research shows that tumours corrupt and disrupt the bodies defence cells into aiding the growth and spread of the cancer. In the artwork, cancer cells (crabs from which the term cancer is derived) spread against the defence cells (doves) and have changed some of the 'doves' to their side in advance of their spread.

Research inspiration:

Jacqui Sheilds

Tumours are not just masses of cancer cells. Instead they resemble complex 'rogue' organs to which many 'other' supporting cells types are recruited, including those from our immune system, which collectively form the Tumour Microenvironment. From an early stage, the 'other cells' are often corrupted to promote rather than control tumour growth. How this switch happens is still unclear. This talk will provide a short introduction to the Tumour Microenvironment, and how we are working to understand the microenvironment to help fight against cancer.

Created by:

Tony White

Tony White has always made art as well as being a research biologist, now retired. He has a certificate in advanced print-making and is a past Chairman of the Society of East Anglian Watercolourists. This is his fifth year participating in 'Creative Reactions' as part of 'Pint of Science'.

IS THIS KIDNEY GOOD ENOUGH TO TRANSPLANT?

(below) **Drawing on Possibilities**

The scarlet ground forms a direct contact with the colour of blood, and together with the use of white in the work, serves to underpin the idea of both red and white blood cells. The white ground for the figuration also reinforces that idea and gives prominence to the juxtaposing images that these elements present. The left-hand image, worked in a lightly free- flowing pencilled linear style, and presented in a roughened sketch form, represents the sense of freedom and relief that engages with the recipient of the appropriately matched organ as they anticipate being released from the continual dialysis process. The androgynous figure represents the universal human, and our universal need for the research to continue its exploration towards a more predictable outcome. In contrast, the warrior figure is an antithesis, static and solidly engaging with the idea of the potentially physical and emotional weight of a failed process resulting from an incompatible donor. In both motifs the torn edges refer to the broken lives of patients with renal disease. The difference in detail, scale, and dynamic further reflects the ideas of acceptance and rejection. The cell images link all motifs and speak for themselves. The mask alludes to the hidden elements of tissue function that lies beneath outward appearances. The black form refers to the need to go beneath the external to shed light on the concealed elements that will ultimately facilitate the prediction of transplant success rates. At this precise moment enlightened and reliably successful predictions are not yet fully established.

Created by:

Lizzie Milsom

I live in a village outside Cambridge and work as a freelance artist.
My overriding approach is to work the drawn line with some degree of figurative representationalism in a looser freer approach to illustrate my responses to music, mythologies, and dance.

Research inspiration:

Dr Menna Clatworthy

Transplantation is the best form of treatment for most patients with kidney failure; patients have a better quantity of life than those receiving dialysis and they live longer. However, one major challenge is a shortage of suitable organs, so some patients wait a long time for a kidney to be offered to them. In this talk, I will discuss how we are applying the most advanced research tools to human kidney samples to help decide whether a kidney is good enough to transplant.

Our society

WHAT CAN WE DO IF SOCIETAL COLLAPSES ARE INEVITABLE?

Red Queen, Alice and Collapse *(below)*

This piece is a digital illustration inspired by the work of Dr Luke Kemp which provides, among other invaluable research, the recipe to avoid societal collapse: modular systems, anti-fragility, recovery plans, diversity, differential technological development and buffers in the system. On his work, Dr Kemp also talks about the Red Queen effect which states that if species are constantly fighting for survival in a changing environment with numerous competitors, extinction is a consistent possibility. The term came from a statement that the Red Queen made to Alice in Lewis Carroll's Through the Looking-Glass where she should run twice as fast to keep moving. Therefore, the hint to Alice and the Red Queen in my image. In my illustration work I like to take good care of the aesthetics; there is always a carefully selected colour palette, a balanced layout or interesting textures… But I also enjoy providing different layers of meaning to the viewer's interpretation. I was very pleased when Dr Kemp saw the very first version of this piece and commented: 'It seems to have some subtle connections aside from modularity. The gold seems to imply a yellow-brick road (to anti-fragility perhaps) and the most precarious blocks are the ones that are stacked (warning against centralisation and too much over-interconnectivity).' You have probably noticed an allusion to climate change as well but do you find anything else?

Research inspiration:

Luke Kemp

Our deep past is marked by recurring failure and transformation. Empires, kingdoms and states around the globe have collapsed throughout history. What can we do if collapse is simply a normal phenomenon that complex societies inevitably undergo? This talk will outline a strategy for building civilizational resilience. I detail effective mechanisms for resilience and recovery by drawing on insights from the study of ecosystems, mechanical systems and previous civilizations. These tools provide a roadmap for making modern society robust to even the worst black swan events.

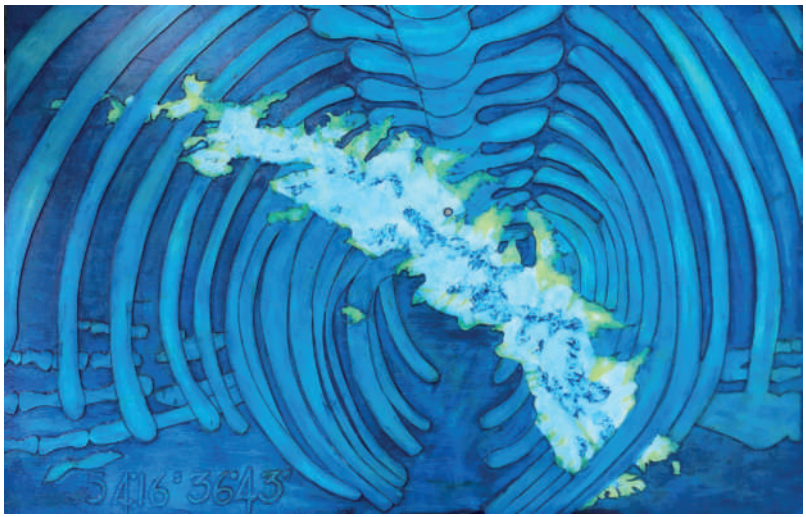
Created by:

Lele Saa

Lele is a Visual storyteller with an MA in Children's Book Illustration from Cambridge School of Art.
Originally from Vigo, northwest of Spain, she began her career in Madrid as an Advertising Art Director and eventually moved to London to be part of the advertising agency of Apple. Now, based in Cambridge, Lele works as a Visual Designer at Dovetailed and is the current Artist in Residence at the Stephen Perse Foundation.

