

Art That Makes Itself

Brown & Son: Purveyors of Digital Images Since 1968



ART THAT MAKES ITSELF

BROWN & SON: PURVEYORS OF DIGITAL IMAGES SINCE 1968

Editor: Bronac Ferran

Designer: Daniel Brown

Available as print on demand via www.brown-and-son.com

July 2015



This book is dedicated to Chrissie Malvern Brown
without whom it could not have happened

And to departed friends: Emma Candy, Roy Stringer and Paul Hirons



Contents

Bronač Ferran	6	Editor's Introduction: IN FORM AND GROWTH
Paul Brown	6	Why Brown & Son?
Irini Papadimitriou	9	Art That Makes Itself at Watermans
Paul Brown	14	From Building Blocks to Building Code
Daniel Brown	24	A Family Tree
Grant D. Taylor	38	The Family Code: Art and Life
Douglas Dodds	54	By Appointment to Victoria and Albert
Golan Levin	66	Making Self-Making Art since 1968
Peter Fowler	72	Danny The Young
Jim Boulton	80	The Dark Side of the Digital Revolution
Maria X	86	Art That Makes Itself, Artists that Make Each Other
Contributors	96	
Acknowledgements	98	

Paul Brown
Untitled: Canvas Reconstruction
1978 (2015 reconstructed), Giclée Print, 130 x 32 cm

Editor's Introduction: IN FORM AND GROWTH

Brona Ferran

This book is the first celebration of the work of two highly talented artists who happen to be father and son, Paul and Daniel Brown. Tracing the threads and influences which have shaped their work over six decades it acts as an ideal accompaniment to a touring exhibition which began in Spring 2015 with a successful show at Watermans and which will evolve in 2016 to be shown in central London before going to venues nationally and internationally. Original contributions by theorists, art and design historians, digital archaeologists and fellow artists help to situate this material and other works from the substantial Brown & Son portfolio within the context of a slowly evolving critical responsiveness to art made with digital technology over the past fifty years. The exhibition revels in the connected yet distinct styles and systems developed by both artists who are deeply embedded within networks of practitioners – the first and second generations

of practitioners globally – who have coalesced and assembled since the late 1960s around the challenging goal of making great art with computer code.

Aligning events in their lives with an ongoing adventure in making '*art that makes itself*' the words and works trace the formation of an exquisite body of practice that holds tight to the logic of a geometric sublime and to core principles outlined by D'Arcy Wentworth Thompson in 1917 in his founding text *On Growth & Form*. In the compelling works reproduced here, and in accompanying texts, we recognize the growth and emergence over preceding decades of what now seems like the most contemporary of art, where Brown & Son invite computers in from the cold, co-opt them as members of an agile team and make them co-conspirators in the fragile game of life.

Why Brown & Son?

Paul Brown

In 2009 Daniel and I both exhibited at the Victoria & Albert Museum in London. We were in different shows – I had several works in the *Digital Pioneers* exhibition, a selection of works from the permanent collection curated by Doug Dodds and Honor Beddard – and Daniel was commissioned to create a major new work (*On Growth And Form*, p.58) as the entrance piece for the blockbuster *Decode* exhibition curated by Louise Shannon and Shane Walter. Although both shows ran during the same period they were not officially linked and many people who visited them didn't realise that family ties connected the two Browns!

Discussing this later we realised that there could be value in creating a brand that would

link both our practices. Brown & Son would allow us to jointly promote our work but more importantly we felt it would also allow us to create a framework for addressing the commonalities as well as the significant differences between our two practices. Simultaneously the family business metaphor would enable us to present a longer-term discussion of the emergence and history of the digital arts and correct many of the misapprehensions that are current and this would also allow us to explain the methodology that is common to both our practices – names like 'generative', 'code' and 'systems' art. These names are useful shorthand for the cognoscenti but can confuse those less familiar with the field. In our first exhibition together we attempted to tackle



these concerns by using wall texts that explained some of the antecedents and inspiration behind our individual work.

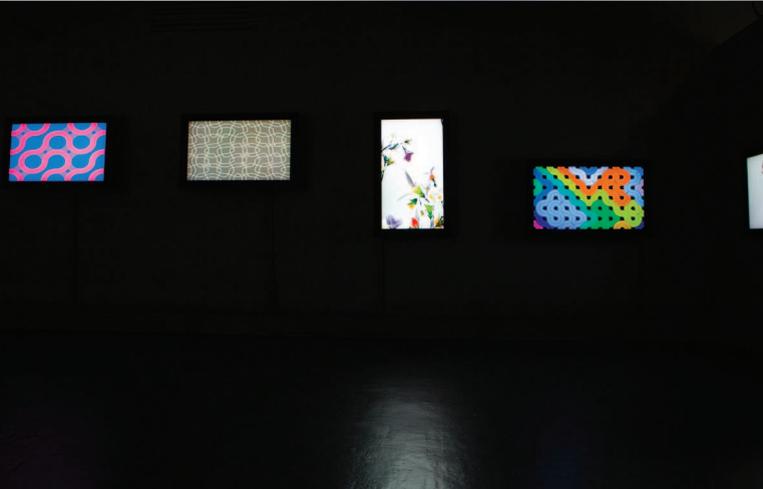
As the essays in this book convey, the digital arts are not some new-fangled thing! Artworks made with computers began in the early '50s and influential philosophers like Max Bense began to analyse aesthetics using the emerging tools of information technology later in the same decade. The computational arts are actually older than artists' acrylic paints which first appeared commercially in 1955. Graphic output technology like pen plotters begin to appear in the early '60s. One of the first was Conrad Zuze's Graphomat 64. Zuke's first customer was Stuttgart University where a graduate student of Bense called Frieder Nake wrote the first device driver for the plotter and together with his friend Georg Nees produced some of the earliest graphic artworks made with a computer.

In 1974 the Slade School of Art at University College London got its own powerful (for its day) computer system. Both the European systems movement and the American Conceptualists influenced the artists there. Sol Lewitt's 1967 statement that "the idea becomes a machine that makes the art"[1] became a rallying cry for the movement. The group at the Slade had a 'real' machine – a symbolic processor – in contrast to Lewitt's metaphorical one and migrated then current ideas of process versus object into the computational domain.

It was here that terms like 'generative' and 'code art' first appeared with artists who no longer made art objects – they created algorithms (implemented in code) that can generate a (sometimes never-ending) series of artworks. The artwork became less important as it can always be recreated from the code: it's the generative process that is at the core of this new kind of art.

Historically these ideas have their roots in several strands of experimentation in 20th century art. Constructivism proposed that art should be constructed and not composed. Exponents of concrete art sought to create artworks that were neither representational nor abstract but self-referential 'things in themselves'. Systems artists dematerialised the object and instead placed the generative process as the central concept of an artwork. With 21st century audiences increasingly receptive to self-organising, autonomous systems playing a creative role in our lives, we welcome you to the first Brown & Son publication, the first we hope of many to come.

1. Lewitt, Sol, Paragraphs on Conceptual Art, Artforum, June 1967



Art That Makes Itself at Watermans

Irini Papadimitriou

It was a great pleasure to welcome artists Paul and Daniel Brown in their first exhibition as Brown & Son to Watermans in the London Borough of Hounslow, West London, where I am Head of New Media Art. Their extraordinary pioneering work represents the first and second generations of artists working with digital art and design. The *Art That Makes Itself* exhibition from 31st March-31st May 2015 was very positively received with a total of 19,500 visitors from Germany, Ireland, Scotland, Wales and England's north east, as well as locally from London and the south east.

The exhibition took place across two floors of the centre which was a new development for the New Media art strand at Watermans. In close dialogue with the artists and co-curator Bronac Ferran we decided to accompany the mainly screen based works in the upper gallery with a display of rarely seen digital prints by both Daniel and Paul in the downstairs riverside gallery to maximise opportunities for visitors to theatre, café, bar and theatre to view the material. A set of contextualising wall-boards were developed to communicate some of the key influences- people and works - which have inspired the artists at different stages in their careers. We welcomed a suggestion by Paul Brown that some of his early film and video works could be installed on the general use television screen to the left of the bar which proved to be a fascinating intervention disrupting the regular flow of news with works such as *The Earth Probe* made in 1977.

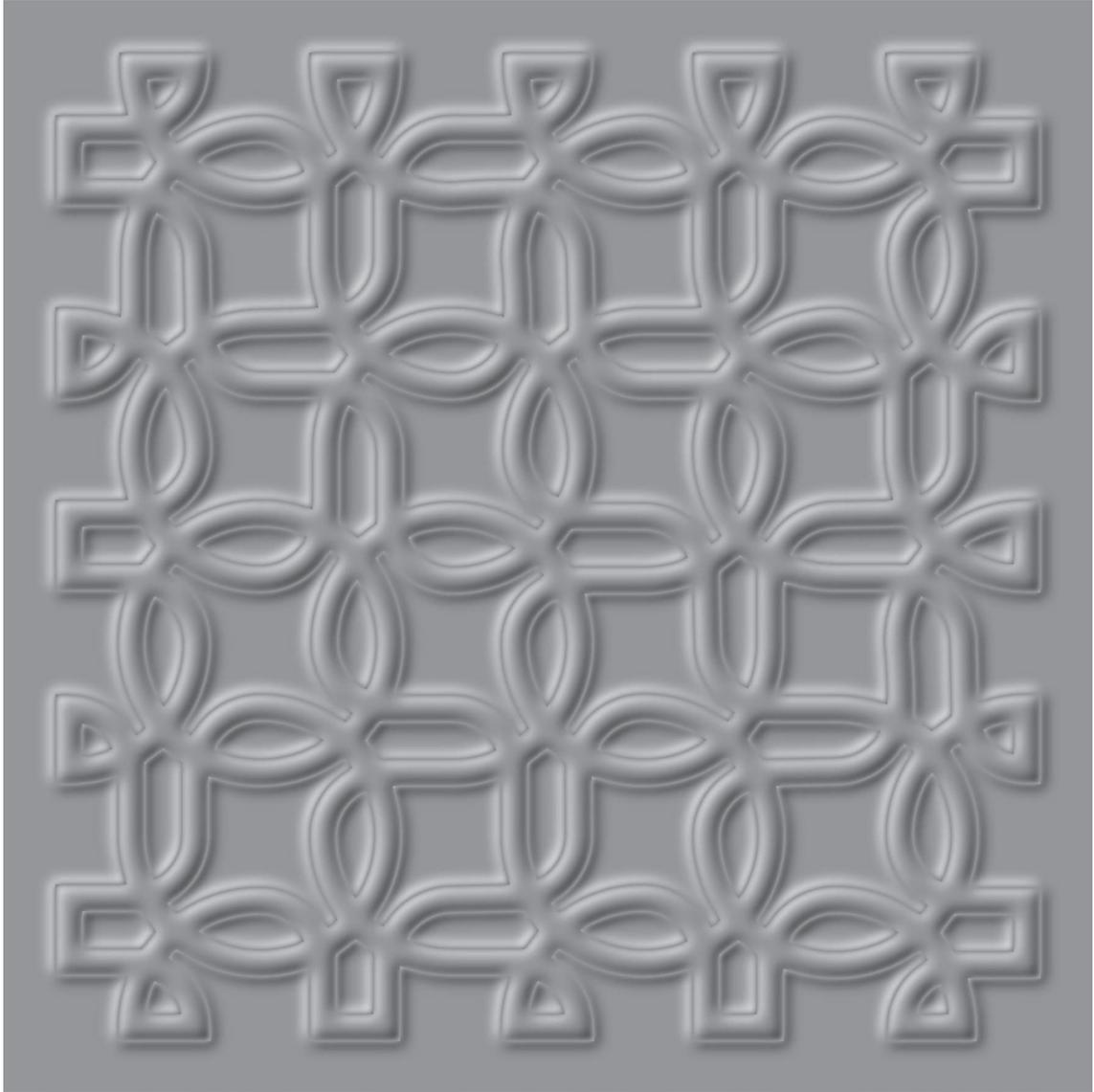
With this show which focused on connections between the live history of Digital Art and Generative Art with exhibition, participatory workshops and a symposium, we successfully extended our programme of exhibitions of contemporary art which has featured among others, Anna Dumitriu, Paul Granjon, Michael Takeo Magruder, Rajs Collective and Stanza.

NAME	E-MAIL	COMMENT
Anna Dumitriu		Amazing! / Great world class!
David Clarkson		Very enjoyable Fabulous!
Bernard Vian		Tots Amazing!
Rebecca Duns		Amazing! / had thought of this 10 years ago but no idea how to do it! Can you help?
Zeph Keogh		Enjoyable though you amazing! / not too much information how to do it. stuff
Liz Keogh	Liz_Koegh@bt.com	Amazing!
Kevin McLaughlin		good photos
Miranda Bennett		amazing - piers, Epic and good + onlabel
Jan Lawson		came twice and was bewildered + amazed more the 2nd time
Jean-Francois My names Jeff		
Phil		
Rose C.	roseann@bt.com	DEFINITELY WORTH A LONG TRIP TO COME AND SEE - LOTS OF THINGS I HAVEN'T SEEN BEFORE, I LOVED THE CITY-BUILDINGS, AND GREAT SHOW! I AM! I AGREE WITH ZEPH - TOTALLY AMAZING!
Robert Salmon		Really excellent. lovely to see the clear contrast + clear similarities between Paul's Birmingham. Both world class.
Beth Gorman	@boudalard.se.uk	
Phil Hubbard		

We have also been delighted to directly support the production of this book which we believe will be an inspiration to future generations working in art and design. We wish to thank digital agency Amaze, Arts Council England, the Computer Arts Society, London Borough of Hounslow and the School of Engineering and Informatics at the University of Sussex for their generous support and to acknowledge also the wonderful contribution of the artists and writers in making both book and exhibition happen.

Above: Excerpt from Visitors Book for Brown & Son show

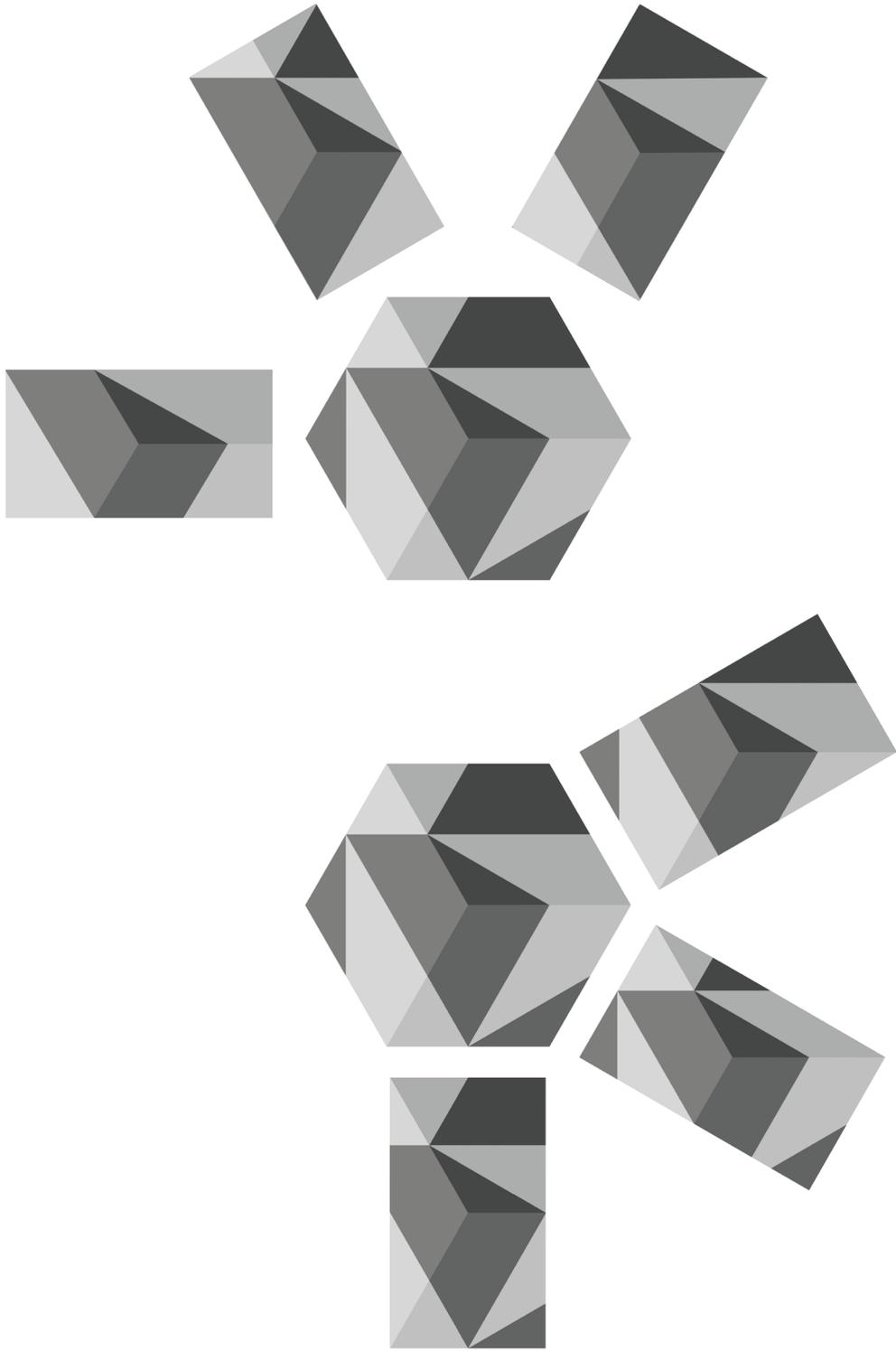
Opposite: *Brown & Son: Art That Makes Itself*
Watermans Gallery | Private View
All photographs ©Oliver King (2015)



Paul Brown
Ceiling Detail from The House of Signs
1996, Giclée Print, 50 x 50 cm



Daniel Brown
Commission for The Four Seasons Dubai
2014, Giclée Print, 50 x 50cm



“Cellular automata (CAs) have been central to the work of Paul Brown, an artist who is one of the unheralded pioneers of a-life art. In fact, Brown’s practice predates artificial life as a field by many years; his work with CAs dates to around 1973.”

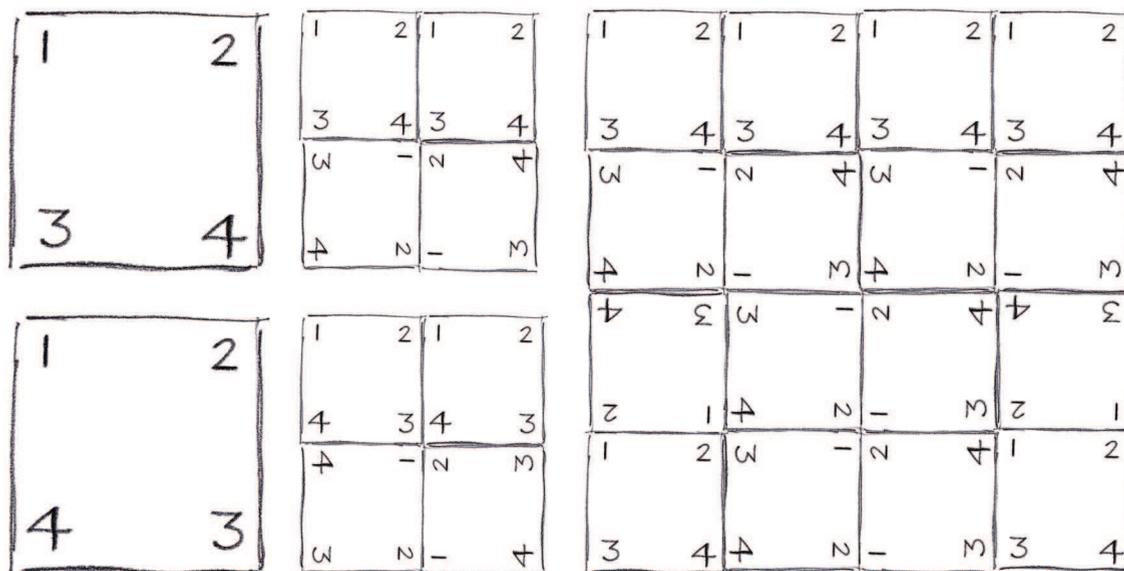
Mitchell Whitelaw, *Metacreation: Art and Artificial Life*. MIT Press

Paul Brown
Hex Cube
2015, Giclée print, 62 x 42 cm

From Building Blocks to Building Code

Paul Brown

Paul Brown | *Untitled Drawing*
1967 (redrawn 2015), Giclée Print, 70 x 40 cm



I was born in 1947 – a child of British post-war austerity – and my toys were all bought in jumble sales. My building blocks were all from different sets, different sizes and shapes. They were stored in a 12-inch cubic metal biscuit tin and my favourite game was to tip them all out then put them back so as to fit the minimum amount of space in the tin. It was a fascinating game and I remember playing it a lot. Nothing much has changed in the intervening 67 years, my obsession with symmetry and order has continued and forms the foundation of my life’s work.

Twenty years later, studying painting at Manchester School of Art, I did a drawing that emerged from this fascination with order and process. A recent reconstruction is *Untitled*, Drawing, 1967 (above) and it was in this work that I heard my own voice as an artist for the first time. It showed me that simple processes could invert themselves and that iterations of a process could manifest copies that contained instances of themselves at different

scales of magnification. Nowadays we would call these phenomena ‘emergence’ and ‘self-similarity’ or ‘fractal’ but it was a decade before terms like this appeared. I was very excited by this drawing and spoke enthusiastically about what it had revealed to me at the annual student crit just a couple of weeks later. Afterwards there was an unusual silence, none of the animated discussion that usually followed the student presentations. Then the head of year spoke and gently and kindly suggested that maybe I wasn’t cut out for a life as an artist and should consider a career in a different field.

Dropping out (this is what we did in 1967, following Tim Leary’s mantra: “turn on, tune in, drop out”) was the best thing I could have done. I experimented with light shows, film, video, multi-media performance and more. Then in 1968 someone suggested a show in London that I might like. I hitchhiked down from Liverpool and Cybernetic Serendipity at the ICA changed

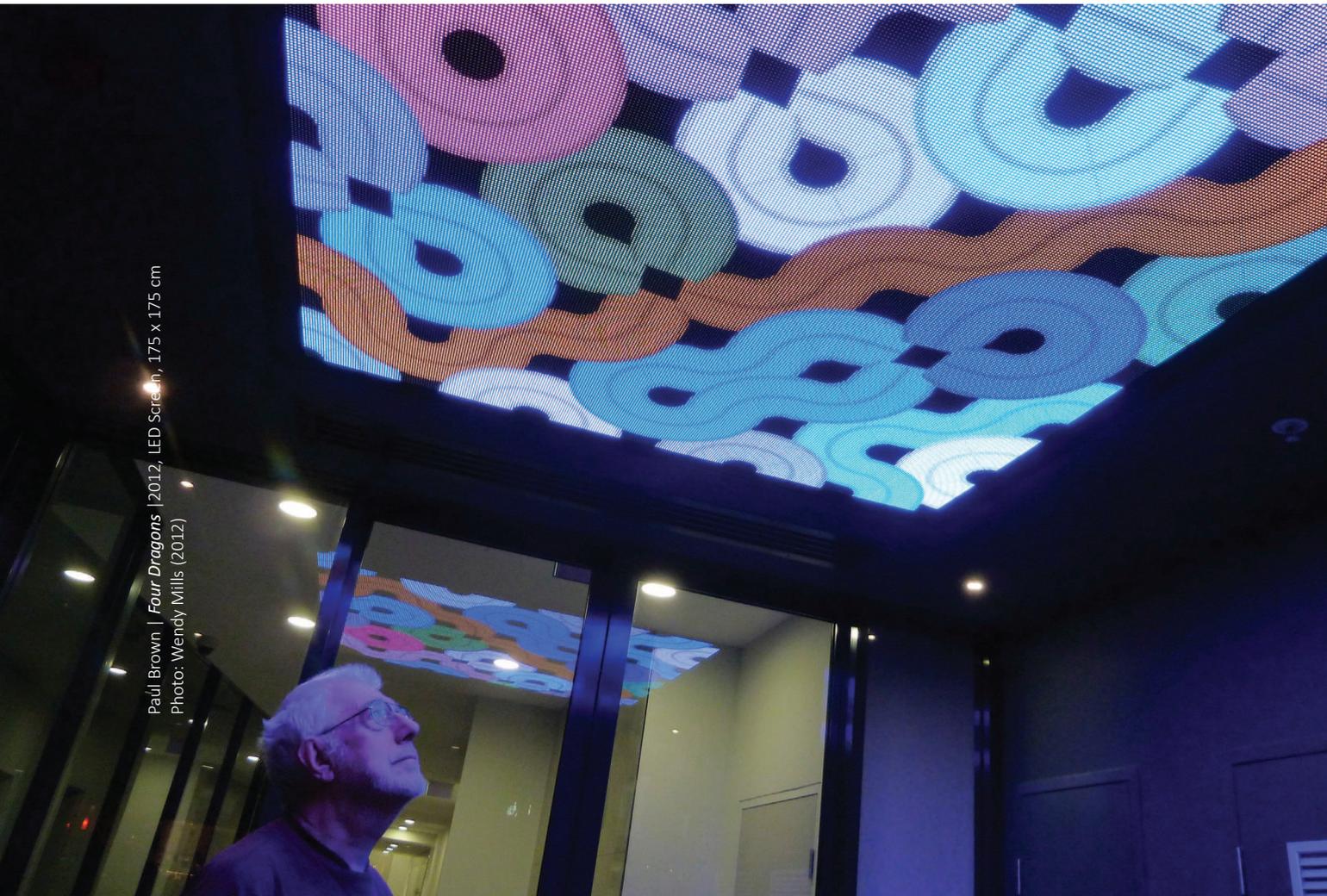
my life. I already knew about computers, my dad and I kept a scrapbook of new technologies as I was growing up – hovercraft, jet engines, atomic furnaces, new building techniques, computers and lots more. But at Cybernetic Serendipity I realised that the kind of stuff I really wanted to do could be done using digital machines. My weird ideas had found their medium.

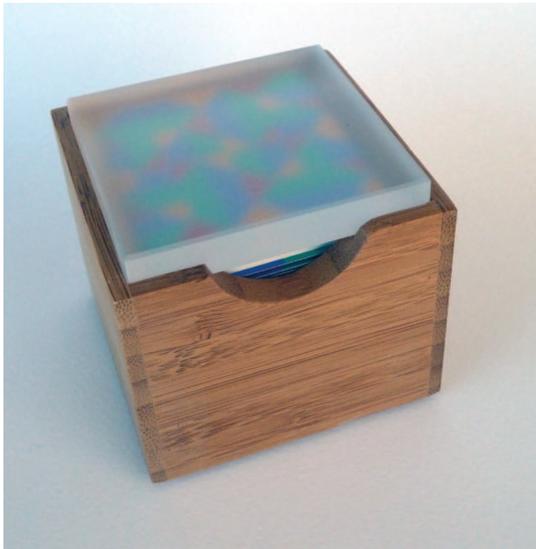
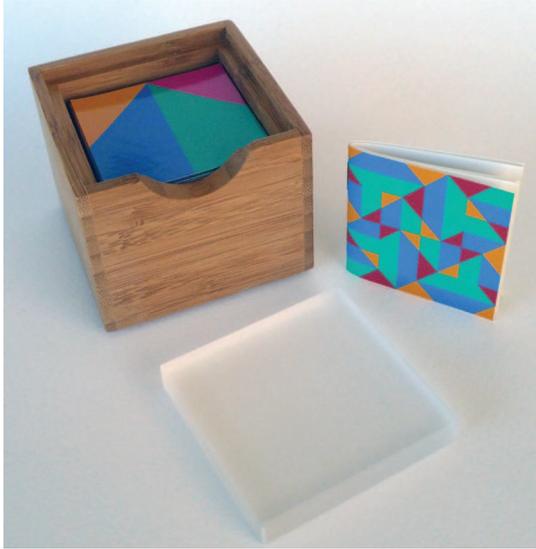
Nova Express Lightshow had moved into residence at the Great George's Community Cultural Project – The Blackie – in Liverpool and it was there I met Chrissie Malvern. Our first son Tris was born in 1974 just after I returned to college to learn about computers. The Polytechnics had been formed and these enabled art students to work in the Engineering and Maths departments and learn how to write code. So I went back to art school in Liverpool (now Liverpool John Moores University), this time as a sculpture student – the sculptors

were much more sympathetic to machines than the painters – and spent three years learning FORTRAN and Assembler and how to design and build my own digital circuits. Somewhere in my final year someone whispered in my ear that I should maybe make some “art” if I wanted to pass my degree and I cobbled together some sculptures with programmed flashing lights and lots of plotter drawings. Just after Danny was born in 1977 I graduated with first-class honours and was accepted into the postgraduate EXPerimental programme at the Slade School, UCL. EXP was one of the few art departments in the world to have its own dedicated computer – a Data General Nova 2 with 16 KB of memory.

It was here that I met many of the UK's Systems Group artists and discovered that what I was doing had a history that extended though 20th century Modernism to Constructivism and beyond. But

Paul Brown | *Four Dragons* | 2012, LED Screen, 175 x 175 cm
Photo: Wendy Mills (2012)





Paul Brown
i4^16
 2013, *Fridge Magnet Game*, Size variable

what especially interested me and several of the other artists based in EXP were the new ideas emerging from science and mathematics: chaos theory, iteration, emergence, fractals – all the bits and bobs that would come together as a new discipline that was named Artificial Life or A-Life a decade later.

