Hearts & **Minds**

Hearts & Minds is a two part exhibition of contemporary art, artefacts and scientific research that considers the perception and wellbeing of the human organs of the heart (at Hannah Maclure Centre) and the brain (at **Life**Space).

Hearts: Runs until 23 October 2015, Hannah Maclure Centre, Abertay University, Dundee

Featuring: Ingrid Bachmann, Martin John Callahan, Jennifer Kelly, Catherine Richards and Martin Snelgrove alongside the scientific research of Dr Nikolai Zhelev.

Minds: Runs until Saturday 17 October, **Life**Space, University of Dundee

Featuring: Ingrid Bell, Tamsin van Essen, Aidan Moesby, Anne Milne and Jim Pattison alongside the scientific research of Dr. Miratul Muqit and Dr. Ulrich Zachariae.

About the exhibition

The **Hearts** exhibition arises from an ongoing body of cardiovascular research at Abertay University. Miniature beating hearts are developed from human stem cells reprogrammed to grow has tiny heart organs which are then used to investigate prevention and cures of heart disease. Hearts is an exhibition that explores scientific and artistic research relating to our life-giving organ, examining local ground-breaking heart disease research and sharing the work of internationally renowned artists whose practice is concerned with the heart in transplantation, the heart as a system, the heart as a poetic object.

The **Minds** exhibition is based around a new dynamic work that uses tweets to determine the nuances in how Dundee's inhabitants are feeling day to day. This periodic table of emotions suggests the feedback loop that exists between our brains, consciousness and bodily behaviour. **Minds** showcases research at the University of Dundee to better understand changes in the brain during neurodegeneration, and the ion channels that enable the flow of the brain's electrical signals. Work by leading artists turns MRI scans into responsive talismans, and sentimental objects into physical reminders of the lesions that can plague the healthy tissue of the brain. Accompanied by work in print and film, Minds invites you to reflect upon your own brain's physical & mental health.

The city of Dundee has an international reputation for world class Life Science research and for supporting contemporary arts practice through our educational institutes and cultural organisations. Held over two sites, this exhibition is a wonderful demonstration of our integrated community and is a joint partnership between the University of Abertay and the University of Dundee. **Hearts** & **Minds** is co-curated by Clare Brennan, Sarah Cook and Morag Martin.

Hearts & **Minds** events at **Life**Space

All events are FREE

Friday 17th September
Exhibition preview 5-7pm

Saturday 19th September
Doors Open Day (11am - 4pm).

11am Tour of Hearts & Minds exhibition at LifeSpace by curator Sarah Cook including a talk by artist Aidan Moseby on his work Sagacity – The Periodic Table of Emotions.

Visitors can also tour LifeSpace as part of a overall tour of the School of Life Sciences. Tours depart from the Street in the Discovery Centre and are scheduled to begin at 12pm, 1pm, 2pm and 3pm.

The Garland Café will be also be open.

Featured artists in Hearts & **Minds**

Aidan Moesby, lead artist
Nick Taylor, University of Dundee
Jon Rogers, University of Dundee
Clive Gillman, Dundee Contemporary Arts
Nicola Prosser, Graphic designer

Sagacity (2015)

Periodic Table of Emotions (2015)
Archival Pigment Print on Hahnemuhle PhotoRag Bright White Paper, 308gsm, Edition of 118.

There are many software tools available that aim to support individuals to measure and define their mood and to represent this in ways that might symbolically or graphically allow better self-awareness and insight, but nothing that enables a city to do this. We commonly talk about the mood of a city, but what can we - or more specifically, I - do as an individual to improve that mood?

This project has resulted from research with the Small Society Lab to determine how mood assessment processes, such as those used to support patients within the mental health system, could be developed to define and influence the mood of an entire city. It seeks to extend these processes to generate a reflexive barometer that it is hoped will create visible manifestations of the city's attitude and mental health.

There were two stages to the development of this work – first defining the terms or keywords about emotional states, captured from geolocated social media texts (via Twitter). Secondly, the team assessed the dynamic significance and weight of these terms by working with both the service users of mental health support systems and the community of social media active people in Dundee.