SOUTH GEORGIA:
OUTPOST OF THE ANTARTIC

Headland Peak



This piece is a tribute to the long and varied career of Bob Headland. He has worked on the cartography and history of Antarctica, and the flora and fauna of the region. The island of South Georgia – vivid with summer greens - is threaded through the skeleton of a whale, and incorporates the position and coordinates of the mountain named after him.

The technique is inspired by the collagraph plates that I construct for printmaking. After building up my relief image with collaged card and texture pastes, I applied and removed layers of ink to create depth and subtlety in the finished artwork.

Created by:

Jackie Duckworth

After 15 years as a geneticist I decided on a change. I studied Illustration at ARU and now work as a printmaker and illustrator. You can visit my studio as part of Cambridge Open Studios in July. This is my third year in Creative Reactions.

Research inspiration:

Robert Headland

Biology, exploitation, politics, a small war. The biodynamics of this remote island involved two periods of massive over-exploitation of marine mammals, adverse effects of introduced species, and politics. The original state, human effects, remediation and present recovery are discussed - with relevance to various other remote oceanic islands.

Our society

ANTARTICA AND APOLLO: EXTREME HERITAGE AND SCIENCE

ANTARCTICA AND APOLLO *(below)*

I have created four paintings based on thematic words I distilled from the forthcoming Pint of Science talk by Dr Bryan Lintott (Research Associate, Scott Polar Research Institute, University of Cambridge) Theme words I have used are The Moon, Antarctica, Artefacts, Extraordinary places, Legacy, Abandoned bases, Robotic machines, Contaminants, North / South poles, Structures.

Research inspiration:

Bryan Lintott

Human presence in Antarctica and on the Moon has resulted in historical remains that range from abandoned scientific bases to operational robotic instruments. This environmental legacy and how it can be utilised for physical, biological and social science research is the core theme of this presentation. How do the contaminants spread, what has been the impact of the environment on various materials and is equipment still functional? The presentation will conclude with an overview of how archaeology in Antarctica can promote the peaceful use of the continent and enhance scientific research.

Created by:

Martin Stephen

Martin Stephen is an abstract expressionist painter working with a variety of medium including oil on canvas, gouache / acrylic on paper. Drawings, sketchbooks a foundation for surrealist ideas often used as the basis for larger paintings. The artist also works with digital composites, photo / video art and multi-media projection for live performance. With music : improvisational sessions are recorded and post produced for albums utilising digital effects and collage cut & paste techniques.

THE MOST EFFECTIVE SCIENCE COMMUNICATION STRATEGY: EXHIBIT A

Science Communicator Bot

(left)

Inspired by the topic of Sophie Weeks (producer, Art and Science Soirée) talk "The most effective science communication strategy: Exhibit A" In my picture I have focused on creative practice as a way to engage, learn, digest new information and create new meaning. We see the world through our own private "filters" and use what we know to make sense of the world. To engage, I think the information must be made relevant to our own lives. Creative practice, (or other practice) can help us see information in a different light, create new meaning, make it relevant to us and help us integrate it into our own lives.

Created by:

Silje Nilsen

I'm an illustrator from northern Norway and I love to create characters and stories. I find inspiration in animals, nature, the everyday, and now also science! I am a graduate of the MA in Children's Book Illustration in Cambridge.

Research inspiration:

Sophie Weeks

Science Communication, Science Engagement, STEM, Science Education have all become 'things'. Sophie Weeks takes a creative, perhaps disruptive look, explaining why she created The Art & Science Soirée, and is developing The Colour Institute.

Planet Earth

EDIBLE INSECTS

A RICH AND DIVERSE TRADITION, AND TREND!

Untitled *(below)*

I was pleased to meet Charlotte Payne - Department of Zoology and learn about her research into Insects as Food.
In many parts of the world, insects are harvested are an important food source. I was struck by the ethical and sustainability aspects of how small community cooperate and manage this important resource requiring many hands to complete the harvesting and processing. Much of this is done on a scale that protects the species from over-harvesting and can help reduce the use of pesticides.
The cooperative element, working together seems so hopeful, so with this in mind, I asked Charlotte to make her mark, use her hands, to help make a creative reaction - a mono-print using repeated shapes of the edible caterpillar and mature Shea moth.

Research inspiration:

Charlotte Payne

Insects have been positioned as a new, sustainable protein source, but what is the science behind the headlines? Insects, which use far less land and water than traditional lifestock like meat and poultry, offer a promising alternative to our current globalised food system. Unfortunately, some methods of insect farming and harvesting are not sustainable. This is particularly important to consider in light of recent evidence of severe declines in insect populations worldwide. Come learn about the stories behind our food, and taste a few insects yourself after the talk!

Created by:

Allison Henderson

I am a graduate of Camberwell, UAL and can usually be found working at my easel - I paint for the fluid nature and versatility of the paint, hinting at narratives using the natural world as my stage and players. Mono-printing is a 'painterly ' form of printing where the one off image is directly created on the printing plate.
Drawing and painting are fundamental to my artistic practice as is encouraging and teaching others to draw and be creative. With Cambridge Open Studios on its way in July, I am busy making new work, come and find me as part of the Fulbourn Art Trail.

OXIDISING THE EARTH

WHY DO WE HAVE A HABITABLE PLANET?

(below) **Windows to the core I - III**

Triptych stimulated by the concept of probing the earth's core with scientific windows.

Created by:

Cheryl Warren

Cheryl trained in sculpture and later art therapy. She became a painter after inheriting her grandmothers oil paints. Her work is stimulated by landscape, environment, boundaries and experimentation.
She produces large and small pieces from her North Cambridge studio where she also teaches art courses.

