

Para Emma y Simon

fig. 2, Fifty Sisters, Jon McCormack, 2012

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From the 15<sup>th</sup> of June to the 29<sup>th</sup> of September, 2019

#### **FOREWORD**



**BOLDEVA** 

Cornwall, UK

Are we as a society, placing enough value in creative and critical thinking? Are we doing enough to nurture and celebrate these skills?

In this age of automation, we have a responsibility to cherish creative intelligence. I believe creating solutions to environmental challenges and promoting social sustainability is critical to future society.

As Senior Art Curator for the Eden Project Trust, I get to work with some of the most inspiring people in the world, from artists to academics to local communities. Together, we are on a mission to make Eden a hub for world-class contemporary art in Mid-Cornwall, and across our international sites.

Eden is a sanctuary of hope, bringing topics of social and environmental importance to life through art; be that horticulture or architecture, craft or contemporary arts. We think that this culture of holistic, joined-up thinking is essential to ignite logical as well as emotional intelligence.

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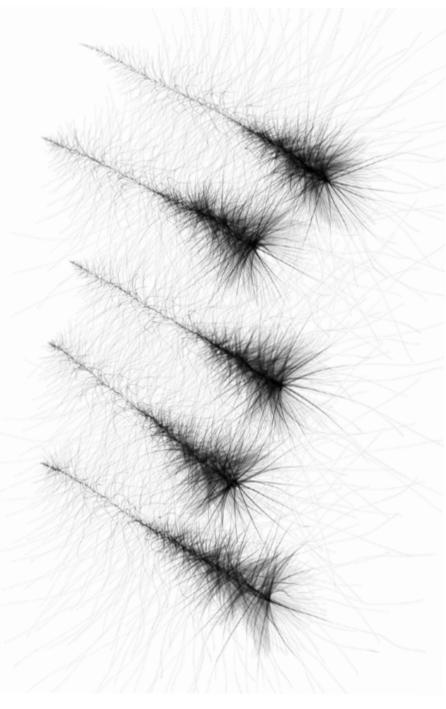


fig. 3, LIA, Tentashao still, digital interactive, 2016

So as part of our arts strategy, we are looking to create opportunities for artists, scientists and academics to collaborate and engage with topics of social and environmental importance.

Climate change and biodiversity decline are the biggest challenges facing the world today, and the data can sometimes leave us feeling disempowered and disengaged.

Art has the power to challenge received wisdom, to provoke, captivate and inspire. It reconnects us to our senses, bodies, minds, each other and to the world around us.

Through compelling artistic programming, Eden is in a unique position to spur our imaginations, spark thought, enthuse engagement and motivate action.

Working with Blanca Pérez Ferrer, LIA, David Bowen, Ian Gouldstone, Jon McCormack and Anna Ridler on this exhibition was an absolute pleasure - an opportunity to engage in a new dialogue around the role of technology in the artists' practice. Through our creative ingenuity, humanity has conquered space, split the atom and made technological innovations that, at first glance, seem more like science fiction than science.

This exhibition champions how innovation can be harnessed artistically, a new form of craft, reconnecting technology with empathy to help inspire a sustainable future for all.

> Misha Curson Senior Art Curator Eden Project

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# ARTIFICIAL CREATORS INSPIRED BY NATURE EXPLORING QUESTIONS ABOUT CREATIVITY AND ARTIFICIAL INTELLIGENCE (AI)

# WHAT ARE THE ROLES OF ARTIFICIAL INTELLIGENCE AND TECHNOLOGY IN SHAPING CREATIVITY?

In recent years, we have witnessed an explosion of interest in Artificial Intelligence (AI) techniques applied to creativity. This exhibition seeks to take the conversation beyond the focus on AI and technology replacing humans and superimposes another layer: to observe how artificial intelligence and human creativity interact and evolve the artistic context. Nature has been a powerful source of artistic inspiration for centuries and still is today – will machines take their inspiration from nature or provide their own background and inspiration for future creations?

