ART & NEUROSCIENCE

ART AND SCIENCE

Peter Stupples

As a system of visual representation art has a long history of recording human investigations into the world of nature and, even more broadly, into speculating, even fantasising, about what that world might look like – out there in unseen worlds or in there, in the body, underneath the surface of things. An unsatisfied curiosity is a characteristic of humankind. Leonardo da Vinci is the prime example of the artist/scientist forever looking and drawing what he or she has seen and, on the foundation of actuality, proceeding to give visual substance to more speculative ideas.

Figure 1. Drawing by Leonardo Da Vinci

In recent years science/technology has expanded the scope of art's reach – adding photography and computer-driven applications, such as photoshop, to the toolbox.

In order to explore this close association of art, science and technology the Dunedin School of Art organised a symposium in 2009 entitled 'Illustrating the Unseeable: Reconnecting Art and Science', bringing together both artists and those working in the visual presentation of science, such as Paul Trotman with his ground-breaking film *Donated to Science* (2009). This was the first of a subsequent series of symposia dedicated to the way aspects of the visual arts relate to our social world in a constantly changing reflexive symbiosis.

In 2011 Ruth Napper, of the Anatomy Department at the University of Otago, suggested returning to the art and science dyad with a new initiative, a nine-month project in which artists and scientists of specific disciplines might be encouraged to share ideas and experience, out of which artworks could be created inspired by that mutual interaction. She joined forces with Peter Stupples at the Dunedin School of Art and together they organised the Art and Neuroscience Project, November 2012-August 2013, that resulted in an exhibition and catalogue.

This venture was regarded as such a success by artists and scientists, as well as the University of Otago and the Dunedin School of Art, that another project 'Art and Anatomy' was launched in December 2013 and will have its exhibition in late June 2014 as part of the Dunedin Science Festival.

The aim is creative cooperation – not the illustration of scientific research but the speculative imagery that comes from the mind and hand of the artist in response to a close acquaintance with the actuality of scientific processes and ideas – or even commentary from the left field upon something that scientists take for granted, as part of their unconscious sense of normality and rationality.

It is hoped that not only artists and scientists can gain from this association, extending their respective cognitive and visual worlds, but that they can both offer the public, the community in which the artists and scientists work and live, as well as future artists and scientists – young people of today – windows into their own worlds that they never had an opportunity to look through before.

Peter Stupples is senior lecturer in art history and theory at the Dunedin School of Art at the Otago Polytechnic He was formerly associate professor and head of the Department of Art History and Theory at the University of Otago between 1990 and 1998. He has written widely about Russian visual culture, his research speciality, and the social history of art, publishing six books and numerous journal articles. Stupples has also curated art exhibitions at the Dunedin Public Art Gallery including "Sites for the Eyes: European Landscape in the Collection of the Dunedin Public Art Gallery" (April 2006–July 2007). He gave the Abbey College Prestige Lecture for 2011 on "Australian Aboriginal Art as 'Art'" and has been invited to give the William Mathew Hodgkins Lecture at the Dunedin Public Art Gallery in August 2011 on "Kikerino and Russian Art Nouveau Architectural Ceramics."

SEEING SCIENCE "THROUGH NEW EYES" IN AN ART AND NEUROSCIENCE COLLABORATION

Sunkita Howard and Jenny Rock

Around the world, art-science collaborations are gaining momentum. They share experimental, exploratory, and knowledge-forming processes that prime reflection, and both aesthetic and social engagement. However, despite this worth, and decades of institutional rhetoric promoting interdisciplinary integrative approaches, structural support is still rare. Collaborations such as the one described here, between a university, a school of art, and privately practising artists, provide meaningful interaction across persisting disciplinary divides. This supports critical changes, shifting universities away from disciplinary fragmentation and academic isolation and allowing them to contribute to critical social dialogue. Out of synch with their growing popularity, assessment of the respective (or collective) impact of art-science collaborations is slow to emerge. And yet, detecting and reflecting on the nature of such collaborative processes is critical to understanding what facilitates or impedes them, and what their more far-reaching impacts are or could be.

Two formal feedback mechanisms were applied during the "Art and Neuroscience" project – a debrief meeting following the final exhibition, and an online survey that programme participants contributed to. Amongst the 15 artists and 17 scientists who took part in the collaborative venture, eight artists attended the debrief, as did nine scientists. Survey participation was lower, with eight artists completing the online survey, along with three of the scientists. In total, almost three-quarters of the artists who took part in the program fed back through one or both of the formal mechanisms, as did over half of the scientists. Of those who offered feedback, recounted experiences and insights shared were diverse and highly individual. This report offers a qualitative discussion of some of the concepts and ideas put forward through feedback by those who took part in the "Art and Neuroscience" project – but it is not an evaluation of the initiative, nor is it representative of participants' diverse, unique experiences and perspectives.

You might wonder who we are to be describing the "Art and Neuroscience" project. We are a pair of biologists in the Otago University Zoology Department who are passionate about art-science crossover and sharing ideas between disciplines. Only discovering the "Art and Neuroscience" project when it was nearly over, but being very excited by the concept, we wanted to understand what had taken place. We hoped that by documenting the participants' processes and experiences in some way, we might also seize a learning opportunity that could contribute to future art-science collaborations.

WHO TOOK PART IN THE "ART AND NEUROSCIENCE" PROJECT?

An assumption that we took into the survey design process was that there were two separate categories of participant, 'artist' and 'scientist.' In fact, more than half of the artists who provided feedback indicated that they were involved in the sciences before joining the project or had a preexisting art practice that explored scientific themes. When we asked questions like "Are you interested in learning more about the scientific method?" in our survey, the response "Am well aware" encapsulated the responses from artists whose previous experience in the sciences had not been considered in our approach.

We also asked scientists if they were interested in learning about an arts practice. Of the very small sample of scientists who responded to the survey, questions relating to an interest in developing their own art practice or learning more about the arts were either skipped or ambivalence was indicated, except for one response: "I'm not sure I have any artistic talent but it would be fun to try [to learn about an artistic practice]." If an existing interest in the sciences was a factor that drew artists to be involved, an active interest in science communication may have been a common trait among the scientists who chose to join this project. Across all the scientists who provided feedback, science communication was a major theme whenever the discussion turned toward what scientists gained from participating.

SEEING SCIENCE "THROUGH NEW EYES"

Artist participants were briefed that the goal of this project was not "illustrating science," and artists' feedback reflected that clearly. Scientists' responses suggest that an interest in the "Art and Neuroscience" project as a mode of science communication was widespread, and these two agendas for the project surfaced frequently in artist and scientist feedback.

Scientists enjoyed the experience as an opportunity to both "hone communication skills with a general audience" – that audience being the artists themselves – and to have their research made available to the general public during the exhibition. Scientists practised using non-technical language to describe their research to artists. They had varying levels of success meeting the right comprehension level. While one artist commented, "I'm not very literate in science so [my scientist] had a real challenge I think trying to explain [their research] to me," artists largely found the experience a positive one, evident in comments such as "I really enjoyed listening." Some artists attended lectures given by their scientist or another scientist in a related discipline, while others took part in multiple meetings with their scientist, in the lab and in the office.

Artistic outputs were described by many of the scientists as "representations of the science." As one scientist put it, "The whole exhibition … tells the public what we're doing and why we think it's important to look at it." Scientists tended to expect that audiences with little scientific literacy would come to the exhibition and engage with the scientific content of the artworks. Some scientists anticipated seeing their research "through new eyes," interpreted by artists in a new medium. In many instances, these scientists came away satisfied that the art in the final exhibition had represented their patients' experiences or the themes of their research. However, for the most part this was not consistent with artists' intentions, as artists "understood [that] the philosophy here was that you weren't illustrating." Rather than communicating a specific research narrative, many artists were interested in the broad ideas and concepts. As one artist reflected, "The topic was relevant to my arts practice … [the scientific method] is irrelevant to my work process." Sometimes the aspect of a scientist's work that provided the inspiration for an artist was probably not what a scientist expecting to have their research interpreted in art might hope for – one artist reported being influenced by the colour scheme of a scientist's poster!