Research inspiration:

Hellen Williams

Earth is the only habitable planet in our solar system thanks to its oxygen-rich atmosphere and oceans.
However, the rocky interior of the Earth is also surprisingly rich in oxygen, so much so that it is out of equilibrium with our planet's central metallic core. How did the chemistry of the Earth's interior come to be so oxidised and what does this mean for the evolution of our planet and the origins of life? In this talk, I'll discuss Earth's formation from primitive meteorites and the chemical reactions that allowed our planet to develop into the oxidised, habitable home it is today.

Planet Earth

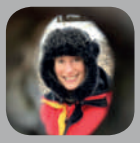
LIMITING GLOBAL WARMING TO +1.5C: WHY DOES IT MATTER?

Outside Natural Influence *(below)*

I was very lucky to have had the opportunity to meet with Dr. Anna Jones at her office in the British Antarctic Survey. Meeting with her there offered me so much visual inspiration; from the look of the building, to the images displayed at the reception, to all the notes, posters and books that filled her office. Anna spoke to me about how her most recent work focuses on the study of greenhouse gases and how they have changed over time. She taught me about ice cores and how they are used to measure greenhouse gases in our atmosphere; the most important greenhouse gas measured being carbon dioxide and the second being methane. I learnt about how studies in temperature can also be derived from looking at isotopes in water molecules, about how human influence, especially though the burning of coal, is causing an increase in the level of carbon dioxide in our atmosphere and that the changes that are happening are now far outside of natural influence. I learnt that the 20 warmest years on record have occurred in the last 22 years and the 4 warmest years have happened in the last 4 years and that coal emits more carbon dioxide than any other energy source. As Dr. Anna Jones continued to speak, I not only grew more fascinated but also concerned with the state of our Earth and I was brought back to a memory of being in school as a 10-year-old learning for the first time about the greenhouse effect, the hole in the ozone layer and how we can better care for our planet. Combining this memory with being inspired not only by the content of Anna's research at present, but also by the images she has shown me on her computer and the posters that adorn her office's walls has lead me to produce a series of colourful metaphorical pencil and watercolour illustrations that reflect a certain raw and childlike nature.

Research inspiration:

Anna Jones



Our climate is changing and we face stark choices that will determine our planet's future. In this talk, I will explore how we got into this situation, presenting evidence that demonstrates how our atmosphere and climate have changed through time. I will consider possible future scenarios, and explain why the choices we make today matter so much.

Created by:

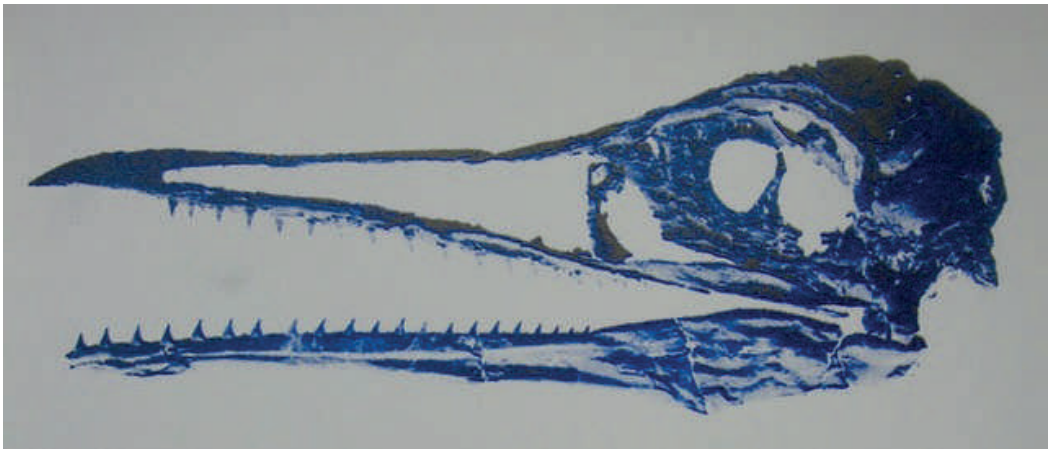
Esther Yasmin

I am a visual artist who's creative style has been influenced by a cultural diversity that stems from an international upbringing. I have always been strongly pulled to scientific, mathematical, psychological, philosophical, spiritual and metaphysical subjects; anything that helps me broaden and deepen my understanding of the nature of reality. I also love to travel and be in nature and in turn my art practice jumps between generating intricate pictures that are symbolic and meaningful and attempts to capture the beauty that I see in the world through photography, drawing and painting.

WEIRDNESS AND WACKINESS ON THE WAY TO MODERN BIDS: NEW CRETACEOUS FOSSILS REVEAL A VELOCIRAPTOR-LIKE SKULL ATOP A MODERN BIRD BODY

(below) **Ichthyornis dispar - Fish bird**

Daniel Field and I discussed his work with modern biodiversity and how using vertebrate fossils helps to answer questions about how, where and when this diversity arose. He combines data from living species with fossil, anatomical and molecular records. Using high-resolution computed tomography he showed me a near-complete 3D image reconstruction of the skull of an Ichthyornis dispar, whose remains were recovered in Kansas in the 1870's. Research shows that Ichthyornis was like living birds except that modern birds are toothless. I wanted to make a screen print from the image of this 'weird and wacky' dinosaurian bird with its avian brain and large beak teeth from 86 million years ago. I coloured the Ichthyornis dispar in sea-blue, overlaid with gold to represent its majestic qualities.



Created by:

Jan Ayton

Jan Ayton's studio practice incorporates screen printing, lens-based media and collage. Her work is currently concerned with landscape, exploring themes of journey patterns and migration cycles. She studied Fine Art (BA) and has an MA in Printmaking.