The exhibition brings together the creations of six artists inspired by nature that have been co-produced by Al. Their work questions how we interact with machines to establish new forms of relationship beyond the utilitarian and explores innovative ways of expression that produce new ways of seeing.

The artists' approaches vary considerably; for some the software is a mere tool, for others a co-creator with full rights. The works address notions such as intentionality of machines, and we will see examples of cutting-edge techniques such as deep learning applied to creation, robotics and generative approaches. Generative art allows constant creation thanks to the action of algorithms established by the artist – a kind of creation by proxy or co-creation. The exhibition has a strong component of live creation and the public will witness the evolution of

pieces in permanent development.

The scenography plays with the contrasts: luminous, chromatic and formal. The exhibition comprises very different spaces; one is full of light, in which the works have a neat organicity inspired by plants, maintaining high chromatic sobriety. Another contains an enigmatic sprayed painted wooden cube inside which we can see a dark space punctuated by animated colourful geometric shapes. The whole exhibition aims to provide a recreational tour adapted to all, where each visitor will find reasons to imagine a future alonside the machines in an informed and positive way.

Wanton Boys and Tele-present Wind are technically inspiring; both Ian Gouldstone and David Bowen use technology in a truly impressive way.

Gouldstone's projection of dozens of animated characters controlled by generative algorithms is both technically outstanding and artistically accomplished, as the algorithms imbue the characters with emergent anthropomorphic properties. We experience artificial life and its limits and constraints. This artwork also talks about how we reflect on things, what we manage to feel about objects when projecting feelings and human behaviours onto things.

Bowen's transatlantic transfer of live sensor data has to overcome many technical challenges to bring a feeling of the Minnesota countryside to Cornwall. His work is a delicate and personal hybridization between technology and nature. He creates pieces of entangled beauty from heterogeneous sources, often mixing natural elements like sticks and flowers with a technological counterpart like in a mirror game or a reflection. Tele-present wind uses data sets and robotics to lease different parts of the world and to connect the inside of the gallery with the exterior world.

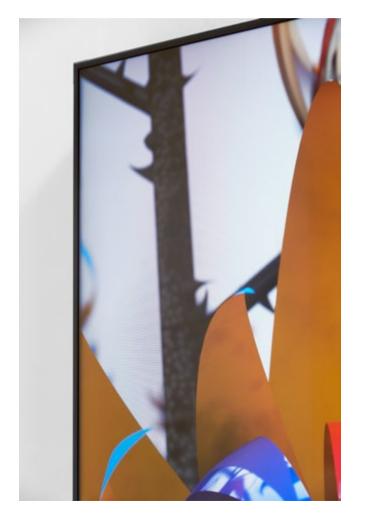


fig. 4, Exhibition space, Fifty Sisters, Jon McCormack, 2012

Bloemenveiling from Anna Ridler is technically a very complex piece and has involved building a mobile app, web page, Al-bots using blockchain technologies and generative machine learning algorithms to produce artworks. To generate the tulip videos, Ridler and Pfau use deep learning via Generative Adversarial Networks (GANs), wherein two neural networks are developed simultaneously: the first generates pictures of imagined tulips based on real images, and the second tries to tell if an image is real or imagined. The two networks compete against each other to become highly accurate in their respective jobs. This form of machine learning has existed for about five years, but has only recently been used in meaningful artistic ways.

Jon McCormack was awarded the Lumen Price for his Fifty Sisters series. These mesmerising images are built with incredible attention to detail. The generated images recreate plants that never existed outside the computer, following natural patterns to reproduce the living world. The sharp images and bold colours are like a magnet capturing the audience gaze and inviting them into the exhibition space.

LIA's elegant algorithmically generated creations add an interactive dimension to the exhibition. She builds her artworks like in a conversation with the software. Organic living forms appear on the screen as visitors touch it. The artist took inspiration from calligraphy to inform the drawing movement.