When I post-graduated from the Slade in 1979 I had two young children and needed an income. I went down to the local job exchange and was surprised to find myself on a plane to Holland just a few days later for a job interview. I worked for two years for Claessen's Product Consultants in Hilversum developing the system and application software for the world's first Graphic Design workstation – the Aesthedes. I asked Chris Briscoe, who had run the EXP Dept. at the Slade to do some consultancy work and he told me about a project he was working on with the Medical Physics Dept. at UCL Hospital where he was creating 3-D renders of CAT Scan data. In 1980 we set up Digital Pictures Ltd as the UK's first company dedicated to computer special effects.

We had dreamed that Digipix would give us access to powerful computers and the time to get on with our artworks but, of course, we worked 24-hour days just cranking out animation for TV commercials. I was bored and in 1984, when the company looked like it was on its feet I left to set up the National Centre for Computer Aided Arts and Design at Middlesex Polytechnic. I spent the next 12 years as an academic entrepreneur setting up new programmes in the UK, Australia and the USA to teach designers about computers and how they were going to change their practices.

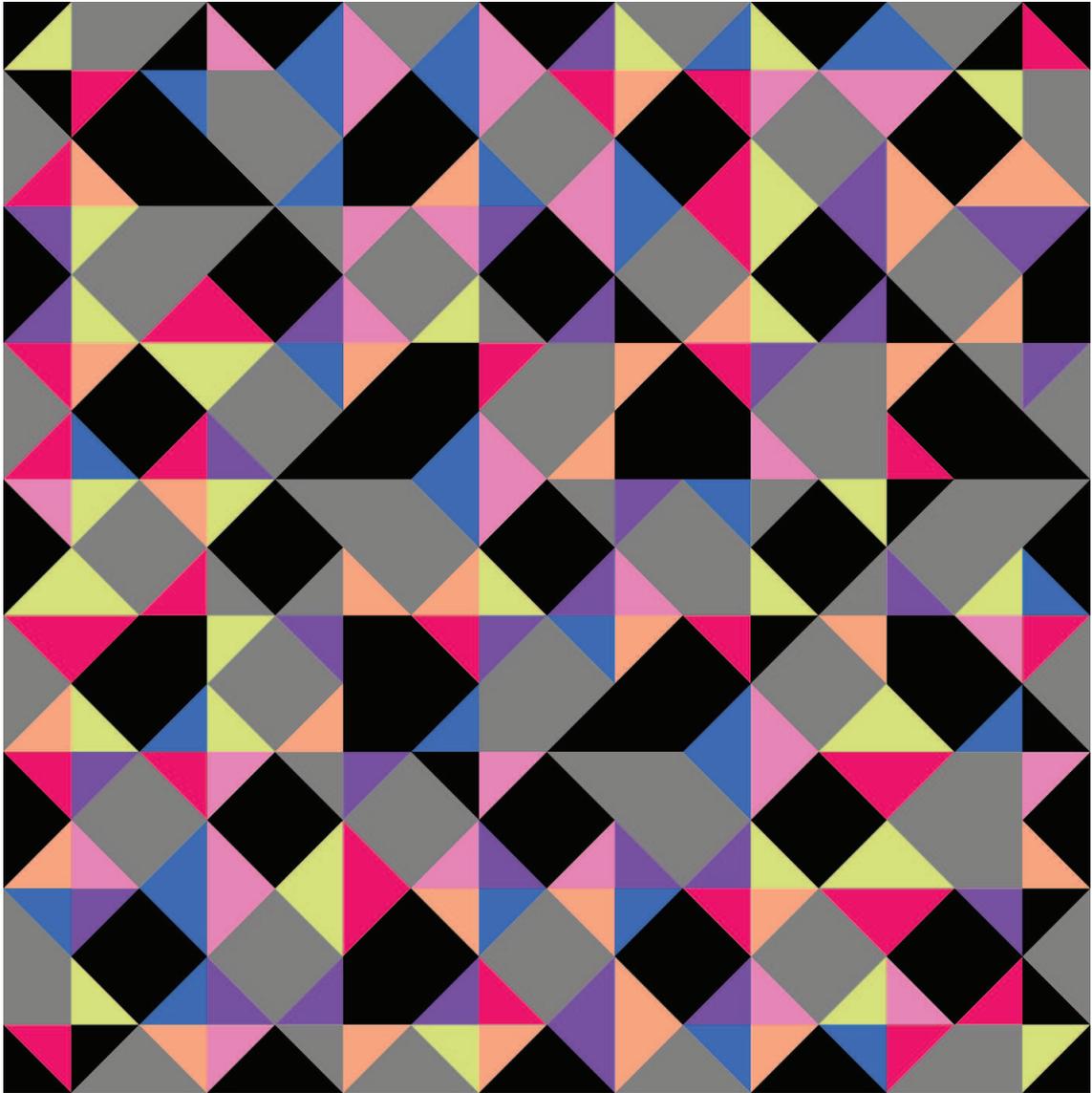
By 1996 Dan had come over to live with us in Australia, his brother Tris had left University and I no longer needed a major salary to support them both. I resigned from academia to re-establish my career as an artist. I had a number of lucky breaks: I won the Fremantle Print Award (then Australia's pre-eminent award for works on paper) for *Ceiling Detail from the House of Signs* in 1996 (p. ?) then in 1999 was awarded a New Media Arts Fellowship by the Australia Council for the Arts.



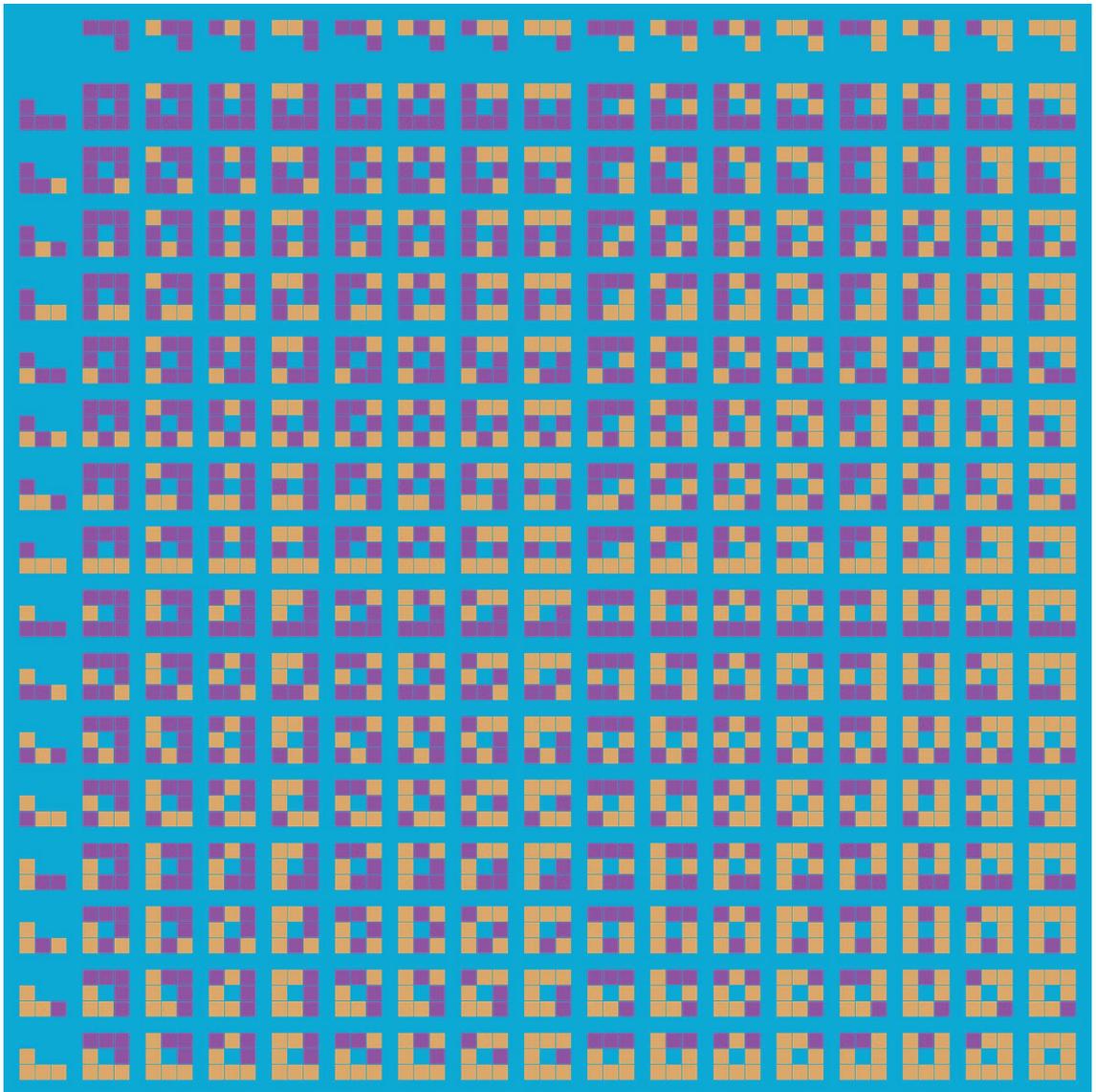
Brown & Son: Art That Makes Itself, Watermans Gallery
Paul Brown
Photo: ©Oliver King (2015)

The 2000s were wonderful. I began my long-standing relationship as artist-in-residence with the Centre for Computational Neuroscience and Robotics in the Dept. of Informatics at the University of Sussex and, after several decades as an outsider, was rediscovered by the art world. The CACHE project (Computer Arts, Contexts, Histories, etc...) co-led by Charlie Gere, George Mallen and I at Birkbeck, University of London helped re-establish the history of British participation in the field and we discovered many other international initiatives that were revealing the history of this long-neglected field. Invitations to exhibit my work became more frequent than in 2009 Danny and I both exhibited our work at the V&A Museum.

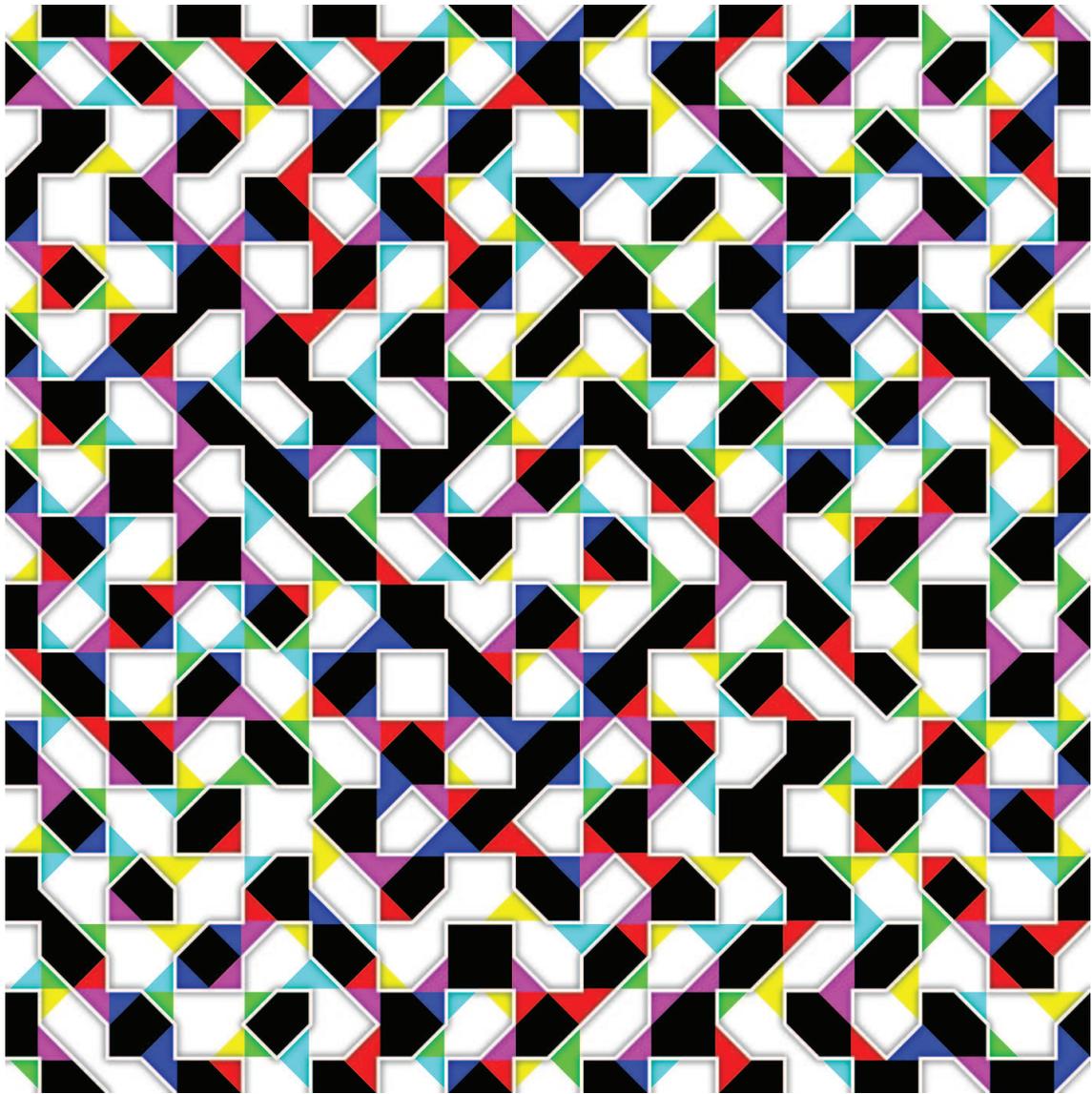
Soon afterwards we decided to create the Brown & Son brand to promote ourselves and in 2012 Sue Gollifer invited us to exhibit at the following year's Brighton Digital Festival. Sadly the funding wasn't forthcoming and this show didn't go ahead but the seed was planted and our first show together was co-curated by Irini Papadimitrou and Brona Ferran and took place at Watermans Arts Centre in West London in April and May 2015. The challenge of working together was a rewarding experience, the feedback was positive and we are now looking toward future opportunities to promote our work and exhibit together.



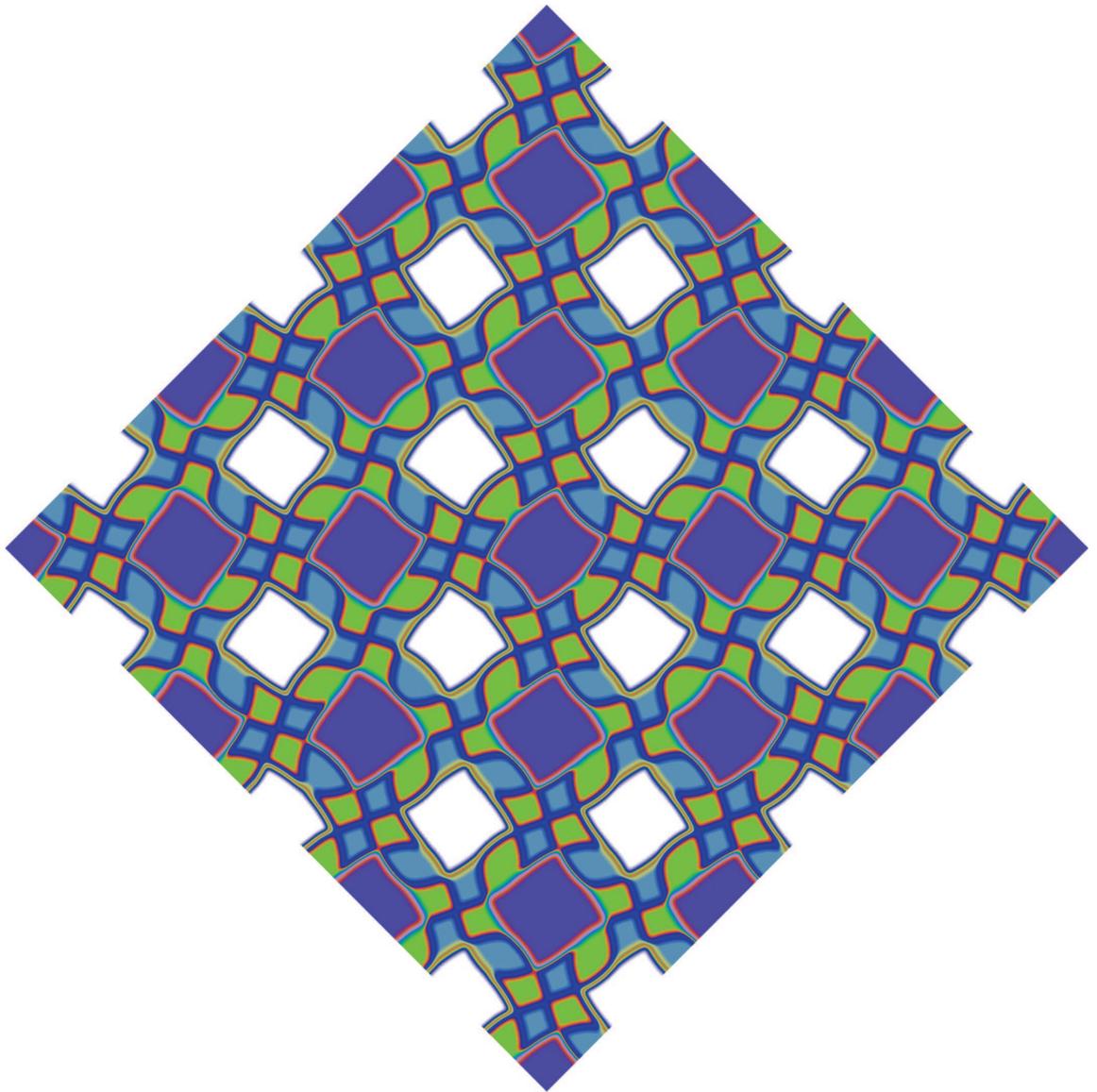
Paul Brown
Amaze Amiss
2000, Giclée Print, 50 x 50 cm



Paul Brown
Neighbourhood Count
1990-91, Giclée Print, 60 x 60 cm



Paul Brown
Primary Diagonal
2005, Giclée Print, 50 x 50 cm



Paul Brown
Dancer
1997, Giclée Print, 75 x 75 cm



“Daniel Brown’s work changes the way we look at and engage with digital imagery. It is technically innovative and emotionally engaging, but also gives us an extraordinary amount of freedom in the way we experience it.”

Jonathan Ive, Head of Design, Apple Inc

Daniel Brown
D'Arcy Wentworth Thompson Zoology Museum Commission
2013-14, 120x120cm

A Family Tree

Daniel Brown

It would be easy for me to believe in fate, or destiny – the idea that an otherworldly force is watching us and subtly intervening at key moments, putting us gently back on a seemingly preset path should we stray from it.

And sometimes, not so gently.

Example: I was born with a spinal deformity that meant I walked with a severe limp until my teens. A rigorous regime of physiotherapy – not to mention constant bullying and the lingering threat that I might end up in a wheelchair – meant I had mostly corrected it by the time I went to high school.

It's a little ironic then that I should suffer a random accident while on holiday in Spain 13 years later and come out of hospital a year afterwards permanently in a wheelchair.

And that this catastrophic event would be a pivotal moment in my career as an artist.

Not all of these fateful incidents are so macabre: as a newly working adult moving out of the family home, I found my first apartment in central Liverpool after weeks of futile searching. When I announced to my family that I had found a perfect place on a street I'd always thought beautiful, you can imagine my surprise when told that I was conceived in the very house next door: my new apartment shared a wall with my first home.

But having been born to a programmer-painter father, and a mathematician-composer (not to mention keen gardener) mother, it seems unsurprising that I should end up being the software artist that I am. The strange thing is that my getting to that point took a rather indirect route.

In school I had an awkward start. The aforementioned limp ensured that teachers assumed I

wasn't up to much, and to be honest my obvious early interest in all things paint and crayons – and an equal disinterest in all things reading and writing – probably didn't help. But I was lucky enough to gain a place in one of Liverpool's top grammar schools, and by my teens things were settling down.

The mathematical guidance of my mother kicked in, and by the age of 15 the school had convinced me to study my strongest subjects – mathematics, physics, and economics – until I was 18. I could make a promising accountant, economist, or engineer I was told proudly.

I didn't even study art.

I had become a model student: that year I was even presented a book token in reward for my transformation. The token, cleverly only redeemable at the city's academic bookshop, meant – to my teenage eyes at least – that a rather boring choice was inevitable. After what seemed an eternity browsing through yawn-inspiring books, I came across a rather curious book with a cover featuring a Nautilus shell. I thought it looked cool, bought it, and after a few pages duly put it on a shelf in my mother's house where it probably still is.

But something in my teenage life wasn't right.

By the time my parents had divorced in 1981, at the age of 4, I had already shown an interest in following in my father's footsteps as a digital artist. I'm told I was making pictures by typing letters on the screen of our family computer before I could barely talk (I can't remember).

Their separation had left a hole in me. Although I regularly visited my father, then living in Australia, and saw his wonderful pioneering experiments in digital graphics on gigantic whirring computers, it



made the distance between us only seem greater. As the 1980s went by, with the explosive days of technological advancement, each visit afforded us a brief time to play on ever more powerful and exciting computers.

Meanwhile in my domestic upbringing back in Liverpool, needless to say, glamorous computers costing tens of thousands of pounds were not lying around merely for children to play with.

In 1990 I was lucky enough to stay with my father while he was teaching a summer school course in computer graphics at California State University at Humboldt. There, they had labs full of the Holy Grail of cutting-edge technology: the Apple Mac II. I quickly learnt how to use the 3D software (RenderMan) and a programming environment called HyperCard.



Brown & Son: *Art That Makes Itself*, Watermans Gallery
Daniel Brown | Photo: ©Oliver King (2015)

At the end of that summer I came home with a crash and a heavy dose of reality.

I was torn: I had found a passion I loved – digital image making – that required the skill that I excelled in: mathematics.

But that was very far ahead of the English grammar school curricula of the 1990s, and recession-struck Liverpool for that matter. At the time Liverpool (a city with a metropolitan population of something like 3 million) had just one Apple dealership.

Fortunately, another one of those curious incidents occurred. It just so happened that my mother's new partner, Mike, played saxophone in a Frank Zappa tribute band alongside a chap called Roy Stringer.

And *Roy* owned the one and only Apple dealership in Liverpool.

Upon hearing of my situation and low mood, he immediately offered to let me come in after school and at weekends and play around with the Mac IIs all I wanted.

His company, Bit32, not only supplied Apple computers but also designed bespoke solutions, including tools to allow severely disabled people to achieve tasks otherwise not possible.

Roy soon saw potential in me and began to guide me in putting my newly acquired skills to practical use. I was soon drawing icons for an interactive laserdisc package he was creating for the Tate Gallery.

Over the next few years I worked with Roy, following him as he took on various roles, and became his apprentice in all but name. If you're interested in that moment in time, please read Peter Fowler's essay, also in this book.

After a long-term battle with cancer, Roy, my mentor, passed away in 2001.

So it was a 'lucky' coincidence that, just as I was looking for a career based on my odd coupling of skills as both designer and mathematician, the field of digital media was born and developing rapidly: one minute laserdisc based, then came CD-ROM, and by the late 1990s, the World Wide Web had exploded.

I immediately saw the potential of the medium. Whereas almost all web design at that time was still, static, and brochure-like, I knew from my work in interactive design, and from my passion for computer games, that something infinitely more fluid, more immersive, more three-dimensional was possible.

I was then working at Amaze, a new company that Roy had founded. Initially I set about creating my own web site to demonstrate these ideas, but after showing Roy a small piece, he saw my vision and let me continue developing it during work hours.

In late 1997/early 1998 *Noodlebox* was born.



Daniel Brown | Four early works from the *Flowers Series* (including piece for the Tate gallery website, top left) | 2000-8

A strange name perhaps, but I thought it apt given the curios-like experience it seemed to anyone expecting a ‘normal’ web site. Behind lots of movable boxes, various small rooms could be found, in each of which a tiny demonstration of a particular idea or technology could be accessed.

At the time, many were speaking of the potential of the web, but precious little content was around that hinted at this promised future. *Noodlebox* hit the spot and was thrust into the limelight by the design media and technology firms like Netscape, Yahoo and Adobe.

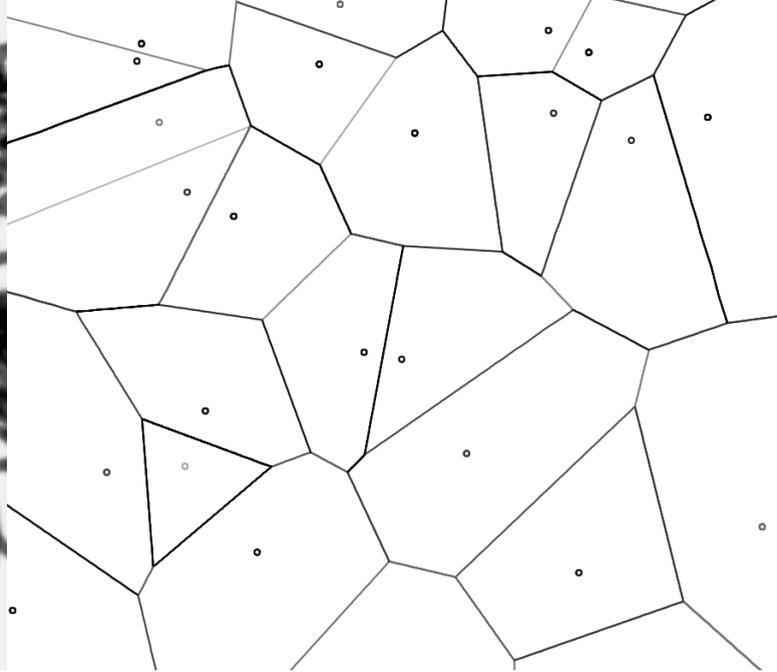
Creative Review magazine quickly picked it up, and featured me in a profile of up-and-coming designers. It was now 1999, and the feature was proudly titled ‘Stars of the New Millennium’. From here, things went stellar. Alice Rawsthorn,

then director of the London Design Museum, had chosen to put on a show of inspirational web design. I was invited in and was offered my own room in which to show my work.

But interestingly, the museum’s researchers had picked up on a very specific bit of my work. One of the ‘boxes’ in *Noodlebox* contained a small gently growing tree (see image overleaf).

It wasn’t a drawing or something I had animated: it was the output of a computer program.

Familiar to anyone who knows anything about computer graphics it merely demonstrated a principle known as fractal mathematics. I had made it as a personal exercise, and it certainly wasn’t unique: software artists had been creating such things since before I was born.



But whereas these earlier works had lacked a medium for exposure – they were typically still-images shown in academic publications from obscure mathematics/computer graphics conferences – here was the same process that could be seen growing live on the screen of any computer with a web browser.

The museum curators loved this piece and a related one I had not yet made public; they convinced me to show these works projected on a huge cinema-sized screen.

The *Web Wizards* show opened in 2001.

Something wonderful happened: the public fell in love with the work. People were mesmerised by the large hypnotic flowing of the ever-growing organic forms. People sat for hours on the beanbags dotted in front of the screen.

I had no idea it would take off like that. What I had started as a technical exercise was being appreciated by toddlers, elderly couples, people who knew nothing about computer programming. I realised then that these organic forms, digital plants, trees and flowers, were a way for the common man to ‘experience’ and admire mathematical computer processes.

For the next couple of years I carried on creating

a series of ever-more complex variants of these computer programs while continuing in my ‘day job’ as a commercial web designer. I started not only to consider the pure mathematical aspects of ‘growth’ but also to try and write programs that simulated the aesthetics of real flowers – colour, texture and pattern. In this way, my work slowly became distinct from that of my peers, who were generally interested in a more minimal abstract aesthetic (such as Voronoi patterns, see image).

About this time I was reminded about an obscure book written roughly a hundred years earlier: *On Growth and Form* by Sir D’Arcy Wentworth Thompson, considered to be the first ‘biomathematician’. In the book, a thick scientific tome of nearly 400 images, the scientist hypothesizes that the beautiful appearance and behaviour of natural phenomena – from the pattern made by water splashes to the shape of fungi, to the evolution of one species to another – could be the result of mathematical and physical principles.

It is illustrated with beautiful hand-drawn diagrams with mathematical models mapped on to delicate sketches of animals, plants and other forms occurring in nature.

On the cover of modern editions, a shell is displayed – boldly showing how its shape follows a basic mathematical formula.

Left: Daniel Brown | *Noodlebox* | 1997-98, Screen capture
Right: Daniel Brown | *Voronoi Graph* | 2015, Screen capture

“I was still an artist/designer – applying a creative process to projects. But something remarkable had happened – I was no longer sitting at a drawing board with a pen or pencil.”

I realised immediately: my as-yet untitled series had a name, a name to honour the scientist I had forgotten all those years ago. To this day I cannot pretend to have understood the whole book (I am not a biologist), but its images, and its premise, that all in nature can be understood with the correct mathematical understanding, has had a huge impact on me.