One artist expressed the following interpretation of the differences between scientists' and artists' approaches to exploring a concept: "As an artist what you want to end up with is a question, not an answer and that's probably the fundamental difference." While art, seen through this lens, could continually widen the realm of possibility, scientific research could be seen as an effort to hone in on an understanding with least uncertainty. As one scientist put it, "We saw that we work very differently. When I tried to focus [the microscope] they made it blurry." That is not to say that the artists rejected overt communication of science. One artist specifically stated that they were interested in science communication and sought to communicate ideas through art because they found visual art a better medium for that purpose than words.

Although tacit and overt differences in scientists' and artists' expectations of the project existed, it was clear that participants valued these differences. One of the most highly cited benefits that scientists gained from the project was the opportunity to interact with an artist who "had a completely different perspective on life, on science, on

everything" and have that person share views about their research from "a different point of view," a "completely different angle." One scientist described how when "you have someone from outside … look in it kind of opens your mind." A parallel comment from an artist was the poignant statement that the experience "opened doors in my imagination."

DIVERSE COLLABORATIVE PROCESSES

Much of the process of sharing ideas was done through verbal discourse that took place during meetings in scientists' offices, in the lab, at the university staff club and even in participants' homes. For some pairings, meetings and ongoing contact between scientists and artists were rich and productive for both parties. One scientist reported, "We … delved real deep into what it was that we were looking at and had a couple of great two-hour meetings." Other scientist/artist pairs formed friendships and met over wine and cheese, describing how "We were both laughing all the time together."

In other pairings, once the artist's desire for "compelling and seductive ideas from discussions with scientists" had been satisfied, they didn't feel the need for ongoing involvement with their scientist. Some scientists reported having met with their artist only during the initial phase of the project, and seeing the resulting art for the first time at the exhibition opening. As one scientist put it, "We met together once. [The artist] had pretty strong ideas about what [they] wanted to get out of the type of research that we were doing." Just as the scientists relished the chance to share how their work was done, statements like "I really enjoyed the opportunity to show somebody else how an art project is set up and how an artwork is produced" suggest that the artists also enjoyed sharing their art practice with a new audience of lay persons. However, it was less common for the scientists to join the artist in their workshop than it was for the artist to enter the laboratory.

Some artists found entering the laboratory environment inside a university to be a striking experience. One describes "Going into these labs with swipe cards … it was so different to our world which is so open" and recounts an impression of secrecy and "huge machines." They were surprised to find that this "completely different world" was populated by people who were "the same as us, not any different." This metaphor whereby the experience of collaboration allowed artists and scientists to enter into each other's "different worlds" was a recurrent theme that cropped up regularly in both artist and scientist feedback.

Most of the comments were positive about the organisational framework that was provided. The core structure was the pairing between an artist and scientist, where meetings between artist/scientist pairs (or small groups) took place at the participants' discretion after the initial pairing had been made. This approach left room for individuals to decide how they wanted to work. The wide variation in the environments where artist/scientist meetings took place, and the range in frequency and content of those meetings, indicates that this flexible approach was appropriate. Artists reported that their scientist's research provided the "brief" that inspired them to move ahead with their artistic process.

In addition to the meetings between artist/scientist pairs or small groups, there were also larger meetings that all participants attended. One artist described the level of structure as a "loose but tight ship." These whole group meetings were described by one participant as a "body count," due to attrition that occurred over the span of the project. Several people reported finding it challenging to make the time to attend these meetings. While it was suggested that allocating topics for these whole group meetings or requiring attendance at talks on specific science subjects would not suit the diversity of interests held by all the participants, several people did express interest in having general themes for these whole group meetings. Ideas for themes included centering the meetings on a general discussion point or even a social event. One participant expressed regret that they hadn't had the opportunity to get to know people other than their immediate collaborators as well as they would have liked, which a more social focus in the meetings could have supported. Another participant suggested that a broadly relevant topic such as animal ethics would be a good focal point for group meetings.

DRAWING CONNECTIONS BETWEEN COMMUNITIES

Another recurrent theme was the concept of participants experiencing an expanded community. The University of Otago main campus and the Dunedin School of Art are physically located in close proximity to each other, and yet some of the comments imply that people inhabiting one organisation felt that their respective communities were disconnected from each other. "I wouldn't ordinarily mix with artists. You guys are miles away on the other side of campus and in my daily routine I certainly wouldn't have the opportunity to, so it was fantastic in that sense."

Much of the positive feedback referred to personal connections established between participants. Scientists talked about finding common ground, building a partnership or relationship, and making friends with their artist collaborator. Likewise, artists talked about the positive relationships that they established with scientists. Artists and scientists typically referred to "my" scientist or "my" artist, which in itself suggests a bond. One scientist also mentioned that they felt like the experience had enabled them to connect with other scientists who took part in the project.

CONCLUSIONS

As observers of only the final stages of "Art and Neuroscience," we acknowledge the limitations of our involvement. We entered at the end of the project, and clearly a much richer picture of events could have been built through involvement from the start, as well as through inclusion of social science researchers. Our observations reflect only one facet of what took place and are unlikely to generalise across every participants' experience. We hope, however, that this reflection will further the discussion about the process and outcomes of collaborative projects such as this, and encourage future art-science collaborations.

It was a pleasure to be able to be involved in the "Art and Neuroscience" project, and we greatly appreciate the feedback from artists and scientists who made this possible.

Sunkita Howard is a Fulbright Scholar and doctoral student at the University of Otago. She incorporates the artistic practices of printmaking and poetry into her research on developing shark bycatch reduction technology for longline fishing gear.

Dr Jenny Rock is a biologist and artist who lectures in critical and creative thinking at the University of Otago's Centre Science Communication. Her interests include the aesthetics of science, visual/sensory cognition, and art-as-hypothesis.

REVIEW OF "ART AND NEUROSCIENCE:" A GROUP SHOW OF ARTIST AND SCIENTIST COLLABORATIONS, THE BRAIN HEALTH RESEARCH CENTRE, THE HUNTER CENTRE, UNIVERSITY OF OTAGO, DUNEDIN, 22 JULY – 9 AUGUST 2013

Franky Strachan

"Art and Neuroscience" is an exhibition which saw 17 artists and 15 neurological researchers working together, either individually or in small groups, to develop visual responses to neurological research topics ranging from Alzheimer's and Parkinson's disease through to the effects of Ritalin. Situated within the Hunter Centre, Otago University's major health science facility, the works are not immediately obvious. Tucked away, framed like specimens, or so strikingly fitting for their environment that they have architectural appeal, they emerge to the viewer one by one. The large space is open and well-lit and is trimmed with a mezzanine which is flanked by glass-walled classrooms and group study areas through which distracted students exchange glances and gaze pensively.

It was neuroscientist and senior lecturer Dr Ruth Napper who, while attending an evening art class, had the spark of inspiration for the exhibition. Interested to know how art students would interpret her own work and that of her colleagues, she took the idea of an art collaboration to Peter Stupples, senior lecturer in art history and theory at the Dunedin School of Art at the Otago Polytechnic. Together they coordinated the project with the ultimate hope that it would draw in audiences who wouldn't normally be thinking about neuroscientific research. The only stipulation for the artists was that the art must express something of the given research, but should not be illustrative of it.

This brief had varied results, with some artists being more figurative than others. Overall, it prompted some serious artistic thought, with the neuroscientists being particularly delighted and intrigued by the aestheticisation of their research. Comprising installations, detailed embroidery, paintings, sculptures, films and videos, prints, photographs, jewellery and ceramics, the exhibition is diverse and each piece both peculiar and thoughtful.

Briefly, here are five examples that give an impression of the range of collaborations: neuroscientist Brian Hyland and artist David Green produced an eerie 'three-in-one' video which overlapped footage and dialogue to translate the Jungian theory of free association; artist Rowan Holt worked through Joanna Williams's Alzheimer's research to produce a large hanging sculpture whose segmented wooden framing is emblematic of the relationship changes which occur as a result of degenerative memory loss; neuroscientist Damian Scarf and artist Sue Taylor presented a felt scarf honouring the cognitive ability of homing pigeons by delicately sewing – in lieu of drawing – images pertaining to pigeons' brain structures and distinctive navigational capabilities; Joe Papps, in conjunction with neuroscientist Laura Boddington, created a box through which the viewer peers in order to experience a powerful looped film involving scratched 16mm footage which had been spliced with digital film; and Amy Moffitt worked with neuroscientist Louise Parr-Brownlie to convey the facial symptoms of Parkinson's on layered and symbolically torn A4 paper.