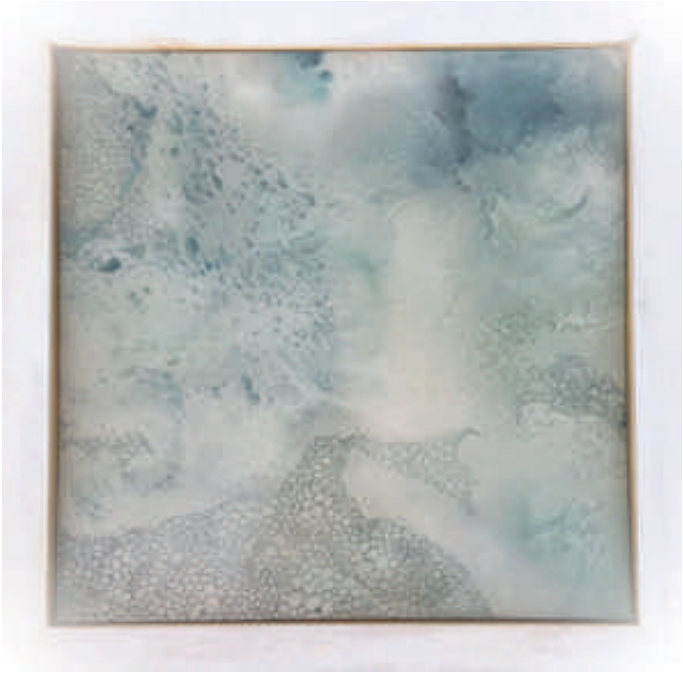
Research inspiration:

Daniel Field

Fossils from the Mesozoic Era (the 'Age of Dinosaurs') reveal the origins of birds' feathers, flying ability, and even warm-bloodedness. However, very few fossils of Mesozoic relatives of birds exhibit complete, three-dimensionally preserved kulls, making it difficult to understand how, when, and why the toothless skulls of modern birds arose. In this talk, we will examine newly discovered 85-million-year-old fossils revealing the evolutionary origin of the modern bird beak, and examine the surprising combination of dinosaur-like features exhibited by this weird and wacky fossil animal.

Planet Earth

UNDER THE GEOLOGICAL RUG: STORING CO2 IN THE SUBSURFACE



Solutions *(left)*

Art inspired by Jerome Neufeld and his research in CO2 Sequestration. In learning the process by which CO2 is removed from the atmosphere and held in porous rock beneath a non-porous one, I chose to replicate the process using similar elements. The porous surface (paper) soaks up and disperses liquid, a mixture of fluids including inks in limestone colours and carbonated water.
When dried, I included a natural pattern found in porous rocks with pen. The drawing is trapped under a non-porous material; clear resin.

Research inspiration:

Jerome Neufeld

Responding to the climate crisis requires action to decarbonise, but what do we do with emissions that we cannot engineer away? One idea is to pump CO2 into porous rocks deep underground, away from the atmosphere and its effects on climate. We'll look at some of the fluid dynamics of geological carbon storage, how CO2 spreads, and importantly how it is trapped in the subsurface. Along the way, we'll ask what we can learn about how fluids move within the Earth, all in an effort to understand how we can lessen our impact on Earth's climate.

Created by:

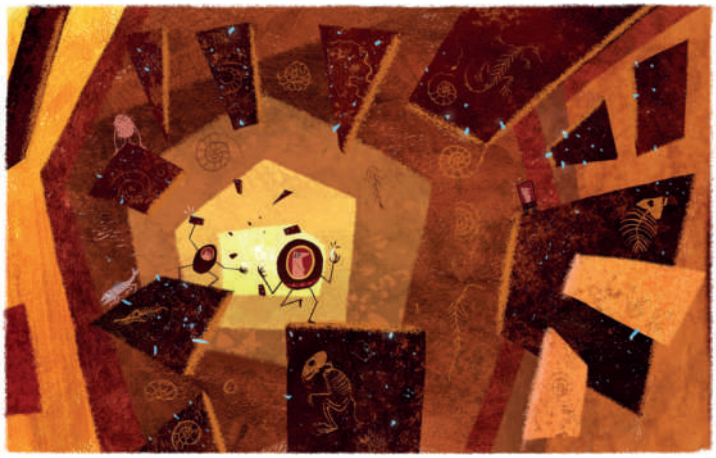
Katherine Gravett

I live in Cambridgeshire and collaborate with artists, scientists and educational institutions. I am part of the Cambridge Drawing Society.
My art is exhibited in artistic, scientific, medical and therapeutic venues.

HOW DO WE KNOW HOW OLD ROCKS ARE?

(below) **Window into our past**

My creative reaction piece is based on Dr Rich Taylors research. Which involves looking back in time using geochronology, studying the oldest minerals on our planet called zircon. Zircon are tough, tiny grains which can survive throughout geological time.These tiny grains can reveal so much in how we understand the time scales on our planet. Using cut out painted textures and a digital finish I incorporated the pattern of the Zircon grain into the background as it reminded me of a time vortex. I wanted to use hot colours as if it was under the earth. It is a hot magma time vortex I tried to layer it with little surprises throughout for people to explore showing a window into our past.



Created by:

Mark Farrell

Originally from an Animation background, currently focusing on some of my own personal projects and studying, working as a chef. Passionate for Illustration and Character design.

Research inspiration:

Rich Taylor

Our ability to think about the processes that shape our planet is underpinned by a basic question: How old is that rock? Geologists have long worked to understand when things happened and for how long: When did plate tectonics begin? How long ago did the Earth form? How old is that volcano? How long does it take to make mountains? Some minerals in our rocks contain radioactive elements, making them geological clocks. In this talk, I'll discuss one such mineral, zircon, that has changed the way we understand the timescales of our planet, and is the time capsule of our planet's history.