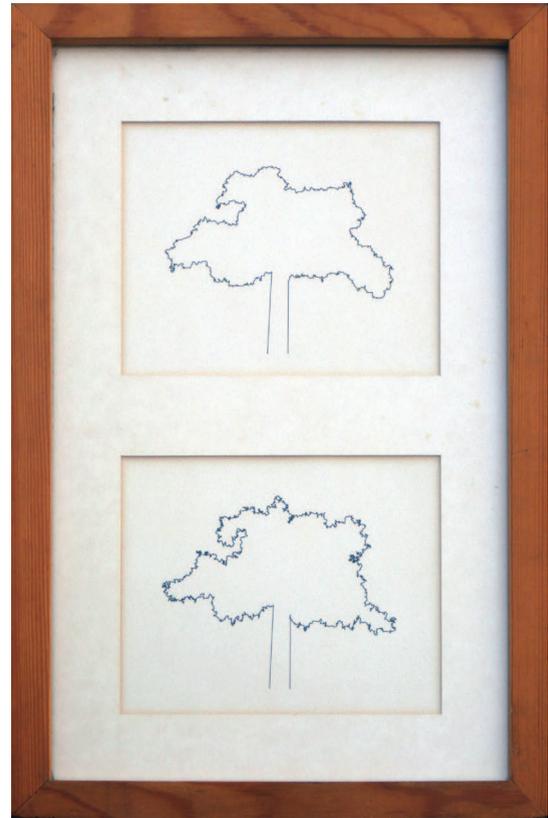
I like to think that our processes can be seen as the opposite sides of the same coin: whereas Thompson tried to break down the natural world into predictable mathematics, my work aims to use mathematics to simulate the beauty of the natural world.

Mathematics is the language of nature.

I continued with my flowers, and at the same time continued with my career as a designer. By now I was working for the fashion photographer Nick Knight, advising him on the creative possibilities of technology.

Digital media had started out as a cottage industry. Small teams, and even individuals, would create entire projects, utilising a basic knowledge of programming, design, animation, music etc. I had realised however, that I was never going to be the best photographer, animator or illustrator.

I decided to specialise in programming and digital design; and to create the best work I wanted to work in collaboration with the best in their respective fields. Nick offered me exactly this, and after just one meeting with him and his wife Charlotte, I knew I wanted to work for them.



Paul Brown | *Tree Drawings*
1978, Plotter Drawing, 15 x 10 cm

For the next eighteen months we worked together on various projects that I consider some of the most exemplary of my career. We created the world’s first live coverage of a fashion show using mobile phones (that were practically taped together); a magazine fashion shoot made using ‘live’ software (that we then gave away); an interactive film that allowed the user to rotate the scene (à la bullet-time photography in *The Matrix*).

I was still an artist/designer – applying a creative process to projects. But something remarkable had happened— I was no longer sitting at a drawing board with a pen or pencil. Nor was I even using their digital equivalent of paint and illustration software: I was writing programs. Abstract lines of numbers and codes, that combined all this content and created a new and unique experience.

Long live the new flesh.



Above: Daniel Brown in hospital
Photograph © Mervyn Nicholson (2003)

In mid-2003, I attended the OFFF conference on behalf of Nick in Barcelona. Two of my colleagues and I gave a presentation on digital media and fashion. We had chosen to stay on for the weekend and enjoy a few days of leisure in the sun. On the last day of the trip, I was involved in an accident.

I spent the next month in a coma in a hospital in Spain, before being airlifted to London and spending another eight months recovering in hospital. Technically, I died twice.

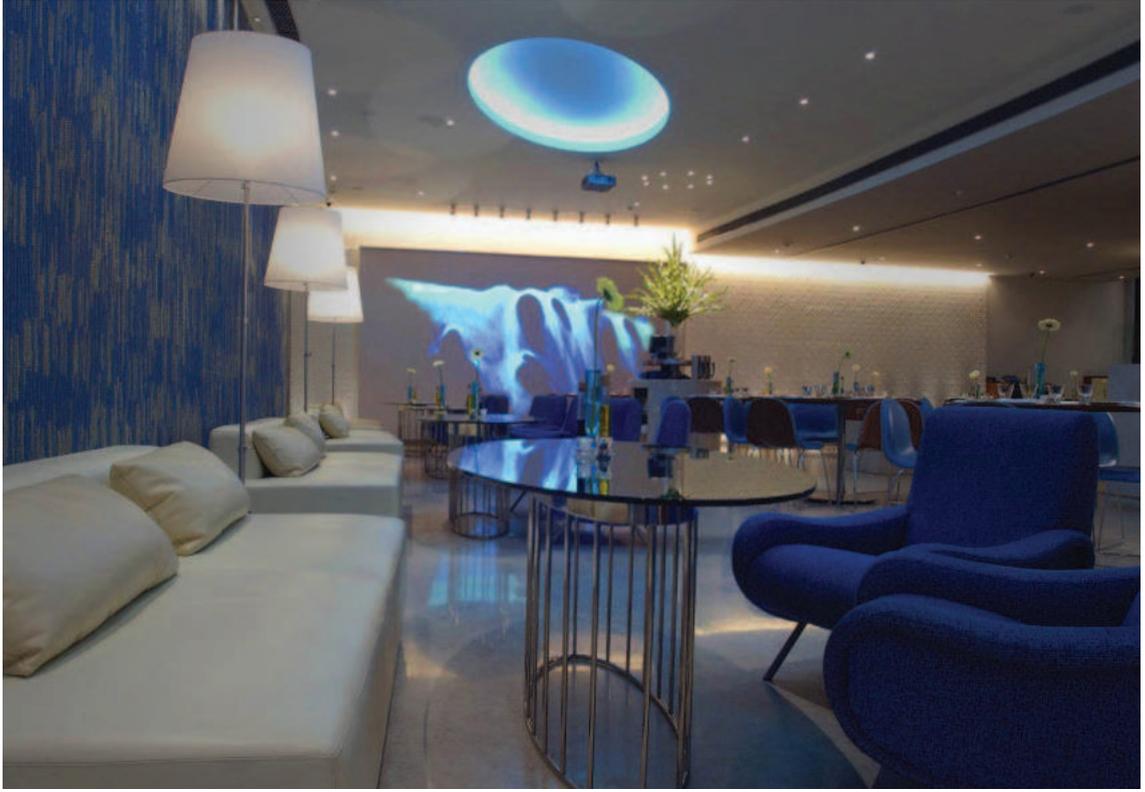
When I was discharged, nearly a year later, I was severely paralysed and in a wheelchair.

I had partial use of my arms, but could not move my fingers. I could no longer hold a pencil: I could no longer use a brush.

But thanks to modern digital technology and simple adaptations of my workspace and equipment – the same sort of approach Roy's company had pioneered back in Liverpool all those years ago – I could still use a computer.

And above all else, I could still write computer programs.

Daniel Brown | *Waterfall*
2005, large-format projection



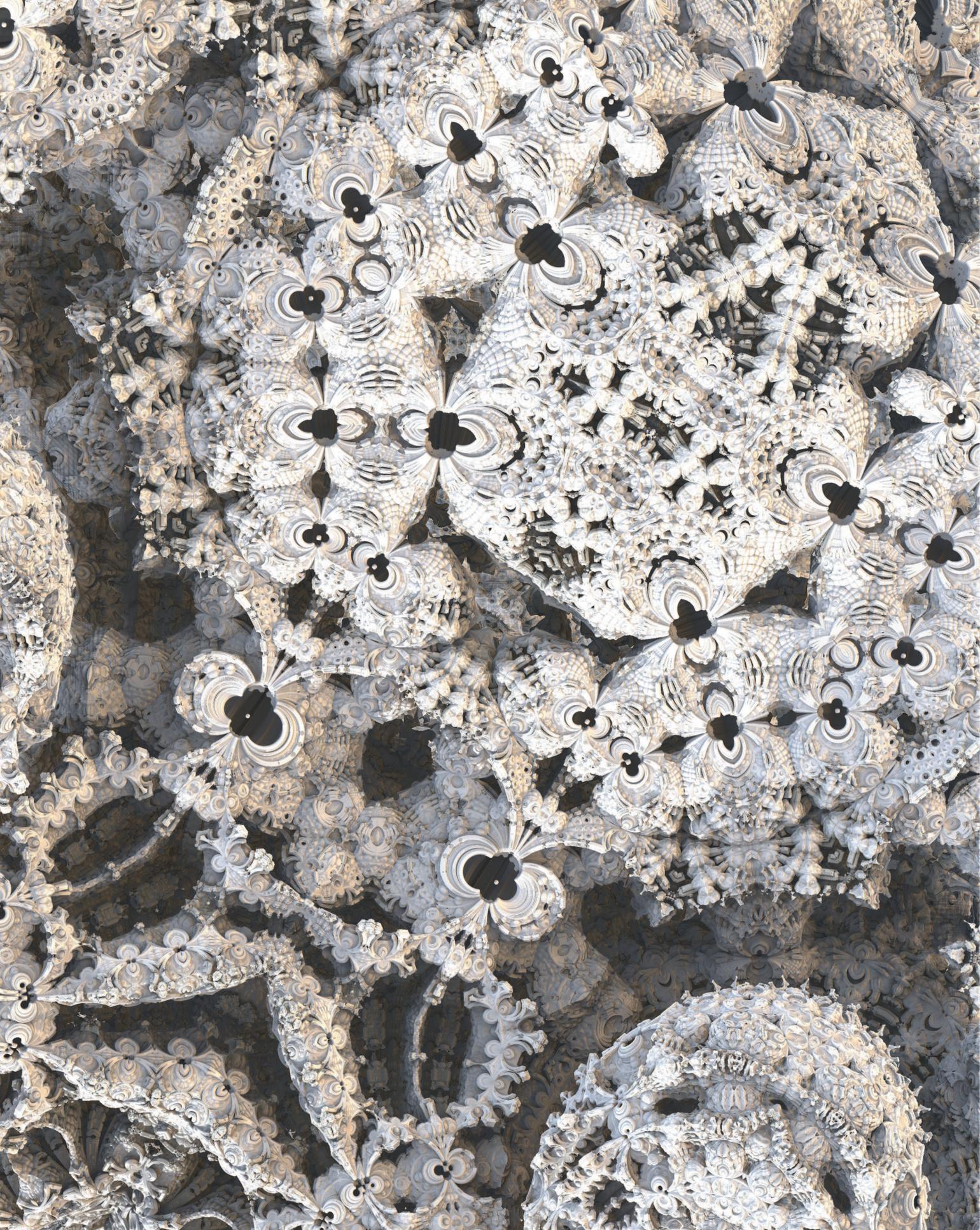
Daniel Brown | *Tropic of Sunderland*
2007, large-format projection
Photograph ©Colin Davison (2007)



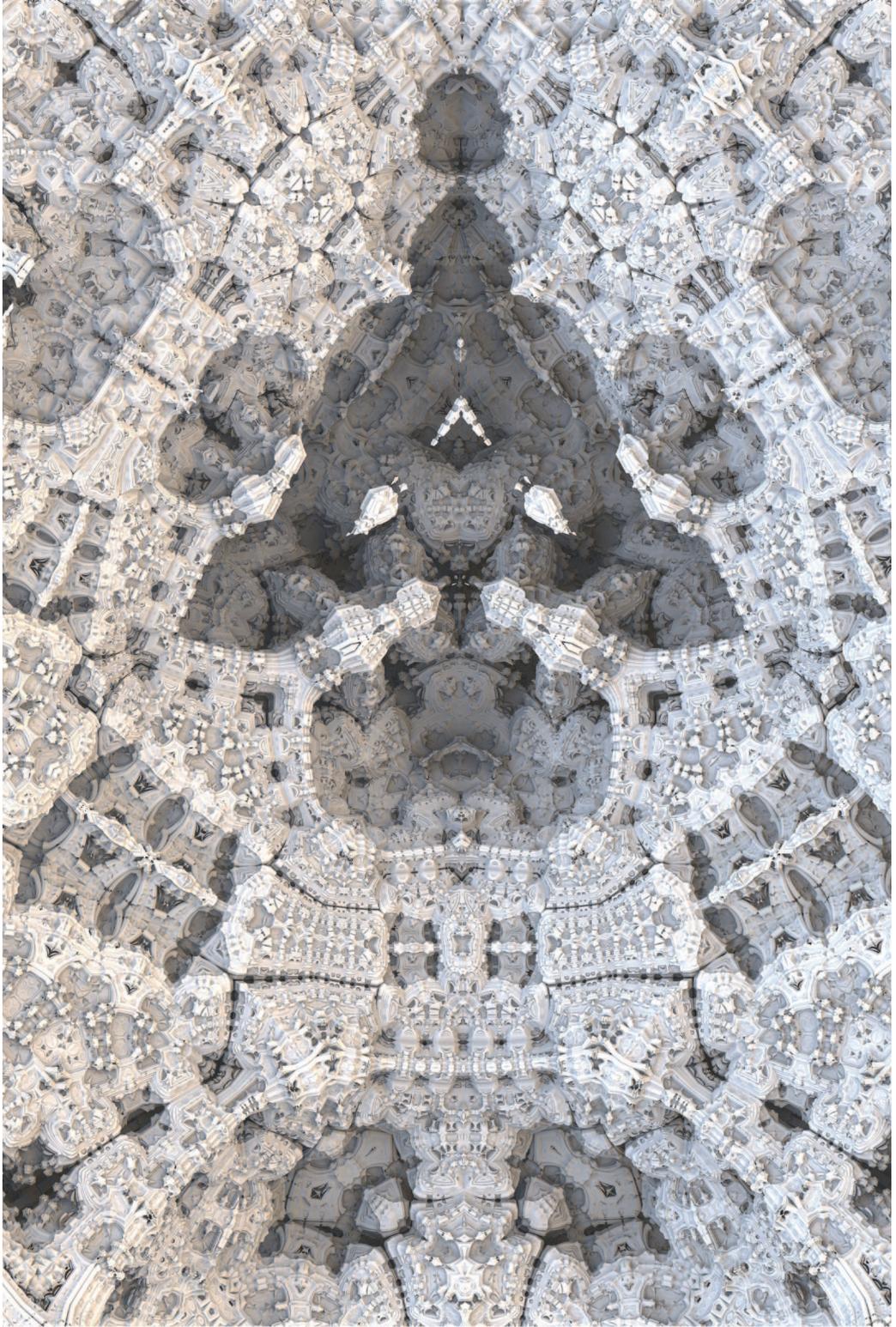


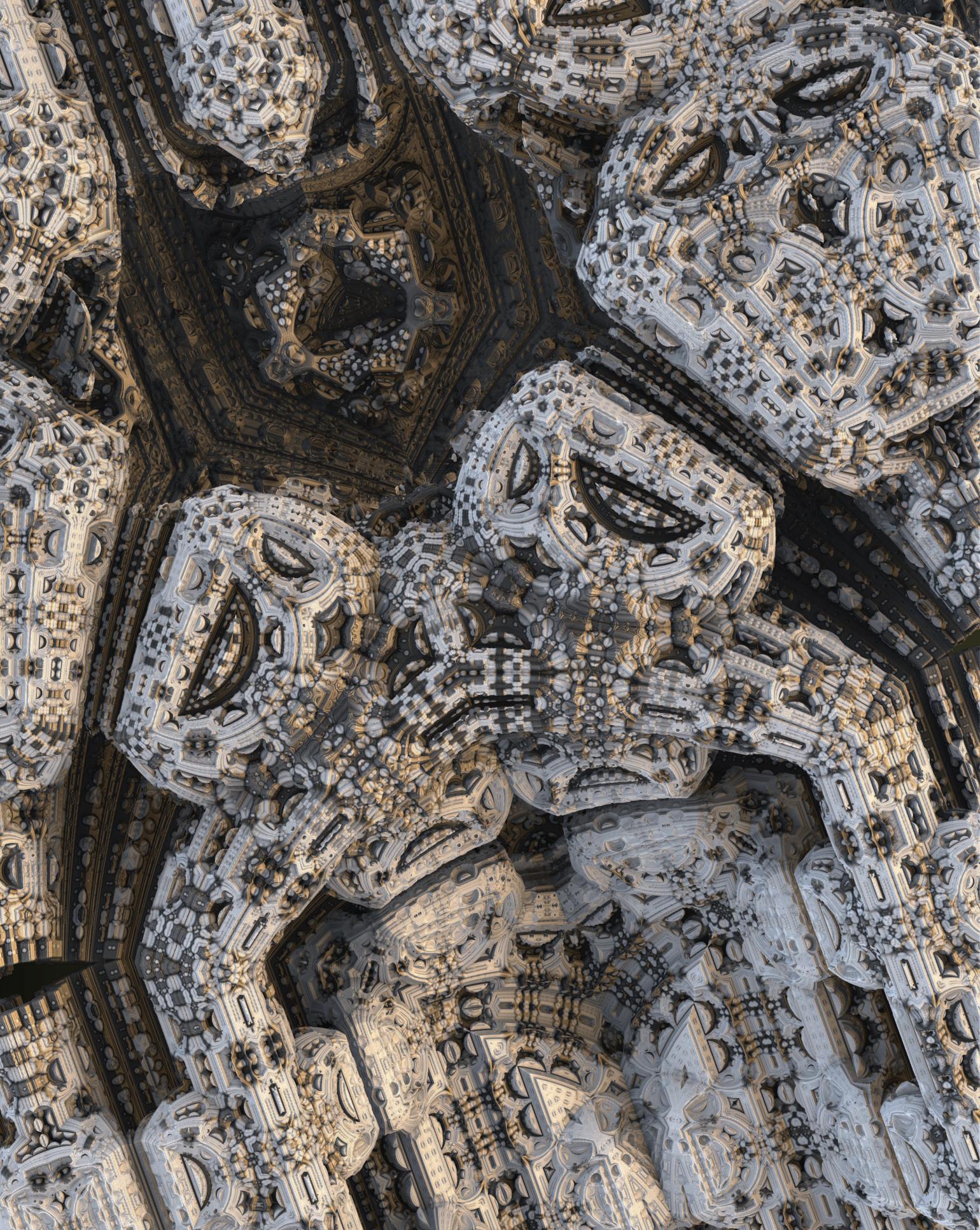


Above: Daniel Brown | Kimono, *Attire of The City of God* | 2014-15, Giclée Print, 120 x 120 cm
Left: Daniel Brown | Fabric artefact from *The City of God* | 2014-15, 30 x 45 cm

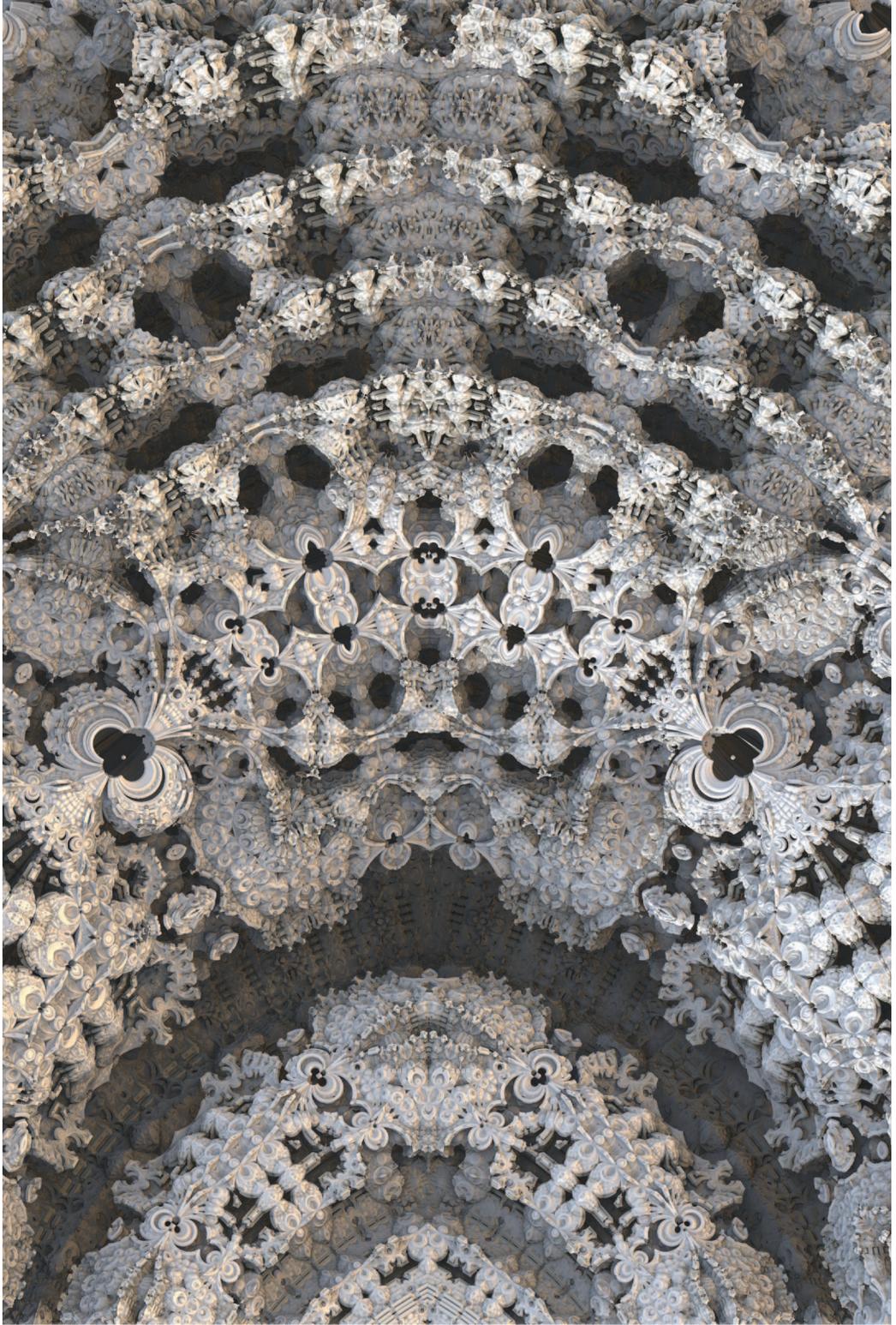


Daniel Brown | *The City of God*
2014-15, Giclée Print, 50 x 40 cm





Daniel Brown | *The City of God*
2014-15, Giclée Print, 50 x 40 cm



The Family Code: Art and Life

Grant D. Taylor

In *The Lives of the Artists* (1550), Giorgio Vasari vividly recounts the colourful and controversial life of the early Renaissance artist and Carmelite monk Fra Filippo Lippi. The artist's son, who was the product of a scandalous affair with a nun, became, according to Vasari, "like his father, a most excellent and famous painter."¹ Known as Filippino, the son received his first training in his father's workshop. Unsurprisingly, the father's linear and graceful style influenced both his young son, Filippino, and his most celebrated student, Sandro Botticelli. After Fra Filippo Lippi's death in 1469, the son was placed in the care of artist Fra Diamante where, under the master's tutelage, he joined the confraternity of Florentine painters and eventually became Botticelli's apprentice. Like his father, Filippino went on to have an illustrious career, one that included the completion of Masaccio's frescoes in the Brancacci Chapel, a fitting commission considering Masaccio was his father's earliest influence.

Although it may seem peculiar to begin an essay on contemporary art with a discussion of familial ties in *quattrocento* Florence, there is an analogy between the Lippis and the Browns worth highlighting. Like the Renaissance example, the son followed the father into the family business (conveyed perfectly in the name *Brown & Son*). Yet, there are countless other examples of distinguished hereditary in the Renaissance beyond the Lippi example. To be sure, the master and apprentice system of the Renaissance workshop became an engine for producing artistic dynasties. The Bellini family of Venice obviously stands out, and Hans Holbein the Elder and his son Hans Holbein the Younger gained fame far beyond Northern Europe. It is the Lippi comparison, however, that is worthy of further elaboration. Both father and son duos were active in centuries where extraordinary intellectual and technical development occurred. Each father began their respective careers at the cusp of revolutionary



Above: Paul Brown | *The Earth Probe* (three still frames) | 1977, 16mm Colour. Sound by Mike Trim

change, Fra Filippo Lippi with perspectival space and Paul Brown with computational art. The sons, both shaped by their fathers' pioneering legacies, pushed the boundaries of the medium in new and electrifying directions. Importantly, the parallel between father and son, each one spanning distinct technical ages, allows us to see clearly how generational practices are in many ways contiguous.

“Cellular automata, along with fractal geometries and other abstract systems, provided Paul with a way to reimagine the spatial organization of abstract art. Paul’s digital image possessed its own transformative logic embedded in an infinite field, which was a significant departure from the traditions of high modernist abstraction.”

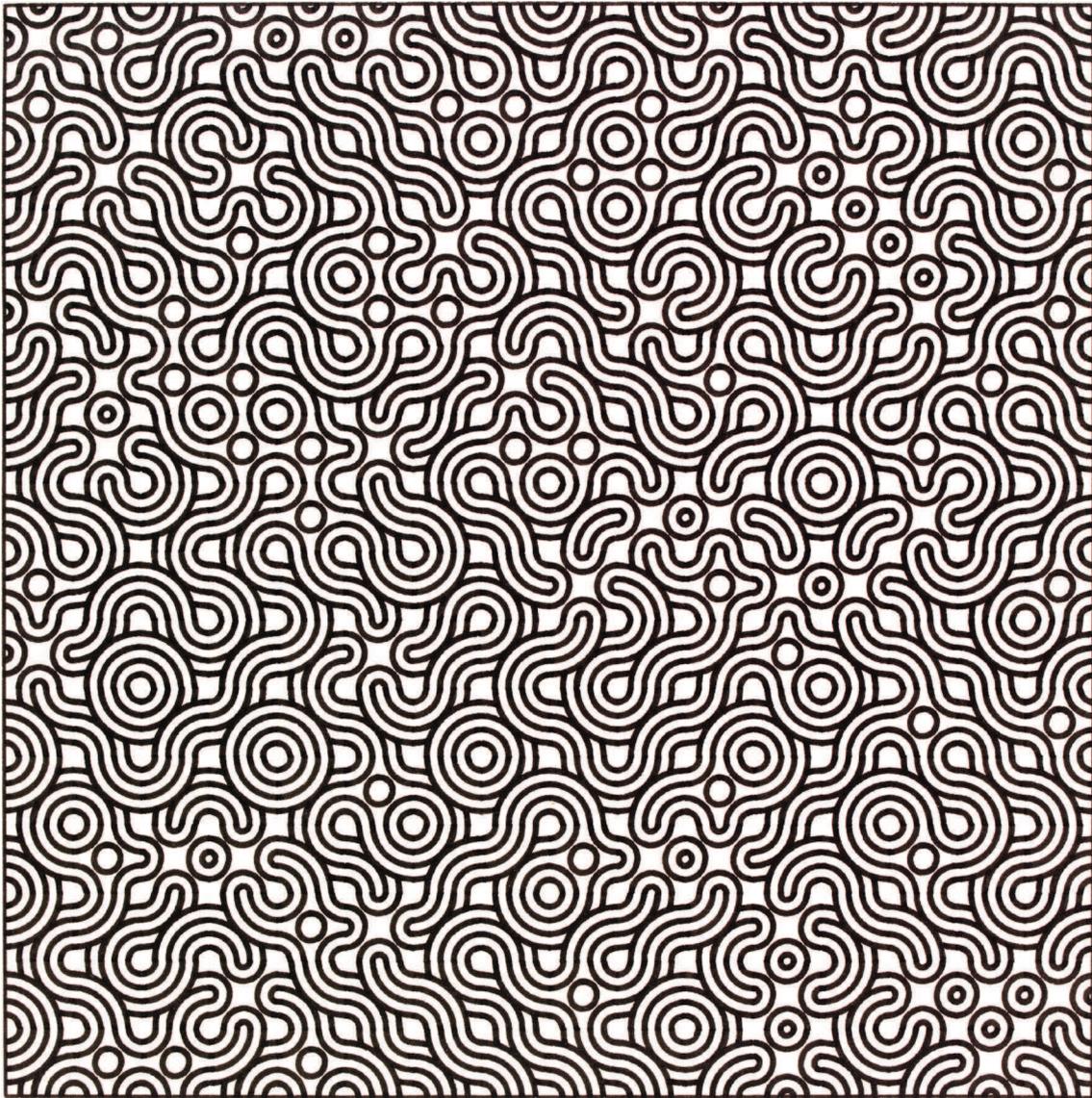
Because artists such as Fra Filippo Lippi first employed mathematics for compositional construction in the 1430s it is considered a key decade in the early Renaissance. Fra Filippo Lippi, following the lead of Masaccio, built three-dimensional spaces based on single-point perspective. The artist proceeded to quickly fuse his highly decorative and linear style with this emerging method. Soon enough, Fra Filippo Lippi’s architectural clarity gave the sensation that the space in the picture and the space occupied by the viewer were joined in an almost seamless extension. This radical development in Renaissance art, both technical and conceptual in nature, holds a strong parallel to twentieth-century artistic innovation. The invention of the modern digital computer (theorized first by Alan Turing in the 1930s and built by John von Neumann in the 1940s), heralded a break with the previous age as distinctive as the *quattrocento*. Paul Brown’s career began in the 1960s at that decisive moment when the digital computer was first introduced as

a possible medium for image production. Like his Renaissance counterpart, Brown would be the first to expand foundational techniques, and, in the following decade, he shaped one of the defining aspects of the digital medium—the ability to build an autonomous art-making system.

