Observations

All religions, arts and sciences are branches of the same tree. All these aspirations are directed towards ennobling man's life, lifting it from the sphere of mere existence and leading the individual towards freedom.

Albert Einstein, 1937

There are many who are sceptical about the collaboration between art and neuroscience. In the art world, in particular, there is an endemic snobbery about using a scientific lens for interpretation, a sense that art should not be confined to the laws that govern the material world. This view imposes a separation between the 'brain', the soft grey matter that lies within our skulls and the 'mind' the ineffable sensation of our own awareness, our thoughts and emotions. It suggests that our sentient selves are expressed only in 'culture', and thereby consigns science to the purely functional. In this way, the sciences and the arts become falsely dichotomised.

The brain and the mind are inextricably linked; human ability to transcend itself through art is not exterior to the brain but a process of it. Once perceived in these terms, it becomes less alien to study art and the brain in conjunction. Brain science and art are just two points in the narrative of human existence. The brain controls how and why we do and think the way we do, and art is one of the more mysterious and complex of its products. The study of brain science and the study of art undoubtedly enrich each other.

The objective of *Affecting Perception: Art & Neuroscience* is to explore the work of artists with altered brain function, in order to question what processes are occurring in the brain when we create art and what drives us to produce. It might be possible to look at certain properties such as style, subject matter or process in the work of artists with neurological conditions and trace them to specific areas of the brain that are

either over- or under-functioning. Exploring them in parallel reinfroces the relationship between maker and product. At the same time, however, it demonstrates our limited understanding of the relationship between brain and mind; as emotional impact, imagination and past experience all impose their own set of rules.

In artists with dementia, the complexity of the relationship between mind and brain becomes particularly acute, as a decline in the artist's cognitive or visual perceptual abilities, while impairing their ability to paint, does not necessarily affect their ability to produce emotionally charged art work. William Utermohlen and Mervyn Peake suffered from two different forms of dementia. Utermohlen's Alzheimer's Disease led to a gradual but steady decline in his memory, cognitive functions and language abilities whereas Mervyn Peake, who is thought to have suffered from Dementia with Lewy Bodies,• felt his alertness, attention and cognitive abilities fluctuate, and experienced hallucinations.

• The exact diagnosis of Mervyn Peake's degenerative disease has been of much debate. Initial hypotheses pointed towards Parkinson's disease (see Fabian Peake's article in this volume), while recent articles have suggested, based on reports of fluctuations in cognition and attention, coupled with hallucinations, that it may have been dementia with Lewy bodies (Sahlas, 2003)

Utermohlen's work illustrates the deterioration of his use of colour, detail and spatial organisation. In the 1998 *Self Portrait*, Utermohlen's thick black outlines flatten the image. His brushstrokes are much looser than in *Self Portrait with a Saw,* painted the previous year, and the image is rendered through the tension of the paint on the surface plane, rather than in three-dimensional perspective. With his memory deteriorating and with encouragement from his nurse, Ron Isaacs, Utermohlen reverted entirely to self-portraiture, a genre that enabled him to explore his diminishing sense of self. However, despite his cognitive deterioration, both *Self Portrait with Saw* and the 1998 work convey his emotional trauma with moving poignancy, suggesting that his ability to feel and communicate his fear and isolation remained intact.

In contrast to Utermohlen's gradual deterioration, Mervyn Peake's works fluctuate in skill, a reflection of his form of dementia. *Head in Profile*, 1962 was executed seven years after the onset of Peake's illness, and the deterioration in his skill is apparent when compared to an earlier piece, such as *Grotesque Head*, 1957. However, in the tender portrait of his wife *Maeve*, drawn a few years before his death (1965), his draughtsmanship revives. He captures the features of her face with nuance and sensitivity, and a skill that seems inconsistent with his degenerative condition. Perhaps the emotionally charged circumstances of drawing his wife of over thirty years, at this reflective point in his life, allowed him to temporarily to regain some of his former flair?