In response to the work of neuroscientist Phil Brownjohn, artist Jimmy Bellaney produced a large abstract painting in primary hues to express the function and dysfunction of the brain post-stroke. The veining, pooling and cracking of the paint as assorted viscosities met and marbled made for an image reminiscent of a brain scan or anatomical thermal imaging. However, if the painting were removed from the context of this exhibition it could easily be taken as some kind of geological reading.

These analytical interpretations suggest something about the way we read imagery. Such configurations and patterns, signposts and symbols, connections and fragmentations, as well as the presentation of new ideas and unexplored territory, are notions we are taught to seek in both artistic and scientific material. When presented with chemical symbols or mathematical notations, symbolic iconography or emblematical colour choices, we learn to perceive visual data as encoded. Not only does this call to mind our scholarly expectations in approaching the artistic and scientific material respectively, but it highlights the fact that the "Art and Neuroscience" exhibition embodied the codification of two disciplines simultaneously.

Artists Desi Liversage and Katya Gunn skilfully illustrate this equivocality in paying homage to lab rats by creating an exquisite reliquary from the (ethically approved) skeleton of a rat. This piece is tied to neuroscientist Justine Fuller's research on the processes which occur in the brain of an ADHD sufferer who is taking Ritalin, but it also relates to the time-honoured art-historical tradition of the memento mori whereby artists provide symbolic reminders of the inevitability of death within their paintings. Like a few other artworks, this small but touching sculpture sits on a pedestal like a displaced museum artifact or a prized curiosity from a Victorian cabinet.

Also in keeping with this aesthetic, Richard Mountain has sculpted an enlarged virus based on the work of neuroscientist Valerie Tan (it could easily feature in a Jules Verne-inspired film). Tan is researching the potential of a virus injection to prevent the onset of Alzheimer's disease and Mountain's three-dimensional interpretation gives weight to the silently violent microscopic world. This can be directly contrasted with artist Becky Cameron's contribution, which likewise pertains to Alzheimer's disease. In the form of the light play created by a softly revolving lantern, Cameron gently connotes temporality and mapping of our memories. I find her piece to be the most poignant of the entire exhibition – there is something unassuming, poetic and penetrating about its ephemeral effect and, while some works in the show are literal interpretations, *Locus Lucidus* asks the viewer to turn inwards.

What is most overwhelming and consistent throughout this exhibition is the mutual respect which underlines the artist-scientist relationships. The artists do not seem interested in criticising their scientific counterparts, but rather have expressed their admiration and respect for them. This could not be predicted. When disparate disciplines collide, tensions can easily transpire and very quickly conflicting ideologies can create an atmosphere of defensiveness. Yet "Art and Neuroscience" does not seem strained, with the result that this project draws in a wider audience to consider the complexities of neurology. A very successful exhibition indeed.

Franky Strachan is a Napier-based art writer, children's writer and painter who has written art reviews for *The Otago Daily Times* and *EyeContact*. She holds a BA (Hons) in Art History and Art Theory and is currently undertaking doctoral studies in the same field. Her research interests are wide-ranging but they tend to circle the nature and various philosophies of twentieth-century art and representation. Most recently, this has meant her re-evaluating the value of Art Deco art and architecture in the shadow of the avant-garde.

SLIDE

Dr Lucia Schoderböck in collaboration with artists Kristin Peren and Marion Wassenaar

My research interest is the molecular and cellular basis of learning and memory. Currently, I am studying newly born neurons in adult brains and their role during memory formation and retrieval. I can test which memory functions are lost when these recently born neurons are switched off by using genetic tools. When I look at samples on slides under the microscope, I often admire the beauty of the brain and its individual cells. I am very excited that this beauty has now been translated into art and am curious to see an artist's take on science.

LUCIA SCHODERBÖCK

Baby's first steps, the family's first overseas adventure, or the simple pleasure of walking through a spring garden filled with the scent of jonquils that remind you of a dear friend; these are memories we treasure. They form experiences in life that connect our past to the present and shape our identity. But what happens when memories fade – seized through brain injury or disease to become frozen in time?

Both Kristin and Marion grew up through the 1960s and '70s, a period when family slide shows were a nostalgic reminder of days gone by. The slide show was an archive of memories that has been superseded by image collections stored in a digital database. *Slide* revisions the outdated slide format with manipulated and magnified images sourced from Lucia's laboratory slides.

Lucia gave us the opportunity to photograph her slides through the microscope. Her slides relate to research on the rescue of memory after brain injury, investigating adult neurogenesis in memory formation and retrieval. In this project, the slide format has involved a revival of old technology in a similar vein to Lucia's research that questions whether older neurons retire or are still actively involved in memory processes.

> And that is the way it goes here
> In the diffused light from the translucent roof,
> One missing extremity after another …
> But outside on the city streets,
> It is raining, and the pavement shines
> With the crisscross traffic of living bodies.

In the first three lines of this excerpt from Billy Collins's poem *Greek and Roman Statuary*, the fragmentation of the statue forms an analogy to the impairment and memory loss suffered by the brain through aging or injury. But it is through this fragmentation, or what is missing, that scientists such as Lucia investigate the complex processes of manipulating newly formed neurons to test cognitive functioning.

Our encounter was insightful and hopeful. This was a fascinating and surreal experience resulting in a printed series of manipulated images.

Our senses were filled with wonder, free to wander, to imagine and reminisce.

KRISTIN PEREN AND MARION WASSENAAR

Marion Wassenaar is a visual artist specialising in print practices and sculpture. Her research interests focus on the collision between humans and their environment, either in terms of social justice or ecological concerns. She lectures in the Print Studio at the Dunedin School of Art. Marion holds an MFA from the Dunedin School of Art.

Kristin O'Sullivan Peren holds an MFA from the Dunedin School of Art. Kristin is a multi-media artist whose practice responds to extremities of land, language and object. O'Sullivan Peren's work has developed from her background as a printmaker. Recent large-scale projects have embraced photographic, sculptural and electronic media, utilising both digital and analogue technologies. O'Sullivan Peren exhibits locally and internationally in public spaces, contemporary project galleries and at artist residency communities here and overseas.

Lucia Schoderböck is a Postdoctoral Fellow in the Department of Psychology at the University of Otago. Lucia received her Master's degree in molecular biology in 2006 at the University of Vienna, Austria. She then undertook a doctorate on RNA localisation in neurons. After receiving her PhD at the University of Vienna in 2010, she moved to the University of Otago. Here, she first worked on a project studying the role of precursor proteins in Alzheimer's disease and then joined a team investigating adult neurogenesis.

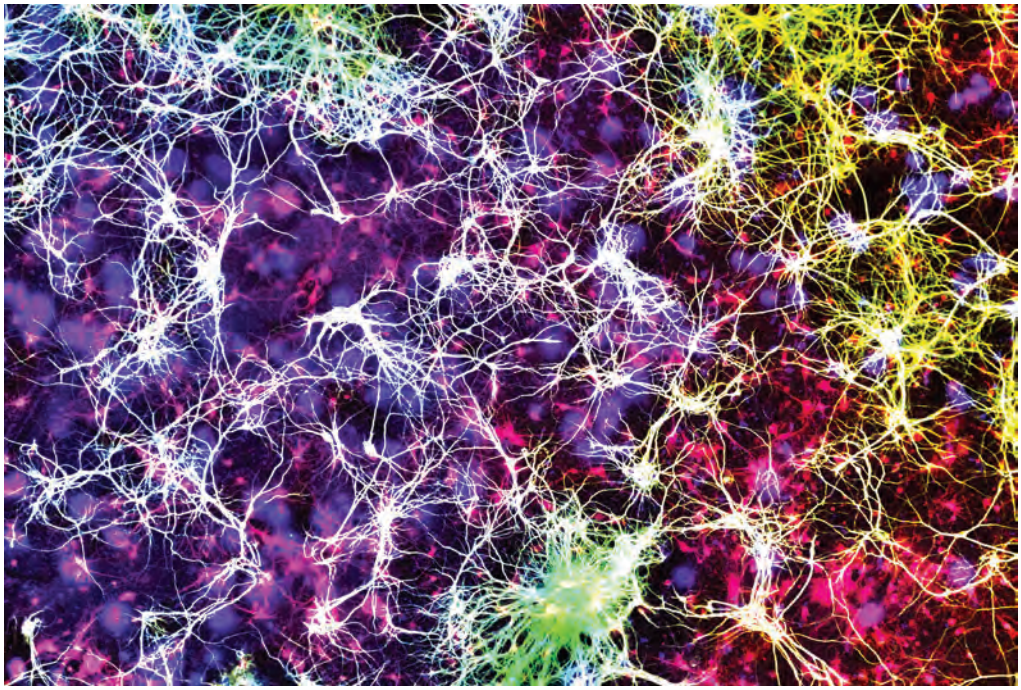

Figure 1. Kristen Peren and Marion Wassenaar, *Slide 1* (2013), laboratory slide photographed under microscope, digitally printed on Hahnemeule paper, 46 × 69 cm, framed 100 × 100 cm.