Planet Earth

BLACK HOLES AND PENGUINS:

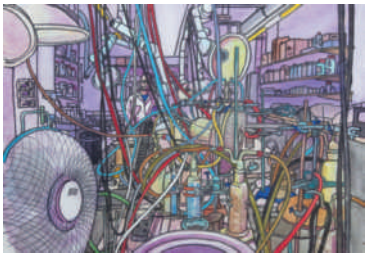
CAPTURING THE SUN WITH BLACK SILICON

(left) Blackened Landscapes 2

I worked with Paul Coxon from the Department of Materials Science & Metallurgy. He is aiming to make silicon solar cells more efficient. He uses molten salt electrolysis to create nanoporous ultra black silicon. Its random nanoscale surface texture allows light to be collected at any time of day. My kneejerk reaction was to think about the negatives. What would our world look like if every roof had a solar panel, and the fields were full of solar panels? But I realise that we will only continue to have those landscapes IF projects like this succeed in finding sustainable and non-polluting ways to power our lives. We cannot afford to think of the solar power spoiling our beautiful landscape, but of being its saviour. I chose my three favourite landscape paintings, and recreated them with the addition of solar panels, on the roofs and in the fields. I usually avoid black in my paintings, but this time I used the most pigmented, flattest, mattest, black acrylic paint in the world to paint the blackest solar panels in the world.We need to blacken the landscapes to save them.

Black Magic *(right)*

I just couldn't resist also painting 'the furnace lab' where Paul and the team work their magic to make the blackest black in the world. I actually simplified the scene for this painting!



Research inspiration:

Paul Coxon

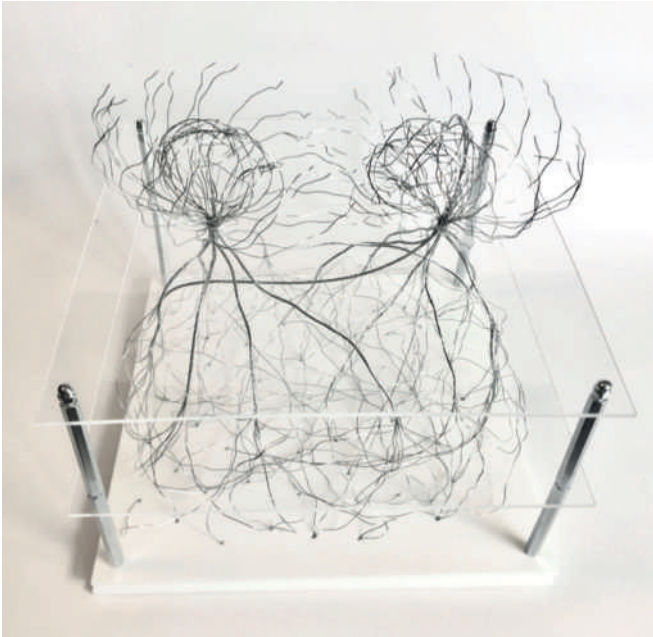
Solar photovoltaics have spread widely over the globe in recent years and could potentially be the world's cheapest electricity source by 2030. In this talk, I will give a history of how humans have used solar energy over time, how the current solar revolution began, and a glimpse at how physicists are now mimicking natural structures to make superblack light-absorbing materials to enhance the efficiency of the solar cells of the future.

Created by:

Naomi Davis

Naomi Davies is a Cambridge based artist working in ink and watercolour. She draws quirky observations of everyday life, usually directly in pen - whatever is around her - aiming for a real scene, rather than a chocolate box view of the world. Her training as a professional family historian means that she likes to record the actual rather than the imaginary. She especially loves to draw when engaging in her other hobbies – drinking coffee, eating out, and watching cycle racing.
Headshot by Mike Sim.

CAN AI HELP IN THE FIGHT AGAINST CANCER?



(left) **Emerging**

Emerge (v) – from Latin emergere, 'to bring forth, to bring to light'. Both natural and artificial intelligence involve sequential processing through 'layers', from vast amounts of incomprehensible data, to finding patterns, to constructing meaning, and finally, to making predictions. I was struck by the representations of neural networks in Dr. Samarajiwa's work – whether by nature or design, dendritic forms embody the flow of information.

Created by:

Emma Mayoux

Formerly an artist-designer by day and science student by night, I'm now attempting to unravel Alzheimer's disease by day and create beautiful things by night.

Research inspiration:

Shamith Samarajiwa

Making sense of the gigantic, complex, data-sets generated by modern biology experiments is beyond human capabilities. To uncover the secrets of living systems buried in the data, computers and smart algorithms are needed. The rise of data science and machine learning is accelerating the pace of discovery and ultimately bringing new treatments for disease closer, faster. Dr. Shamith Samarajiwa, MRC Cancer Unit, will discuss how his lab uses data science to understand genes and genomes and the impact of artificial intelligence breakthroughs in his field of cancer biology.

Tech me out

AI & NEURAL ENGINEERING:

INCREASING THE HUMAN LIFESPAN AND LIFE QUALITY

The Pursuit of an Equilibrated Wavelength *(below)*

Oliver Armitage and the researchers at BIOS are pursuing a way to intervene with the human nervous system to promote health. With the use of hardware, software and AI, the company is building an two-way interface to promote homeostasis or the tendency towards a relatively stable equilibrium as maintained by physiological processes of the body. Signals and feedback from the organs of the body move along nervous system and BIOS' pursuit includes tuning into these signals. These signals are represented in the background of most of the paintings in the series. The smaller-neuron paintings stand-in as the connection or interface BIOS is building to address different disorders that disturb the equilibrium of the body.

Research inspiration:

Oliver Armitage

Oliver will explore how artificial intelligence (AI) is being used to transform healthcare through neural engineering and how it can be integrated into the human body, giving a glimpse of the work BIOS has been doing to advance research and expand real world applications in this field. He will illustrate the solutions BIOS and others in the field are creating and will set the scene to what we can expect to see in the coming years.

Created by:

Barbara Nasto

Barbara studied oil painting and other classic fine art disciplines at the Arts Students League in New York City. Her forays into sci-art are informed by biomedical research studies in the field of Physiology and decades working as a scientific writer and editor. Dwelling on historical anatomy texts is a reoccurring theme in Barbara's work.

YOUR GENOME AS NATURE'S CLINICAL TRIAL

(below) **Mountain Matrix**

Mountain Matrix is a 'mountiain of the mind' and references eastern metaphysical landscape painting filtered through an organizing visual language and processes of a colocalization matrix and a Manhatten grid. The work takes visual source material from Mount Everest's textures and summit profiles. Multiple angles of this visual data are repeatedly overlaid to create landscape elements such as peaks, valleys, and waterfalls, crowned by a single composite pinnacle.