Although Peake's subject matter did not drastically alter after his diagnosis with dementia in the way that Utermohlen's did, neurologist Demetrios Sahlas argues that he did express his struggle with illness through his art.• Sahlas interprets the *Helmeted Figures* (p. 35) to be wearing dunce caps, which he suggests is a projection of the frustration and shame Peake felt about his worsening state. Our own discussions with the artist's son Fabian, however, revealed that capped figures such as these had entered Mervyn Peake's work at an early stage in the artist's career and therefore called into question the validity of Sahlas' interpretation. We deliberately included Peake's *Helmeted Figures* in the exhibition to stand as a reminder of the potential for misinterpretation when analysing an artist's work through the lens of their neurological condition. When carried out sensitively, however, it can provide fascinating insight into the artist's process and works.

• Sahlas DJ (2003) 'Dementia with Lewy bodies and the neurobehavioral decline of Mervyn Peake'. *Archives of Neurology*, 60(6), 889.

An artist's process can provide a key to unlocking aspects of their neurological condition. Autism and Asperger syndrome expert, Professor Simon-Baron Cohen is one advocate of this. He argues that, 'just like a spider spins webs and science can learn

by watching how they do this, so people with autism love to systematise (ordering information, collecting things, analysing rules and regularities) and science can learn about autism naturalistically – by watching how they do this in their art'.• Autism is a condition that begins early in a child's development and affects how a person relates to and communicates with others. Jon Adams and George Widener both have Asperger syndrome, a form of autism, and display the characteristic systematising tendencies.

• Simon Baron-Cohen, email correspondence with Rachel Stratton and Cosima Gretton, 25 January 2013

The Asperger syndrome of Jon Adams and George Widener has played a central role in their artistic process. *228* is one of a series of works Adams produced for the Cultural Olympiad, in which he systematised objects he collected every day for two years. Trained as a Geologist, Adams applies a set of scientific rules to his whole life. He carries a notebook with him at all times, which he fills with pages and pages of graphs resembling cross sections of rock formations. Rather than recording layers of earth, however, Adams uses these graphs to record his daily activities and organise the samples he collects. He then employs a computer programme to process the information and produce images like *228.* Deciding that he wanted to be an artist at the age of just six years old, Adams' scientific approach is synonymous with his artistic endeavours.

Like Adams, Widener's process also reveals his compulsive need to systematise, as well as his immense ability to retain and communicate information. His mind functions like an advanced computer, able to calculate the day of the week for any given date over hundreds of years. Using this computed data, he locates patterns within calendar history; noting, for instance that disasters tend to happen on a Friday.• Rules such as this he also applies to future events, allowing him to construct a fantasy future calendar based on the historical patterns he has found. He claims that 'calendar dates have rhythm and motion' and that 'they reflect and balance each other out', a statement that perhaps goes some way in explaining why Widener records his data through art.• The mathematical rhythms are reflected in the balanced compositions of his pieces and he visually maps the data, rather than simply notating the information. Exploring the way that Widener systematises dates and historical facts can assist scientists' understanding of Asperger syndrome and likewise, knowledge of Asperger syndrome provides insight into his work. However, our understanding of *why* he feels compelled to create art remains an open-ended question.

• George Widener, *Friday Disasters*, featured in 'Out of this World', The Museum of Everything, 2009