TORN

Neuroscientist Louise Parr-Brownlie in collaboration with artist Amy Moffitt

The overarching goal of work in my lab is to improve treatments for patients living with Parkinson's disease. Parkinson's disease is a neurodegenerative disorder that causes movement deficits in approximately 8000 people in New Zealand. Our research focus is to understand how the brain normally codes voluntary movements and how that code is altered when it takes a long time to start a movement or movements are slowed. We investigate this by recording the activity of individual brain cells during functional tasks, such as reaching, and look for changes in the way cells code information and interact with each other in the parkinsonian state. We apply this knowledge to investigate potential novel treatments that normalise the coding of information in the brain and restore movements.

LOUISE PARR-BROWNLIE

In this project, entitled *Torn*, I have mixed classic studio portraiture with contemporary street art to portray my reaction to Parkinson's disease.

Through this project I became interested in the facial symptoms patients experience throughout disease progression – for example, the mask-like appearance patients develop.

Using classic portraiture techniques, I photographed a middle-aged woman and printed the photographs using the street-style format of cheap A4 paper posters. I then used poster glue to overlap each photograph onto wood panels. The panels were left out in the elements to decay and peel through to reveal each layer.

My work portrays the idea that the visual signs of Parkinson's are just that – visual.

AMY MOFFITT

Amy Moffitt graduated from the Dunedin School of Art in 2012. Since then, she has been working for Dunedin's Fortune Theatre doing production photography. She is interested in the combination of film and photography as a single medium and is working towards a new project reflecting the potentialities of both practices.

Louise Parr-Brownlie works in the Department of Anatomy at the University of Otago and in the university's Brain Health Research Centre. Her research focuses on the neural mechanisms that underlie voluntary movements and the movement deficits of Parkinson's disease.

Figure 1. Louise Parr-Brownlie and Amy Moffitt in front of *Torn* at the Hunter Centre in 2013.

OPTOGENETIC RAT

Neuroscientist Clementine Bosch in collaboration with artist Chris Reid

My research is undertaken to better understand how the brain is disturbed in Parkinson's disease, to potentially find better treatment for this disease. For that, I am using a new technique called optogenetics to control the activity of a rat brain with light. I am using light to stimulate the brains of both healthy and parkinsonian rats while they are reaching with their forepaw for Coco Pops. Our ultimate goal in using light to control a precise area of the brain is to restore normal motor behaviour in parkinsonian rats. I really enjoyed showing my experiments to Chris and seeing his photographs, because it gave me a new outlook on my work.

CLEMENTINE BOSCH

The idea of working on a project that is based on the use of light is very interesting to a photographer. So when the artists and scientists involved in the Art and Neuroscience Project were asked to sort themselves into working groups, I was immediately taken with the idea of optogenetics. It also helped that my research partner Clementine was friendly, helpful and an interested photographer herself.

I initially thought that I would look at the metaphorical possibilities arising from this research technique and how the lives of Parkinson's disease sufferers might be improved by treatment developed here. However, I soon found myself intrigued by the appearance of the experiments; colourful strobing lights, strange-looking apparatus and the quick movements of the research rats appealed to my eye.

I was also interested in the working relationship between Clementine and the rats. Although they would ultimately be sacrificed in order to help develop a treatment for Parkinson's, they lived well in the meantime. Treated with respect and kindness by their researcher, able to play with the other rats between experiments – and, best of all, their job was to see how fast they could grab one Cocoa Pop after another: nice work if you can get it.

In my photographs I try to depict both of these facets of the research.

CHRIS REID

Chris Reid makes photographs that explore distortions in time and space. The images shown in the Art and Neuroscience Project were made while he was a postgraduate student at the Dunedin School of Art.

Clementine Bosch (PhD Collège de France) is a Postdoctoral Fellow in the Department of Anatomy at the University of Otago and also works in the university's Brain Health Research Centre. Clementine's research area is the neurophysiology of Parkinson's disease. In 2013 she was the recipient of the Otago Medical School Research Society's (OMSRS) Research Staff Award.

Figure 1. Chris Reid, *Optogenetic Rat* (2013), photograph.

THE ONLY THING MORE POWERFUL THAN FEAR IS HOPE

Neuroscientist Christine Jasoni in collaboration with artist Sally Shephard

Was your mother's health during pregnancy to blame if you feel awkward at parties, or if you can't stop eating those fatty foods?

These may seem odd questions. But recent studies suggest that our mother's health when she was pregnant with us can have an uncanny influence on our mental health and behaviour.

Pregnancy is a time when a mother and her offspring interact most intimately. After all, the fetus in the womb relies on its mother for, well, everything. So if a mother is in poor health, it should be no surprise that her fetus may be adversely affected. But how does this actually happen? Our research is aimed at discovering how a mother's health can affect the development of her unborn child such that its long-term health is compromised. Our goal is to protect the unborn child in the face of poor maternal health in order to give the child the best chance of a healthy start to life and lifelong well-being.

CHRISTINE JASONI

My work is concerned with issues of optimism, discovery and society's attitudes to progress. Scientific research is the main tool for discovering the new, but as a society we all need to address and discuss how any new knowledge might affect the individual and the decisions we make.

Art and artists are in a unique position to provide a starting point for these discussions. The way a society treats the vulnerable within in it is a marker of its humanity and goodness. I have always been interested in relationships between child and parent and am continually dismayed by the appalling statistics we have in New Zealand regarding child abuse, neglect and unnecessary deaths.

The issue of parental responsibility for the care of the children we choose to bring into the world is one we must not shy away from. For the research – exciting and well intentioned as it is – to be valuable and helpful, it must be acted upon by the pregnant mother. Motherhood and parenthood itself is under scrutiny here. The child, although unborn, in my view has a right not to be intentionally damaged.

I am exploring ideas around the feminine, danger, the precious, and the continuum of life; after all, there is nothing newer than a new life, and no greater promise than that of the unborn.

SALLY SHEPHARD

Sally Shephard is a practising artist who is also enrolled for the Master of Fine Arts degree in the Dunedin School of Art.

Christine Jasoni is a senior lecturer in the Department of Anatomy at the University of Otago. She trained in the United States and moved to New Zealand in 2002, where she is still trying to get used to not having Christmas in the middle of winter. Her scientific interest is in understanding how our most impressive and complicated organ, the brain, forms in the period before birth. Her research focuses on understanding how adversity in the womb can increase the risk of neurobehavioural disorders and mental illness in later life.

Figure 1. Sally Shephard, *The Only Thing More Powerful than Fear is Hope* (2013), mixed media, dimensions variable.

VIRUS #72

Neuroscientist Valerie Tan in collaboration with artist Richard Mountain

My project attempts to prevent the onset of Alzheimer's disease by using a virus injection to transport proteins into a target region of the brain. Alzheimer's disease is most noticeably a dysfunction of memory and learning, and therefore we are aiming for those regions in the brain. We look at behaviour changes and also changes in the electrical signalling of the brain.

VALERIE TAN

My work derives from a response to illness. By looking at the microscopic world we are now able to combat illness in new ways. Viruses in the past have hindered us, but now we are harnessing them to deliver life-altering medicine to help prevent and cure debilitating illnesses such as Alzheimer's disease. The research into Alzheimer's that Valerie Tan is currently conducting contributed towards this work, *Virus #72*.

I see clay as a very human material. It is from the ground we have come and to which we will return. Ceramic forms can be anthropomorphic – foot, belly, shoulder, neck, lip and mouth are all words used to describe a ceramic vessel. My early works have broken away from conventional ceramics. Putting them on the wall has removed their function and turned them into compositions.

I chose my Masters degree topic because of my experiences with illness and the processes that saved my life. Drugs administered to my body fascinate me. I am interested in the way they affected the cells inside me, becoming a series of lifesaving events on a molecular level.

