

# The art of connectivity – using the brain as a community art project

**Stuart Greenhill** (Aston University, UK)

**Petro Lutsyk** (Aston University, UK)

**Kamaljit Suman** (Art at the Heart CIC, UK)

**Mukesh Kumar** (Art at the Heart CIC, UK)

We have been using the brain, and all the marvellous systems, cells and structures within it, as the basis of a community outreach project using art to engage children and young people in science. Through this, we aim to show that communication within our brains and bodies, between our own close networks of friends and families, and across disparate groups the world over, depends upon the same principles of connectivity, diversity and feedback. Ultimately, we will use the project as a springboard to engage more community organizations, hospitals and schools around the UK and beyond to add to our network of budding scientist-artists.

Biological science is filled with examples of vast, interconnected networks and systems all dependent upon one another for the normal and healthy function of a cell, an organism or an entire ecosystem. Such systems can be discovered in the most surprising ways; an expedition to gather microorganisms from Rapa Nui (or Easter Island as it is known in the West) eventually led to the discovery of rapamycin and the identification of mTOR as a fundamental pivot in the physiology and metabolism of everything from brains to buttercups. The testing of a dead salmon from the local fish market in the calibration of an MRI machine led to a fundamental rethink about how statistical analysis of imaging studies is carried out, and our understanding of how algae make sure they are always getting the light they need led to a revolution in how we control cells and organs with optogenetics.

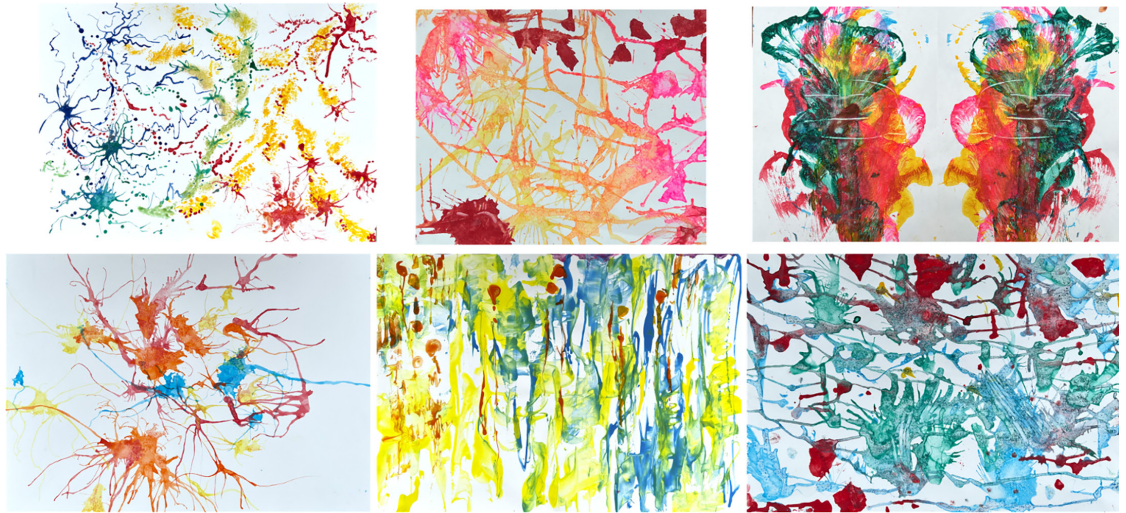
But despite all this connectivity, the process of science and medicine itself can seem a bit 'removed' from day-to-day life, especially when young people might not have the same access to higher education as their peers in other parts of the country or might not have a broad idea of their choices in future careers and interests. Another group who might not experience that fundamental connection with the scientific community are young people who have been admitted to hospital for long-term treatment, in some cases with conditions that are extremely rare and lead to further conceptual, as well as physical, isolation. We aim to bridge the gap between these young people, creating connections between those in hospital and those in the wider community, by using our project to create a sense of shared achievement and to install themed art pieces in our university and in children's hospitals across the UK and beyond. We are beginning this with a community project and moving on to using art packs we can send to children

in hospital so they can also contribute to the wider project – both in the physical installations and as a virtual art experience online.

One of the best ways we can bring communities together, and help to explain what we as scientists are doing, is to link the domains of art and science. Both are highly creative processes but are often seen as very separate things in the world of culture and academia. In reality, many of the biggest breakthroughs in science have been realized by or communicated with artistic talent – the works of Leonardo Da Vinci for example, or the anatomical drawings of Andreas Vesalius. In the world of neuroscience, the very notion of how the brain is put together and works as a collection of distinct, connected, specialized cells was brought into public consciousness by Santiago Ramon y Cajal, a skilled histologist and microscopist whose ability to draw and communicate what he saw from his preparations was a vital tool in our understanding of the brain and beyond.

Here in the West Midlands, we are using funded scientific research as a jumping-off point for a project which is engaging young people in art and science, helping them to see the links between the two and ultimately to create an installation which will illustrate that, although we are all separate people, we are connected via our brains and our ability to communicate in the same way that the cells in our brain, and the molecular pathways within those cells, link up to form a system greater than the sum of its parts.

The project is a collaboration between scientists at Aston University and educators from Art at the Heart CIC, a West Midlands-based non-profit who provide art outreach and community engagement projects for a wide range of organizations including local councils, schools and



**Figure 1.** A selection of artistic representations of cells, neurons, networks and tissue created by students during the first sessions of the project. Each of these was arrived at dynamically by swirling, blowing and salting paint to help link the dynamics of cells and cell growth with the active creation found in artistic works.

colleges and community groups. Titled ‘How do our brains talk to each other?’ it takes a Royal Society APEX grant and associated outreach funding as its starting point. This research uses a selection of cutting-edge manufacturing and nanomaterial techniques to improve outcomes in tissue culture experiments and increase the amount and quality of data extracted from these studies.