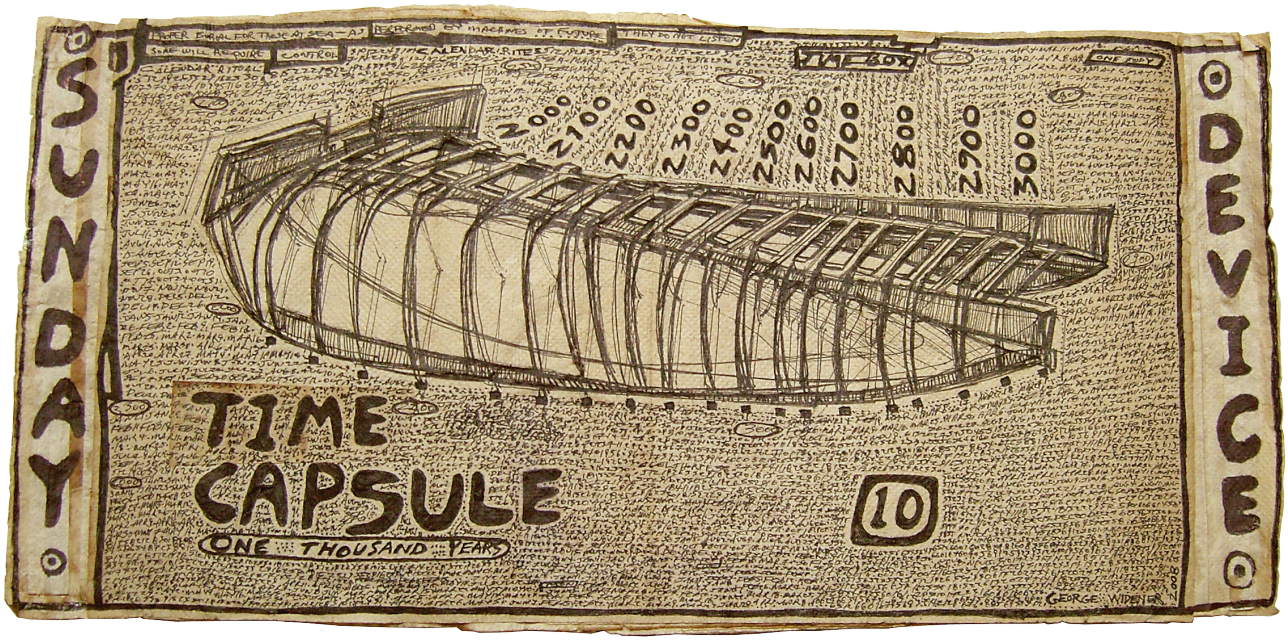
• 'Ingenious Minds: George Widener', *Brain and Intelligence* (film) on science.discovery.com

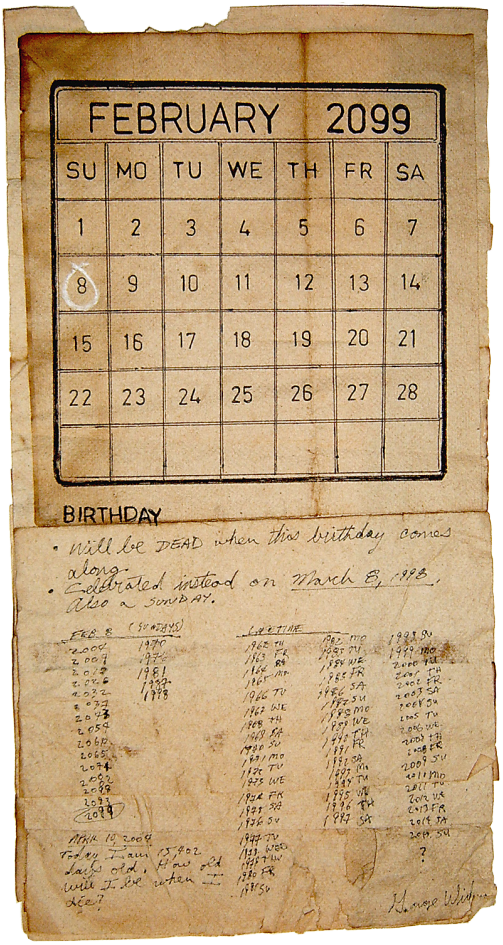
Creative drive is one of the many mysteries of the human mind yet to be fully described in scientific terms, perhaps because it so various. Jon Adams, for instance, knew he was an artist at the age of six and Cecil Riley at ten, whereas Jon Sarkin and Jason Padgett both developed overwhelming impulses to create art following brain injuries that occurred in their adult lives.• Although our understanding of what brain functions drive creativity is not fully understood, we can begin to build a rudimentary picture by looking at artists like Sarkin and Padgett, and questioning how the damage to their brains might have stimulated their desire to produce art.