Technically speaking, all the artworks presented in the exhibition are outstanding. Artistically meaningful, each artist depicts a new possible relation between nature and the artificial world. We hope visitors to the exhibition will appreciate not only the technical skill, but the artistic value of each piece, enjoying the dialogues each artwork establishes with the gallery space, the surrounding art installations and the Eden Project.

Blanca Pérez Ferrer June 2019

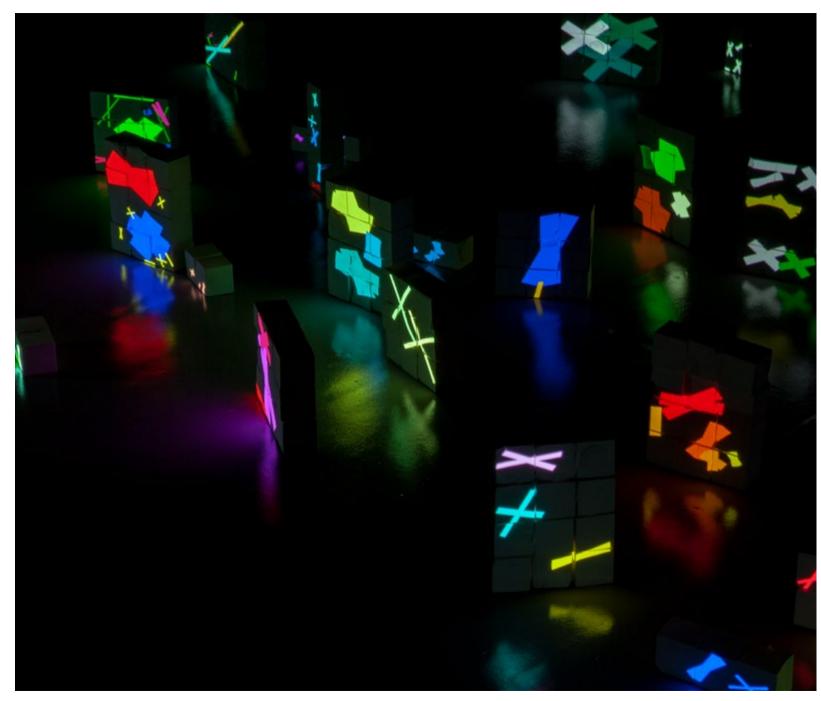


fig. 4, Wanton Boys, Software sculpture, Ian Gouldstone, 2017

THE

# **EXHIBITION**

GUEST ARTISTS

David Bowen

Ian Gouldstone

\*
LIA

Jon McCormack

Anna Ridler and David Pfau

# DAVID BOVVEN

#### Tele-present wind

fig. 6, Sculpture, 2017



# IAN GOULDSTONE

#### Wanton Boys

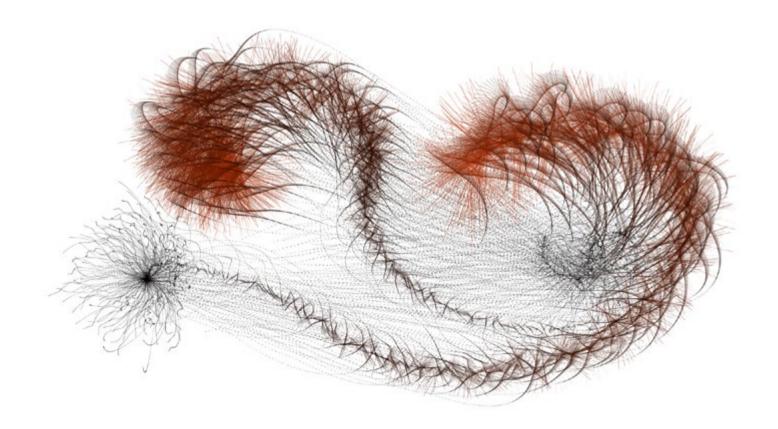
fig. 7, Software sculpture, Plaster, Projectors, Raspberry Pis, Custom Software, 2017