Created by:

Chloe Leaper

Leaper is a Cambridge based artist whose practice explores spatial perception as an experienced condition of connection, disconnection and flux. Leaper's recent work examines the dynamic systems of psycho-spatial structures through two and three-dimensional delineation.

Research inspiration:

Mike Silvey

Every gene in your genome is a potential drug target, and every mutation a potential drug. We each play host to thousands of naturally-occurring drug trials: subtle genetic differences that change the way our bodys work. Some of us are testing a "drug" that helps to maintain a healthy body weight. Others are testing a "drug" that reduces the risk of heart disease. Come and learn how we use genetics - nature's clinical trial - to guide real drug discovery, and how an electronic health record can help to avoid serious side effects.

Tech me out

USING MACHINE LEARNING TO MODEL URBAN CITIES AND NATIONAL MIGRATION

Cafe success & failure *(left)*

I have produced two multi-colour reduction linoprints as a (separated) diptych using the colours yellow, black and red. Print I: Abstract cityscape and Print II: Cafe success & failure. The first print is an abstract cityscape with location markers and pathways in red. The second print is a figurative street scene showing people checking their phones, a taxi in the foreground outside one cafe 'to let' that has failed and one that is busy and successful. This is my creative reaction to Krittika D'Silva's work using big data sets from taxis and location data to predict food and beverage business success or failure with 80% accuracy.

Research inspiration:

Krittika D'Silva

Machine learning is quite the buzz words these days. In this talk, I'll give an overview of machine learning and how it can be used. I'll also talk about two applications of machine learning that I have worked on. First, I'll describe how social media data can be used to understand urban cities and predict whether a business will survive or fail. Second, I'll describe work I did at the United Nations using mobile phone data to model internal migration trends in Vanuatu.

Created by:

Clare Trowell

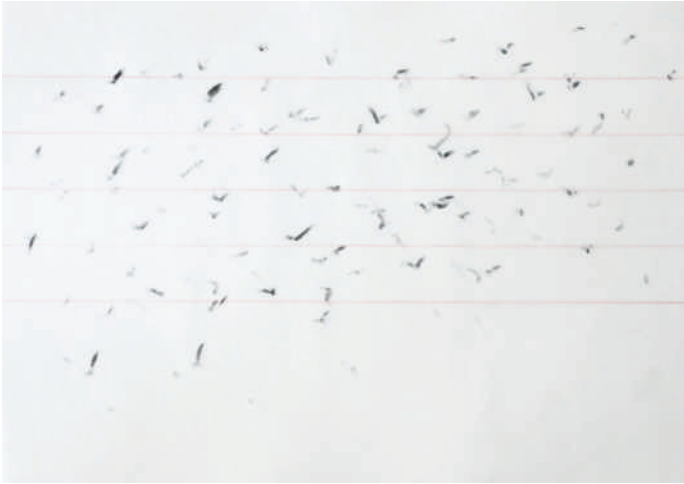
I am an artist who loves to draw but I primarily work using the linocut technique. I have been paired with a computer scientist, Krittika D'Silva for Creative Reactions 2019. I am inspired by how woodblock and linoprints were used to the best advantage by the Expressionists. I particularly admire the work of abstract expressionist Vassily Kandinsky, who was part of the German Expressionist group Der Blaue Reiter (The Blue Rider). Later he was also part of the Bauhaus, where he taught.

FROM PIANO PLAYING TO LETTUCE PEELING:
DESIGNING ROBOTS TO COMPETE WITH HUMANS

(below)

Traces of touch

Touch can be slight, ephemeral and precious; or forceful, resisted. Taking the passive pressing movement of Josie Hughes's robotic hand as a starting point, Tiina has created delicate marks, traces of the touches made by her fingers, here tipped with charcoal. She has experimented with this movement over and over, also testing different media including ink and silver clay. These repetitive actions gave time to wonder about the boundaries of touch, the red lines, and the repercussions of this in the wider world. We touch and are touched at the same time.patterns, to constructing meaning, and finally, to making predictions. I was struck by the representations of neural networks in Dr. Samarajiwa's work – whether by nature or design, dendritic forms embody the flow of information.



Created by:

Tiina Burton

Tiina examines how art practice can help her understand the world, with a current focus on attention over time. Her processes include analogue recording and making with a DIY and collaborative ethos. Her work has been collected and exhibited internationally, including in London and New York.

Research inspiration:

Josie Hughes

Will robots ever be able to peel a lettuce, play the piano or use chopsticks? While simple to humans, these tasks are difficult for robots because the solutions require creativity and dexterity. To meet these challenges, the field of robotics is moving away from rigid industrial systems toward soft, compliant and adaptive systems that can be safely used around humans. In this talk we will discuss how inspiration from biology is being used in modern robotics, from design and fabrication to longer term trends of bio hybrid robotics.

Tech me out

SCIENTIFIC AND ETHICAL IMPERATIVES FOR OPENING UP GENOMIC RESEARCH

(above) **What is it to be human?**

Having had an enlightening chat with Jerome about his research looking in issues of equity, attitudes and ethics in genomics research, I wanted to show the iconic DNA double helix – the centrepiece of the genome – flowing across the work encapsulating figures from different ethnic backgrounds. It is intended to be viewed both as a celebration of a molecule that binds humanity together and also as a cage that can trap us and fuel inequality and fear. Each figure is connected across the panels by the DNA backbone but also isolated in their own DNA cage. The gap in the bars (representing base pairs) seen in the centre of each cage can be interpreted as missing information resulting from an incomplete genetic picture. Only by furthering participation in genomic research across all of the world's peoples can we truly understand what it is to be human at the genetic level and go on to fully reap the benefits yet to be unlocked in the age of genomic medicine.

Research inspiration:

Jerome Atutornu

Identification of disease risk, design of targeted therapies and prediction of drug response have all been enabled by genomics. This progress has resulted in growing optimism that genomics has the potential to revolutionise healthcare. However, due to existing inequalities in health systems, genomics is in fact at risk of perpetuating disparities. Research already suggests a lack of representation for minority ethnic groups in genomic research. This talk will discuss the scientific imperative and the issues of social justice that underpin the need for increased diversity in genomic research.