• Interview with Jon Adams, 23 January 2013; Interview with Cecil Riley, 31 December 2013

Jason Padgett was left severely concussed after a brutal mugging, in which he received repeated blows to the head. The injury left him with a remarkable form of conceptual synesthesia, in which he perceives graphic representations of mathematical formulae and geometrical structures, embedded in objects around him – despite having no previous mathematical qualifications.• Padgett obsessively reproduces these equations in painstaking hand-drawn diagrams (p. 25) that require so much precision that even a fraction of a millimeter discrepancy can render them ruined, in his view. Although tests carried out on Padgett, by Professor Berit Broogard at the University of Missouri, showed little overt damage to his brain, they did reveal some surprising abnormal functions. When asked to look at a geometry equation,

• Brogaard B, Vanni S, & Silvanto J (2012) 'Seeing mathematics: Perceptual experience and brain activity in acquired synesthesia', *Neurocase: The Neural Basis of Cognition.*





George Widener, *Time Capsule* (top), c.2005, ink on napkin, *My Birthday*, (bottom) c 2005, ink on napkin
(courtesy of Henry Boxer Gallery, © Henry Boxer Gallery)

Jon Sarkin, *On and On* (top) and *Billie Holiday #3* (bottom), 2012, permanent marker on paper, © the artist

Padgett's brain scan showed a strong left lateralisation of activity, rather than the bilateral network of brain areas that normally work together in mathematical processing. This confirmed that Padgett's capacity to perceive geometry was not synonymous with normal mathematical aptitude but perhaps the result of subtle rewiring in his brain that caused him to access this synesthetic ability.[1]

Jon Sarkin's brain injuries, although not associated with synesthesia, also caused him to produce art at a prolific rate. Sarkin incurred damage to a large part of his left hemisphere following a stroke, which resulted in the removal of the left half of his cerebellum. Pathways between the cerebellum and the cortex, specifically with the frontal lobes, are thought to play a significant role in cognitive function and the changes Sarkin reports are similar to those seen in purely frontal damage.[2] He has a tendency to perseverate on a single word, phrase or motif, much in the way that a glitch in a record creates an unbreakable loop. The sheer size of his body of work is testament to these obsessive-compulsive traits and lends weight to his claims that he cannot *stop* making art.

As neurological case studies, Sarkin and Padgett are remote from one another, as the damage that occurred to each artist's brain is very different. The context of their art also differs in that Padgett's drawings convey what he physically sees. For him art is another branch of science because, as he puts it, 'everything is geometry.'[3] By contrast Sarkin's work seems to stem from a desire to communicate the tangential workings of his post-trauma mind. Art provides a language through which Sarkin can express himself and is therefore an end in itself. Despite these differences, however, the parallels between the two artists' sudden creative drive reinforce the view that these higher functions are perhaps impossible to localise.

The reluctance of the art world to allow neuroscience to penetrate its robust shell is challenged by artists who actively engage with their neurological condition as a form of inspiration. Cecil Riley and J.J. Ignatius Brennan both experience hallucinations that form a basis for their art. J.J. Ignatius Brennan, an artist who suffers from severe migraines, represents the spreading lines of his migraine aura through zig-zag patterns, which reflect activity in his visual cortex, as discussed in the essay on the artist by Klaus Podoll. Brennan's hallucinations provide a whole vocabulary of imagery that is entirely his own making. He incorporates strange biomorphic forms into his art and in so doing, aligns himself with a Surrealist tradition and introduces his work into a mainstream art historical context.