LIA

#### Interactive Installation

fig. 8, Tentashao, still image, 2016



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# JON McCORMACK

Fifty Sisters

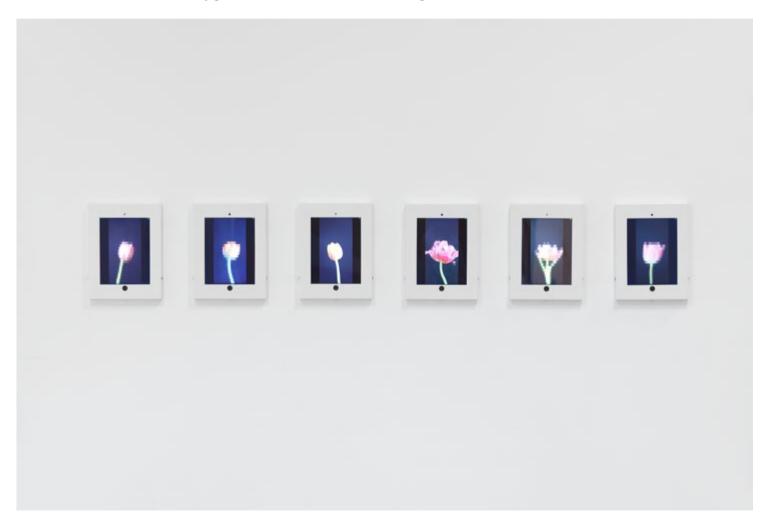
fig. 9, 4K Video, 2013



# ANNA RIDLER AND DAVID PFAU

#### Bloemenveiling (flower-auction)

fig. 10, Website; smart contracts; GAN generated video; AI bots, 2019



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GUEST

# **ARTISTS**

# ARTIFICIAL CREATORS fig. 10, Tele-Present wind, David Bowen, 2018

# DAVID BOVVEN

David Bowen is an award-winning studio artist and educator whose work has been featured in numerous group and solo exhibitions nationally and internationally. Bowen's work is concerned with aesthetics that result from interactive, reactive and generative processes as they relate to intersections between natural and mechanical systems. He is currently an Associate Professor of Sculpture and Physical Computing at the University of Minnesota.

David Bowen's work has been exhibited across the world at leading galleries, including the ZKM Center for Art and Media, (Karlsruhe, Germany), Le CENTQUATRE-PARIS (Paris, France), la Fundación Telefónica, (Madrid, Spain), the Hanshan Art Museum (Suzhou, China), Prix Ars Electronica (Linz, Austria) and, The National Art Center (Tokyo, Japan).

# BIO



#### **TELE-PRESENT WIND**



fig. 11, Tele-Present wind, David Bowen, installation at the Eden Project, 2019



fig. 12, Tele-Present wind, David Bowen, installation at the Eden Project, 2019

#### TELE-PRESENT WIND, 2018

126 x/y tilting devices, dried plant stalks, accelerometer installed outdoors

This installation consists of a series of 126 x/y tilting mechanical devices connected to thin dried plant stalks and a dried plant stalk connected to an accelerometer installed outdoors. When the wind blows it causes the stalk outside to sway. The accelerometer detects this movement, transmitting the motion to the devices in the gallery. Therefore the stalks in the gallery space move in real time and in unison based on the movement of the wind outside.