In contrast, the careers of both sons spanned a period of rapid growth in which the ideas established during their father’s generation were extended. For example, Filippino became a virtuoso of perspective construction in the 1490s. Proceeding to extend pictorial space with ever more complexity, the young artist produced exquisitely wrought figures occupying highly illusionistic urban and pastoral spaces. In his highly immersive frescoes, the son constructed dynamic relationships between figures and the built environment. Mirroring the shift from Early to High Renaissance, Daniel Brown found himself in a wholly new world compared to that of his father. While Paul was first active in the age of large mainframe computers, specialist laboratories, and artist-programmers, Daniel began his practice two decades later in the era of the personal computer, graphic interfaces and the internet. Taking these new graphic and interactive capabilities, Daniel proceeded to reimagine the virtual spaces of website design and projected-image art. However, like his Renaissance equivalent, Daniel would be highly influenced by those ideas developed by his father, particularly generative systems of art.

Those conceptual models so visible in Daniel’s practice arose as a result of Paul’s highly inquisitive outlook. Paul digested the diverse ideas coursing through the culturally turbulent era of the late 1960s (which also reminds us of the eclectic nature of humanist thought rousing the early Renaissance artists to action). One text in particular, Anton Ehrenzweig’s *The Hidden Order of Art* (1967), enthralled the then young Manchester College of Art student. The writings of this Austrian psychologist shaped the artist’s career and, by implication, his son’s. Employing Freudian language, Ehrenzweig proposed the concept of ‘dedifferentiation’ which explained the process by which the ‘ego’ suppresses surface

Paul Brown | *Untitled: Computer assisted drawing*
1975 (reprinted 2015), Plotter Drawing, 32 x 32 cm



imagery, thus reaching a structure that can only be understood by syncretistic vision.² The psychologist was able to describe the stages of perception from the holistic and non-hierarchical to the analytic and systematic. Ehrenzweig employed contemporary forms of abstraction, most notably the art of Jackson Pollock's, to test his notion of an undifferentiated field of vision. Ehrenzweig was convinced that successful abstract art, as opposed to mere abstract ornamentation, engaged deeper levels of the mind. Though inspired by the text, Brown quickly questioned some of Ehrenzweig's

basic propositions, including the use of the Freudian subconscious to explain self-expression. With simple drawn octagonal tiles arranged in four orientations, Paul proceeded to devise a logical procedure capable of testing the psychologist's hypothesis.³ The act of building a generative system, one visualized in simple geometry, formed the basis of the artist's entire career.

The psychological understanding of art's underlying principles was not the only source of Paul's theoretical reflection. Like other artists



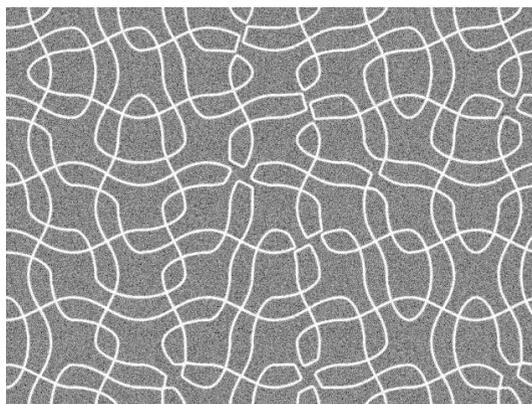
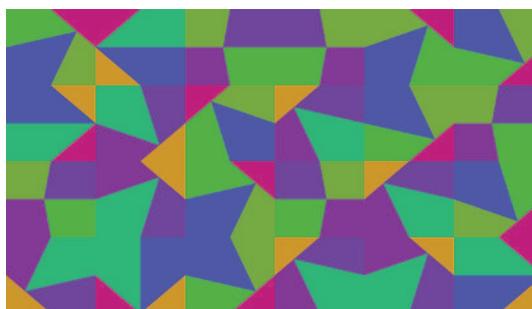
interested in science and technology, Paul was frustrated with established disciplinary boundaries and the restrictive definitions of late modernist abstract art (here the writings of Harold Rosenberg and Clement Greenberg come to mind). As an alternative, Paul looked to trends in theoretical science or Eastern philosophy for inspiration. His thinking would be influenced by diverse thought, including the underlying logic of Chinese ancient divination in *I Ching – Book of Changes*, the philosophic mathematical musings of G. Spencer-Brown's *Laws of Form* (1969), and the procreant possibilities described in Martin Gardner's essay on John Conway's cellular-automaton *Game of Life*.⁴ What these writings gave Paul was a way to understand art through its production, and, importantly, the role of the artist was not essential in the act of creation. For Paul, objectifying the artistic process and then separating it, thus making it synthetic, was a radical and freeing act. It effectively broke the chains of artistic agency that had remained so central to late modernism's hegemonic claims. Art was no longer a vehicle for carrying artistic temperament or a sense of

selfhood. Ultimately, Paul believed, authorial identity could be yielded to the machine.

Faced with a restrictive curriculum and an indifferent faculty, Paul left Manchester College of Art. Excited by the expanding nature of art, in particular new light projection technologies, Paul co-founded the lightshow *Nova Express* and toured the North and Midlands of England. Putting together experimental light environments, for the likes of *Pink Floyd* and *The Who*, gave Paul a sense of the aesthetic possibilities of large-scale immersive environments. There is an obvious correlation here between father and son, beyond the fact that each practice is now defined by real-time projection and screen-based imagery. It becomes evident that both artists moved between the art and design world with relative ease. Like his father, Daniel also produced leading-edge multimedia for major music acts, including *Lady Gaga* and *Kanye West*, and like his father before him (who co-created the first computer animation company, Digital Pictures Ltd, in the U.K.) he would do some of his most important work in the service

of major design studios. Art and design remained always permeable for the Browns.

In 1974 when Paul eventually returned to study, this time at the College of Art at Liverpool Polytechnic, he expressed a burning desire to explore the computer. As the most technically challenging technology of the day, any artistic endeavour required perseverance and a willingness to be self-taught. *Computer Assisted Drawing*, 1975, is from this period and one of Paul's first computer-generated and plotter printed artworks. Building on the logic of his earlier hand drawings (including the Ehrenzweig investigations), he constructs a tiling mosaic system in which each tile could be rotated through a random process of distribution. The shifting tiles once rotated produce new linear configurations and a fluid field of geometry. But even at Liverpool Polytechnic the traditionalists in painting were sceptical of his work, perhaps unable to suppress the deep anti-computer sentiment so common to the orthodox art world during the period. Consequently, he transferred to the sculpture department where they were more inclined to engage advanced technologies, especially in the area of kinetics. However, it was not until Paul's graduate studies, started in 1977 at the Slade School of Art, University College London, that the artist found a group of likeminded and supportive individuals. The Slade's postgraduate experimental programme, started by the British constructivist Malcolm Hughes, was one of the most innovative experiential art studios in Europe, with a raft of pioneering digital artists moving through the programme as graduate students and as visiting artists. In the late 1970s, the latest innovation in robotics and artificial intelligence were shaping the nascent field of computational arts. The likes of Edward Ihnatowicz, Harold Cohen, and Marvin Minsky enriched the program with startling propositions for the production of art. When Brown arrived at the Slade in 1977 as a postgraduate, artists like Chris Briscoe and Julian Sullivan had begun experimenting with the procreant capabilities of cellular automata, a system that eventually informs much of Paul's work.

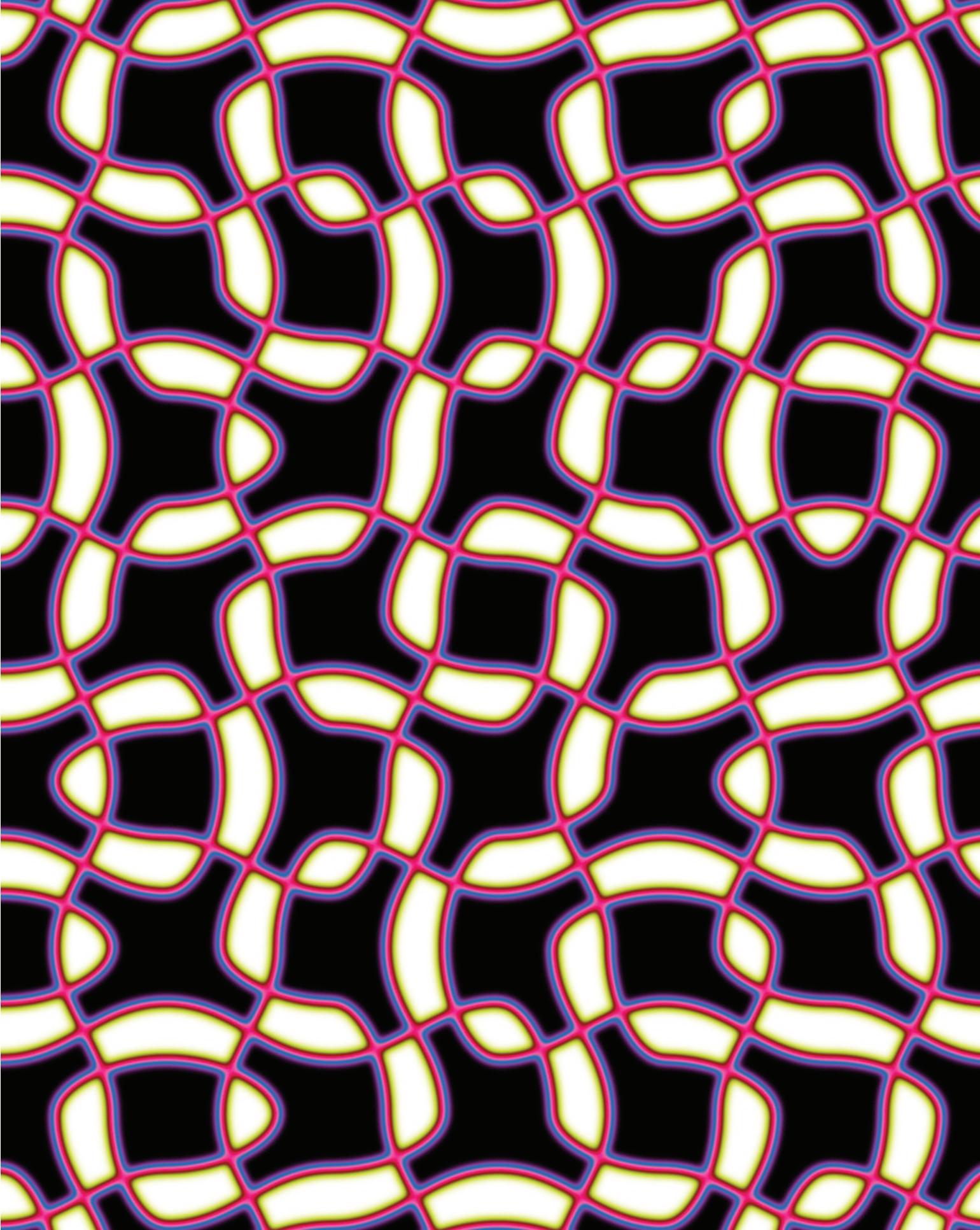


Paul Brown | *Infinite Permutation V1* | 1992, Kinetic Painting, Size variable

Paul Brown | *4^24* | 2006, Kinetic Painting, Size variable

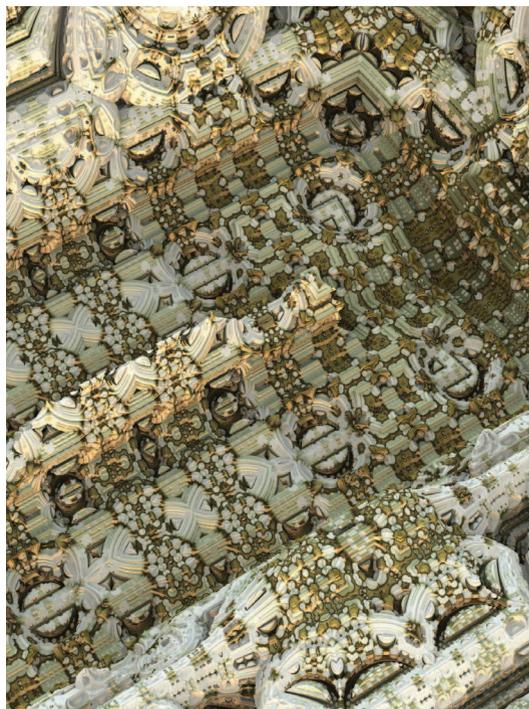
Paul Brown | *Sand Lines* | 1998, Kinetic Painting. Sound by Carla Thackrah. Size variable

Opposite: Paul Brown | *Gymnasts* | 1997, Giclée Print, 80 x 60 cm



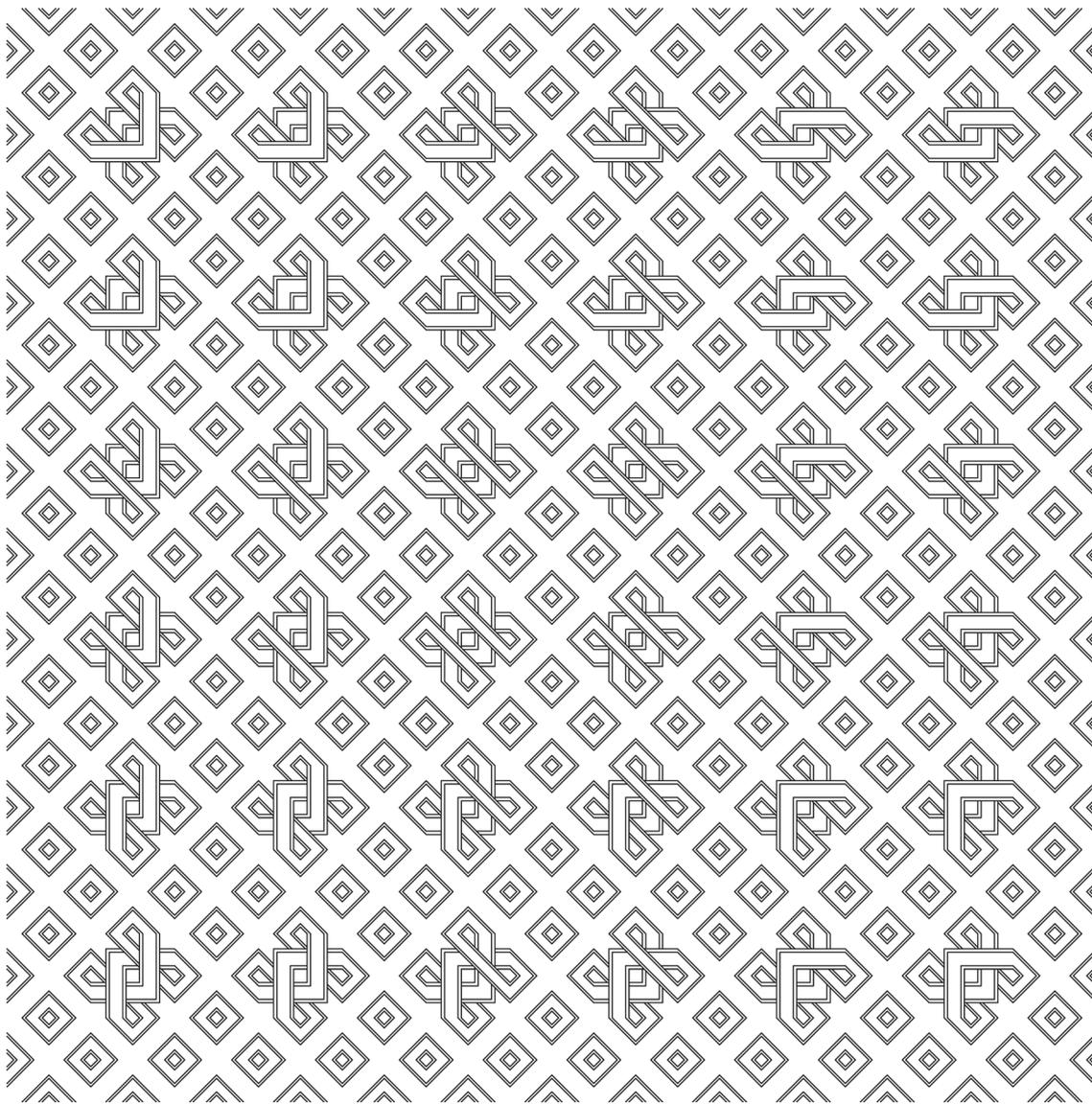
The impact of cellular automata remained relatively obscure—an interesting quirk of cybernetic research of the mid-century—until mathematician John Conway invented in 1970 the *Game of Life*, a simple board game based on the idea of cellular logic. In the classical cellular automaton, cells are part of an infinite orthogonal grid of squares, and each square cell is a finite-state automaton—essentially a simple computer. In determining its next state, the square cell takes its own present state and the state of its adjoining cells as input for the next iteration in the cycle. What made cellular automata so peculiar is that the simplest rule set produces unpredictable and complex behaviour. Because Brown had been experimenting with image building logic early in his career, when the cellular automata became common he too was drawn in. But now, at the Slade, he had the necessary digital tools and a corpus of peers with mutual interests. Together they were spellbound by the games ability to proliferate structures that reminded them of living microorganisms. These digital creatures, with names like *gliders*, were collections of square cells that crawled across the grid like sentient beings. In 1977, ironically also the year of Daniel's birth, Brown creates the historic artwork *Builder/Eater* (p.41). Through the arduous programming process of hand-punching tape in machine code, Paul was able to build this totally unique kinetic real-time artwork. To the viewer, the screen displays clusters of moving cells (each driven by two concomitant algorithms) all exhibiting the frenetic activity of life. Fascinated, the viewer traces each lifelike mass as it competed desperately for space on the matrix. For Paul, this type of complex computational assemblage—an entity that was self-directed and adaptable—could be the tool to radically redefine artistic subjectivity. The possibility for an entirely new category of art existed.

Cellular automata, along with fractal geometries and other abstract systems, provided Paul with a way to reimagine the spatial organization of abstract art. Paul's digital image possessed its own transformative logic embedded in an infinite field, which was a significant departure from the traditions of high modernist abstraction.



Daniel Brown | *The City of God (detail)* | 2014-15, Giclée Print, 50 x 40 cm

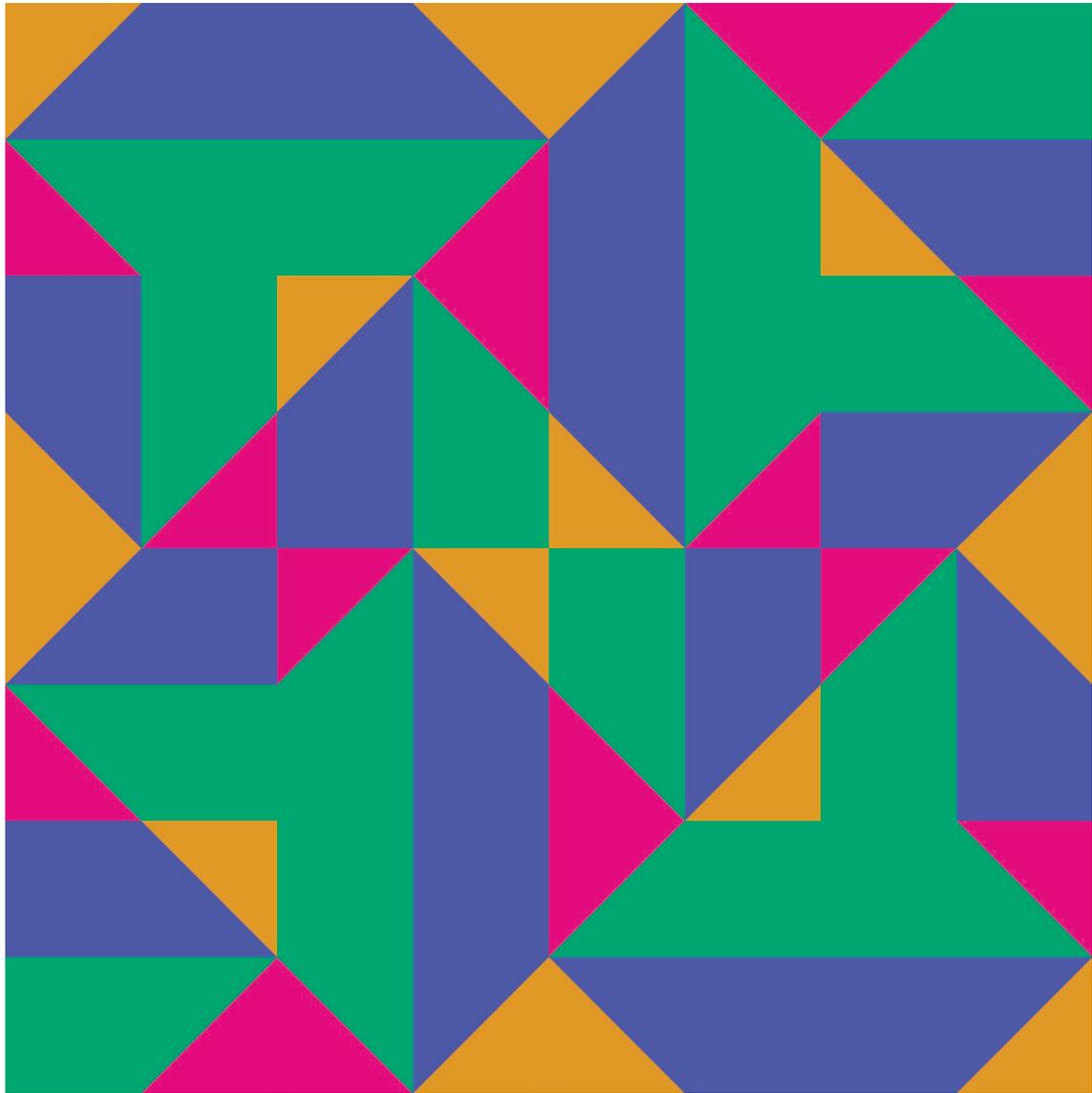
Rather than the dense visual fabric of Abstract Expressionism, Brown had created an animate topology devoid of all the physical immediacies of the painted surface. Paul's organic geometries share more in common with Islamic decoration than with the expressive symbolism and heroic gestures of Abstract Expressionism. The field of vegetal ornamentation, most commonly found in the *arabesque* design, held a type of protean multiplicity that attracted both Paul and later Daniel. What was important about the arabesque was its infinite correspondence, meaning that the design can be extended indefinitely in any direction. Unique in world art, the structure of the arabesque gives the viewer enough visual information for them to imagine how the design would appear if it were extended beyond its actual limits. Paul's geometricized surface, like Islamic organic design, possesses a repeating and rotational logic that allow the viewer to imaginatively extend the structure beyond the frame's borders. Print works, such as *Gymnasts*, 1996 (p.43) and *My Gasket*, 1998, displayed this type of interconnected mosaic form. Captured in



a single moment of surface change, each appears to glow with a certain synthetic plasticity. Paul's kinetic time-based works, *Infinite Permutations VI*, 1992, *Sandlines*, 1998 (P.42) and *Dragon*, 2012 (P.93) are prime examples, each providing the viewer with the full visual effect of Paul's generative engine. As the image's divisional substructure rotates, endless new organic configurations are formed. Daniel's *Flowers* series and his new work, *City of God*, 2014 (P.32) also employ the abstract and generative framework of Islamic design, but

this time in the third dimension. In the intricate patterned petals of the *Flowers* series and in the recursive fractal symmetries of the *City of God* series, the surface mark of Islamic architecture is made visible.

While curvilinear or biomorphic forms provide the basis for many of Paul's compositions, much of his work is defined through simple geometric shapes and linear patterns. Paul's early prints, at least in aesthetic terms, share the same planar geometric



Paul Brown
4A16
2005-6, Kinetic Painting, Size variable

construction of 1960s Post-Painterly Abstraction. Principally theorized by Clement Greenberg, this trend in abstract painting emerged as a reaction to the gestural stylistics of Abstract Expressionism. This movement—exemplified by the works of Frank Stella or Ellsworth Kelly—was defined by smooth surfaces, fluorescent pigments, and clearly delineated shapes. Eventually, the strict spatial relations and self-similarity would give way to the concrete materiality of minimalism and op art. While Paul’s work shares these

aesthetic sensibilities, his kinetic paintings placed transformation and motion at the centre. Rather than revelling in the static relationships of hard-edge abstraction, the artist looks to create a dynamic field in which geometric forms manifest their own rules and corresponding behaviour. The clarity of Paul’s aesthetic field remains constant, whether in his early linear drawings, such as *Untitled Gouache*, 1974 (p.92) and *36 Knots for Fu Hsi*, 1979 (p.45), or in his later kinetic paintings, such as the shifting equilateral and quadrilaterals

Daniel Brown | *Poppy Petals*
2012, Giclée Print, 30 x 45 cm



of *4^16*, 2005. Although Paul's field appears unified, the self-perpetuating logic that creates the constant state of structural rearrangement is difficult to grasp, remaining just beyond the viewer's comprehension. Once again, as his polychrome tiles—a type of digital tesserae—make ceaseless surface reconfigurations, Paul's abstraction aligned with the expanding morphology of Islamic geometry.

“Sharing the astronaut’s weightless vision, the viewer feels a palpable deceleration as if orbiting the object.”

Image metamorphosis underpinned Daniel's work too. Daniel's career shared certain similarities to his father's. Mastering the art of programming would be a self-taught venture, thus matching his father's experience. In contrast to Paul, Daniel avoided the clearly defined scriptures of art education and instead submerged himself in the virtualities

of interactive gaming. Indeed, sidestepping the prescribed pedigree of an art education became common practice for artists of the new media generation. Like his father, however, Daniel was attracted to centres in which creative minds continually rethought advanced technology. As it happened, Daniel sought the cutting-edge early on.

Because Paul travelled between newly created media art departments (at large research universities in the U.K., U.S., and Australia), he led a peripatetic existence. Even so, Paul's influence as a leading pioneer, theorist and commentator was acutely felt by Daniel. Others also had a strong mentoring influence on Daniel, including the pioneer multimedia designer Roy Stringer. It was at the Learning Methods Unit at Liverpool John Moores University where Stringer was head of multimedia research and development that Daniel had his first experience with advanced software and machines. Once Daniel completed high school he went directly to Amaze, the commercial agency started by Stringer, and began to reimagine the navigation systems of websites. Daniel proved a prodigious talent. In 1997, he created the seminal experimental website *Noodlebox*, which rewrote the rules of website design by extending it far beyond the flat spatiality of traditional menu systems. Imagined more as a conceptual space, Daniel allows the user to playfully navigate through the website by rearranging building blocks. In Daniel's reorganizing modular architecture, one can see a direct correlation to the discrete self-modifying units of Paul's abstract field. The key shift for Daniel, other than the way his space made interactivity vital, was how his forms now firmly inhabited the third dimension.

It is in Daniel's commitment to generative code—those programs that produce constant states of variation and modification—that aligns him most fully with his father's practice. Paul, after all, was one of the first digital artists to theorize the natural alignment between the idea of the generative programming and biological growth. In fact, his experimentations at the Slade were done a decade before the formation of the techno-

science field of artificial life. By the early 1990s, artificial life practitioners from the computer sciences believed they could create, through a materialistic and reductive method, a new class of organism in a nonorganic structure. By extracting the logical principles of nature and correctly digitizing them, the artificial life pioneers hoped to produce with some fidelity the properties of living systems. Both father and son would remain fascinated by how abstract systems—based on growth, fractal, or genetic algorithms—could create novel, unexpected, or unpredictable results. Emergence and mutable forms analogous to life’s metamorphosis captivated Daniel. His most ambitious and long running series, *Flowers* would be firmly placed within the meta-creative paradigm of artificial life. Indeed, this series was given the subtitle *On Growth and Form* as homage to D’Arcy Thompson’s influential 1917 text.⁵ *On Growth and Form*. The impact of this Scottish botanist was profound. Thompson provided crucial insights into nature’s morphology for both a generation of mid-century British painters and sculptors (led by Richard Hamilton) as well as the first generation computer artists, including Kerry Strand and Petar Milojević. Daniel’s work, therefore, can be clearly situated within the continuum of two historical traditions: the development of protean behaviours in digital art and the use of growth patterns in British art and design.

However, Daniel’s *Flowers* series is like no other in the pantheon of biology-inspired digital art. His work does not share the strange, uncanny, or even monstrous forms inhabiting the art of Yoichiro Kawaguchi, Karl Sims, or William Latham. Furthermore, there is no desire in Daniel’s work for rupture or bodily dislocation, those common disorientating effects so central to new media art. Daniel’s art, in contrast, is highly seductive. While his forms are shifting and contingent like his peers, his *Flowers* series radiates a delicacy and beauty more in keeping with the world of fashion. The minute attention to surface texture, the drama of colour, and the shifting frame all express the atmospheric of fashion photography. Unique to his generation of new media artists, Daniel applied the latest aesthetic sensibilities circulating through



Daniel Brown | *Software As Furniture*
2005, Projection Mapped Crockery

the fashion and design worlds. Drawing from the major design studios in which he has worked (Nick Knight’s avant-gardist design firm *SHOWstudio* is a prime example), Daniel’s art expressed the visual richness and hyper-realities that defined the cutting-edge of current forms of cinematic and photographic media.