My response to this experience was to try and make sense of my existence in the universe and the world I live in by looking at the parallels between 'micro' and 'macro' and patterns in nature. By combining thrown objects with hand-built components I built forms inspired by microbiology.

I began to include bio-mechanical aspects influenced by rapid advances in medicine. The works explore how man and machine are starting to co-evolve through nano-technologies and bionics. These works question whether this cooperation between man and machine will change the notion of what makes us human.

RICHARD MOUNTAIN

Richard Mountain holds an MFA from the Dunedin School of Art in ceramics. His work is influenced by the chemical and physical events that occur in our universe, resulting in 'us' and other biological organisms.

Valerie Tan is a PhD student at the University of Otago. Valerie works in the Biochemistry Department at the School of Medical Sciences.

Figure 1. Richard Mountain, *Virus #72* (2013), ceramic and glaze.

THIS PAINTING IS ABOUT MEMORIES

Neuroscientist Lucia Schoderböck in collaboration with artist Sue Novell

My research interest is the molecular and cellular basis of learning and memory. Currently, I am studying newly born neurons in adult brains and their role during memory formation and retrieval. I can test which memory functions are lost when these recently born neurons are switched off by using genetic tools. When I look at samples on slides under the microscope, I often admire the beauty of the brain and its individual cells. I am very excited that this beauty has now been translated into art and am curious to see an artist's take on science.

LUCIA SCHODERBÖCK

It is memories that enable us to tie our life experiences together – providing continuity in personal and collective histories. Without the binding force of memories, consciousness of our unique self and knowledge of culture would be lost.

The work is a collaboration between the brain science of memory and a photograph of a scene that captures a significant personal memory. Memories in the brain require activity in special single cells; similarly a digital photograph is made up of individual pixels and a painting of individual brush strokes.

At another level, our memories are constructions of multiple levels: sounds, sights, emotions, layered together. For this painting I merged a photograph of a significant scene in my life with a photograph of memory cells taken by Dr Lucia Schoderböck in the course of her research.

The result is therefore a visual metaphor for the experience of constructed memory and its biological underpinnings.

SUE NOVELL

Sue Novell lives and works in Dunedin, New Zealand, where she graduated from the Dunedin School of Art with a Master of Fine Arts with distinction in painting in 2009. Since then her work has been shown in group and solo exhibitions in Auckland, Dunedin and Christchurch. Her work is held in private collections in New Zealand and Switzerland. A recent work was acquired by the James Wallace Art Trust in Auckland.

Lucia Schoderböck is a Postdoctoral Fellow in the Department of Psychology at the University of Otago. Lucia received her Master's degree in molecular biology in 2006 at the University of Vienna, Austria. She then undertook a doctorate on RNA localisation in neurons. After receiving her PhD at the University of Vienna in 2010, she moved to the University of Otago. Here, she first worked on a project studying the role of precursor proteins in Alzheimer's disease and then joined a team investigating adult neurogenesis.

Figure 1. Sue Novell, *This Painting is about Memories* (2013).

NEUROSCAPE

Neuroscientists Phil Brownjohn and Jonathan Shemmell in collaboration with artist James Bellaney

Following stroke, patients often experience disability resulting from damage to the neural pathways that control movement. Recovering the function of these pathways, and thus regaining movement, is a core goal of neuromodulation techniques such as transcranial magnetic stimulation. This technology involves the application of magnetic pulses to the scalp, which then pass painlessly into the outer layer of the brain, the cortex, and directly stimulate neurons involved in the motor system

Repetitive stimulation of neurons in this manner can have long-lasting effects on the properties of these cells and their pathways, and implications for improving functional recovery after stroke. Understanding the basis of this neuromodulation and how it interacts with existing rehabilitative strategies in the context of stroke recovery is a key research aim of our laboratory.

PHIL BROWNJOHN

My collaborator was Phil Brownjohn, whose research explores the functioning of the cortex which becomes overactive during a stroke. The result is a shut-down in the brain causing paralysis.

As an artist, what interested me was the idea of function and disfunction, active and inactive, which in an organism as complex as the human brain signifies to me both the magnificence and fragility of the brain and ourselves. My painting is not intended to be a representation or a narrative, but functions more in ambiguity.

In the work, I used my 'organic abstraction' method, which involves pouring and merging paint of different consistencies to create fractals and marble affects that play with the idea of macro and micro, comparing geological perspectives as if seen from a satellite with the cell structures in our bodies and all living things.

The briliance of Phil's research lies in the re-stimulation of the zones in the cortex. Reigniting these zones re-establishes the neurological connections running from the brain to arm or fingers or face – the movements that help us through our daily lives.

For me, this suggests a metaphor that applies to art, connecting art and science. The importance of art is in the experience involved, the individual's self-reflection that invokes the imagination which risks becoming more and more dormant through easy-to-use technology and media that is fed by the machine.

JAMES BELLANEY

James Bellaney has been exhibiting locally and nationally since completing his BFA at the Dunedin School of Art in 2011. His work includes painting and drawing as well as performance art. He exhibits in galleries, and in artist and community spaces. James was a finalist in the Clifton Art Awards 2012 and the New Zealand National Art Awards

in Waikato (2013) and has received commissions for public artworks in Dunedin. He sees himself as an active artist, experimenting with and exploring ideas around the medium of paint, the human condition and the imagination. He is currently working towards an exhibition in Wellington.

Jonathan Shemmell works in the School of Physical Education, Sport and Exercise Sciences at the University of Otago, and is also a researcher in the Sensory Stimulation Project at the university's Brain Health Research Centre. Jon joined the School in 2009. After obtaining a Bachelor's degree in sports coaching in 1997 from Deakin University, Jon completed a Master of Science (1999) and PhD (2004) in motor control and neurophysiology at the University of Queensland. He went on to investigate methods for improving outcomes for stroke survivors during his postdoctoral training in clinical neurophysiology at Boston University and the Rehabilitation Institute of Chicago (2005-08).

Phil Brownjohn is a Postdoctoral Fellow in the School of Physical Education, Sport and Exercise Sciences at the University of Otago and a researcher in the university's Brain Health Research Centre's Sensory Stimulation Project. Phil Brownjohn works with Jonathan Shemmell in the area of sensory stimulation research.

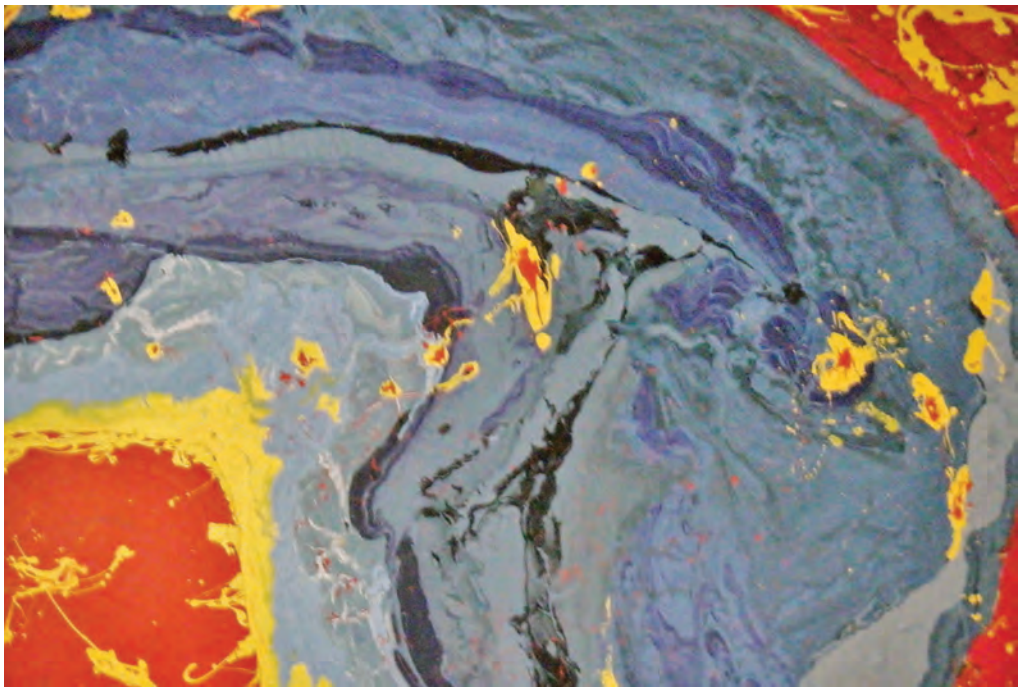

Figure 1. James Bellaney, *Neuroscape* (2013), house paint on canvas, 1700 × 1300 mm.