The accelerometer is installed in an outdoor location adjacent to the Visualization and Digital Imaging Lab at the University of Minnesota. Thus, the individual components of the installation here at Eden move in unison as they mimic the direction and intensity of the wind halfway around the world. As it monitors and collects real-time data from this remote and distant location, the system relays a physical representation of the dynamic and fluid environmental conditions.



fig. 13, Tele-Present wind, installation, David Bowen, 2018



fig. 14, Tele-Present wind, David Bowen, installation at the Eden Project, 2019



fig. 15, 5twigs, David Bowen, 2017

#### **5twigs, 2017**

Found twigs, 3D printed twigs

Found twigs, 3D printed twigs. This installation consists of five found twigs that were three-dimensionally scanned and then printed in translucent plastic. Each original twig was then mounted in opposition to its artificial counterpart.

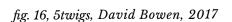






fig. 17, 5twigs, David Bowen, 2017



fig. 18, 5twigs, David Bowen, 2017



fig. 19, 5twigs, David Bowen, installation at the Eden Project, 2019



fig. 20, Tele-Present wind, outdoor accelerometer, David Bowen, 2018



# IAN GOULDSTONE

RIO



Ian Gouldstone is a BAFTA-winning artist and filmmaker whose work incorporates games, animation and new media. He has shown work and held events internationally at venues including the Institute of Contemporary Art, London, The Australian Centre for the Moving Image, Ars Electronica Linz, The National Videogame Arcade, Nottingham, The Jozef Stefan Institute, Ljubljana, and in 2018 had his debut American solo show at SLEEPCENTER, New York.

lan is a founder of the Australian games collective Pachinko Pictures (2010-2013), a former member of the Computational Creativity Group at Goldsmiths (2013-2015) and also the Gesture and Narrative Language Group at the MIT Media Lab (1999-2003). He graduated from Harvard University (2001) with a degree in mathematics before studying animation at the Royal College of Art (2005), and has recently completed his MFA in Fine Art at Goldsmiths (2017). Based in Southeast London, lan Gouldstone is also a trustee of Deptford X, London's longest-running contemporary art festival.



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fig. 21, Wanton Boys, Ian Gouldstone, installation at the Eden Project, 2019

#### **WANTON BOYS**

Wanton Boys, 2017 Software sculpture Plaster, Projectors, Raspberry Pis, Custom Software

Wanton Boys is an ongoing series of digital installations about containers and the contained. Custom-made videogame and projection mapping software create an illusion that virtual creatures are not only living but also bound within physical structures. Wanton Boys is not pre-recorded. It is a unique live performance.

#### Response by David Surman

Our gaze imbues the material world with life. We instinctively discover different faces in the undulations of woodgrain or wallpaper. It can leave us wondering, 'did I really see that?' as if the senses brushed something of great importance and reluctantly let it go.

Our unruly perception is now corralled into numerous frames that contain and train us in the patterns of mediated experience and expectation. Our attention is now greatly managed by numerous digital devices, processes and spaces. Technologies free us to express our individualism to the group, offering a new common space in exchange for our dedication to a platform. Our subjectivity is repositioned, our perception changed.

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As flies to wanton boys are we to th' gods, They kill us for their sport.