It is hoped that ongoing dialogue through social media will be able to mark out a coherent and useful definition of the city mood and a representative measure of it, helping Dundonians to assert their positivity in a creative and reflexive manner. Through tweeting, you can continue to participate in the piece. The elemental emotions of the periodic table will appear brighter and stronger based on how the software captures and understands your tweets.

Aidan Moesby is an artist and curator based in Newcastle. His work is informed through dialogues which may be experienced personally as a participant, or observed. His research based practice focuses on the relationships between people and place, how we make sense of the everyday through the imagery of ritual and routinel and how we communicate and

connect, The work seeks to distill intimate, sometimes concealed, histories into text-based site- or context-specific interventions in which the works serve as a catalyst for a socially-engaged conversation and personal or communal exploration.

Sagacity was commissioned by Dundee Contemporary Arts in partnership with the Small Society Lab, the University of Dundee and Duncan of Jordanstone College of Art and Design. It was supported by Project Ginsberg and New Media Scotland's Alt-w fund.

Anne Milne

The Living Brain (2013)
Video [12:44 mins]

The Living Brain tells the story of William and Jean and their involvement in a unique study of the ageing brain led by Professor Ian Deary. Both William and Jean sat the Scottish Mental Survey at the age of 11 – William in 1932 and Jean in 1946. These nationwide surveys are unique in the world for testing the IQ of a segment of an entire country's populace (87,498 children were tested in 1932 and 70,805 in 1947). After the original results of these studies were rediscovered in the 1990s, the Lothian Birth Cohorts were established. These studies look at ways in which the cognitive ability of the brain changes as we grow older, and this film reflects upon the lives of those who have taken part in them.

Filmmaker Anne Milne collaborated with the Centre for Cognitive Ageing and Cognitive Epidemiology at the University of Edinburgh to produce this short film, which was premiered at the Lothian Birth Cohort reunion in April 2014. It has since been screened a number of times, including at the Edinburgh International Science Festival. Anne Milne is a BAFTA award-winning Scottish-based filmmaker and educator. Her work is documentary in nature and is shaped by a wide range of influences and experiences. This is the second time she has exhibited her work at **Life**Space

Ingrid Bell

Bleeding Brain (2014)
Blind embossed prints on paper
(On loan from Mr. Alistair Young)

Ingrid Bell is an artist, printmaker and art therapist. She has recently completed a Masters of Fine Art in Art, Society & Publics at Duncan of Jordanstone College of Art & Design. She is interested in developments in neurobiology and advances in visual research through neuroimaging that allows insight into the brain-mind connection. Accessibility to MRI imaging poses further questions around neuroaesthetics, which is the study of the brain and how it is affected by looking at art and how it is affected by making art.

Bell was awarded the Purcell Paper Prize at the Society of Scottish Artists Annual exhibition in 2014 for her work *Bleeding Brain*.

Hidden States (2015)
Wallpaper installation

Hidden States is a work which was first installed in the Cooper Gallery at Duncan of Jordanstone College of Art & Design as part of the MFA degree show, and has been restaged here for this exhibition. The work requires the viewer's participation for a change to occur in both the image and the viewer's sensory experience and perception of the artwork. Printed with thermochromic inks, the wallpaper responds to touch, to reveal colours printed underneath, leaving a trace of the viewer's interaction. Thermochromic ink has its own lifespan, chemically speaking, and so this work is time-limited and sensitively affected by external influences of light and heat. In the artist's words, the ink's range of activity will weaken, and it will eventually become unresponsive and die.

Jim Pattison

Connections (2008)

Voltage Gated Potassium Ion Channels
Archival Pigment Prints

Channel Form (Square Letters)
Mixed Media

Channel Form (Wood)
Plywood

15 K+ Channels
Screenprint

A random meeting, in a Glasgow bar full of banter rather than muzak, between artist Jim Pattison and scientist Brian Robertson, is what led to an inspired collaboration that harnesses the potential of visual art to communicate the complexity of tiny channels of communication in a cell's membrane called potassium (K+) ion channels.

Nerve cells are specialized for electrical and chemical communication by virtue of a large set of ion channels. Potassium ion channels (of which there are many different types) are specialised transport proteins in the cell membrane, coded by different sections of the cell's DNA. Different types of potassium channel are grouped into families, based on their molecular similarity. Like all families, members look alike, but the differences are crucial –

each channel protein has a slightly different physiological function in the nerve, and has its own unique behavioural 'fingerprint' and sensitivity to different drugs.