LOCUS LUCIDUS

Neuroscientist Margaret Ryan in collaboration with artist Rebecca Cameron

My research is focussed on Alzheimer's disease, a devastating neurodegenerative disease that initially robs the sufferer of recent memories and gradually leads to the loss of personality and independence.

We are interested in how this memory loss occurs and are focused on a particular region of the brain, the hippocampus, which is important in maintaining these recent memories. It is one of the first regions of the brain affected in Alzheimer's disease, and we are investigating the molecular changes that occur in this region in Alzheimer's disease. Identifying these changes will contribute to our overall understanding of how Alzheimer's disease develops and progresses.

MARGARET RYAN

This project began with a discussion about memory and memory loss, and about how memory affects how we orientate ourselves in the world. I started thinking about an analogy between gene mapping and our mapping of our physical environments. This work also continues my investigations into how we establish a sense of place and build up our personal maps of an area, and how other places we've lived in and cultural ideas we bring with us affect this.

The lantern shown here has a cut-out design based on a place I've lived in in the past, one that's been formative for how I perceive where I live in the present. The mechanism used is influenced by technology from the era before photography. As it revolves it traces a pattern in light that forms a visual analogy for how body memories of place are built up through repeated paths taken through a landscape. It also reflects how memory, like the body or a home place, can be transient.

BECKY CAMERON

Based in Dunedin, **Becky Cameron** holds an MA in art conservation, and in 2013 completed a Bachelor of Visual Arts with Honours at the Dunedin School of Art. She has been exhibiting since 2008, and her most recent project, "Te Ao Huri Huri / The Turning World," was shown as a part of the Dunedin Matariki Festival in July 2014. Cameron's practice explores landscape, memory, belonging and home.

Margaret Ryan is a Research Fellow in the Division of Health Sciences at the University of Otago. Memory loss arising from neurodegenerative diseases such as Alzheimer's disease is devastating both to the individual and to their loved ones, robbing sufferers of many of their uniquely identifiable characteristics. Dr Ryan's interest is in how memories are formed and stored in the brain at the molecular level and how this may be altered in Alzheimer's disease.

Figure 1. Becky Cameron, *Locus Lucidus* (2013), fire retardant paper, aluminium from drink cans, light bulb, found stand, wire and tracing paper. Dimensions of lamp: 540 x 200 mm.

PIGEON PI

Neuroscientist Damian Scarf in collaboration with artist Sue Taylor

My initial work with pigeons focused on 'higher order' abilities that were once thought to be unique to primates. This line of work has demonstrated that, like primates, pigeons are able to encode the ordinal property of sequences (i.e., 1st, 2nd, 3rd, etc.), plan for the future, and form abstract numerical rules.

My current focus is homing. Homing is the one cognitive ability where pigeons are clearly superior to primates, including humans. The aim of this work is to show how early life experiences influence the formation of a pigeon's multifactorial map.

DAMIAN SCARF

My attraction to Damian's research work with pigeons is grounded in my general interest in birds and their abilities. Through observing commonplace birds in my home garden I have come to respect and enjoy their unique ways of being.

The Mobius strip is a form with only one plane so that there is no starting or ending point, but a continuous line that represents the eternal. Homing pigeons remind me of this continuous flow as they soar through the atmosphere, above the landscape, finding their way by means we are now learning to understand and appreciate.

The process of drawing is usually associated with tools such as pencils, charcoal, crayons, and pastels. In this work, however, I have used a sewing machine as a drawing tool to create delicate line drawings on soft creamy felt. To add tone and texture I have used metallic threads of different colours mixed together. Differences in stitch type and size are also used to add to the overall effect.

Gold, silver, and bronze threads are used to elevate the pigeons from the ordinary to the exquisite. These pigeons are not 'flying rats,' but have abilities that are represented in images of them working with symbols and in the intricacy of their brain structure.

SUE TAYLOR

Susan Helen Taylor is an artist and writer who completed a Bachelor of Fine Arts at the Dunedin School of Art, Otago Polytechnic/Te Kura Matatini ki Otago, in 2010. Coming from a background in both crafts and the humanities, she seeks to bring these two strands together through the creation of fine art objects.

Damian Scarf is a lecturer in the Department of Psychology at the University of Otago. It was a third-year psychology paper (PSYC 319) and its teacher (Professor Michael Colombo) that first got Damian interested in psychology. After completing his BSc in zoology, Damian went on to complete his PhD in Professor Colombo's lab; his doctoral research focused on how pigeons execute and plan sequences. Damian continues to collaborate with Professor Colombo and his comparative research now employs electrophysiological techniques in order to uncover how sequences are represented at the neural level.

Figure 1, Sue Taylor, *PIGEON PI* (2013), hand embroidery and stitching on quilting dacron. when used with metallic threads on felt, a sewing machine becomes a drawing tool.

MINDTHEGAP I

Neuroscientist Brian Hyland and others with artist David Green

This three-in-one channel video plays with a number of ideas around mind and self, using a translation of Carl Jung's 100-word 'free association' formulary.

Research for this project included extended conversations with and recommended readings by the following scientists: Mike Paulin, Department of Zoology; Elaine Reese, Department of Psychology; Grant Gillett, Bioethics Centre; Brian Hyland, Department of Physiology.

David Green is a lecturer in electronic arts. An acclaimed director, director of photography and visual effects supervisor at RGA graphic film studios in Manhattan, he was represented by Lee Tamahori's Flying Fish Productions in New Zealand where he became known for directing a number of iconic and internationally award-winning television commercials before coming to work at the Dunedin School of Art.

Brian Hyland is head of the Department of Physiology at the University of Otago and a member of the department's Cellular and Molecular Neuroscience research group. His areas of research are the neurophysiology of midbrain dopamine systems and pathways and the effects of abnormal dopamine activity, such as occurs in Parkinson's disease, on activity in the motor control pathways.

Figure 1. David Green, *mindthegap 1* (2013), video still, three-in-one channel video loop, 1:10:16:00.

FORAMEN MAGNUM

Neuroscientist Stephanie Hughes in collaboration with artist Paddy Woodman

Viruses get a bad rap, and rightly so, as the cause of a wide array of diseases from the flu to HIV/AIDS. However, we can harness viruses for good. Viruses are expert at transferring DNA to cells. By replacing the virus's disease-causing DNA with something beneficial we can use viruses to treat disease instead. Our lab modifies viruses to test gene therapy for neurodegenerative diseases including childhood diseases, Alzheimer's and Parkinson's disease. These viruses can also be used to discover how the brain achieves various tasks, such as the role of specific neurons in learning and memory or in the control of movement.

STEPHANIE HUGHES

This latest work is a combination of my interest in and fascination with jewellery and science. I have found the most compelling and intriguing overlap between science and jewellery to be the concepts of looking and discovery. Both artists and scientists are searching, discovering, analysing and reflecting on what they see and, in turn, often make discoveries by chance and serendipity. This series is intended as a celebration of gene therapy and jewellery, merging them to create a metaphor of the process and the ideas present in both.

I have utilised the structure and form of the lentivirus in my piece. The lentivirus is used in gene therapy as a means of carrying genetic code into the brain in order to spark repair of tissue responsible for memory. Fragility became an important notion which I embraced in my emerging prototypes. I feel this concept reinforces the techniques used in gene therapy and is reflective of the complications involved in memory loss.

Observing the brain affected by the debilitating disease of Alzheimer's, one encounters the phenomenon of holes and space. By their nature, such empty spaces are often overlooked. Yet holes are places to peer into, a chance for discovery. I am drawn and intrigued by the unseen world of what is inside a hollow object. A void is a seductive and mysterious entity, a thing of curiosity and allure.

PADDY WOODMAN

Paddy Woodman graduated with a BVA from the Dunedin School of Art. This latest work reflects his dual fascination with jewellery and science. He has found the most compelling and intriguing overlap between science and jewellery to lie in the concepts of looking and discovery: both artists and scientists are searching, discovering, analysing and reflecting on what they see and, in turn, often make discoveries by chance and serendipity.