99

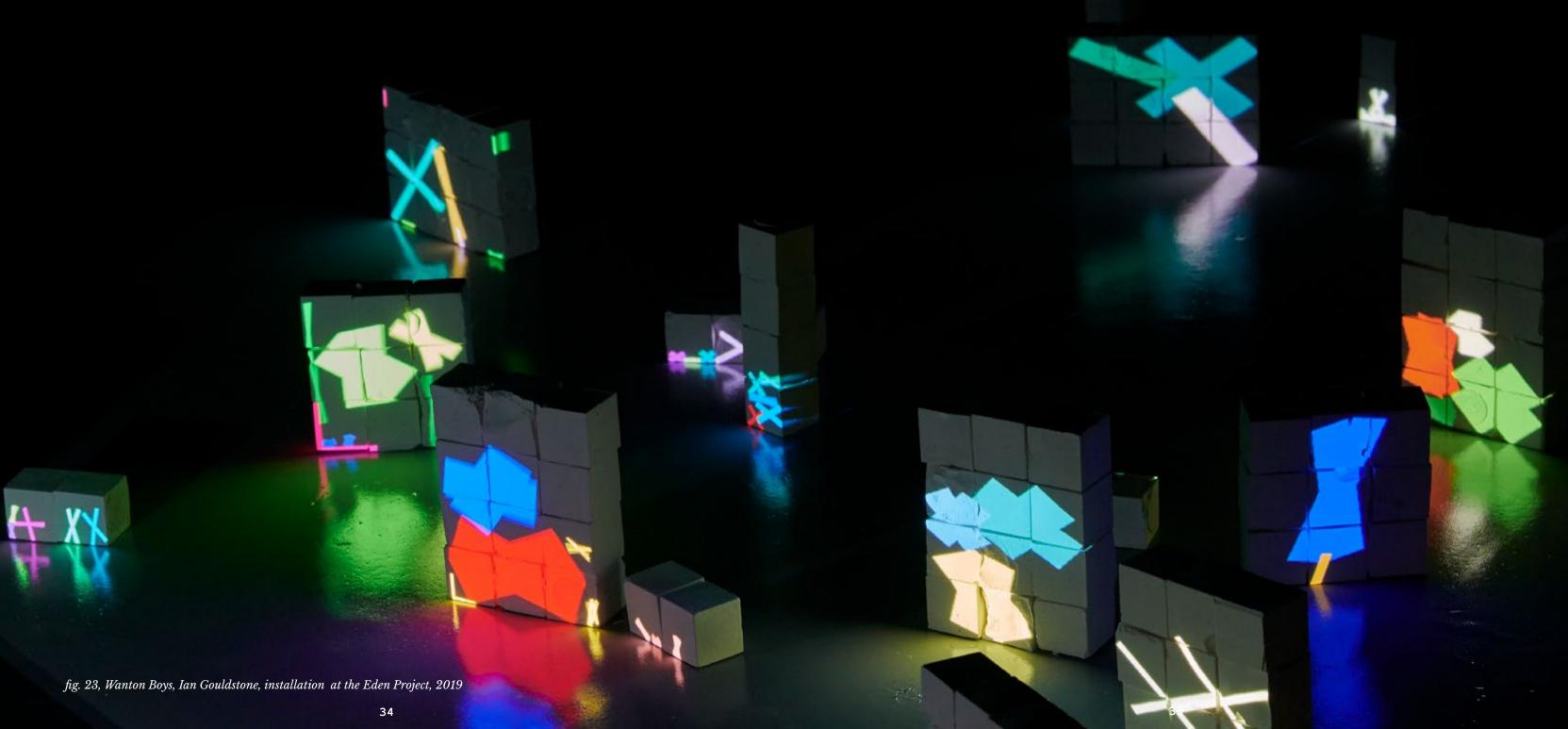
King Lear Act 4, scene 1, 32-37

Shakespeare's image of divine cruelty is deliberately evoked in the title of Ian Gouldstone's latest work; are we gods or flies? Dozens of small plaster sculptures assembled from rudimentary cubes, three wide and four tall, stand at irregular intervals throughout the gallery floor, which is painted to a high reflective gloss. It is a large work that engages the entire room. In the darkness, two projectors throw onto these uniform casts a series of animating cross-forms that are serialised yet different, varying in colour, size and number