Created by:

Max Durell

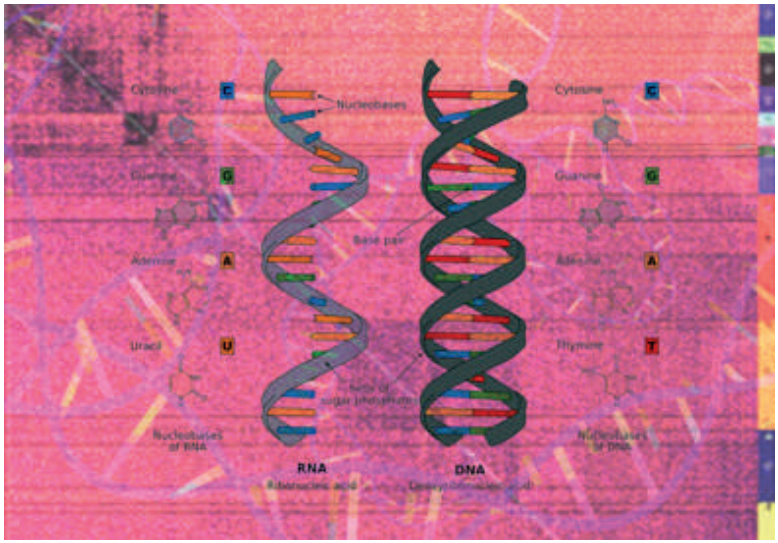
I studied BA Hons Graphic Design and Graphic Illustration at University Campus Suffolk. After that I fell into family portrait photography and now I work on Illustration commissions. I have a varied style and subjects also vary from fantasy to real life. I mostly use ink, watercolour, acrylic and the medium that started it all, pencil.

YOU ARE A WALKING TIME-CAPSULE

WHAT DNA CAN (AND CAN'T) TELL US ABOUT OUR PAST

(below) **The Patterns of genetic and Iberian Peninsula -2**

The artwork is based on the collaboration with Oxford scientist Clare Bycroft, research article 'Patterns of genetic differentiation and the footprints of historical migrations in the Iberian Peninsula'. The Iberian Peninsula has a complex demographic history. They studied the fine-scale genetic structure of its population from across Spain. The results indicate clear genetic impacts of population movements associated with both the muslim conquest and the subsequent Reconquista. The background red and black diagram represents the matrix of coancestry values in Spanish 1413 individuals (who are involving in the research) in the research. The bulk shows the variation of values, aboding the 90th percentile (7.7cM) are coloured black. The color diagram represents the Spanish binary tree which inferred hierarchical relationship between clusters inferred using genotype date of 1413 individuals. I make the background with the texture to represents the population movements. In the article, is more about how does the movement affects the population genetic.



Created by:

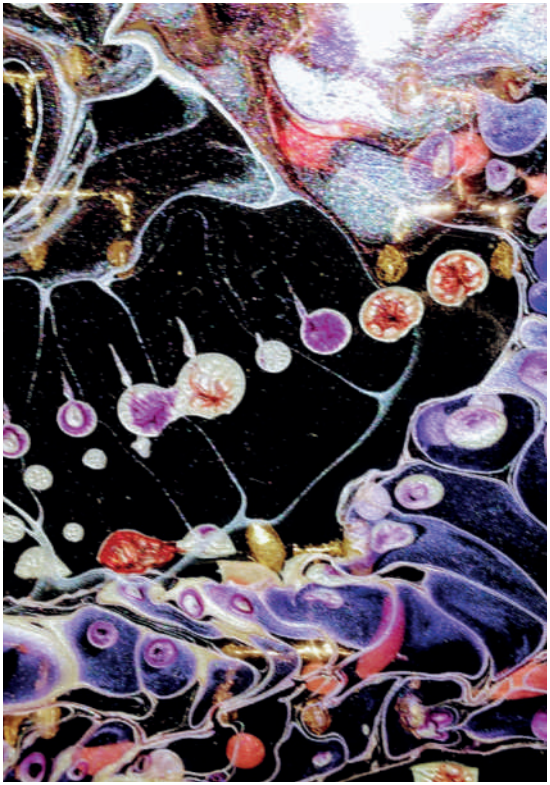
Reggy Liu

Reggy (Tong) Liu (b.1992, Haerbin, China) working and living in-between London and Shanghai.
Reggy is a mix media artist. Liu's work is about 'Masquerade' issue combining art, psychology and neuropsychology, revealing the intangible emotions in-between spiritual and reality world. Reggy's research navigates her own communication experience, and merges the differences in between oriental and western cultures.

Research inspiration:

Clare Bycroft

Each of us carries a treasure-trove of information about our ancestors in the form of DNA. For a little bit of saliva and a not-so-little bit of cash, numerous direct-to-consumer genetic services now offer people an insight into their ancestry. With a scientist's eye, I'll talk about what DNA can (and can't) tell us about the ghosts of our ancestors - not just as individuals, but as populations of people with a lively history of migration, isolation, and mixture.



(left)

We never sleep

Kate work uses resin, with embedded antique keys, timepieces, and nuances of cellular structures like blood cells, salivary glands, and other tissue. This suggests the unlocking of our Genome, being 'locked up' because of the traces we leave behind, the development of genome sequencing over time, and the eternal fascination humans have with collating information about each other.

Research inspiration:

Anna Middleton

Big Data and DNA now go hand in hand. This is pivotal for exploring the link between genes and disease. The bigger the datasets the better. Most DNA data is 'de-identified', i.e. names and addresses have been removed but it will soon be possible to identify a person from their DNA alone. Would this stop you donating your DNA data for research? What harms can come from this? We explore what public across the world have said and how their views are shaping policy.