The flow of potassium through ion channels is central to many different cellular processes; potassium currents in the brain, for example, are involved in every thought, perception and movement, and the heart's contraction relies upon the steady ebb and flow of potassium.

Spurred on by the desire to create new images and better visual metaphors to help explain Professor Robertson's research into potassium (K+) ion channels – and its role in the membrane of a neuron – artist Jim Pattison has created a series of two and three-dimensional visual proposals that consider the location, form, and function of voltage gated potassium ion in the brain.

Glasgow based artist and printmaker Jim Pattison is an honorary fellow of Duncan of Jordanstone College of Art and Design. Born in Dundee, he has exhibited in internationally and his work is featured in a number of collections such as The McManus Galleries, Alvar Aalto Museum, Glasgow Museums, Aberdeen Hospitals Collection, University of Dundee, Dundee City Council and Abertay University.

Tamsin van Essen

Mementos (2014)
Ceramic objects

Central to Alzheimer's disease, is a small protein fragment amyloid-beta. Amyloid-beta is a social molecule, binding together into large assortment of fellow amyloid-beta molecules. Some of these assemblies can wither away brain cells, whereas others are relatively benign. What triggers the formation of toxic grouping of amyloid-beta is one of the key questions in Alzheimer's disease research, as well as how these toxic grouping kill brain cells.

An accidental contamination in the drinking water of rabbits, found that copper gave the rabbits Alzheimer's-like symptoms. This discovery, together with the knowledge that patients with Alzheimer's disease have elevated levels of copper, prompted research at Queen Mary University to investigate whether copper has any impact on how amyloid beta comes together.

Through Art-Neuro, a project to bring together 16 artists and 16 neuroscientists, artist Tamsin van Essen worked with scientist Christian Matheou to consider the potential involvement of copper build-up in degenerating the structure of the brain, thereby affecting the faculties of memory and recognition. They asked a group of people to choose objects they felt particularly attached to: mementos that had sentimental value and familiar objects they treasured in everyday life.
The artist began to reproduce some of these chosen objects in porcelain, while exploring the action of copper in eroding the structure of clay. Small sections of copper wire were

added to the porcelain, assembled to mimic the toxic Amyloid-beta clumps found in Alzheimer's disease. The copper melted and burnt during the firing process, breaking down the structure of the objects so they become successively harder to recognise.

Tamsin van Essen is a London based artist, working mainly in ceramics. Her work explores notions of beauty and perfection through examining scientific, medical and social historic themes. She has exhibited extensively throughout the world, including at Sotheby's, 10 Downing Street, the Saatchi Gallery, Pierre Bergé, Design Miami, the Nobel Museum and other prestigious international locations. Her work is included in the permanent collections of the Israel Museum in Jerusalem, the Montreal Museum of Fine Art, the Fonds National d'Art Contemporain in Paris, the Wellcome Collection and the Royal Pharmaceutical Society Museum in London.

Artefacts from University of Dundee Museum Services

Elastoplast tin
T J Smith & Nephew Ltd. (On loan from University of Dundee Museum Services, Medical History Museum Collection, DUNUC 7942)

Metronome
(On loan from University of Dundee Museum Services, Psychology Collection, DUNUC 3372)

At the invitation of the curators, these objects were selected from the University's collections for this exhibition by artist Aidan Moesby, whose project *Sagacity*, forms the centerpiece of Hearts & Minds. To explain his choices, Aidan writes,

"There is a clear disparity between the treatment and attitudes to Mental Health as compared to physical health. There is the all too common 'pull yourself together', you'll get over it' and 'worse things happen at sea'. Clearly, if someone was in extreme physical distress one would not say such things, there would be an urgency to triage and treat. An elastoplast is inappropriate for a broken leg or cancer and is just as inappropriate for a serious mental health condition. An elastoplast covers things up, it is a short term solution and quick fix, it does not deal with the underlying cause of the symptoms. The elastoplast as metaphor maintains the mental/physical binary, it contributes to the passive stigmatisation of mental health. Mental Health needs parity of esteem, to be talked about openly and to no longer be taboo. There is no physical health without mental health."