Stephanie Hughes is a senior lecturer in the Biochemistry Department, School of Medical Sciences, at the University of Otago and works in the department's Neural Development and Disease Lab. Stephanie's research team aims to identify molecular pathways that regulate neuronal development, maintenance and disease. The lab is also developing tools and gene therapy vectors for Batten disease as well as Alzheimer's and Parkinson's disease.

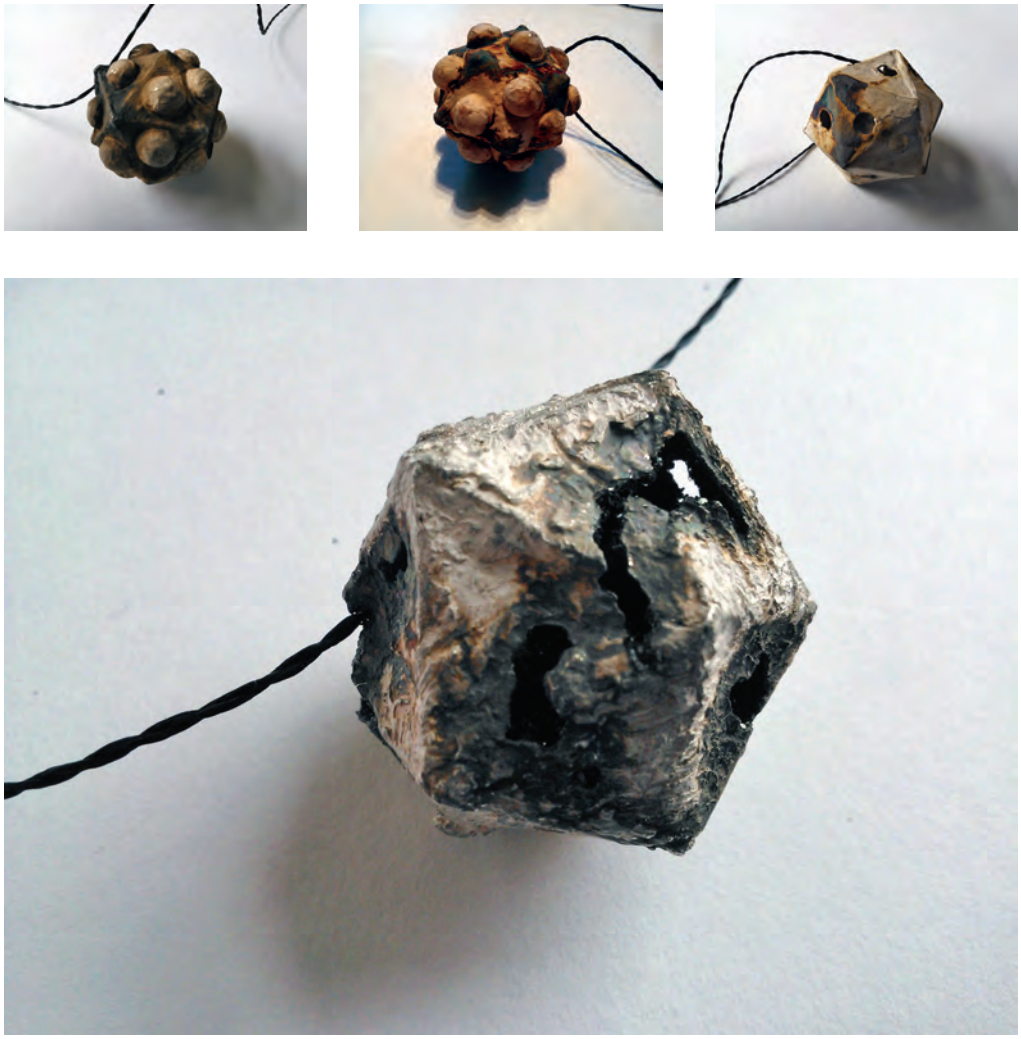

Figure 1. Paddy Woodman, *Foramen Magnum* (2013).

*IS THIS THE WORK OF SADISM OR LOVE?**

Researcher Justine Fuller in collaboration with artists Desi Liversage & Katya Gunn

I use electrodes to measure the presence of dopamine and observe how it changes when cues predict that something rewarding is about to happen. We can see changes when Ritalin affects neurons that release dopamine and we can understand more about how Ritalin works – how it affects the processes that are going on inside an ADHD sufferer's brain. These are the shadows cast on the wall of our cave. We have to be careful how we interpret them, but it is much better than sitting in the dark.

JUSTINE FULLER

Having chosen the dopamine pleasure pathway project, we met with Justine to discuss her work. What struck us the most was the respect Justine had for the lab animals she worked with.

Initially, we were wary about the use of an animal in the experiment as we are both animal lovers who struggle with animal experimentation. However, we have both had life-threatening illnesses, which we may not have survived without past animal research and acknowledge that it would be hypocritical of us to decry all experimentation. This work is our way of paying our debt of gratitude.

We decided to create a memento mori 'reliquary' to our rat, acknowledging Justine's research by taking our colour scheme from the graphs of her research and beading dopamine and sucrose molecules.

The rat is made of silk and Mickey Mouse paisley, the spine evolving from bone to beaded dopamine molecules; it lies in state on an ornate silk brocade cushion, surrounded by a frame of glass beads, delicate bones and gold thread. Crystal beaded sugar cubes are enclosed as a reward. It was a rare privilege to work with these delicate, beautiful bones.

DESI LIVERSAGE AND KATYA GUNN

*Full ethical approval was sought and granted for this artwork

Desi Liversage is a textile and mixed media artist with a particular interest in found materials. She holds a BFA and MFA from the Dunedin School of Art.

Katya Gunn is a self-taught beading artist who delights in luscious and beautiful materials. She trained as a doctor at the Otago Medical School.

Justine Fuller is an Assistant Research Fellow in the Department of Physiology, Otago School of Medical Sciences, University of Otago. Justine works in Professor Brian Hyland's lab in the Cellular and Molecular Neuroscience research group.

Figures 1–3. Desi Liversage and Katya Gunn, *Is This the Work of Sadism or Love?* (2013), fabrics, rat bones, glass beads, gold thread (detail).

PATHWAYS

Neuroscientist Laura Boddington in collaboration with artist Joseph Papps

Stroke is a leading cause of adult disability in the developed world, and a key component of post-stroke rehabilitation is the recovery of movement. Following stroke, the strength of the connections between each hemisphere of the brain is disrupted, which can result in one hemisphere becoming more inhibited than the other.

Theta-Burst Stimulation is a pattern of electrical stimulation that mimics the natural theta rhythms in the brain and has shown promise as a therapy for improving stroke recovery. We are investigating the application of electrical TBS to decrease this stronger inhibition seen in the brain after stroke. It is hoped that this will improve the brain's natural ability to reorganise itself and form new connections, to allow for improved restoration of function following a stroke.

LAURA BODDINGTON

As an artist, my practice is based in electronic arts, comprising the elements of film, light, and sound installation. I specialise in the use of 16mm and digital film. Primarily, I work with found footage, taking films and imagery that already exist and reforming them into works that might include between two and ten different original films.

After meeting with Laura and learning about her work with stroke and motor function, I decided to make a film combining both old format film and digital film, using editing and layer techniques to create a unique piece of work. The main focus of my film is based on two aspects of Laura's work: the practice of Theta-Burst Stimulation and the formation of connections or pathways.

What interested me most about TBS was the repetitive nature of the electrical stimulation applied. Reflecting this, I developed a looped film with repetitive imagery, painting on celluloid using dyes. Secondly, the notion of forming new connections from old pathways was particularly intriguing to me as it reflected my current practice of working with found footage. This involves taking old 16mm films and cutting them up, scratching into their surface, and blacking out or painting into the cells. Once this is done I splice the pieces of film back together, essentially creating my own new pathways. This piece reflects the work that Laura does and is my interpretation of and support for her work.

JOE PAPPS

Joseph Papps graduated with a BVA from the Dunedin School of Art in 2013, majoring in electronic arts. He is currently travelling and working in China.

Laura Boddington (BSc Hons Neuroscience Otago) is a PhD student in the Basal Ganglia Research Group at the University of Otago. Laura completed an Honours degree with John Reynolds in 2012 and is now undertaking a PhD looking at how electrical stimulation protocols can be applied to improve rehabilitation following motor cortex stroke.