While Daniel’s art had the sophisticated visuality of fashion design, his display method remains firmly within the realm of contemporary art practice. Indeed, both father and son have pioneered new screen-based and projected-image techniques. Paul understood early, through his experience with light projections and his experimental screen artwork *Builder/Eater* that technology would transform the museum space. For spectators, brightly lit interiors gave way to darkened cinematic spaces and passivity gave way to interactivity. One of Daniel’s earliest projected-image artworks, *Software as Furniture*, 2005 experimented with projection mapping, a software process that allowed the artist to employ irregular objects as display surfaces. The artist’s code generates an endless array of patterns that are projected onto white ceramic bowls. Through this spatial augmented reality, Daniel reimagines

the sculptural and concrete materiality of the everyday objects by activating each surface with modifying pattern. So seductive were the changing surface light, spectators would reach down to touch and caress the moiré patterns and floral designs, sensing the possibility that light particles could transform their own body surfaces.

“But while Daniel’s flowers are hypnotic (the same trance-like space viewers describe when viewing Paul’s shifting geometric field), the temporal effect differs.”

Daniel’s projected real-time video projections are often large format, sometimes measuring over thirty feet high. Resembling the screen projections of Bill Viola or Douglas Gordon, which engage one entire surface of a room’s architecture, Daniel’s images also envelop the spectator’s field of vision. But while Daniel’s flowers are hypnotic (the same trance-like space viewers describe when viewing Paul’s shifting geometric field), the temporal effect differs. Whereas Viola and Gordon rely on meditative engagement through a change of tempo, the slowing down and looping of footage, Daniel’s image achieved the opposite effect by speeding up the metamorphosis of a plant’s growth cycle. That phenomenological moment as the flower burst into bloom, followed by the quickening frame as it circles the plant, creates a unique spatial interiority. Sharing the astronaut’s weightless vision, the viewer feels a palpable deceleration as if orbiting the object. Beyond the rich aesthetic experience of Daniel’s art lies a highly integrative approach, one that includes site specificity. With the sensitivity of an archivist, the artist integrates colour, pattern, and form based on objects within the museum’s collection. For example, when a new *Flowers* series was created for London’s Victoria and Albert Museum it exhibited both the vestiges of nineteenth-century *Arts and Craft* design and Japanese textiles. Similarly, the taxidermy specimens of flora and fauna in the repositories of the D’Arcy Thompson Zoology Museum also shaped Daniel’s generative

code for his University of Dundee exhibition. By expressing the multifarious forms of world art, Daniel’s practice conveys a unique type of encoded universality found nowhere else in contemporary art.

Viewing the Browns side by side gives us a rare opportunity to see how two artists, joined by the strongest of kindred bonds, shape one another. In the history of digital art, there is no other example of this type of father and son combination. While the Browns developed in two different cultural and technological periods, reminiscent of earlier examples of Renaissance artistic heredity, there remains continual and direct transference of ideas between each generation. Obviously, the Renaissance comparison of the Lippis does not hold here, as the father died early in the son’s artistic development. With the Browns, in contrast, we are able to trace the intersections, parallels, and equivalencies active in each practice. While differences are clearly visible between the art of Paul and Daniel Brown, each approach centres on the same quest, a unique type of shared artistic vision in which an autonomous and self-making art is made real.

1 Giorgio Vasari, *The Lives of the Artists*, trans Julia and Peter Bondanella (New York: Oxford University Press, 1998), 195.

2 Anton Ehrenzweig, *The Hidden Order of Art: A Study in the Psychology of Artistic Imagination* (Berkeley: University of California Press, 1967).

3 Paul Brown, “Stepping Stones in the Mist,” in *Creative Evolutionary Systems*, ed. Peter Bentley and David Corne. (San Francisco, CA.: Morgan Kaufmann, 2002): 387-409.

4 James Legge, Ch’u Chai, and Winberg Chai, *I Ching: Book of Changes* (New York: Bantam Books, 1969). G Spencer-Brown, *Laws of Form* (London: Allen & Unwin, 1969). Martin Gardner, “Mathematical Games: The Fantastic Combinations of John Conway’s New Solitaire Game ‘life,’” *Scientific American* 223 (October 1970): 120-123.

5 D’Arcy Wentworth Thompson, and John Tyler Bonner, *On Growth and Form* (Cambridge: Cambridge University Press, 1961).



“The harmony of the world is made manifest in Form and Number and the heart and soul and all the poetry of Natural Philosophy are embodied in the concept of mathematical beauty. “

Sir D’Arcy Wentworth Thompson,
from *On Growth and Form*, 1917





Daniel Brown
On Growth And Form series, Commission for the Victoria and Albert Museum
2009, Giclée Print, HD Screen Capture

By Appointment to Victoria and Albert

Douglas Dodds

Grant D. Taylor has drawn attention to parallels between the modern-day family “firm” of Paul and Daniel Brown and one of the artistic dynasties of the Italian Renaissance, namely Fra Filippo Lippi and his son Filippino. As Taylor points out, the Brown and Lippi families were both heavily involved in exploiting new technological and artistic developments during periods of significant social and intellectual change. The analogy between the Renaissance workshop and the modern digital studio is a useful one, not least because it also suggests an economic aspect to the art or craft. Golan Levin writes that the Browns are “pioneering creators of artisanal software”. Somewhat tongue-in-cheek, they describe themselves as “Purveyors of fine digital images since 1968”. Daniel has even conjured up images of his father sweeping the pavement outside the metaphorical shop. According to the Oxford English Dictionary, a purveyor is “a person who procures, provides, or supplies something”. I want to start this essay by highlighting Paul’s activity in the first of the OED’s categories, procurement, then go on to describe how he and Daniel are represented in the V&A’s expanding digital art collections.

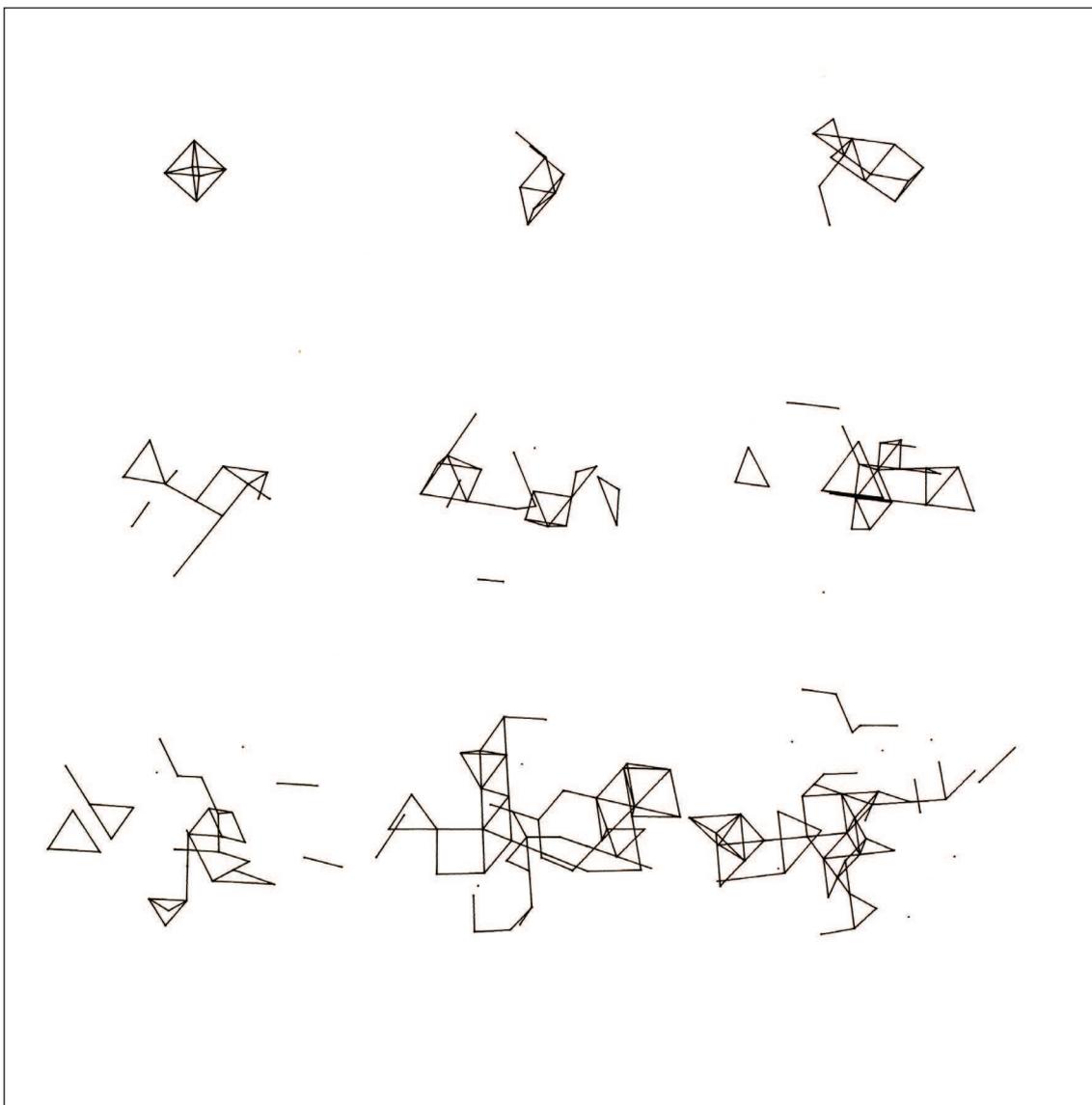
The Museum acquired two internationally significant collections of computer-generated art in the mid-2000s, and Paul was heavily involved in both of them. He was one of the co-investigators in the Computer Arts, Contexts, Histories Etc (CACHE) project, funded by the UK’s Arts and Humanities Research Council from 2002-2005. The project’s focus was the archives of the Computer Arts Society (CAS), established after the *Cybernetic Serendipity* exhibition was held at London’s Institute of Contemporary Arts in 1968. CAS went on to organise regular meetings and events, and it published an influential magazine called PAGE. The Society also collected work created by members and visiting speakers, plus artworks from various exhibitions organised in the late 1960s and early 1970s. For many years these

were stored in the offices of System Simulation Ltd, in London’s Covent Garden. The firm’s chairman, George Mallen, was one of the founders of CAS and certainly recognised the material’s historical significance. As an outcome of the CACHE project, the V&A acquired the Society’s collection of some 250 individual artworks, plus a significant quantity of supporting archival material. The entire collection was donated to the Museum by the newly reconstituted CAS, with the active support of System Simulation, Paul and other members of the CACHE project. Paul became CAS chair, editing some issues of the revitalised PAGE magazine.

“Somewhat tongue-in-cheek, they describe themselves as “Purveyors of fine digital images since 1968”. Daniel has even conjured up images of his father sweeping the pavement outside the metaphorical shop.”

In parallel, he helped to facilitate the V&A’s acquisition of an equally important archive assembled by the American art historian and archivist Patric Prince, who was actively engaged in the emerging world of digital art and design. With Paul’s encouragement, Patric donated her collection to the American Friends of the V&A, who gave it to the Museum in 2008. The Patric Prince Collection contains around 250 artworks, plus thousands of books, periodicals, letters, photographs, slides and audio recordings. Although the collection does include some digital files, most of the artworks are actually works on paper, including plotter drawings, prints and photographs.

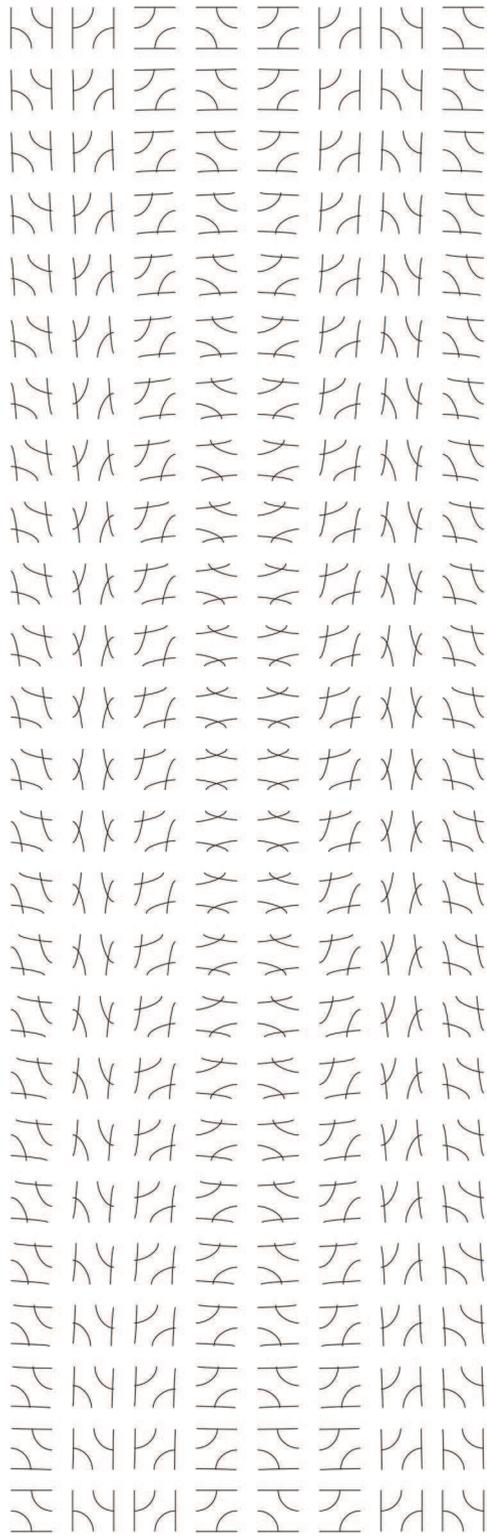
Paul Brown | *BIGDIM / 0 10 100 0 0 200, 120* | 1979 (reprinted 2015), Plotter Drawing, 65 x 65 cm
Collection: Victoria & Albert Museum



The Patric Prince Collection provided the basis for another AHRC-funded project, entitled Computer Art and Technocultures (CAT). One of the main outcomes was a V&A exhibition entitled *Digital Pioneers* (2009-10), which provided an overview of the history of digital art from the early 1960s onwards. A small book with the same title acted as a brief introduction to the V&A's collection.¹ The show and the book included a number of works by Paul, described in more detail below. In addition the Museum hosted a major conference entitled

Decoding the Digital, held in February 2010. Paul and Daniel were interviewed together, in what was perhaps the first occasion when a father- and-son family of digital artists discussed their practice in a major museum. Other speakers included artists Frieder Nake, Roman Verostko, Karsten Schmidt and Casey Reas, plus collectors Patric Prince, Anne Morgan Spalter and Michael Spalter.

One of the most significant outcomes of the CAT project was the establishment of the V&A as the



UK's national collection of computer art, at a time when few other public collections of this important new medium existed anywhere in the world. Following the *Digital Pioneers* exhibition and the accompanying book – plus the creation of online catalogue records and images for the entire collection – many other artists, collectors and gallerists began to offer the Museum additional artworks that complemented the existing material. As a result, the V&A now possesses one of the world's largest and most wide-ranging collections of computational art, from the early 1960s to the present day. The collection is particularly strong in early works on paper by pioneers such as Frieder Nake, Georg Nees and A. Michael Noll, who were among the first people to exhibit computer-based artworks in a gallery setting.² Other artists who are well represented include Harold Cohen, Ernest Edmonds, Herbert Franke, William Latham, Manfred Mohr, Vera Molnar, Barbara Nessim, Steven Scrivener, Roman Verostko, Darrell Viner and Mark Wilson.

Paul has described how he was greatly inspired by the experience of visiting the *Cybernetic Serendipity* exhibition in 1968. One of the artists who featured in this landmark show was Edward Ihnatowicz, who exhibited *SAM*, a Sound Activated Mobile sculpture that captured the imagination of many visitors. Ihnatowicz went on to create the *Senster*, a huge computer-controlled kinetic sculpture that was commissioned by the technology company Philips for its Evoluon building in Eindhoven.

By then Ihnatowicz was based in the Department of Mechanical Engineering at University College London (UCL), where he developed strong links with the Slade School of Fine Art. One of the founders of the Systems Group, Malcolm Hughes, had started to teach part-time at the Slade in 1970 and went on to become the head of its Graduate School, where he established the wonderfully-named Experimental Department in 1972-3. This subsequently became known as the Experimental and Computing Department, or EXP. One regular visitor was Harold Cohen, who had attended the Slade from 1948-52 and subsequently established

himself as an internationally recognized painter. Cohen moved to the University of California in San Diego in 1968 and became a visiting scholar at Stanford University's Artificial intelligence Laboratory in 1973. At around this time he began to develop AARON, a computer program that was designed to produce art autonomously. The V&A now holds more than thirty computer-generated works by Cohen, including some signed by AARON. The V&A also has plotter drawings by Ihnatowicz, plus works by many other artists connected with the Slade during the 1970s. Among the Experimental Department's first students was Stephen Scrivener, who used UCL's mainframe computer system to produce a range of plotter drawings.³ Darrell Viner attended the art school from 1974 to 1976 and majored in sculpture, producing some fine plotter drawings too.

Paul studied at the Slade from 1977 to 1979, but he had already created some impressive works, including *Computer Assisted Drawing* (1975, V&A E.961-2008). When studied closely, it is possible to see the individual "tiles" that make up this unique plotter drawing. The pen pauses and creates a mark at the end of each move, leaving a ghostly hint of the underlying grid structure.⁴ The year he left Liverpool Polytechnic, Paul produced *A-B Modulares*, another unique plotter drawing on paper (1977, V&A E.1080-2008). Created with a fine pen, this shares some of the geometric characteristics that feature in historic Islamic patterns.

He has explained how the Slade "was a magnet for artists working with computers and generative systems. Many of them were involved with automata or other procedural or rule-based systems and we were all fascinated by the area that would later be called "Artificial Life" or A-life."⁵ One of his contemporaries was Dominic Boreham, who also studied there from 1977 to 1979. Catherine Mason has described how the students would use UCL's computer facilities at night, creating plotter drawings that could take two hours or more to produce.⁶ During Paul's final year his work was included in the EXP at PCL show at the Polytechnic of Central London (now Westminster University)

alongside Boreham and other Slade students.

As Grant Taylor has outlined, Paul went on to develop his academic career and artistic practice, participating in numerous events and leading a somewhat peripatetic existence. In 1986 Patric Prince curated a retrospective organised by SIGGRAPH, the Special Interest Group for Computer Graphics, in Dallas. The show included a raster image by Paul, *Sculpture Simulation* (1983), a copy of which is now in the V&A's collection (E.171-2010). Several of his later works were featured in the V&A's *Digital Pioneers* book, including *Neighbourhood Count* (1991, V&A E.1066-2008). This image consists of a 16 x 16 grid of squares made up of smaller squares, plus "indices" of the available permutations along the top row and left hand column. As Paul has explained: "A cell in a square matrix is surrounded by eight neighbours. If each neighbour can take one of only two states (i.e. ON or OFF) there will be 256 unique neighbourhood states in total." The work demonstrates the artist's interest in John Horton Conway's *Game of Life*, and the concept of cellular automata.

Swimming Pool, a digital print on paper, (1997, V&A E.994-2008) was included in a V&A display entitled *Prints Now: Directions and Definitions* (2006), alongside recent works by Harold Cohen and other artists. As Paul says, "each tile is a cell in an automaton which develops over time according to some simple rules. The resulting image was a vector graphic, or line artwork, that was subjected to a number of continuous tone raster graphics filters to create the coloured and textured surface that composes the final print."⁷ With its dayglow red and purple lines, *Gymnasts* (1997, V&A E.942-2008) presents a kinetic energy that radiates out from the surface. This sense of motion is no accident, since the image is derived from a generative animation created via Macromedia Freehand. Although both are vibrant digital inkjet prints, *Swimming Pool* and *Gymnasts* retain some of the characteristics of a much earlier monochrome plotter design, *Computer Assisted Drawing* (1975).

THE PORTER GALLERY

On Growth And Form Commission shown at the Victoria &
Albert Museum | Photograph by Marius Watz 2009



In 2000 Paul produced *The Book of Transformations* (V&A E.159 to E.166-2010), a suite of eight digital prints. All the prints contain a 10 by 8 grid of black symbols, with one row highlighted in pale blue. In each case the highlighted symbols match the ones that appear in the left hand column. By the eighth print or page, the symbols in the bottom row coincide with those at the left, completing the transformation. Although they presumably lack a specific meaning, the symbols themselves are reminiscent of Chinese characters. While the underlying algorithmic procedure remains something of a mystery too, the effect is decidedly Zen-like. Individual prints from the series were included in *Transformations: Digital Prints* from the V&A Collection, shown at the Great Western Hospital, Swindon in 2012 and then at the Royal Brompton Hospital, London in 2013. Organized in collaboration with the charity Paintings in Hospitals, the exhibition also included works by James Faure Walker, Ernest Edmonds and Mark Wilson. The aim of the project was to display V&A prints that would help to create a calming, positive environment for patients and staff alike.

Golan Levin has highlighted the way in which Paul and Daniel have both moved between the fine and applied arts. As the UK's national museum of art and design, the V&A is heavily engaged with the interaction between these two complementary spheres. Indeed, in the early years of computational art, it was often impossible to distinguish what was "art" from what was computer-aided design or computer graphics. More recently, the distinction continues to be blurred. In 2009-10 Daniel's work featured prominently in *Decode: Digital Design Sensations*, a highly interactive V&A exhibition that coincided with the rather more contemplative *Digital Pioneers*. Although *Decode* had "Design" in the sub-title, many of the works could also be viewed in a fine art context.

The *Decode* show was co-curated by Louise Shannon, a member of the Museum's Contemporary team, and Shane Walter, the creative director and founder of ondedotzero. Daniel was commissioned to create one of his

generative "flowers" pieces, entitled *On Growth and Form* (2009). This large format projection was installed at the entrance to *Decode*, and could also be seen by everyone who passed through the Museum's main foyer. As Grant Taylor says, the title refers to a book written by D'Arcy Wentworth Thompson and published in 1917. Thompson actually wrote much of the text a century ago, in 1915, but his words remain highly relevant to digital artists and designers today:

*"An organism is so complex a thing, and growth so complex a phenomenon, that for growth to be so uniform and constant in all the parts as to keep the whole shape unchanged would indeed be an unlikely and an unusual circumstance. Rates vary, proportions change, and the whole configuration alters accordingly."*⁸

In this case, Daniel incorporates digital images of patterns, shapes and textures taken from selected V&A objects, including prints, drawings, watercolours, textiles, ceramics and metalwork. He also makes use of British, Chinese and Italian ceramics, Indian watercolours, Japanese fans and much more besides. The patterns are overlaid on the petals of the flowers as they grow, providing colour, texture and three-dimensional form. Of course, they also give some design-historical context for Daniel's own digital art practice.

Among other things, *On Growth and Form* refers back to the work of artists associated with the Arts and Crafts movement, such as William Morris, Philip Webb and William De Morgan, all of whom created floral designs for ceramics, textiles and wallpaper. In a subtle way, the artwork draws attention to the taxonomy of art production, museum collections and the whole apparatus of collecting. In biology, the term "phylogenetic" refers to the evolutionary relationships between taxonomic groups. In Daniel's work, flowers emerge and are ultimately replaced by other blooms inspired by artworks from the V&A's collection.

On Growth and Form also relates to one of Daniel's earlier works, *Software as Furniture* (2005), which features abstract patterns projected onto

blank white pieces of crockery laid out on a table top. More recently, he created another unique “Flowers” piece for the D’Arcy Thompson Zoology Museum in Dundee, the city where Thompson wrote much of the text for *On Growth and Form*. Fittingly, Dundee is now a major centre for the production of computer games, many of which also exploit the potential of generative code.

“Of course, museums such as the V&A are increasingly grappling with the complexities of acquiring, documenting and preserving born-digital works and no single institution can claim to have all the answers. With this in mind, various collaborative projects are undertaking research into specific aspects of digital preservation.”

After the *Decode* exhibition’s world tour ended, *On Growth and Form* was added to the Museum’s permanent collection (V&A E.297-2014). As such, it now ‘sits’ alongside an increasing range of computer-generated artworks from the 1960s to the present day. In practice the acquisition was relatively straightforward, since the software consists of a single Adobe Flash program plus the images or “assets” derived from objects in the V&A’s permanent collection. Other acquisitions from *Decode* include Aaron Koblin’s *Flight Patterns* (2009), Random International’s Study for a *Mirror* (2009/10) and Karsten Schmidt’s *Recode Decode* digital marketing identity (2009) for the exhibition itself. In addition the Museum now holds a number of works by another of the *Decode* exhibitors, Casey Reas, whose *Process 18 (Software 3)* (V&A E.297-2011) also relies on a single, elegant program to generate an astonishingly delicate and subtle artwork.

Of course, museums such as the V&A are increasingly grappling with the complexities of

acquiring, documenting and preserving born-digital works, and no single institution can claim to have all the answers. With this in mind, various collaborative projects are undertaking research into specific aspects of digital preservation. Inevitably, we are heavily reliant on wider technological developments relating to format migration, software emulation and other techniques that will ultimately benefit museum collections.

In essence, though, some objects are still easier to collect than others, whether or not they happen to be digital. In June 2007 the V&A celebrated the 150th anniversary of its opening at the South Kensington site. To mark the occasion, 150 leading artists, designers, architects and photographers – including Daniel – were invited to contribute a page to an anniversary album, expressing what they found most inspiring about the Museum and its collections. The creative brief stated that the submission could be a drawing, design, sketch, graphic, computer-generated image or a simple message in words. Although it was imagined that Daniel might create something digital, he chose to supply a 3D cut-out paper model of the main entrance facade of the Museum itself, produced in collaboration with Jana Carga and Mieke Van De Water (V&A E.481-2008). Intriguingly, the paper cut-out is white, like the ceramic blanks in *Software as Furniture*, as if waiting for images to be projected onto it. The model is now in the Museum’s permanent collection, along with contributions by Neville Brody, Jason Bruges, Nick Knight, Paul Smith, Zandra Rhodes, Troika, United Visual Artists, Vivienne Westwood and many others.

At an early age, Daniel also helped to create some of the smallest artworks that featured in the V&A’s Digital Pioneers show. In July 1990 the American artist Barbara Nessim was artist in residence at Humboldt State University, where she was developing the software for her *Random Access Memories* installation in collaboration with British-born artist Tony Longson and his student Lamar Taylor. The RAM software would enable the gallery visitor to generate the content for miniature books which could then be printed and assembled. As it



happened, Paul was also visiting Humboldt for a Summer School, accompanied by Daniel. Nessim spotted how the thirteen year old was able to observe and then contribute to the development of the RAM program. A range of Nessim's mini-books are now held in the V&A's National Art Library. As purveyors of digital images, Brown and Son have served the Museum brilliantly.

1 Honor Beddard and Douglas Dodds. *Digital Pioneers*. London, V&A, 2009.

2 Georg Nees first exhibited his computer graphics at the Studiengalerie der Technischen Hochschule Stuttgart in February 1965. In April, A. Michael Noll and Béla Julesz displayed "computer-generated pictures" at the Howard Wise Gallery in New York. Georg Nees and Frieder Nake showed computer graphics at the Galerie Wendelin Niedlich, Stuttgart in November 1965.

3 Stephen A.R. Scrivener. *Connections: a Personal History of Computer Art Making from 1971 to 1981*. In Brown, P, et al, eds. *White Heat Cold Logic* (2008) pp. 291-305.

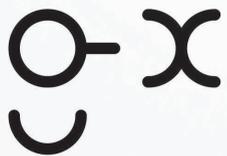
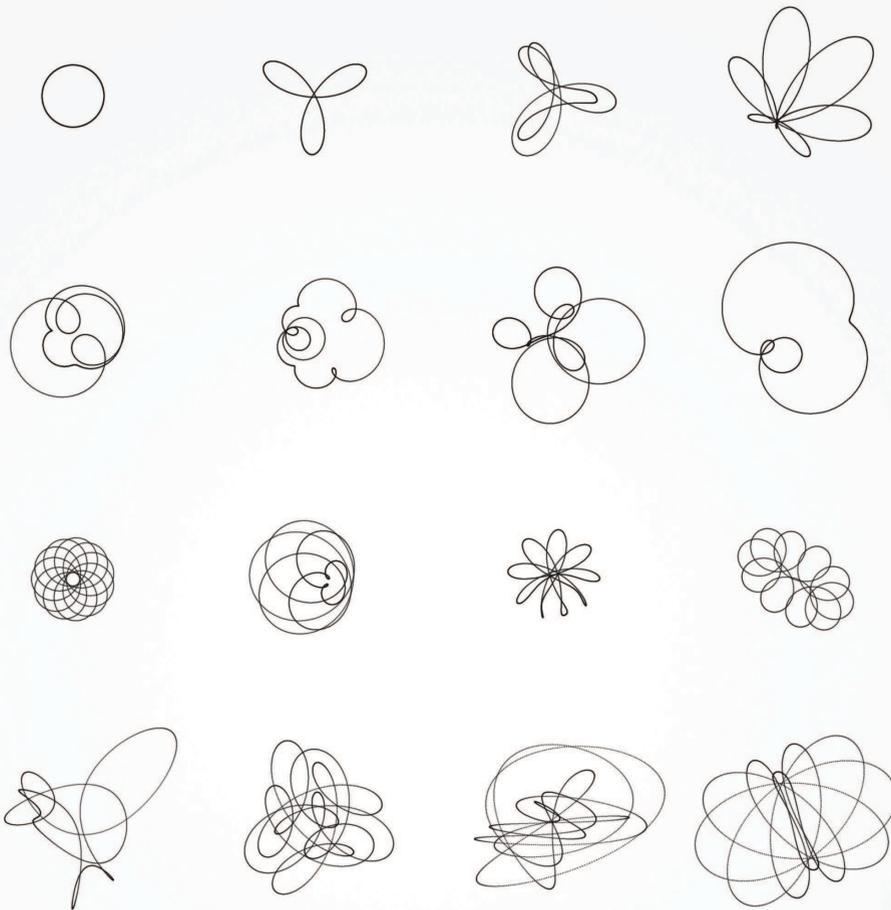
4 A digital photographic print of the original *Computer Assisted Drawing* was included in the *Brown & Son: Art That Makes Itself* exhibition at Watermans Centre in 2015.