"A metronome is a keeper of pace and rhythm, a marker of time. It is a tool of the researcher, the psychiatrist, and it is an instrument redolent of the medicalisation of even time. Often when people are mentally unwell or distressed their rhythms become disrupted, routines can be broken, and a sense of time can become distorted. Routines and rhythms can provide a framework to keep us well, and ground us in our everyday. In a similar way when someone has a physical issue such as a broken leg or arm, we know it will be 4 to 6 weeks in a cast followed by physiotherapy. However in the case of mental illness, definite time does not exist. Who can say how long it will take to get over grief-

related depression at the death of a loved one? No two people are the same; time and the rhythm of life can stutter, speed up, slow down or stop completely."

Brain chart
(On loan from University of Dundee Museum Services, Dundee College Collection, DUNUC 10250)

Model of the human brain
Model of a human brain, in eight parts. (On loan from University of Dundee Museum Services, Zoology Museum Collection, DUNUC 9282).

Model of the human brain at embryo stages
Friedrich Ziegler (On loan from University of Dundee Museum Services, Anatomy Collection, DUNUC 9140 and DUNUC 9142)

Lund's skull coronet
Was used in post mortems at Ninewells Hospital.(On loan from University of Dundee Museum Services, Medical History Museum Collection, DUNUC 8599).

Trephining set
Hudson's brace with six burrs, Allen & Hanburys Ltd. (On loan from University of Dundee Museum Services, Medical History Museum Collection, DUNUC 7867)

University of Dundee scientists featured in **Minds**

Ulrich Zacharaie, University of Dundee
David Köpfer, Max Planck Institute for Biophysical Chemistry, Göttingen, Germany
Owen Vickery, University of Dundee

Ion Channels (2014)
Simulation (0:58mins)

Ion channels are specialized protein pores present on virtually all living cells that create a pathway for charged ions to pass through the otherwise impermanent lipid cell membrane. The opening of an ion channel is a fleeting event. Within a few milliseconds of opening, most ion channels close and enter a resting state, where they are unresponsive to signals for a short period of time. The change in the amount of ions inside and outside the cell alters the electrical charge of the cell and determines how easily messages are sent from one cell to another.

Ion channels play a crucial role in transmitting signals between brain cells and helping to control the frequency of our heartbeat. When they do not work properly they leave us liable to a range of diseases, loss of neurons and heart disease.

There are many techniques used to study ion channels. At the University of Dundee, Dr. Ulrich Zachariae has developed computational methods to predict the conductance (ease of flow) and selectivity of these channels.
In 2014, Dr Zachariae and colleagues reached a paradigm shift in the understanding of potassium channels. It was previously believed that ions were separated by water as they passed through the potassium channel and that ion-to-ion contact was unlikely due to high electrostatic repulsion, but the research team has found a completely different scenario. Looking at computer simulations and the channels 'in action', the group found that water is not transported through the channels along with ions, and is also not needed to separate them. They also found that pairs of potassium ions were stably formed before passing through the channel, with electrostatic repulsion driving the efficiency of the process. The findings explain how potassium flux is able to happen at the maximum physically attainable speed, which is vital for the fast response of neurons.

The work was published in the top scientific journal Science[1].

1. *Science* 346, 352-355 (2014).

Miratul Muqit, MB, ChB, PhD
Sonal S. Das, PhD
Caitlin C. Monney
The Dementia Research Centre, University College London
The Predicting Language Outcome and Recovery After Stroke (PLORAS) project, University College London

Neurodegeneration in the Brain

The MRC Protein Phosphorylation and Ubiquitylation Unit carries out fundamental research to uncover the causes of a number of diseases affecting human health ranging from cancer and immune disorders to neurodegenerative diseases. It is hoped that this will lead to new ideas for diagnosis and treatment. Recent advances have identified a number of genes encoding enzymes linked to neurodegenerative diseases such as Parkinson's and several Principal Investigators within the Unit are researching how these enzymes are regulated and how their disruption leads to disease. In 2014 Dr Miratul Muqit, a clinical neurologist and Unit investigator, envisaged bringing to the public an event that highlighted the intricacies of the brain with a focus on neurodegeneration. Working with artist Caitlin Monney, he and his team collaborated with centres across the UK to source Magnetic Resonance Imaging (MRI) brain scans of adults that Ms. Monney then illustrated – paying special attention to highlight those areas most affected in disease. The resulting images and illustrations demonstrate normal and affected brains from a variety of neurodegenerative disorders. The dramatic alterations exhibited in these illustrations convey the impact of the disease process and the importance of basic research in finding cures for these devastating illnesses.