Cecil Riley suffers from *macular degeneration* (age-related damage to the central part of the retina) and experiences hallucinations in the blind area of his vision, in a condition known as Charles Bonnet syndrome. He talks about his initial fascination with these internal images and how they appealed to his artistic curiosity. The mandala is a form that has recently begun to appear to Riley and has become a regular feature of his late work. In the version seen on p. 30, the form emerges from the darkness in a ball of luminous blue light, conveying the transience and immateriality of his visions. Riley's hallucinations are not psychiatric but caused by damage in the retina that cuts off the signal to those areas of the brain that carry out the early stages of visual processing in the visual cortex. Having lost their main input, the neurons in the damaged part of the retina are thought to become hyper-excitable and create images to fill the blind area.

Like many of the artists in this exhibition Riley describes his artistic production as both frustrating and engaging. He finds it increasingly difficult to muster the willpower

[1] Snyder AW, & Mitchell DJ (1999) Is integer arithmetic fundamental to mental processing? The mind's secret arithmetic. *Proceedings of the Royal Society of London B*, 266, 587-592

[2] Gottwald B, Wilde B, Mihajlovic Z, & Mehdorn HM (2004) 'Evidence for distinct cognitive deficits after focal cerebellar lesions'. *Journal of Neurology, Neurosurgery & Psychiatry*, 75(11), 1524-1531.

[3] Interview with Jason Padgett, 23rd January 2013

to begin working but also speaks about how painting his hallucinations 'exorcise[s]' them. William Burke, who has conducted research in this area, hypothesises that the neurons in the visual cortex that were made hyper-excitable become reactivated by inputs from neurons representing other areas of the visual field.• Therefore, through focussing on his hallucinations, Riley might actually influence the rate at which his brain adapts to the loss of visual input. Another artist for whom painting offers a relief is local Oxford artist Tom Eyre. Eyre suffers from a form of *apperceptive visual agnosia*, which renders it difficult for him to perceive objects in front of him. He describes how when he begins to paint he cannot recognise the object in front of him but that it comes to him in 'the moment of painting'.•

• Burke W (2002) The neural basis of Charles Bonnet hallucinations: a hypothesis. *Journal of Neurology, Neurosurgery & Psychiatry,* 73(5), 535-541.

• Conversation with Melissa Roed (Martha Crawford, 11 December 2012)

The burgeoning relationship between art and neuroscience has opened the way to a proliferation of contemporary artists who actively explore discoveries in neuroscience through their work. Nicholas Wade, a Professor of Psychology, creates graphic prints that use the current understanding of visual processing to trick our visual system. In *Back Propagation* (2012), for instance, shimmering lines appear in the periphery of the image, which move, or propagate, outwards through the picture, when the viewer approaches or distances himself/herself from the image. Wade's works, therefore, challenge the assumption that visual perception is objectively correct and ask us to question our acceptance of what we see. Yoshimasa Kato and Yuichi Ito are two Japanese artists who use the properties of the brain to create synesthetic representations of neural activity, thereby making physical an otherwise intangible brain phenomenon. A participant's brain waves are read using an electroencephalogram (EEG). The waves are then converted to sound and played through loudspeaker covered in potato starch, which dances and jumps when sound is played through it.

The artists in this exhibition are diverse and their approaches to neuroscience and their conditions are equally so. We therefore make no attempt to draw definitive conclusions and openly acknowledge that grouping artists together under this common theme inevitably shines a spotlight on one facet of their work that leaves others in shadow. We hope, however, in this essay and the subsequent essays and interviews, to relate some of the research being carried out in neuroaesthetics, to draw out interesting parallels between the artists and, above all, to excite people's curiosity about the human brain and its ability to create art that, in turn, have the capacity to expand our sense of our own consciousness.

Cosima Gretton and Rachel Stratton, Curators