5 Paul Brown. *Stepping Stones in the Mist* (2000) <http://www.paul-brown.com/WORDS/STEPPING.HTM>

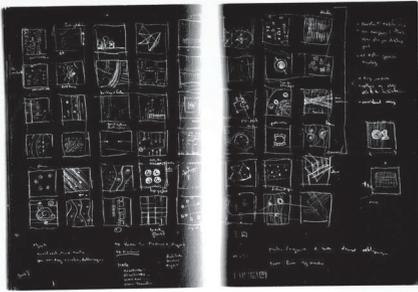
6 Catherine Mason. *A Computer in the Art Room: The Origins of British Computer Arts 1950-1980*. JIG Publishing, 2008. p. 197.

7 Gill Saunders and Rosie Miles. *Prints Now: Directions and Definitions*. London: V&A, 2006. p. 12.

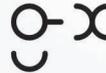
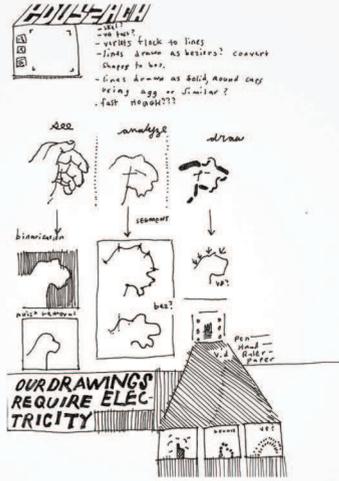
8 D'Arcy Wentworth Thompson. *On Growth and Form*. 1942 edition, p. 205.



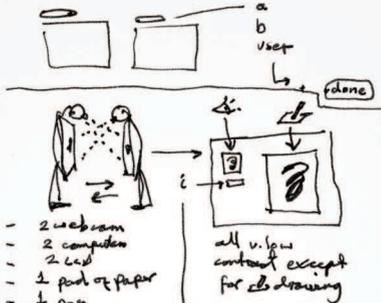
daniel_brown / generative-X at onedotzero



casey_reas / generative-X at onedotzero



zachary_lieberman / generative-X at onedotzero



- 2 webcam
- 2 computer
- 2 lcd
- 1 pad of paper
- 1 pen
- 1 bin
- no mouse
- no keyboard

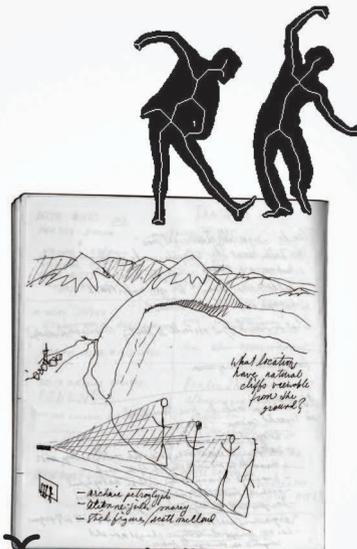
drawing triggered when view is "stable" for N seconds.

(reset by change?)

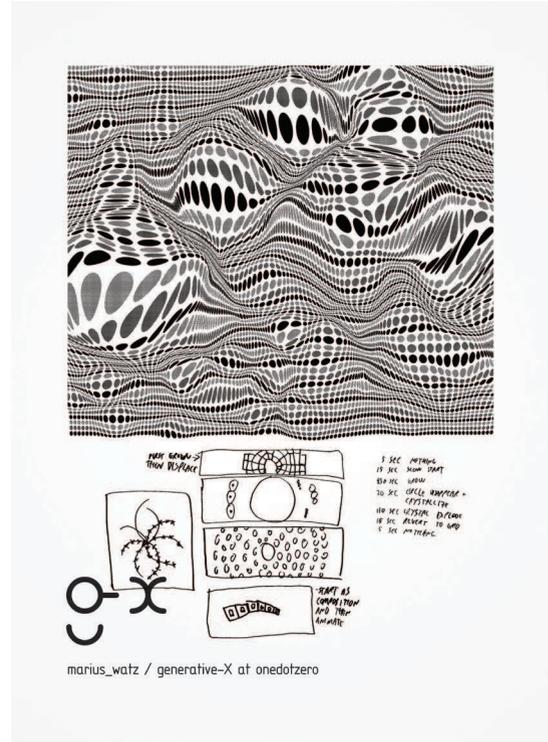
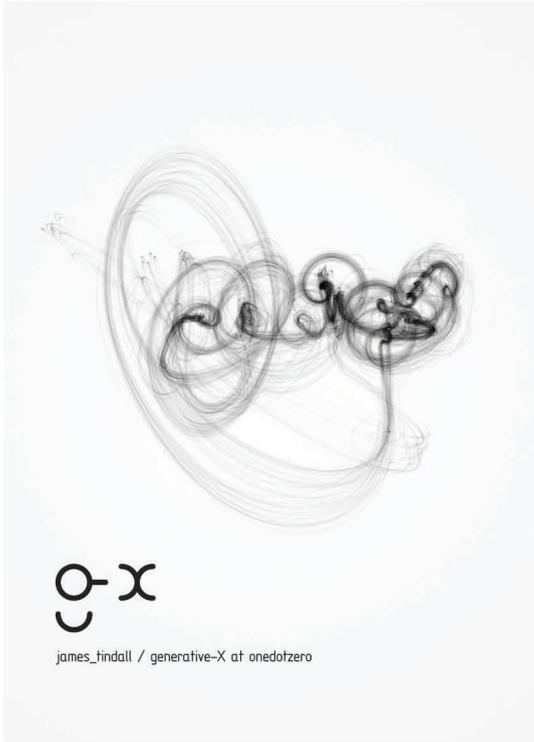
b (allows system to converge to steadily state?)



ed_burton / generative-X at onedotzero



golan_levin / generative-X at onedotzero



All works on Pages 62-65 are from the *Generative-X* series, an exhibition curated by Daniel Brown for the 2005 *onedotzero* festival at the ICA. As well as the artworks shown Daniel asked each artist to provide a sketch or diagram demonstrating the processes in their work.

Participating artists included: Daniel Brown, Paul Brown, Ed Burton, Golan Levin, Zachary Lieberman, Casey Reas, James Tindall and Marius Watz.

Making Self-Making Art since 1968

Golan Levin

Half a century of computer art. It may seem difficult to imagine that this spring is the Golden Anniversary of software-based art making, but fifty years after the first exhibitions of computationally generated drawings (by Georg Nees, Michael Noll, and Frieder Nake, in early 1965), the field of digital art is now mature enough that, for one unusual father-and-son pair, it's even an intergenerational family business. I'm speaking, of course, about Paul and Danny Brown: pioneering creators of artisanal software art since 1968.

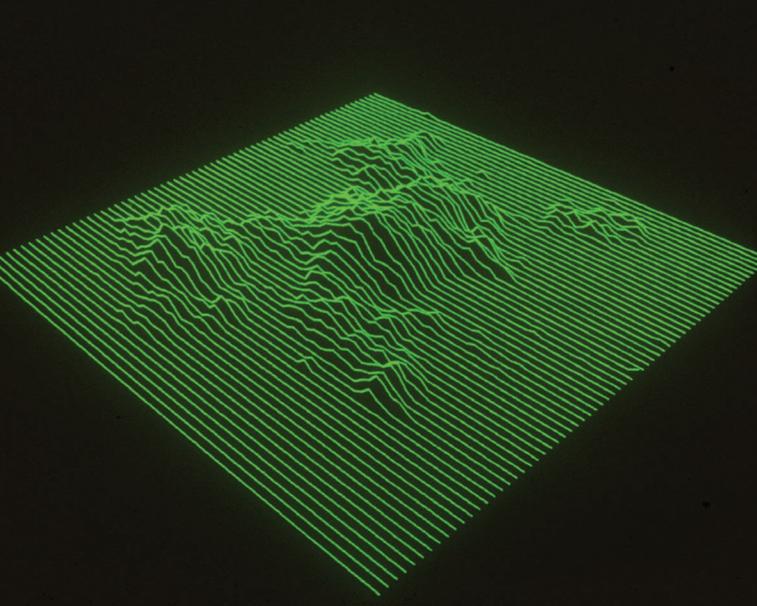
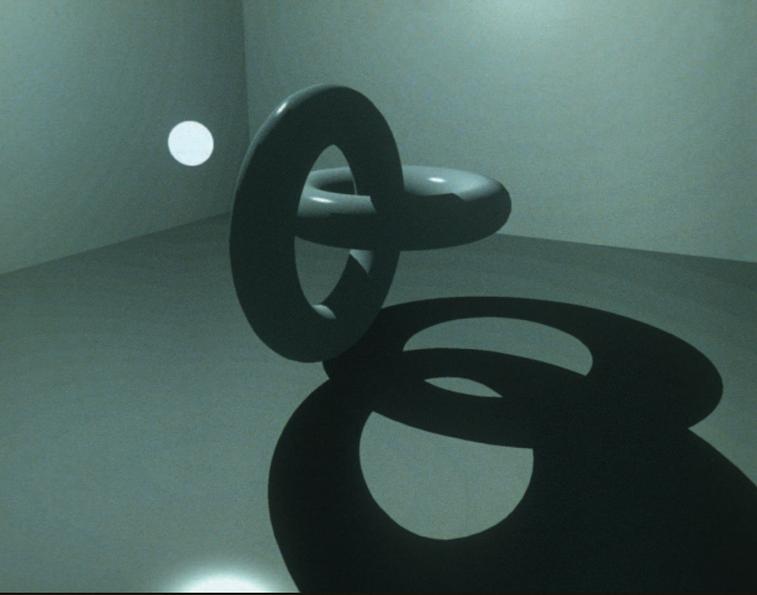
Paul, born 1947, stands among the first generation of British computer artists. Influenced by the legendary *Cybernetic Serendipity* exhibition at the London ICA, in 1968, Paul had by the early 1970s developed a completely digital art practice. His work—part and parcel of the era's response to the perceived romanticism of abstract expressionism—explored the removal of the artist's hand through logic, computation and combinatorial design.

The 1960s and 1970s were not an easy time to commit to the computer as an artistic medium. Materially speaking, it was enormously challenging: artists were obliged to master difficult computer languages, conduct their work in government and industrial laboratories, collaborate closely with professionals in very different disciplines, and even build their own machines. It was an easy recipe for being misunderstood by both the arts community (for which the computer was anathema) and the computer science community (which had little patience for such obviously non-utilitarian applications). If the removal of the artists' hand was celebrated in the minimalist and conceptual art of the time, it was reviled in computer art, where the machine was seen as a military-industrial force degrading to the human condition. Paul, writing in 1996 of his early experiences communicating his work to arts audiences, described his dawning awareness that the computer was a “forbidden medium”, and his decision to use it, a “kiss of

death”. Critics at the time judged Paul's art to be ‘cold and clinical’ (an evaluation leveraged at much early computer art). Years later, in 2009, Paul would reclaim these reactionary terms in the volume he co-edited, *White Heat Cold Logic: British Computer Art 1960-1980*—but not before, one suspected, they had become a personal signifier for that uncomprehending era.

“Computational art may be the only plastic art that can be conducted almost entirely through mentation. Daniel Brown is living proof that one needs no more (and yet, no less) than a sharp mind and a great eye to create some of the most lovely, lively and important digital art in the world”

In the creative careers of both Danny and Paul, we see extensive movement between pure and applied arts. I believe this is a natural consequence of the economic conditions that bound computer arts, and the kinds of institutions or entities that are interested in funding new work and experimental practices. Since its inception, and in part owing to its highly interdisciplinary nature, the field of computer graphics has touched on applications in industry, architecture, advertising, medical research, and the military. In the 1970s, access to computing power was still rarefied—one graphics system on which Paul worked, for example, the Aesthedes, cost as much as “30 middleclass cars”—and in many circumstances one worked wherever the hardware could be found, whether this was a software company, commercial animation studio, fine art school, or polytechnic. Paul made a major move in 1981, however when



Paul's son Daniel Brown erupted on the scene in 1997. The World Wide Web, barely three years old, was stiff, awkward, painfully unbecoming – and yet bursting, we all sensed, with the potential of a new expressive medium. Danny was among the first to probe these possibilities through the engaging creations on his *Noodlebox* website: experiments that were playful, innovative, moving, fresh, and quite simply, arrestingly beautiful. At that time, the budding cohort of people exploring the nature of online interactive art – just as with the computer artists of the late 1960s and early 1970s – was tiny and widely scattered. Unlike computer art in the early 1970s, however, this “new, new medium” was instantaneously shareable. Danny's online work spread quickly and was consumed by a global audience hungry for innovative visual culture. Followers of experimental media in the late 1990s and early 2000s began to speak of Danny Brown in the same breath as a small handful of highly innovative peers such as Marius Watz (Norway), Joshua Davis (USA), John Maeda (USA), Lia (Austria), Yugo Nakamura (Japan), and British artist-designers like Ed Burton, James Tindall, and Andy Cameron. These influential practitioners brought together a knack for computational thinking, a sophisticated visual aesthetic, a sensitivity to ludic and delightful interactions, a research interest in the expressive potential of real-time imagery, and a street-smart savvy about the use of the browser as a tool for reaching people. Like them, Danny showed the way.

he co-founded Digital Pictures Ltd., the UK's first company wholly dedicated to CGI and special effects. Based within the Slade School of Art at University College London, he wrote modelling and animation software for Digital Pictures, and contributed to the development of pioneering computer graphics primarily for television titles. Paul re-established his art career in the late 1990s, when he was awarded an Australia Council for the Arts New Media Arts Fellowship. Since that time, he has maintained a long-standing relationship as artist-in-residence and honorary visiting professor of art & technology in the Informatics Department at Sussex University.

As Danny explored new contexts and concepts for online interactivity and generative art, an eager audience followed his evolution through projects like Bits and Pieces, Play/Create, and the works he created for Nick Knight's SHOWstudio. Taken together, the works Danny created for these showcases anticipated, predicted or outright invented many of the idioms of responsive online design that we see everywhere on the web today. Over the past fifteen years, Danny and his pioneering work in defining the visual language of web design have been recognized with a remarkable array of awards and accolades: he was named London Design Museum's Designer of the Year in 2004; selected for Design Week's Hottest 50 Designers; chosen by Internet Business Magazine as "one of the top 10 Internet designers"; designated one of Creative Review's Stars of the New Millennium; and more recently, his work was selected to represent the best of British design in international exhibitions organized by the Design Council and the British Council. Danny, like his father, is a genuine pioneer and innovator at the intersection of art and technology.

It's a curious and little-known fact that more than a few of the leading figures in Danny's generation of new-media artists—including some of those mentioned earlier—never completed university. Nowadays, of course, there's a proliferation of undergraduate and graduate programmes in 'new media art', 'interaction design' and related fields. Yet, when Danny was of college-going age, these weren't yet considered fields. At the close of the 20th century, such programmes were exceedingly rare; indeed, while Danny was seeking to pursue such studies, Paul was simultaneously working to establish viable university programmes in computer arts and design. Despite the interdisciplinary groundwork laid decades before by the computer artists of Paul's generation, and despite the obvious changes to culture wrought by computation, few institutions were configured to educate artist-engineers and other native hybrids. (Applying to colleges in the early 1990s, for example, I was told by one leading American university that I could study art or computer science, but not art and computer science.) In the face of this double-

ended orthodoxy, computer art remained, in the words of Grant Taylor, "the unwanted child of unloving parents", and there was little institutional accommodation for students who straddled the two cultures. Students wanting to get access to the latest in technological innovation sometimes had to forge their own paths in the commercial sector rather than to wait a decade or more for financially strapped universities to provide it. It's a testament to Danny's profound strengths as an autodidact that he has achieved as all he has, without the typical 'advantages' of a university degree and its attendant social capital. I can only imagine that having a living, hybrid role model like Paul Brown helped Danny find the courage to forge his own path.

"In other respects, their work is truly complementary. Paul's work focuses on logic and simplicity, combinatorics, geometry, and the elegance of ideal forms. Danny's, by contrast, has for some years explored themes of nature, complexity, and outrageous ocular beauty: through investigations into emergent behaviours, organic morphosynthesis, and the ways in which mathematics (in the manner demonstrated by D'Arcy Wentworth Thompson) underpin the deep structure of the natural world."

In early April 2003 Danny was nearly killed in an accident. When he awoke from coma, he was paralyzed from the neck down. Although he has gradually regained a limited ability to move his arms, he has remained legally quadriplegic since that day. Yet over the past twelve years Danny has created more works—let alone works of

surpassing beauty—than most artists will create in a lifetime. For Danny, his condition is a personal matter, not a public or professional one; there is no indication of it on his web site, and such is his productivity that many of his collectors, clients and Internet contacts are often surprised to learn that he is disabled at all. How Danny has managed to construct a creative new life in the face of such an existential challenge and profound constraint is utterly beyond my comprehension. To be honest I completely lack words to express my awed admiration for him, for his indomitable will, and for the loving family that has supported him through this trial.

“Paul, born 1947, stands among the first generation of British computer artists. Influenced by the legendary *Cybernetic Serendipity* exhibition at the London ICA, in 1968, Paul had by the early 1970s developed a completely digital art practice.”

No doubt there are many factors that have made it possible for Danny to construct such a productive life as an artist, designer and researcher. But I have to wonder if perhaps the quintessentially intellectual nature of his chosen medium—code—is one? Computational art may be the only plastic art that can be conducted almost entirely through mentation. Daniel Brown is living proof that one needs no more (and yet, no less) than a sharp mind and a great eye to create some of the most lovely, lively and important digital art in the world.

Observing Danny’s precocious talent at age 19, Paul observed, in his essay *An Emergent Paradigm* (1996) that “forty years is precisely the time it takes for a technology to mature and, more importantly, for a new generation of artists to develop who haven’t been influenced by the

previous paradigm.” This may indeed be true, but ironically, it won’t be Danny and Paul—a pioneering computer artist inextricably influenced by a pioneering computer artist—who permit us to evaluate this claim. What we see instead is the passing of a torch, and a dialogue in both shared and divergent visual languages.

As a digital artist, Danny’s artistic concerns both dovetail with and differ from his father’s. Of course, some of the most obvious differences in their work arise from the inherent limits of the physical media that contain their ideas: printed plots and computed film animations, for example, versus interactive, networked, real-time displays. But common to both men is a concern with formal generativity: the capacity of a computer program to operate as a “meta-artwork”, producing an infinite variety of inner forms. In other respects, their work is truly complementary. Paul’s work focuses on logic and simplicity, combinatorics, geometry, and the elegance of ideal forms. Danny’s, by contrast, has for some years explored themes of nature, complexity, and outrageous ocular beauty: through investigations into emergent behaviours, organic morphosynthesis, and the ways in which mathematics (in the manner demonstrated by D’Arcy Wentworth Thompson) underpin the deep structure of the natural world. One might potentially note an Apollonian/Dionysian dichotomy in their bodies of work as well—though, whether this is more a result of the arcs of art history to which their work belongs, or the qualia of the particular media in which they have developed their best-known projects, or simply the particular proclivities of this father-son pair, it is impossible to say. Perhaps you will discover yet other ways in which their work communicates across time.



“Every medium, from paint to film, has its art and the digital medium is screaming out for uniquely digital content that can be called fine literature. I believe that the emergent order will be the inevitable result of efforts by artists rather than technocrats.”

Roy Stringer

Paul Brown
Untitled: Canvas Reconstruction (inset)
1978 (2015 reconstructed), Giclée Print, 130 x 32 cm

Danny The Young

Peter Fowler

I first met Danny Brown when he was 15. He was brought into the University Unit I ran in Liverpool, the Learning Methods Unit at the John Moores University, by Roy Stringer, a designer working with us on a number of contracts. We were developing what were then called 'multimedia learning materials' ending up, at that time on, Laserdisks.

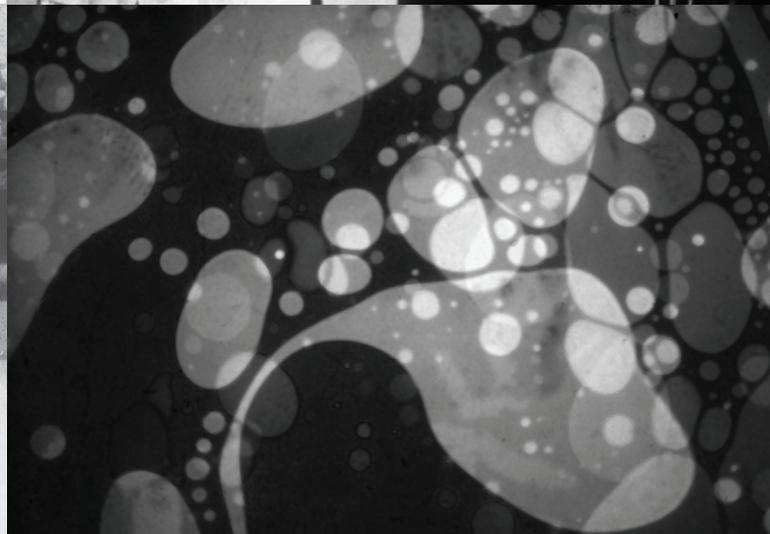
Stringer was an extraordinary figure: a scouser with a love of his city, a guy who had left school with three O-levels, a passion for Apple Computers and Frank Zappa. He had no formal training in either computing or art and design but managed to master both the uses of the machine and the way in which its effect could be enormously enhanced by adding ingredients from the design world into its customary association with mathematics and the sciences. Stringer understood, very early, that the user of the machine could be entranced by different kinds of interfaces; that engagement was possible. That learning on the machine could be playing. It need not be, he would scream, the paradigms of the DOS programmers.

Stringer had bumped into the young Danny because Danny's stepfather featured in the Liverpool band *The Muffin Men*, a group dedicated to the music of Zappa. Roy himself was in the band 'playing the Mac', adding sounds and various digital pieces into the group's performances.

Somehow, it's a very Liverpool tale: the boy at Blue Coat School, where John Lennon's Dad had been, living in a neighbourhood surrounded by both posh Liverpool at one end and Toxteth at the other, a boy whose mother and father met doing lightshows at local community centre; the mentor, a man with no formal qualifications who had learned, on his own, the idiosyncrasies of early computers and understood – much better at that moment than his contemporaries in the University's Art Schools and Computer Science Departments – the ways in which the computer future was unfolding, with its world-wide networks and the inevitability of different forms of media emerging from its potential of acting as an intersection between so many disciplines.

Chrissie Malvern Brown, *Theatre of Mixed Means*, circa 1974

Nova Express Lightshow, circa 1968





And Zappa, somehow a perfect fusion point for the meeting of Stringer and Brown: an essential anarchy of approach, joyful and exhilarating, a maelstrom of sound (in his case); but constructed and delivered with a tightness and a precision built on endlessly hard work and practice. (Think of a parallel from the generation before: *Please Please Me*).

“[Roy] developed what he called the navihedron, an icosahedron which acted as a navigational tool: it replaced the usual hierarchical menu system with a plethora of 3D interconnected nodes.”

When Danny ambled into that shambles of a location in which we worked, the basement of the Aquinas Building in Mount Pleasant, he already

had many of Liverpool’s characteristics burned into his soul: the immersion into the widest of musical cultures, the multiculturalism of a city that lived the very meaning of that word generations before it was coined, his years at one of the most ancient of Liverpool schools. The offbeat humour; the speed of the quip. The cheek; the nerve.

Roy told me, with Danny standing there, all gauche and teenage, that Danny was the son of a friend of his, linked to his band, and desperate to use the Macs we had in our studio. Any chance? He was so talented, he said, that he could probably do something useful for us. Any chance? I only asked Danny one question and I think he grunted something, I can’t remember any actual words.

Lucky for Danny that the Unit was well hidden in the University and operated as a rogue cell in the body of a conventional institution. It was absolutely obvious that any act of formally going to my seniors and suggesting this boy could simply dip



in, whenever he wished, and use our equipment would have resulted in a process lasting at least a year before being rejected.

Within days, Danny seemed to turn up all the time. He was quickly accepted by the bunch of young designers working under Stringer's direction if only because of his obsession with computer games: each day seemed to finish with a group of them exploiting the University computer network, playing those vicious 1990s game in competition with each other; but each day saw them all, including Danny, working their socks off in the hours from nine till five. Stringer was a hard taskmaster.

It was also obvious to the existing staff there that the kid had something. He was a little bit special. He seemed to approach problems from different angles, came at them, as someone said to me, sideways. He learned the most complex of software packages by playing with them, never really seeming to head for lists of instructions: the odd question to Stringer, the odd remark from Stringer, sometimes the help from the guy at the next desk.

We were working on a leading-edge piece of work, developing learning materials for technicians in cytology labs in hospitals. Those who spent their lives examining slides taken from cervical smear tests. Those whose false analysis could, literally,

result in the death of a woman. One of the problems these labs had was judging the effect of the different stages of the menstrual cycle on the smear taken: each stage impacted in a slightly different way. Those technicians needed to understand the menstrual cycle.

“When Danny ambled into that shambles of a location in which we worked, the basement of the Aquinas Building in Mount Pleasant, he already had many of Liverpool’s characteristics burned into his soul: the immersion into the widest of musical cultures, the multiculturalism of a city that lived the very meaning of that word generations before it was coined, his years at one of the most ancient of Liverpool schools. The offbeat humour; the speed of the quip. The cheek; the nerve.”

Extraordinarily, it was Danny, just 16 at the time, who created an animation explaining, perfectly, the menstrual cycle. An animation that is still sometimes used in hospitals. His work, moving on at a remarkable rate, not only demonstrated imagination and design flair, but the need, when important, for a perfect clarity and logic. The overall product, with Danny’s pieces included, won a string of international awards, Golds in the States, Golds in Europe.

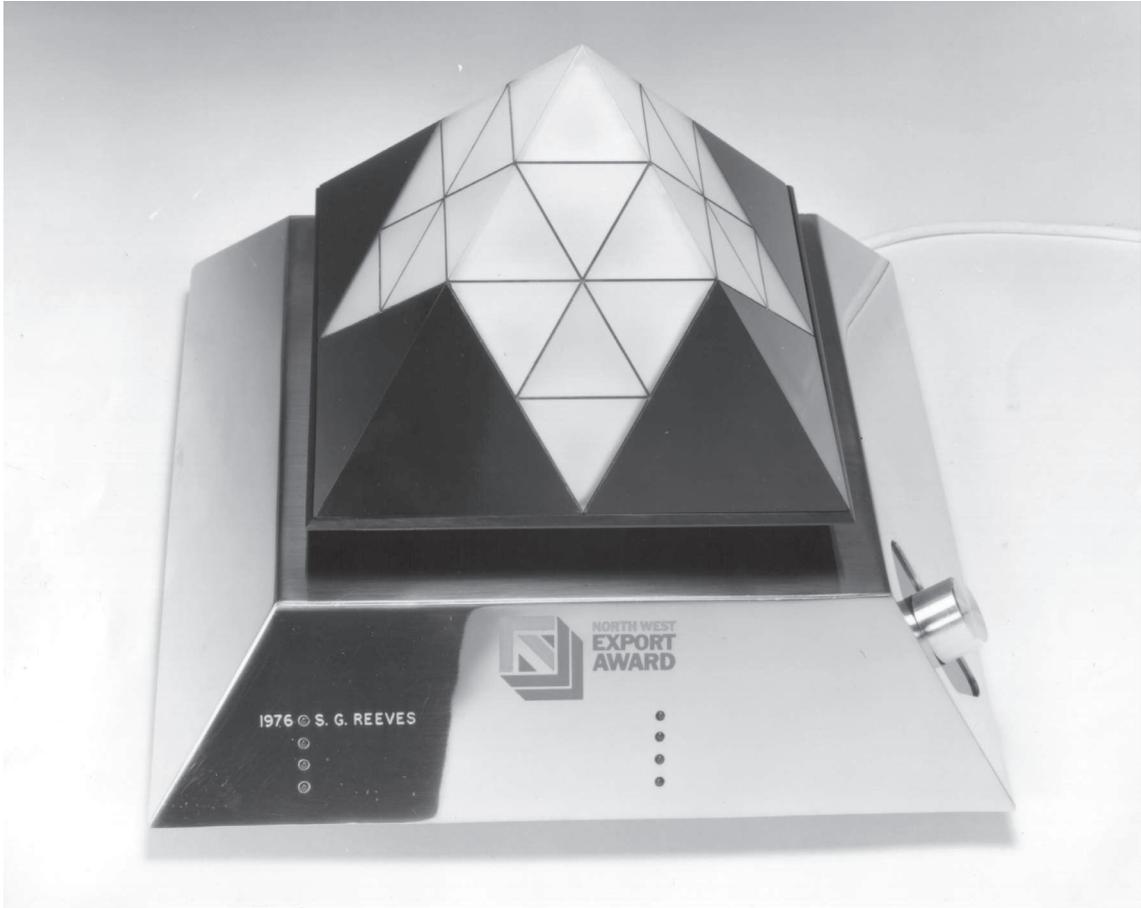
Danny stayed with us until he joined Roy in the company we spun out, Amaze, in 1995. He skipped University to stay with his mentor and sat there, in a sparkling new office overlooking the Mersey, as a member of the Amaze Research team, a small group that experimented and explored. Stringer, working more and more with games metaphors,

and learning, himself, more and more from one of his heroes, Ted Nelson, became obsessed with different forms of navigation. Breaking the linear mode that ruled the computer world. Escaping the ‘prison of paper’ in Nelson’s phrase. He developed what he called the navihedron, an icosahedron which acted as a navigational tool: it replaced the usual hierarchical menu system with a plethora of 3D interconnected nodes.