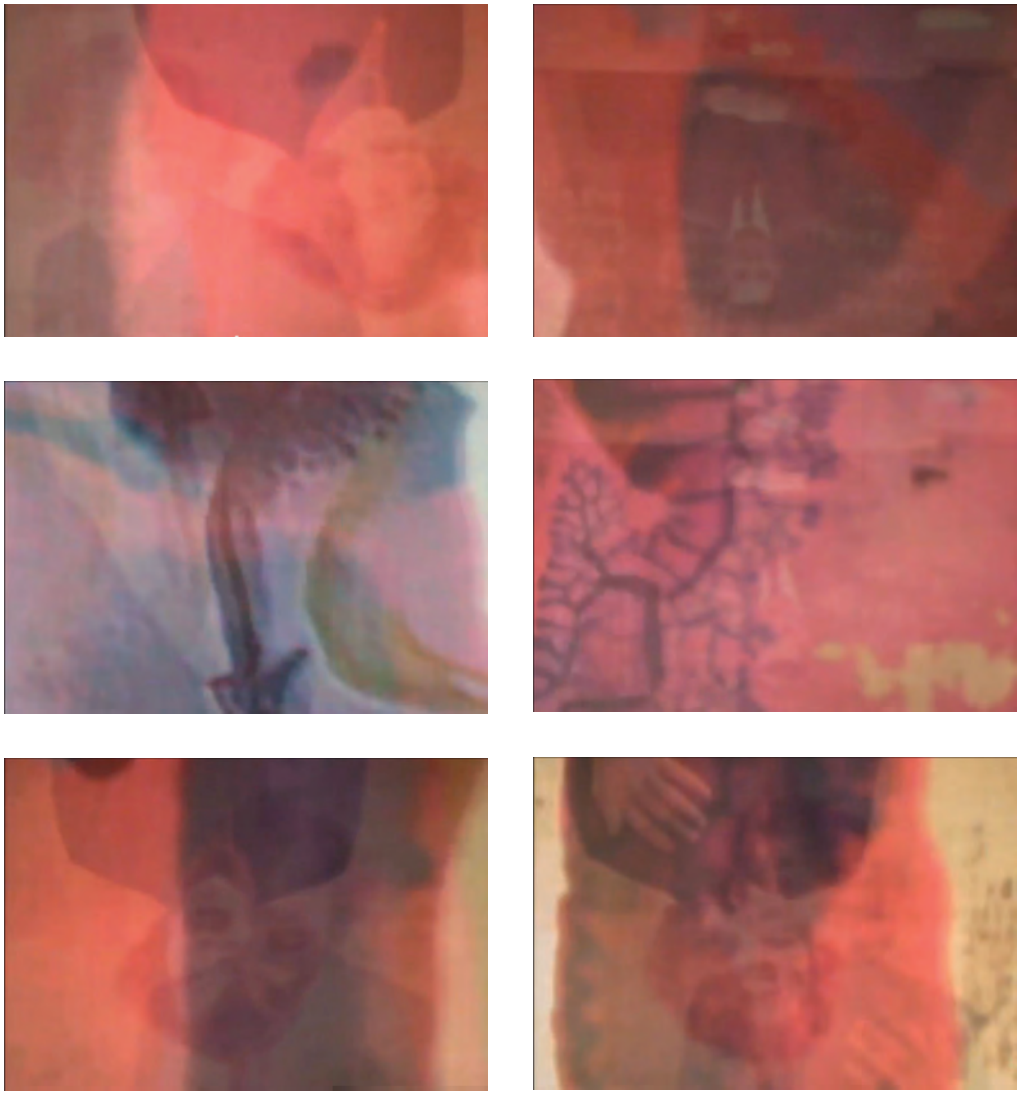

Figure 1. Joseph Papps, *Pathways* (2013), film installation, 16mm film, digital film, no sound, ink, dye, 3 min 23 sec.

COMPOUND LOGIC

Neuroscientist Andrew Clarkson in collaboration with artist Emily Grace Hill

Research in our laboratory is focusing on finding new pharmaceutical therapies that can either minimize the extent of damage to the brain or enhance the recovery of lost functions following a stroke. Recent findings have resulted in the discovery of new mechanisms that can help the brain regain lost motor functions. These mechanisms are mediated in part by establishing new connections between brain regions, enhancing weakened connections and unlocking silenced connections.

Pharmaceutical therapies that can unmask silenced connections in the brain, induced as a consequence of a stroke, can have profound effects on improving motor functions within hours to days of starting the therapies. These therapies are under intense investigation in the laboratory to understand how this occurs.

ANDREW CLARKSON

Slices of yellow, droplets of turquoise and lines of intrigue thrown around captions of coding fill these prints. These works resonate with possibility and opportunity afforded in the sunny optimism of Andrew Clarkson's stroke rehabilitation research.

These prints' subtle narrative holds promise of memory being reawakened, of sections of the brain stirred to life again.

My current practice plays with the push and pull of depth of field and opacity of form through the context of architectonic forms. My interest is in the postmodern materials and features of postmodern architecture and the interaction with geometric forms influenced by the Russian Constructivist movement. Through this collaboration, I have abstracted these values in the form of text as the architectural backdrop and presented the contrast of biometric forms in place of geometric ones.

The setting of the Hunter Centre is a larger context for these works, the architectural enclosure providing the contrast of concrete and glass that I am most fond of utilizing in my work practice. Here the microscopic depths of human architecture are plumbed and the concrete pavilion of Stroke invited to hope for healing.

EMILY GRACE HILL

Emily Hill's artwork is architecturally themed, reflecting her interest in multi-disciplinary approaches to painting and printmaking. She studied painting at the Ilam School of Fine Arts at the University of Canterbury until 2012 and has since been experimenting with textiles and wood and combining printmaking techniques with her painting practice. Emily's work is influenced by Art Nouveau, Bauhaus and Russian Constructivism and she takes an ongoing delight in abstraction. She is currently painting on canvases, printing on timber and exploring ways of combining two modes of representation.

Andrew Clarkson is a Senior Research Fellow in the Department of Anatomy at the University of Otago. Research in Dr Clarkson's lab focuses on post-stroke neuroprotection and regeneration and repair mechanisms. It is directed at promoting recovery of function following a stroke. The approaches used involve novel combinations of intensive rehabilitation, drug therapy and, more recently, the use of stem cells to enhance brain repair processes. This utilises behavioural, electrophysiological, optical imaging and anatomical measures to assess recovery after stroke.

Figure 1. Emily Grace Hill, *(Compound Logic)*, 2013,.

HOPES

Neuroscientist Joanna Williams in collaboration with artist Rowan Holt

My research is focused on Alzheimer's disease, which is the leading cause of dementia in the elderly. Alzheimer's disease is a progressive neurodegenerative disorder, with the underlying pathological changes occurring in the brain years before the characteristic symptoms of memory loss become acknowledged by the individuals afflicted by the disease and their families.

There is a pressing need to be able to predict the onset of the Alzheimer's disease process to allow appropriate therapeutic interventions to be carried out. The aim of this work is to identify altered levels of small molecules in blood plasma which may act as a surrogate for the disease process and allow early detection of Alzheimer's disease.

JOANNA WILLIAMS

By using processes reflecting house-building, I acknowledge the effect Alzheimer's disease has in the domestic setting and the changing dynamics of relationships that occur within families.

As memories vanish and disappear, the solid frame still exists, suspended in space like rays of hope. The staining on the wooden frame mirrors the methodology and visual result of preparing blood samples to reveal the indicators Williams is looking for. Williams uses a simple blue forget-me-not emblem to label successful finds, and this is directly translated in my painting of a single stem.

ROWAN HOLT

Rowan Holt is a textile artist who lives in Karitane, near Dunedin. She incorporates her art practice into daily life while juggling a young family and a career as a registered art teacher. These domestic themes form a common thread in her work. She also enjoys gardening, horse-riding and playing the violin. Rowan holds an MFA from the Dunedin School of Art.

Joanna Williams is a senior lecturer in the Department of Anatomy at Otago University and also works in the university's Brain Health Research Centre. Dr Williams' research team applies the tools of molecular biology to uncover the mechanisms underlying the ways in which the brain adapts and responds when memories are formed.

Figure 1. Rowan Holt, *Hopes* (2013), epoxy resin, Japanese poplar, shellac, gouache, 500 – 1700mm (variable).