Normal Brain (MRI images)

Magnetic Resonance Imaging (MRI) is a test that uses a magnetic field and pulses of radio wave energy to make pictures of organs and structures inside the body. When used to image the brain, MRI can look at the brain for tumours, an aneurysm, bleeding in the brain, nerve injury, and other problems, such as damage caused by a stroke. These healthy adult brain MRI images are from a 27-year old woman – showing coronal, saggital and axial sections.

Images provided by the Predicting Language Outcome and Recovery After Stroke (PLORAS) project, University College London.

Brain conditions (illustrated by Caitlin Monney)

Frontotemporal Dementia

Frontotemporal dementias are more likely to affect a patient's behaviour and language abilities than their memory. Semantic dementia is a type of frontotemporal dementia that results in quite severe loss of brain tissue in the left temporal lobe, towards the front of the brain. Patients with semantic dementia have "word finding" difficulties and difficulty

remembering the meaning of even basic words.

The patients presented in these images have died, leaving their brains to the UK Brain Bank. The UK Brain Bank performs microscopic examination of brain tissue to determine the specific disease mechanisms responsible for symptoms experienced during life.

Images provided by the Dementia Research Centre, University College London and illustrated by Caitlin Monney.

Posterior Cortical Atrophy due to Alzheimer's disease

Posterior cortical atrophy is usually caused by the same disease mechanisms that cause Alzheimer's disease. However, these patients are more likely to suffer from visual impairments than memory problems. On MRI, loss of brain tissue is more prominent at the back of the brain than in the hippocampus.

Images provided by the Dementia Research Centre, University College London and illustrated by Caitlin Monney.

Stroke

MRI brain image(s) from a 66-year old male stroke survivor. This man's stroke resulted in language difficulties (aphasia). Axial image sequence demonstrates extensive infarction (death of the tissue or lesion) in the right frontal and parietal lobes. These areas are involved in many sensory, motor and cognitive functions, including controlling movements of the left side of the body.

Images provided by the Predicting Language Outcome and Recovery After Stroke (PLORAS) project, University College London and illustrated by Caitlin Monney.

Hearts & **Minds** events at **Hannah Maclure Centre**

Friday 11th September – Sunday 13 September
Game Jam

The *Charged Hearts Game Jam* places game development, and the game jam itself within the exhibition as a form of artwork. Jammers are invited to take part in this exciting exhibition, by creating game protoypes during the opening event of the exhibition. The Jam will take the format of a typical game jam, with only the location of the event differing from typical jam experiences. The event is open to all game developers, students, graduates, industy developers and even those with no experience of games development.

The jam will take place around the theme of hearts, encouraging participants to re-interpret the Charged Hearts Game (see link) for a contemporary audience. This theme is optional and those who undertake this theme will be eligible to win one of the jam awards, judged by artist Catherine Richards, HMC Curator Clare Brennan and games industry representatives.

Full info: https://www.eventbrite.co.uk/e/charged-hearts-game-jam-tickets-18397799313

Saturday 12th September, 12pm – 1.30pm
Artist talks from Catherine Richards, Ingrid Bachmann. Richards and Bachmann discuss their practice and the work present in the Hearts exhibition.

Friday 25th September, 10am -12pm or 2pm-4pm (World Heart Day)
The Heartstart Discovery course offers you the chance to learn some Emergency Life Saving skills such as CPR and recognising the signs of a heart attack. This FREE 2 hour session is very practical, hands on and often fun experience. *Just Two Hours of your Time to learn Life Saving Skills!*

Friday 25th September, 12.30pm
Live lunchtime dance performance which brings to life Ingrid Bachaman's film 'The Gift', a moving exploration of the words and gestures expressed by heart transplant patients.