For the user, it addressed Nelson’s demand to ‘have a user interface that aligned with people’s minds’: the navihedron, nuggets of different kinds of information, could be accessed at any point, with users determining their own routes to exploration and learning. Stringer still spent lots of time in the Learning Methods Unit at this time, constantly returning to what he called ‘the mother ship’. However much he explained the navihedron to me, a mere mortal of an academic, I often got lost in the complexities of his thinking.

Until one day, in 1997, he wandered into my office with tears in his eyes. He showed me *Noodlebox*, Danny’s take on Roy’s idea. An immersive little game that seemed to come from Lego and children’s toys; and a perfect exemplar – and a completely understandable one – of the power of the navihedron.

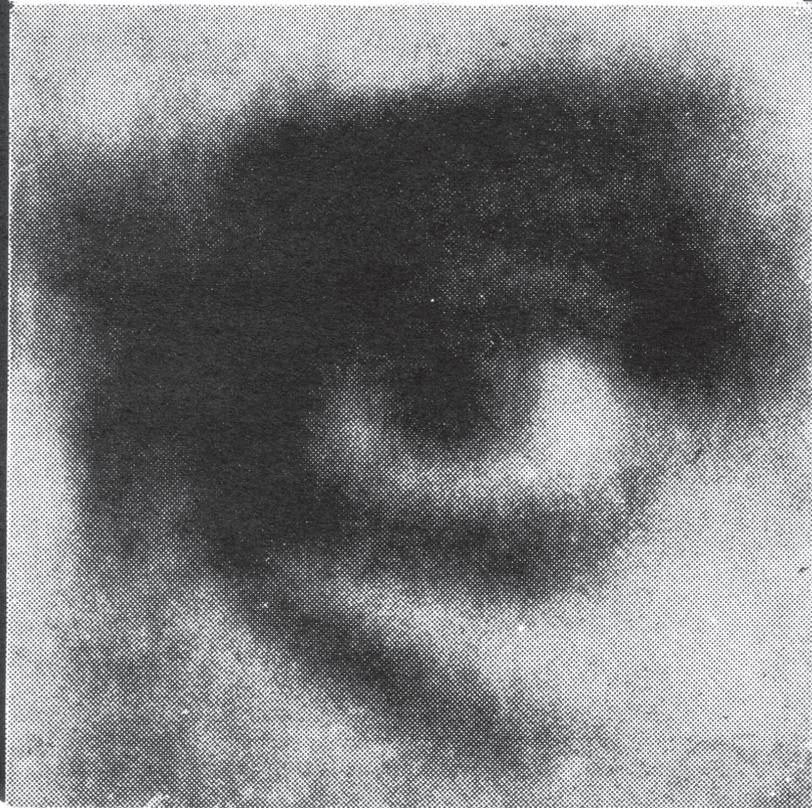
Danny Brown had come of age. His own background - the games and the proximity to childhood, the imagination and the leaps in the dark- had allowed him to put his own mark on the Liverpool work. He had learned from his teacher, he had absorbed the culture of his Liverpool landscape, he had played the nights away and broken the boundaries of the intense apprenticeship he had served under Roy Stringer.



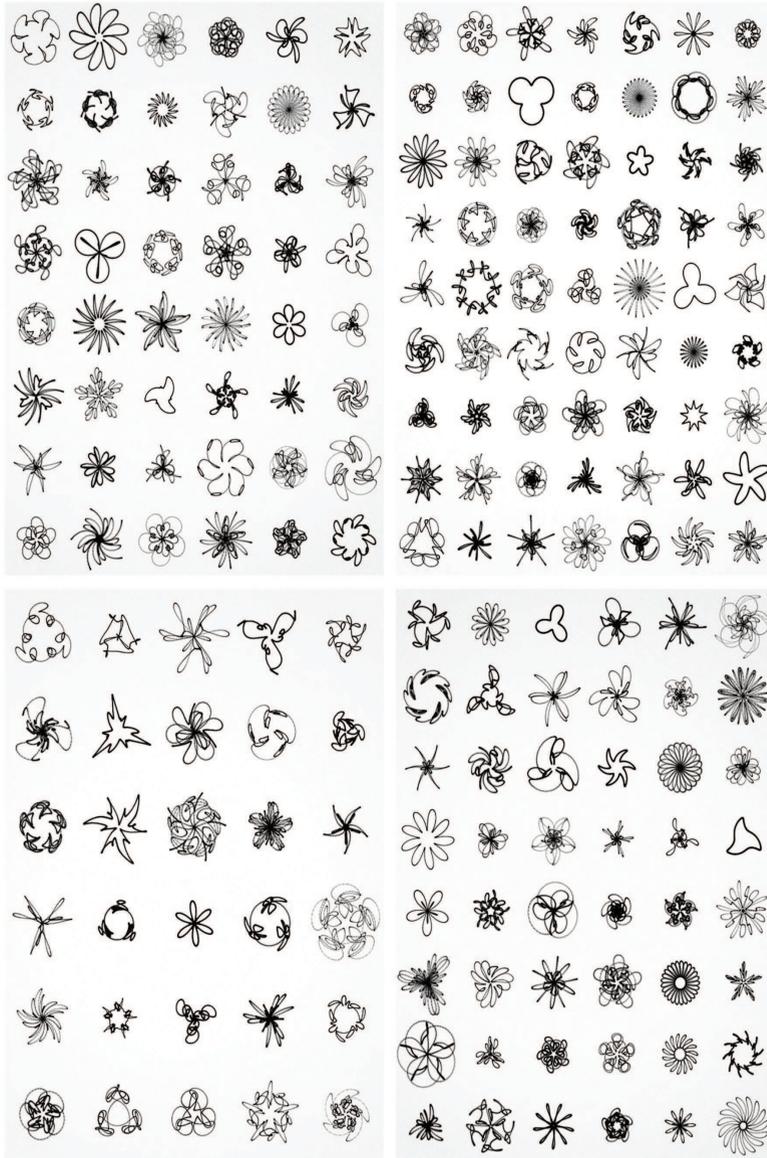
Paul Brown
The North West Export Award
1976, electronics, stainless steel, acrylic, 25 x 25 x 22 cm

A new show from the Theatre of Mixed Means - Calder, Trim and Brown. A tapestry of poetry, electronic and concrete sound pictures, film and projected visuals, live theatre, dance and mime, the show is constructed and performed live and can be tailored to fit most spaces. Performance lasts between 1½ - 2 hours, including a tea-break. For details contact- THEATRE OF MIXED MEANS, PO BOX 2, MERSEYSIDE ARTS ASSOCIATION, BLUECOAT CHAMBERS, SCHOOL LANE, LIVERPOOL LI 3BX.

CUBE was not at first observed being composed initially of transparent and non reflective surfaces. It had however already sterilised many command centres by means of misinformation, false programmes and restrictive education.



Commissioned by MAA



Daniel Brown
Roses
1990-now, HD Screen Capture

Not only computing—also art

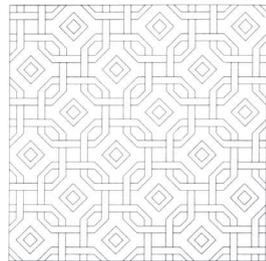
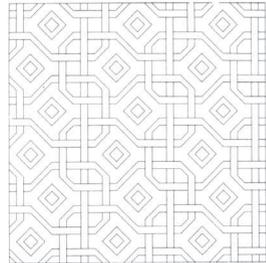
JOHN LANSDOWN

The return of the module

Ever since I first described in these columns how the use of 'modules' can be particularly effective in computer art, I have received a steady stream of graphics examples from artists using this technique. An interesting series of drawings prepared by Robert Colvill of ULCC was shown at a recent CAS meeting. These were based on the module I presented in the June 1977 issue of *Computer Bulletin*, and Robert had used this in a systematic way to produce a large number of, as it were, variations on a theme. He pointed out that, by combining orientations of the original module into larger units, it was possible to produce an apparently endless series of different, but related drawings (Figures 1 and 2), and castigated me for my statement in the September 1977 issue that there were only seventeen possible different patterns.

I realise now that, in attempting to give a shorthand note on patterns, I might have been slightly misleading, but there are indeed only seventeen regular basic patterns in the plane and these are

Figure 1
Figure 2

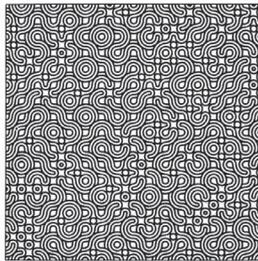
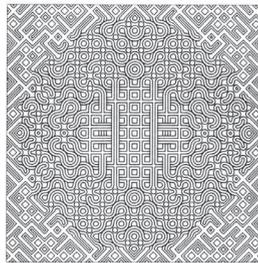


shown together with a short and elegant proof in that excellent book, *The Geometry of the Environment* by March and Steadman (RIBA Publications Ltd, 1971). For example, even the most complicated regular wallpaper pattern can be shown to be one of these seventeen—though it's quite tricky to do so in some cases. Perhaps some patient reader would like to identify which of the seventeen patterns Figures 1 and 2 fall into. I think one of the interesting things to come out of the work so far is that even quite trivial modules, when properly combined, can produce fascinating images.

One = good, more = better

If using one, not very clever, module can produce interesting graphics, one wonders what the effect would be of using two or three more imaginative designs. Paul Brown of the Postgraduate Experimental Course at the Slade School has been investigating this point with striking results (Figures 3 and 4). Paul began consciously using modules in drawings, paintings and constructions in

Figure 3
Figure 4



1972. Originally his drawings were produced by hand—a long and difficult process—but, in 1974, as a sculpture student at Liverpool Polytechnic, he began using computers and, over the next three years, developed a number of works on a modular basis. These included some in the form of jigsaws which can be rearranged by the viewer—the most ambitious being 12 feet by 6 feet at which several people can work at the same time.

Paul says: *I have never heard a mathematician claim his work to be 'computer maths' and I am reluctant to describe mine as 'computer art'. The computer allows me to do things which would be inconceivably time-consuming, monotonous, difficult or inaccurate if done by hand. As such it is a valuable tool and one which I suspect will play an increasingly important role in future art activity.*

A prize worth winning

If I were a manufacturer in Northwest England, I'd be trying especially hard to export everything I made. Not only because that's what the country needs, but because I would want to win the CBI Northwest Export Award trophy designed by Paul Brown. The trophy (Figure 5) has, built into its pyramidal shape, a kinetic display—essentially a square comprising 32 triangular sections. These are illuminated to form a three-segment 'worm' which appears to travel about the display until it becomes trapped in a corner where it dies only to be born again at the centre.

At the heart of the device is a 1702A EPROM configured as an 8×32 array of 8 bits each. Bits 1 to 5 control the lamps, bits 6 and 7 control the direction of travel and bit 8 deals with the edge conditions. Altogether sixteen companies contributed help, advice, services and gifts to make this beautiful object. Congratulations to all concerned.

A country without a prophet

In November last year, I was lucky enough to be in Amsterdam to see Harold Cohen's latest art work—a concept which, together with Edward Ihnatowicz's *Senster*, is likely to have a profound and far-reaching effect on the way art develops over the next few years. Essentially, the work consists of a device for making drawings under computer control and, whilst the main feature of the idea is the program, for exhibition purposes Harold Cohen (Figure 6) has designed and built a little

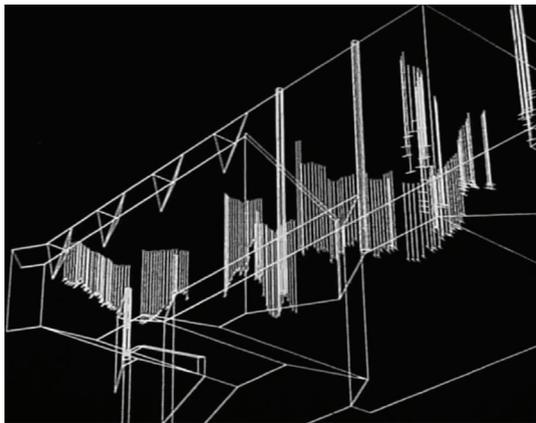
The Dark Side of the Digital Revolution

Jim Boulton

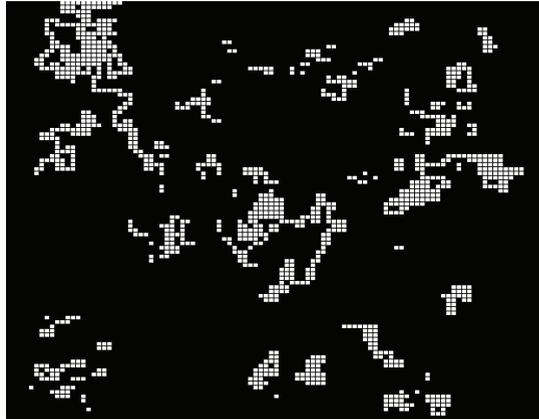
We need more exhibitions like Brown & Son, *Art That Makes Itself*. Not only does it celebrate the inter-generational history of computer art, it's a catalyst for digital preservation.

I've been involved with the preservation of websites since 2010. One of the first projects I archived and exhibited was Danny Brown's *Noodlebox* from 1996. Danny supplied the HTML framework and compiled Director files (two HTML files, four GIFs and 36 DCR files). I bought a machine from the era, downgraded the OS to System 7, installed Netscape Navigator 3 and a Shockwave plugin and we were good to go. Whilst it was tricky to source and install the software, especially the plugin, recreating the exact environment from fourteen years earlier was a realistic ambition.

More recently, my digital archaeology investigations have expanded into computer art, video games, and CGI. I was asked to tell the creative history of computers in 100 projects as part the Barbican's Digital Revolution exhibition last summer. As an iconic example of generative art, I was keen that *Builder/Eater* was one of the artworks in the



Paul Brown
Hall's Curtain (still frame)
1981-2, 16mm Silent B/W



Paul Brown | *Builder/Eater* | 1977
(Reconstruction 2014), Kinetic Painting
Size variable

show. Paul wrote *Builder/Eater* in DG assembler language on a Data General Nova 2 minicomputer in 1977, the year *Star Wars* was released. Like *Star Wars*, two opposing forces battle it out on screen. One random walk switches pixels on, the other switches them off, creating a non-repetitive animation that will never be resolved.

When I approached Paul about how we might exhibit *Builder/Eater*, it was obvious using the original hardware, software and media was not an option. Not least because he no longer had the code! Even if a copy of the code had survived and we could source a Data General Nova 2 minicomputer, the six-foot rack would not be practical for a touring show. Even at the time, *Builder/Eater* was only ever exhibited at The Slade School of Fine Art where Paul and the DG minicomputer were based.

The version Paul recreated, shown in *Art That Makes Itself*, was programmed in Processing and runs on a Raspberry Pi outputting to a 1980s Sony CRT monitor. Despite the software and hardware updates, the only concession to the underlying code was to tweak the run speed. In the original version, the screen was refreshed as fast as the computer would run. Today, the refresh rate had

Digital Archaeology section of the Barbican's Digital Revolution exhibition showing Noodlebox projected
Photo: ©Micha Theimer (2014)

to be throttled to reflect the processing power of the 16-bit DG Nova 2. Although only the random walk algorithms themselves are true to the 1977 version, witnesses testify that the resulting artwork is virtually identical to the original.

“Software shapes our lives. When historians look back at the digital revolution, they’ll use software to do it.”

Builder/Eater is a fitting metaphor for digital preservation. The battle between conservators and media obsolescence is ongoing, never to be fully resolved. It’s unrealistic to preserve the original hardware and software indefinitely. The aim has to be to sympathetically migrate the work to new platforms and technologies whilst respecting the artist’s intent. My personal preference is to

house a new hardware within the original cases, maintaining the user experience, but this is one of many solutions.

Respecting the artist’s intent is straightforward if they can be asked but what if they can’t? Nam June Paik playfully changed his works with each installation. Who’s to guess how he would present any of his work now? And the views of the artist can change. In the 1970s Paul, like many of his contemporaries, was hugely influenced by the auto-destructive art of Gustav Metzger and embraced the ephemerality of his work. As he has got older, his views have changed.

A constant cycle of migration can check media obsolescence but there’s more to conserving digital artwork than updating the hardware and software. Computer artists are essentially hackers, breaking the rules and pushing back boundaries is part of their DNA. Collaboration, subversion and making technology do things they were not



designed to do are common attributes of their work. All complicate the preservation process.

An issue for web-based work like Danny's is that any single artwork may exist in a multitude of forms. *Noodlebox*, for example, runs on multiple platforms – Mac and PC and a plethora of browsers. *Noodlebox* also rejects the traditional menu system, instead creating an interactive landscape of building blocks. Behind each building block is an interactive experiment but more importantly, each building block is moveable, the user can effectively design their own navigation system. Which combination represents an authentic experience?

Collaborative pieces also present a unique set of problems. Sometimes it's necessary to preserve multiple versions. For example, *The World's First Collaborative Sentence*, put online by Douglas Davis in 1994 stopped working in 2005. When it was 'fixed' in 2012, two versions were made. One recreates the sentence right up to the point where it stopped working, the second is a re-coded, live version of the sentence, which visitors can add to, just as they did with the original work.

Subverting third-party services complicates things again. Cory Arcangel's *Punk Rock 101* consists of a transcription of Kurt Cobain's suicide note with embedded Google Ads. When it came to Google's attention, they pulled the ads. The work only exists

today as a screenshot. Works like Chris Milk's *The Wilderness Downtown* and James Bridle's *Dronestagram* are equally vulnerable.

“This raises the question what is the digital work? Is it the source code or the compiled file? Is it a set of instructions? Is it the data, the logic or the presentation? Is it the first version, bugs and all, or is it a bug-fixed future release? Does it include auxiliary software like the operating system, firmware or software package it was created on?”

How artists address issues of continuity differ from case to case. Some, like Alexei Shulgin, embrace the temporary nature of technology. *Form Art*, subverts HTML, creating form out of function. It evolves as browsers evolve, demonstrating the unknown future of the Web. Others, like Olia Lialina, capture a moment in time. Although she tolerates her work *My Boyfriend Came Back From The War* being exhibited on contemporary hardware, she insists it is shown on a period browser and downloads at a speed equivalent to that of a 33k modem. Lynn Hershman is happy for *LORNA* to be shown on interactive DVD rather than laser disc but draws the line at a PC version. JODI request their site, www.jodi.org was simply shown as a slideshow of screenshots. Cory Arcangel's 2008 work *Photoshop CS: 110 by 72 inches, 300 DPI, RGB, square pixels, default gradient "Spectrum", mousedown y=1098 x=1749.9, mouse up y=0 x=4160* exists simply as a set of instructions.

Ruse Laboratories offer an alternative approach, paring the work down to the underlying algorithm. Their recent Algorithm Auction examined algorithms for their aesthetic merits as well as their functionality. They curated and sold seven



Metadata Implementation Strategies). Smaller exhibitions take a more hands on approach but are equally informative, the process existing as a use case for future migration exercises. Even if the object can't be preserved and is shown as screenshots or in print, the catalogue and surrounding conversations helps to preserve its cultural significance.

Migration is not just an issue for the art world. Artists and conservators also make a valuable contribution to wider digital preservation challenges. Industry, cultural institutions, government agencies and individuals across all aspects of life face the same problems. Multidisciplinary individuals, like digital artists, who have both the creative insight to retain the spirit of the work and the practical skills to manage technological change, are well placed to lead the conversation.

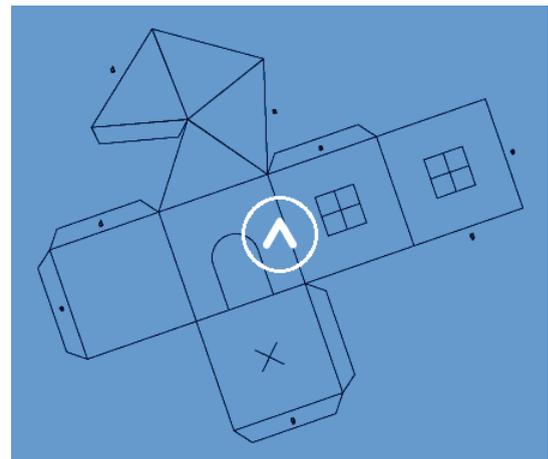
Software shapes our lives. When historians look back at the digital revolution, they'll use software to do it. If they can do so successfully, it will be at least partially thanks to artist-engineer-Jedis like Brown & Son.



of the most elegant algorithms ever created. Lots included Brian Kernigan's *Hello Word* (1978) and the *OkCupid Compatibility Calculation* (2003).

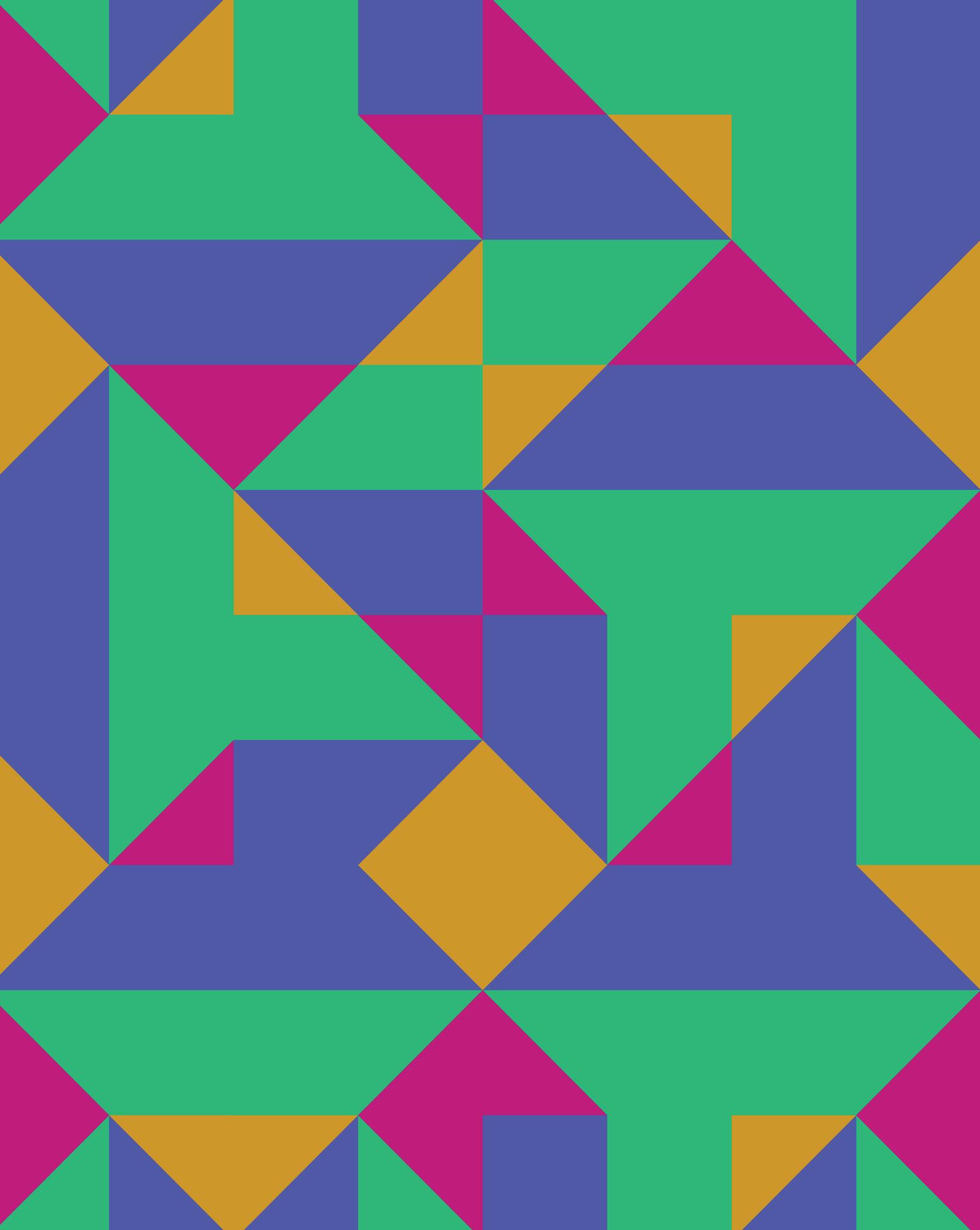
This raises the question what is the digital work? Is it the source code or the compiled file? Is it a set of instructions? Is it the data, the logic or the presentation? Is it the first version, bugs and all, or is it a bug-fixed future release? Does it include auxiliary software like the operating system, firmware or software package it was created on? What about the hardware? What about the input and output devices and other peripherals? Or is it purely the underlying mathematics?

By exhibiting their work, artists and curators are forced to answer these questions. When the work is acquired or borrowed by a major gallery, the curator is likely to use a recognised metadata framework such as PREMIS (PREservation



Top left: ICL 1900 Computer (detail), circa 1970
 Bottom left: The Aesthedes Workstation, circa 1983
 Above: Daniel Brown | *Noodlebox* | 1997-98, Size variable

Opposite: Paul Brown | *Builder/Eater* installed at *Digital Revolution* | 1977 (Recreated 2014)



“I look forward to a future where computational processes like the ones that I build will themselves make artworks without the need for human intervention. The creation of such processes is something that has always fascinated me.”

Paul Brown

Paul Brown
4^24
2005-6, Kinetic Painting. Size variable

Art That Makes Itself, Artists that Make Each Other

Maria Chatzichristodoulou (aka Maria X)

In 2014 Google launched DevArt as part of the influential show *Digital Revolution* at the Barbican, London. DevArt was, Google said, a new ‘movement’ of art ‘made with code, by developers that (...) use technology as the canvas and code as the raw materials to create innovative, engaging digital art installations’¹. Not surprisingly mailing list Netbehaviour, digital arts blog Furtherfield and Twitter, among other online fora saw a flurry of posts by artists, curators, theorists and historians criticizing ‘Google’s unsubtle rewrite of digital art history’, and discarding it as ‘badly researched’, ‘short-sighted’ and ‘a touch imperialistic’². A group of artists came together to ‘Hack the Artworld’ as a response to this event, creating a virtual counter-exhibition and sending an open letter to Google executives pointing out the historical trajectory of art made with code since the 1950s, by artists such as Frieder Nake, Lillian F. Schwartz and, soon after, Paul Brown, among several others.