Created by:

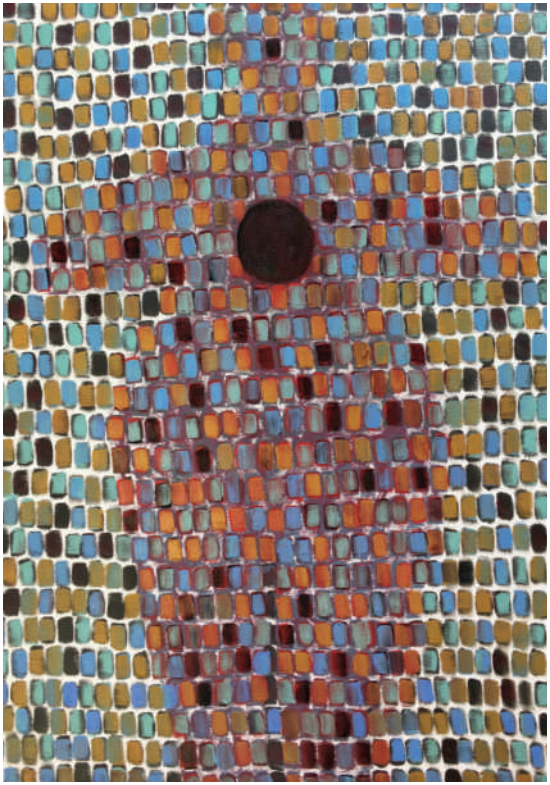
Kate Grant

Kate is a GP. She has collaborated with The Cambridge Brain Unit, Wellcome Genome Campus, Stem Cell Institute Cambridge & MRC Lab of Molecular Biology. Her work has featured on Anthropology Today, www.Citigen.org & the Collection Of SciArt Centre NYC

(right) **Unearthed**

The final piece is painted in oils on canvas and won't be completely dry for many weeks - it will therefore be presented digitally and is not currently for sale.

The work is in two parts (front and reverse), both of which are points of arrival in the connective journey following my first communication with Dr Gemma Chadratillake. There have been many ideas, drawings and experiments along the way and at times it has been difficult to know which trail to follow. The most consistent thoughts have been around the contrast between the work and surroundings of Gemma and myself, as well as the very human element in which we are both interested.



Created by:

Eithne fisher

I am a painter and drawer - mostly oils on canvas using drawing and (amongst other things) photography, sound, found materials and colour mixing as points of departure. I draw from a life model most weeks and work from a studio in Cambridge. The joy is in the process.

Research inspiration:

Gemma Chandratillake

On 5 Dec 2018 Health Secretary Matt Hancock announced that the 100,000 Genomes Project had reached its goal of sequencing 100,000 whole genomes uncovering new diagnoses and improved treatments for patients with rare inherited diseases and cancer. This marks the end of a chapter rather than the end of the story and earlier this year a new target was announced for the NHS to sequence one million genomes over the next 5 years. Will delivering genomic medicine in the NHS enable better outcomes for patients and contribute to a wealth of information to drive the treatments of the future?

Rare Diseases

CAN WE TURN BACK THE CLOCK ON RARE PREMATURE AGEING DISEASES?

Children of Progeria *(below)*

The work of Dr Delphine Larrieu on Progeria is particularly interesting as it involves both structure and replication which have parallels in the creative process. This set of artists books explore and evoke a curiosity into the structure of the cell nuclear envelope. The books play with themes of structure and replication and invite interaction with the story from different perspectives. These works are deliberatley both playful and beautiful to counterbalance the harsh realities of the symptoms and prognosis of Progeria while optimistically communicating the path of scientific research.

Research inspiration:

Delphine Larrieu

Rare genetic premature ageing syndromes called progeria trigger the appearance of ageing signs in early childhood causing many changes to the body over time, including heart disease, bone changes, hair loss, joint and skin changes, and early death around 14 years old. Unfortunately, there is no current cure and therapies just improve the symptoms. Hear how Delphine's team is tackling this and suggesting new treatments and how the lab's work could also open up new perspectives into improving normal age-related pathologies.

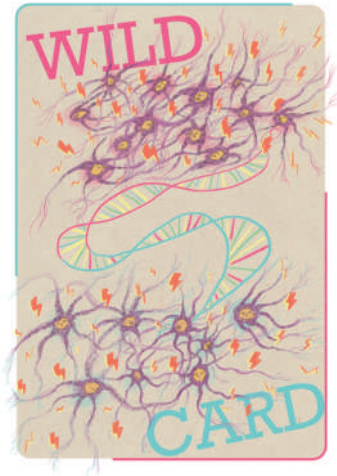
Created by:

Elizabeth Fraser

Elizabeth Fraser is an artist printmaker working with text, pattern and image through analogue processes of hand set letterpress type and linoprint. She is interested in using artist perspectives on science to create interesting and thought provoking work.

EVERYBODY HURTS SOMETIMES... OR DO THEY?

(below) **Wild card & An Ace Up One's Sleeve**



"We know that risk of pain is heritable, but little is known about the exact genetic causes which underlie susceptibility to pain or pain threshold. This is where the rare disease aspect comes in - there is a very rare condition called congenital insensitivity to pain where a person is born with no pain sensing whatsoever." When Dr. Mike Nahorski gave me this introduction to his research, I began to think how to represent it visually. The amount of pain we feel actually depends on signal sensitivity from body part to neuron. I imagined a card game where we all get a Wild Card in the womb - we don't know what kind of sensitivity to pain we're going to get: neurons that are more sensitive to the information of pain or those that are not.

Created by:

Eli Ikuno

Hi there! My name is Eri and I'm an illustrator hailing from colourful Mexico, currently based in Cambridge. I trained as a Graphic Designer, but quickly derailed to illustration. My favourite places to find inspiration are the cinema and home.

Research inspiration:

Mike Nahorski

Chronic pain is a debilitating condition that affects 14 million people in England alone. But scientists think the have come a step closer to understanding it - by studying a rare group of people with congenital insensitivity to pain, who feel no pain at all. Cambridge University researchers have identified a faulty gene that seems to switch pain off in some people and it is hoped the discovery could lead to new treatments for those who live with pain every day.