We began by having neuroscientist Stuart Greenhill visiting art clubs run in the Core Library, Solihull, by Art at the Heart. These clubs are attended by children and young people in age groups ranging from 7–9 to 13–16. Stuart gave a series of brief talks through the sessions, with the young artists commissioned to produce simple representations of cells, neurons and networks using simple materials in between learning about the brain, biochemistry and physiology. Concepts ranging from how brain waves synchronize across different cortical areas (by getting everyone to clap and make a lot of noise!) to how artist-scientists like Cajal have moved our knowledge along by using their talents set the students up for each exercise, with the session leaders providing constant feedback and encouragement to help drive the creative exercises along and show how what is being created resembles structures and cells in the brain and body – it is surprising how many pieces end up looking like real microscopy pictures or histology slides!

To ground the art in the science, even the most basic materials such as salt and glue can be used to explain how our cells and organs work. The young artists use simple table salt to provide texture and extra dimensions to their painting; this kicks off a discussion about how our thoughts, actions and memories are really just created initially by the movement of salt (well, ions) in and out of our cells. We can then go on to talk about the biochemistry

and physiology underneath this, introducing them to membrane proteins and messenger systems at a level tailored to each age group. Glue is used to provide more texture and resistance to dynamic painting sessions (using string and straws to spread paint around the paper) and leads into a discussion of glial cells and the unsung heroes of our brains and bodies (Figure 1).

But ultimately this is all about connection – showing young people that although the chemical pathways, cells and organs within our bodies exist in relative isolation from other people, by bringing it all together and using our brains to communicate, we are connected within families, communities and across the whole world to people who we have never even met. To make this clear, the final output of the project will be an installation hosted within the university. Each student will produce a tile containing a representation of a neuron or brain network, projecting out to the sides of the tile. This means that we can create a giant tiled network of cells both physically and digitally showing that each individual part (or person) comes together to make something bigger and more beautiful than the sum of its individual parts. Moving on from this, we are creating packs to send out to children’s hospitals and community groups around the country (and possibly the world) which will allow us to expand the physical and digital mural to bring in even more communities and show that no one is isolated as long as our brains are talking to one another!

The project is still ongoing, a month of art sessions having been run with the scientists coming back to offer concluding talks showing how what’s been created aligns with neuroscience, biochemistry, anatomy and physiology at a number of levels, and how our understanding of materials (from paint and glue to marble and metal) either in art or science helps us to push the boundaries of what is



**Figure 2.** The sessions in action! As the students create their art, they are talked through how what is emerging resembles real biological structures by our resident neuroscientist and encouraged to get as creative as possible by our artist-educators.

possible (Figure 2). The finished pieces are being used to create large, permanent tiled installations in our research institute, across the buildings of the university, and in the BCH.

We're excited that this is just the start of something bigger – by using the installation as a focus for more collaboration and wider engagement, we can cast our (neuronal) network to help more people and communities

feel included in the scientific process and connected to each other across the world. ■

## Funding

This work was made possible via an outreach grant from the Royal Society (APX\PE\22100002) to Stuart Greenhill and Petro Lutsyk, Aston University.

### Further reading

- Wullschleger, S., Loewith, R. and Hall, M.N. (2006) TOR signalling in growth and metabolism. *Cell*. **124**, 474–484 DOI: 10.1016/j.cell.2006.01.016
- Bennett, C.M., Wolford, G.L. and Miller, M.B. (2009) The principled control of false positives in neuroimaging. *Soc. Cogn. Affect Neurosci.* **4**, 417–422 DOI: 10.1093/scan/insp053
- Boyden, E.S. (2011) A history of optogenetics: the development of tools for controlling brain circuits with light. *F1000 Biol. Rep.* **3**, DOI: 10.3410/B3-11
- Santiago Ramon y Cajal Nobel Prize Biography: <https://www.nobelprize.org/prizes/medicine/1906/cajal/biographical/>
- Andreas Vesalius' *De Humani Corporis* in the Hungarian Museum: <https://www.gla.ac.uk/myglasgow/library/files/special/exhibns/month/sep2002.htm>

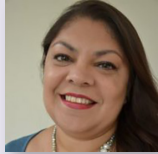
### Author information



Dr Stuart Greenhill is Senior Lecturer in Neuroscience in the College of Health and Life Sciences at Aston University, Birmingham. A member of the university's Institute for Health and Neurodevelopment, his research looks at the contribution of synaptic plasticity in healthy development and a range of neurological conditions. Email: [s.greenhill@aston.ac.uk](mailto:s.greenhill@aston.ac.uk)



*Dr Petro Lutsyk is a Lecturer in Electronic Engineering and Systems, an academic member of the Aston Institute of Photonic Technologies and the Nanoscience Research Group. His scientific background and interests embrace research areas of electronic and photonic device engineering with use of nanotechnology and advanced materials science. Email: [p.lutsyk@aston.ac.uk](mailto:p.lutsyk@aston.ac.uk)*



*Kamaljit Suman is an artist-educator with an arts and graphics lecturing background. She advocates the use of arts-rich learning to develop spirituality alongside digital skills and champions design thinking as a mind-set and process that should be widely adopted, empowering people to break through barriers and accelerate change. Email: [kamaljit@artattheheartcic.org](mailto:kamaljit@artattheheartcic.org)*



*Mukesh Kumar is an artist, educator and community mentor. Prior to holding senior leadership roles in FE, Mukesh was the first South Asian visual arts lecturer in the West Midlands. Overcoming the cultural barriers facing young people of BAME heritage aspiring to careers in the arts is one of his key passions. Email: [mukesh@artattheheartcic.org](mailto:mukesh@artattheheartcic.org)*