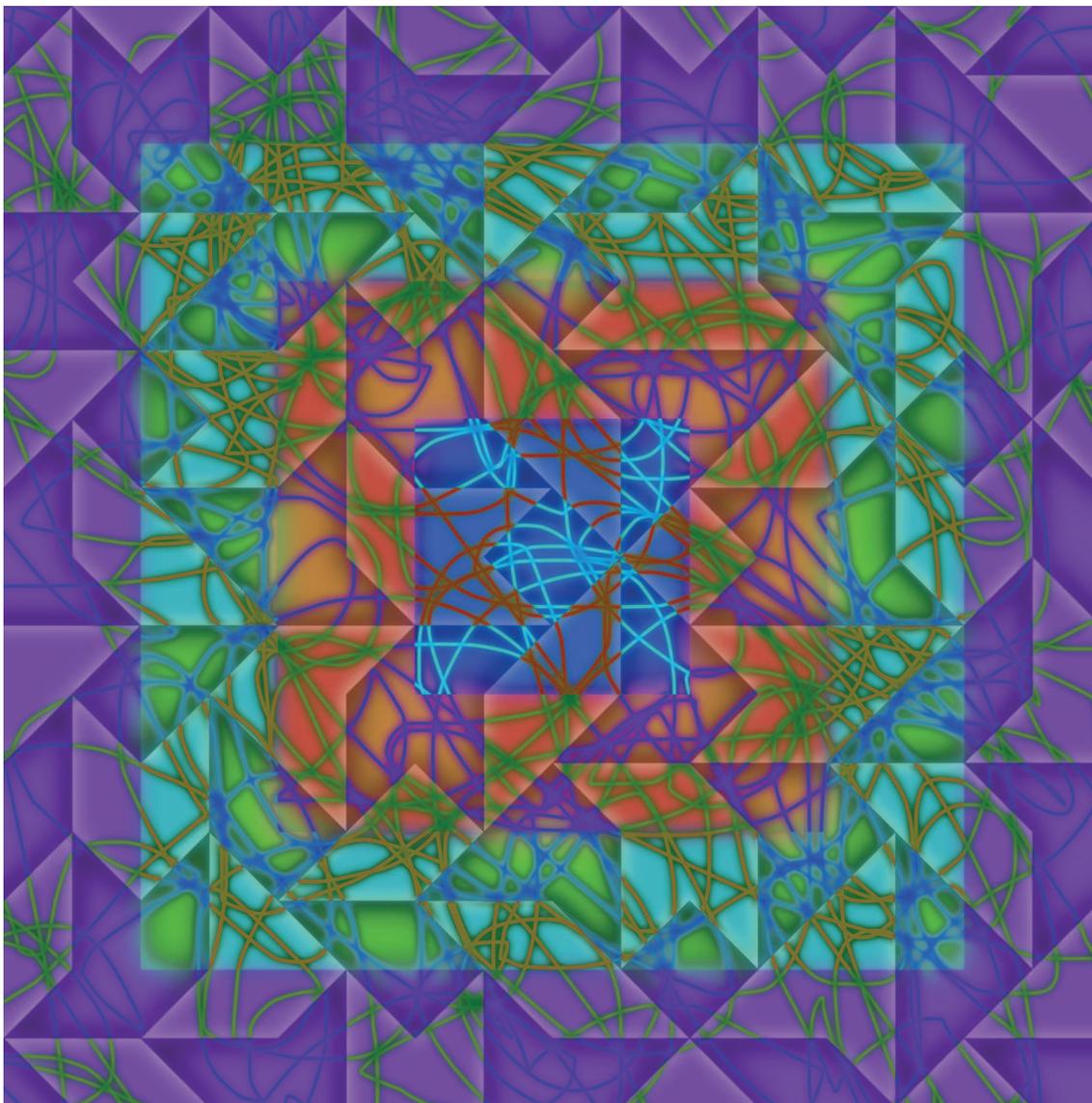
What is curious is that both Lillian F. Schwartz and Paul Brown, and indeed the younger Daniel Brown, were included in the *Digital Archeology* section of *Digital Revolutions*: Paul with his time-based piece *Builder/Eater* (1977) in which ‘two concurrent processes dynamically compete for possession of a digital image’³ imitating physical or biological processes; and Daniel with his iconic website *Noodlebox* (1997), which differed from other websites of its time due to the immersive, playful experience it offered users through a landscape of lego-like building blocks inspired by 1980s computer games. Indeed, art made with code is old enough to span two generations of ‘digital revolutionaries’, and to claim its first family-owned business in the name of Brown and Son. Family-owned enterprises used to primarily operate in traditional businesses such as manufacturing, trade and services. Not any more: Brown and Son present themselves as ‘*purveyors of digital images since 1968*’, and so they are.

Paul Brown is a pioneer of generative art who appeared in the UK art scene in the late 1960s generating ‘computer-assisted drawings’. To produce these Paul, a self-taught programmer, created a tile-based image-generating system influenced by art psychologist Anton Ehrenzweig’s study of art as the investigation of unconscious phenomena⁴. Paul’s aim was to ‘test’ his hypothesis by replacing the first of three stages of the creative process, which Ehrenzweig called ‘schizoid’ and identified with accidental elements that are recognizable but also unknown and incongruous, with ‘a system for positioning tiles according to a random number generator – a dice!’⁵. To put it crudely, Paul created work in which he replaced the human unconscious with an algorithmic dice mechanism.

Around the time that Paul created his first work in response to Ehrenzweig’s theories, psychologist George Cockcroft published his novel *The Dice Man*⁶ that recounts the story of Luke Rhinehart (the author’s pen name) who makes decisions about his life based on the roll of a dice. Cockcroft/Rhinehart and Paul Brown do not hold much in common: Rhinehart’s dice-based decision-making process, which removed personal responsibility to rely on chance, led him to sex, rape and murder; indeed, the novel was banned in many countries. Luckily, Paul did not get as carried away through his reliance on computer-generated randomness. Nevertheless, his decision to pass on a degree of authorial responsibility and aesthetic choice to algorithmic processes that produced results beyond his control, coupled with the fact that machines ‘assisted’ with the production of the actual works, led to repeated accusations of generating work that is ‘cold and clinical’ (Brown, 1996).

Another curious phenomenon, as the deployment of randomness as part of the creative process was neither new as an idea, nor dependent on

Paul Brown | A-Hunting of the Quark | 2006, Giclée Print, 50 x 50 cm



computation as a process. Musical ‘dice games’ (musikalisches würfenspiel), a system of using dice to randomly generate music from pre-composed options, were popular in Western Europe in the 18th Century, the most well-known being attributed to Mozart (1792). Furthermore, Surrealists who, like Paul, were influenced by psychoanalytic theories, engaged in automatic drawing and writing games such as *Exquisite Corpse* (around 1925); while Conceptual artist Sol LeWitt talked of the idea as ‘a machine that makes the art,’⁷ in reference

to his instruction-based geometric artworks that were often executed by several people other than the artist. Though Brown himself points out that he ‘soon became dissatisfied with the simple equation of randomness with intuition’⁸, he was, and still is, fascinated and deeply influenced by dynamic models of cellular automata. Of major importance was the *Game of Life*, a ‘zero-player game’ (meaning a game whose evolution is predetermined by its initial state), devised by mathematician John Conway (1970).

Daniel Brown, a self-taught digital artist/designer who has become one of the most celebrated digital designers in Britain, picked up and furthered his father's engagement with the 'cold' processes of computer-generated art, creating awe-inspiring, beautiful and emotive works such as his series of animated flowers entitled *On Growth and Form* (ongoing). Inspired by the legacy of mathematician and biologist D'Arcy Thompson, Daniel's flowers grow according to computer algorithms, their shape and texture derived from a range of physical materials or objects. As they grow in generative patterns the flowers create unique blooms (Daniel combines two different generative formulae to ensure that no bloom is ever the same with another). Though Paul's clean and pristine geometric artworks are obviously based on mathematical principles, Daniel's flowers appear organic and natural, reminding us that natural forms also abide by mathematical principles. In Daniel's generative work the conceptual 'coolness' of the computer-generated process is no longer visible in the outcome, which evolves like a breathing, living, three-dimensional organism – though a digital one whose habitus is the screen.

Paul Brown and Daniel Brown are both innovative digital artists. Each has produced work that has challenged preconceptions in the art world and in art education establishments, pushed disciplinary boundaries, experimented with different approaches, appropriated computational methods for the production of aesthetic and emotive outcomes, questioned the boundaries between pure and applied art moving between fine art, design and entertainment, and forged paths for creative experimentation with new materials, processes and methods. Their work is distinct; in the first instance it would be difficult to consider that Daniel's *On Growth and Form* series has much in common with Paul's kinetic paintings such as *Studies in Perception* (2006), or *Dragon* (2012), for example. Now look at them closer: Paul's work is two-dimensional, based on clean geometric patterns and solid colours; Daniel's work is three-dimensional, using natural forms, textures and shades. Nevertheless, both works live on the screen, gently moving, growing,

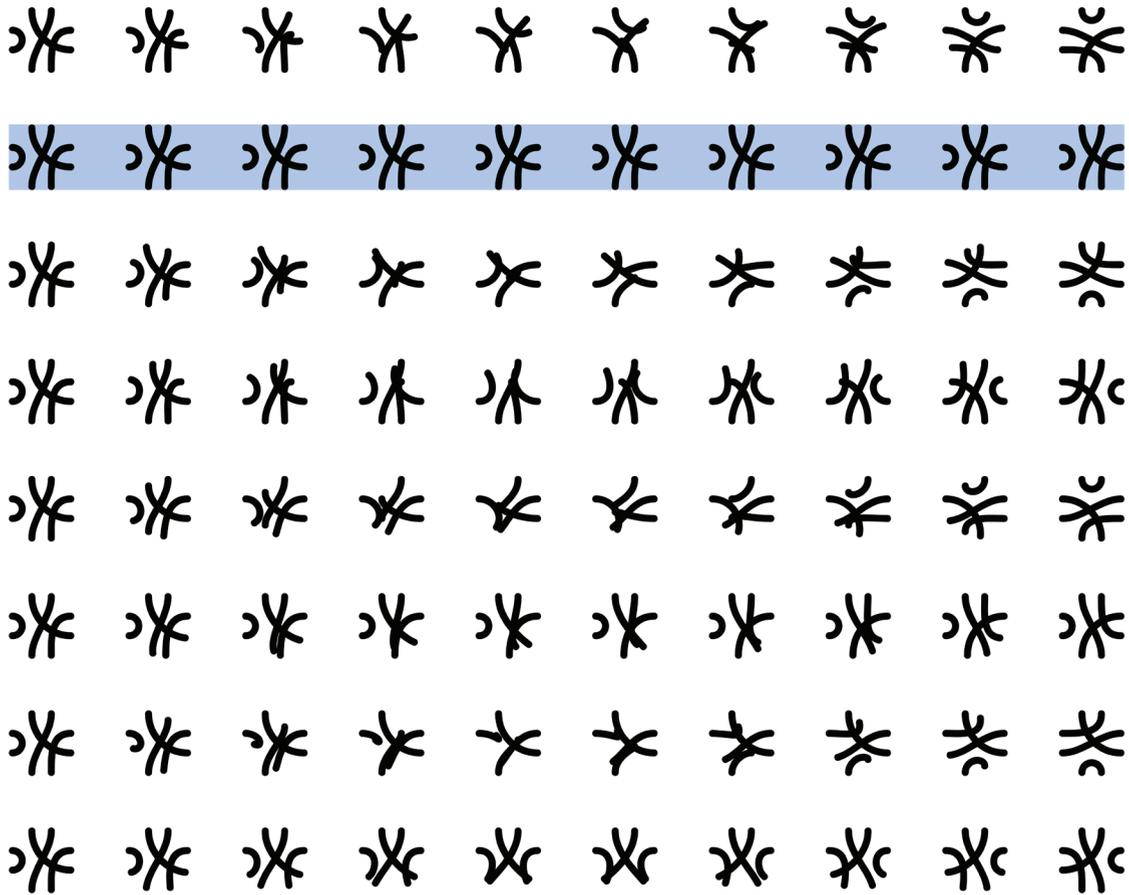
evolving, and mutating from one form to another. Both works are preoccupied with form and colour and the rules that make them, working with mathematical equations, algorithms and code. Both works are time-based. Both works remove a degree of agency from the artist and pass it on to the machine, creating meta-artworks that make themselves. Both works evolve on the basis of controlled randomness, as the computer operates autonomously within parameters set by the artists. Both works are unique and, when seen together, familial, in the same way that family members might be between them. Paul and Daniel are family; the influences between father and son are palpable in their practice, and can be seen to traverse both directions. They belong, of course, in other, much bigger familial communities: those of inquisitive artists who have experimented with ideas, methods, and forms, challenging the norms and opening up new possibilities; those of inquisitive scientists who have imagined, pushed and challenged the limits of technology; and those of digital artists who have used code as their medium to create innovative and engaging experiences.

At a time when cultural institutions, corporations and governmental organizations jump on the bandwagon of digital innovation, often making unfounded claims about their achievements, it is important to be reminded that digital art is now officially in the hands of its second generation of makers. As a 'middle-aged' practice it is rooted in well documented, if often ignored, art historical lineages. Art might make itself, but artists make each other.

1 DevArt (2014) *What is DevArt?*. Available online: <https://devart.withgoogle.com/#/about> (accessed 9 April 2015).

2 Pearson, Matt (2014) comment on *Hack the Art World* website. Available online: <http://hacktheartworld.com/discuss.html> (accessed 9 April 2015).

3 Brown, P. (2008) *From Systems Art to Artificial Life: Early Generative Art in the Slade School of Fine Art* in Gere, C., P. Brown, N. Lambert and C. Mason (eds.) (2008) *White Heat and Cold Logic: British Computer Arts 1960-1980. An Historical and*



Paul Brown
Book of Transformations. Page 2
2000, Giclée Print, 50 x 40 cm

Critical Analysis. Cambridge, MA and London: MIT Press, 275-290. See page 281.

4 Ehrenzweig, A. (1967) *The Hidden Order of Art: A Study in the Psychology of Artistic Imagination*. California: University of California Press.

5 Brown, P. (2000) *Stepping Stones in the Mist*. Available online: <http://www.paul-brown.com/WORDS/STEPPING.HTM> (accessed 9 April 2015).

6 Rhinehart, Luke (1999) *The Dice Man*. London: HarperCollins. First published in Great Britain by Talmy, Franklin, 1971.

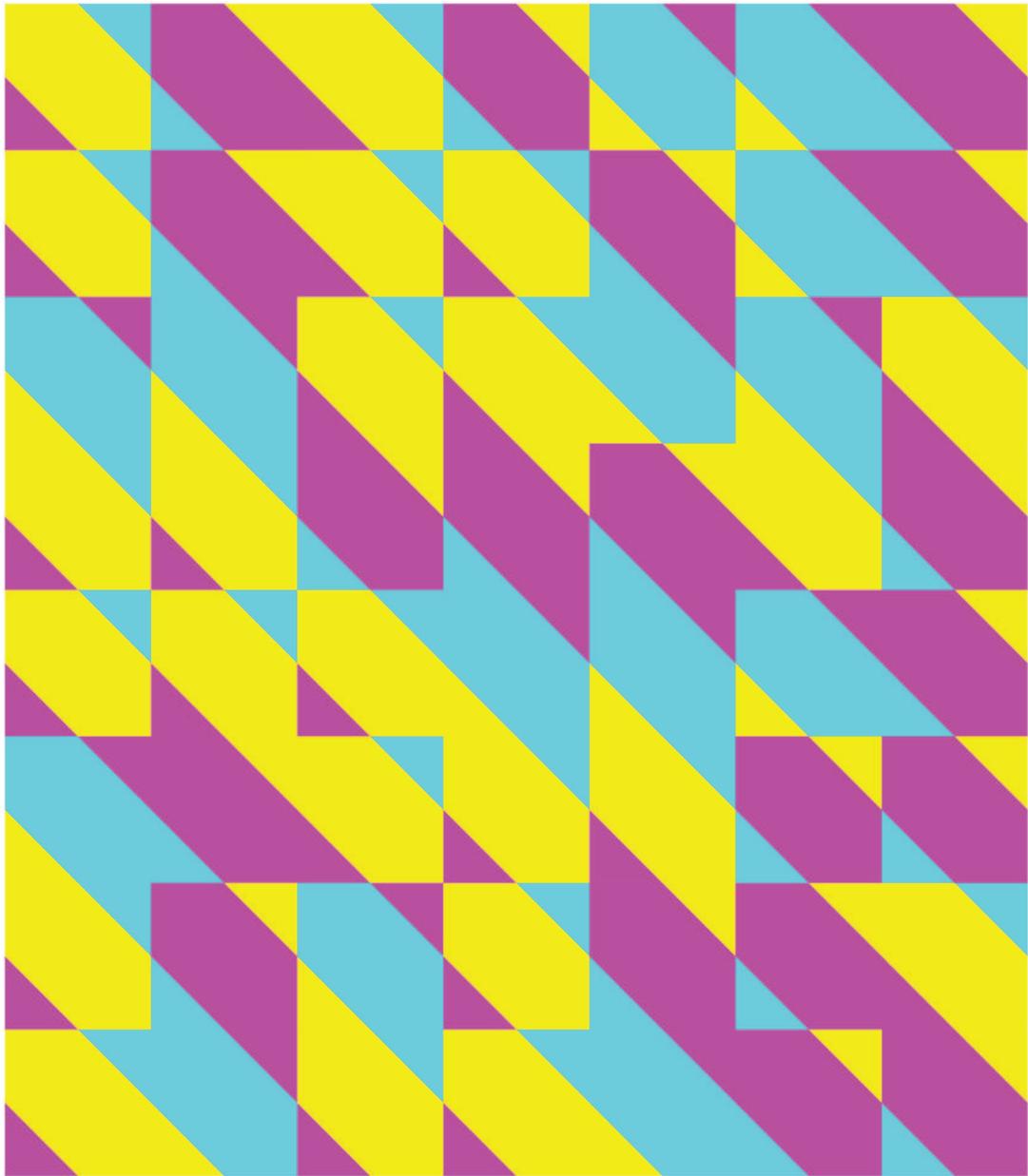
7 LeWitt, S. (1967), *Paragraphs on Conceptual Art*, *Artforum*, 5(10): 79-83.

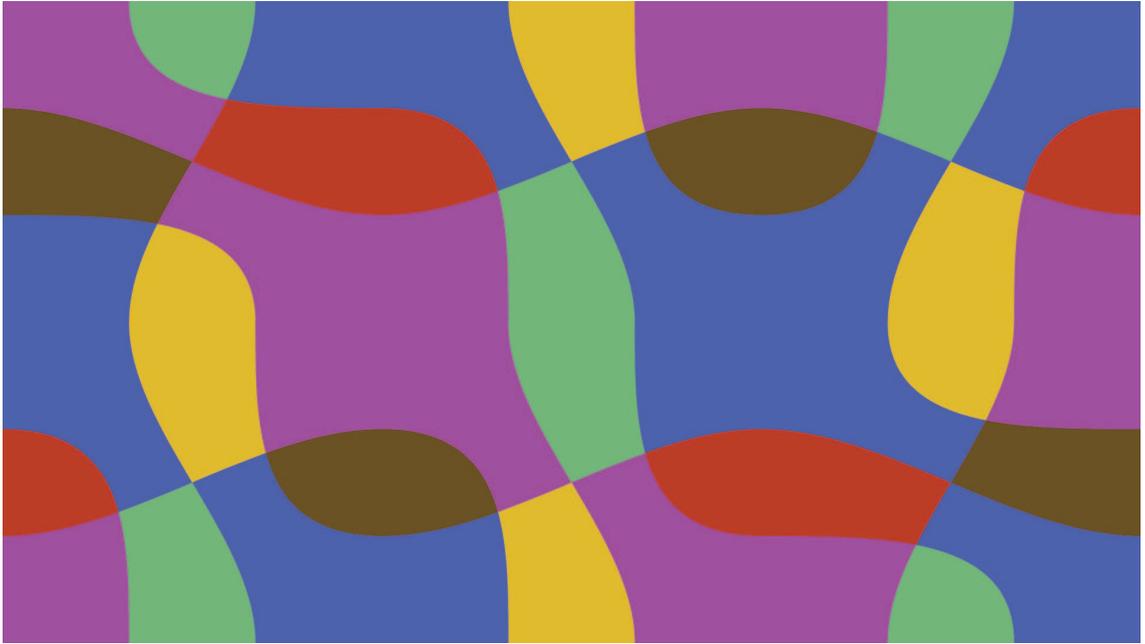
8 Brown, P. (1996) *An Emergent Paradigm*. Available online: <http://digitalartmuseum.org/essays/brown01.html> (accessed 9 April 2015).





Daniel Brown | Commission for The Four Seasons Dubai | 2014, Giclée Print, Size Variable





Above: Paul Brown | *Dragon*
2012, Kinetic Painting, Size variable



Left: Paul Brown | *Untitled Gouache*
1974 (reconstructed 2014), Giclée Print, 45 x 60 cm





Daniel Brown
D'Arcy Wentworth Thompson Zoology Museum Commission
2013-14, 120x120cm

Contributors

Daniel Brown is co-founder of Brown & Son, a designer, programmer and artist, specializing in the fields of Creative Digital Technology and Interactive Design and Art. With a background in programming and interactive, generative and user experience design, he is acknowledged as a new media pioneer with works archived in SF Moma and the Victoria and Albert Museum London and included in the internationally touring *Digital Revolution* exhibition. He became London Design Museum's Designer of the Year in 2004 and was selected by *Creative Review* as one of the Stars of the New Millennium. He is an honorary member of the International Academy of Digital Arts and Sciences (IADAS). Daniel designed this publication.

Paul Brown is co-founder of Brown & Son and has an international exhibition record dating to the late 1960s that includes the creation of both permanent and temporary public artworks. He has participated in shows at major international venues like the TATE, Victoria & Albert and ICA in the UK, the Adelaide Festival, ARCO in Spain, the Substation in Singapore and the Venice Biennale and his work is represented in public, corporate and private collections in Australia, Asia, Europe, Russia and the USA as well as in the Victoria and Albert Museum. His work *Builder/Eater* is part of the internationally touring *Digital Revolution* show and he is also in *Primary Codes*, a group show in Rio de Janeiro from June 2015. Since 2005 he has been an honorary visiting professor of art and technology in the Dept. of Informatics, School of Engineering and Informatics, University of Sussex.

Jim Boulton was introduced to Daniel Brown's *Noodlebox* by Andy Cameron when he enrolled on a Masters Degree at the Hypermedia Research Centre in the mid 1990s. Inspired, he co-founded Large, a web design agency building critically acclaimed sites for Agent Provocateur, Bang & Olufsen etc. After visiting *Game On* an exhibition of historic video games in 2001, Jim saw the need

for something similar for the web. In 2010, he organised *Page Not Found*, an exhibition of Web 1.0 websites. He has been looking backwards ever since. Jim is the author of *100 Ideas that Changed the Web* and curator of *Digital Archaeology*, a showcase of computer art, video games, CGI and websites, now on international tour as part of The Barbican's *Digital Revolution* exhibition.

Maria Chatzichristodoulou (aka Maria X) is a performance and new media practitioner. She has been a lecturer at University of Hull since 2009 and formerly taught at Birkbeck, Goldsmiths and Queen Mary, University of London (2005-9). She has also worked as community participation officer at The Albany (2003-5), and co-founded/directed the international art and technology festival *Medi@terra* in Athens, Greece (1997-2002). She is co-editor of the volumes *Interfaces of Performance* (Ashgate, 2009) and *Intimacy Across Visceral and Digital Performance* (Palgrave Macmillan, 2012). She is working on the edited collection *Live Art in the UK* (Bloomsbury, forthcoming 2016) and a monograph on *Live Art in Network Cultures*.

Douglas Dodds is Senior Curator in the Victoria and Albert Museum's Word & Image Department, which holds the V&A's digital art collections. Douglas was Co-Investigator in the Computer Art and Technocultures project, funded by the Arts and Humanities Research Council from 2008 to 2010. He has curated various V&A exhibitions, including *The Book and Beyond* (1995), *Digital Pioneers* (2009-10) and *Barbara Nessim: An Artful Life* (2013). An expanded version of the Nessim show opened at the Bard Graduate Center, New York, in 2014. Douglas is also responsible for a project to digitise the V&A's prints, drawings, paintings and photograph collections.

Bronač Ferran is a curator, editor and writer. Recent catalogue essays include texts on the early work of artists Liliane Lijn and Gustav Metzger and *Mind Over Media* in *Time & Motion: Rethinking Working Life* (Liverpool University Press, 2013). In 2015, she curated *Graphic Constellations: Visual Poetry & the Properties of Space* at the Ruskin Gallery in Cambridge and *a token of concrete affection*, an archival show, drawn from the collection of Stephen Bann which was shown initially at the Centre of Latin American Studies in Cambridge and which will transfer to the Brazilian Embassy in London in November 2015. She co-curated the *Art That Makes Itself* exhibition and edited this book.

Peter Fowler spent forty years in Education, teaching at every level from infants to post grad. At Liverpool John Moores (JMU) he was Professor of Learning Technology and ran the Learning Methods Unit, a pioneering developer of early digital teaching materials. The Unit won major international awards for its work (at EMMA, COMDEX, BAFTA) and led to the first MA course in Multimedia Production (JMU, 1994). Peter is retired and spending his time writing and helping bringing up grandchildren.

Golan Levin is Associate Professor of Computation Arts at Carnegie Mellon University, where he also holds Courtesy Appointments in the School of Computer Science, the School of Design, and the Entertainment Technology Centre. A two-time TED speaker and recipient of undergraduate and graduate degrees from the MIT Media Laboratory, Levin was named one of “50 Designers Shaping the Future” by *Fast Company* magazine in October 2012. Levin’s research explores new intersections of machine code and visual culture, combining equal measures of the whimsical, the provocative, and the sublime. His artwork is shown widely internationally and spans themes such as gestural robotics; the tactical potential of personal

digital fabrication; novel aesthetics of non-verbal interactivity; and information visualization as a mode of arts practice.

Irini Papadimitriou is Head of New Media Arts Development at Watermans, where she curates the exhibition programme. She is also Digital Programmes Manager at the V&A, responsible for programmes such as the *Digital Design Weekend*: an annual event exploring intersections of art, design and technology with an interest in contemporary issues and is one of the organisers for London’s Elephant & Castle *Mini Maker Faire*. She is part of the *Bodies of Planned Obsolescence*, an AHRC funded international research project engaging with the political, sociological and ecological issues of electronic waste. She co-curated the *Art That Makes Itself* exhibition for Brown & Son.

Grant D. Taylor is an art historian who specializes in digital art. His latest book, *When the Machine Made Art* (Bloomsbury, 2014), charts the complex history of computer-generated art. Taylor also curated the recent travelling exhibition *The American Algorists: Linear Sublime*, the first large-scale exhibition of the Algorists in the United States. Taylor has taught and created art projects, including a documentary film and multimedia installations, in the United States and Australia. He currently holds the position of Associate Editor at *Media-N Journal* and is associate professor of art history at Lebanon Valley College, Pennsylvania.

Acknowledgements

We would like to take this opportunity of recording our gratitude to the following allies in the game of life without whom the *Art That Makes Itself* exhibition and publication would not have been possible.

We are especially grateful to Jim Boulton, Maria Chatzichristodoulou (aka Maria X), Douglas Dodds, Peter Fowler, Golan Levin and Grant D. Taylor who have gone to endless trouble to create compelling new essays for our book.

Our sincere thanks go also to Irini Papadimitrou and all at Watermans for their consistent care and investment in both the *Art That Makes Itself* exhibition and publication.

We have reproduced several photographs taken at the *Art That Makes Itself* Private View by Oliver King and warmly thank him for his permission.

The printing of this book has been made possible by the generous support of the Centre for Computational Neuroscience and Robotics and the School of Engineering and Informatics at the University of Sussex.

Our thanks also go to the Graphics Department at Furness Plastics for their fine work on prints and wallboards for the exhibition.

We thank the Victoria and Albert Museum and D'Arcy Wentworth Thompson Zoology Museum in Dundee for their loan of works to the exhibition.

We would also like to thank:

Aoife Cantrill; Apple Inc; Chrissie Malvern Brown; Sue Gollifer, who planted the original Brown & Son seed; Phil Husbands; Nick Knight; Wendy Mills; Paul Musgrave; Diane Mynors; onedotzero; Jon Pratty; Joan Sherriff; Lloyd Thomas and Charlotte Wheeler.

A large debt of gratitude is owed to our funding partners:

Digital agency Amaze

Arts Council England

Computer Arts Society/British Computer Society

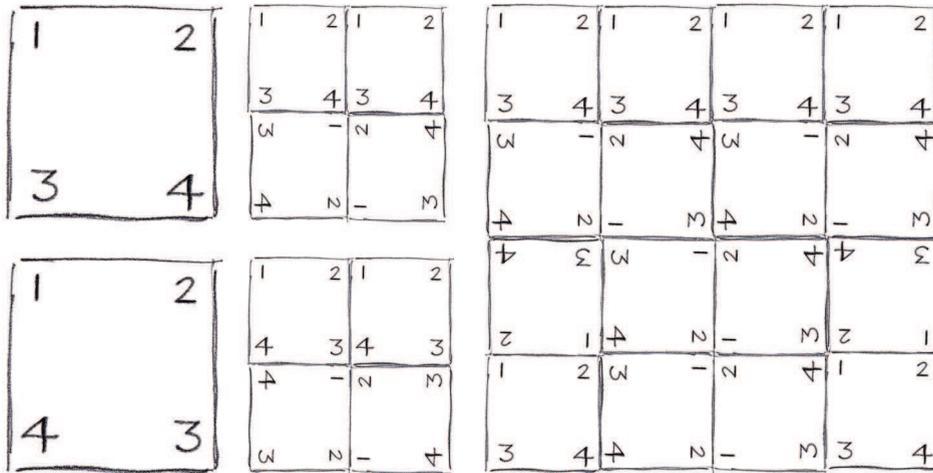
London Borough of Hounslow

The School of Engineering and Informatics at the University of Sussex

Watermans

Copyright statement. July 2015. All texts within this book are the sole property of the individual authors and cannot be reproduced without permission. If using for citation purposes please credit the relevant author and the book's full title and editor. Design rights belong to Daniel Brown. Requests for reproduction should be made directly to Brown & Son or to the book's editor.

 <p>Supported using public funding by ARTS COUNCIL ENGLAND</p>	 <p>Supported using public funding by ARTS COUNCIL ENGLAND</p>
 <p>London Borough of Hounslow</p>	
	
<p>Supported by:</p>  <p>University of Sussex Engineering & Informatics</p>	



“While differences are clearly visible between the art of Paul and Daniel Brown, each approach centres on the same quest, a unique type of shared artistic vision in which an autonomous and self-making art is made real.”

Grant D. Taylor