ARTIFICIAL CREATORS



INSPIRED BY NATURE



ARTIFICIAL CREATORS



fig. 25, Wanton Boys, Ian Gouldstone, installation at the Eden Project, 2019



fig. 26, Wanton Boys, Ian Gouldstone, installation at the Eden Project, 2019

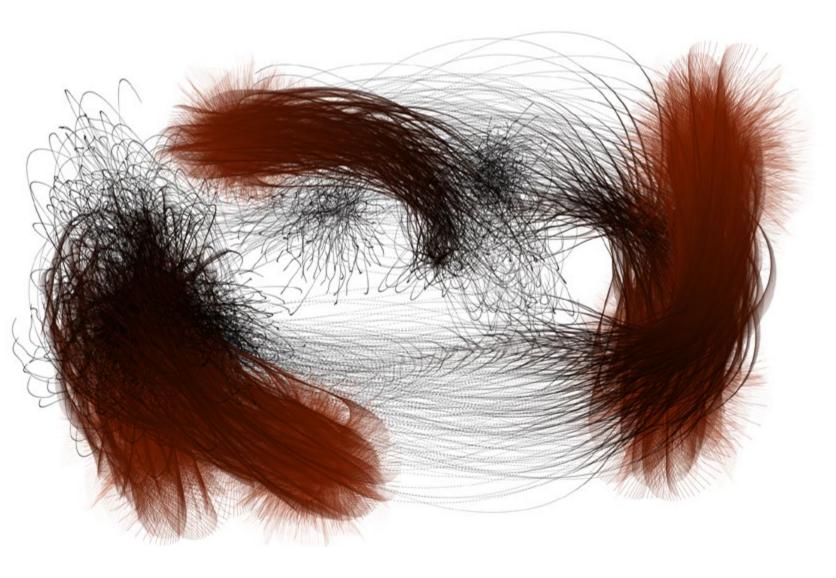


fig. 27, Tentashao, LIA, still image, 2016

# BIO

Austrian artist LIA is one of the pioneers of software and net art, and has been producing works since 1995. Her practice spans video, performance, software, installations, sculpture, projections and digital applications.

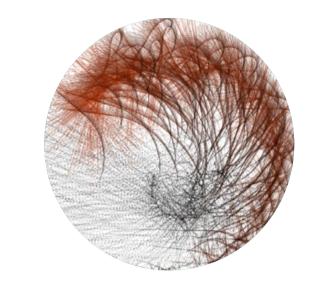
LIA's primary working material is code, which consists of translating a concept into a formal written structure that then can be used to create a 'machine' that generates real-time multimedia outputs. Since her concept is fluid – as opposed to the formality of the written code that requires engineered precision – the translation process between machine and artist can be viewed like a conversation. The process is repeated until LIA is satisfied with the machine's interpretation; at which point the generative framework, in which the artwork can develop, is considered finished.

LIA's works combine traditions of drawing and painting with the aesthetics of digital images and algorithms, characterised by a minimalist quality and by an affinity with conceptual art. She focuses on the translation of certain experienced principles into abstract forms, movements and colours in order to allow the viewer to explore the same on a subconscious level. LIA lives and works in Vienna.





fig. 28, Tentashao, LIA, installation at the Eden Project, 2019





#### **TENTASHAO**

#### Generative interactive installation, 2016

Tentashao is a procedural work by LIA that can be experienced as an interactive touch screen installation, as a self-running generative system or as a projection. Some parameters of the system can be controlled by using the onscreen interface and by inputting gestures on the canvas. The five interface controllers are not explicitly labelled and the interactions with them or with the canvas bring forth outcomes that are often unexpected and surprising.

The generative mode takes over whenever there is no input from a user. As if the piece is impatient and eager to create new compositions, Tentashao starts acting on its own, creating images and animations which explore the system's phase-state, using variations of the same parameters and controllers accessible to users. Yearning to act, Tentashao creates but also destroys, not allowing any composition to persist for long.

Tentashao's aesthetic is strikingly minimal, but not necessarily in a formal sense, as the compositions that are generated can be quite complex and detailed. Tentashao's minimalism derives from LIA choosing to work with a single algorithm, a limited chromatic scope, and narrow ranges of variation within a restricted number of controllable parameters, that are tirelessly explored for the countless variations that emerge from them.

Text: Miguel Carvalhais

figs. 29 & 30, Tentashao, LIA, still images, 2016

ARTIFICIAL CREATORS

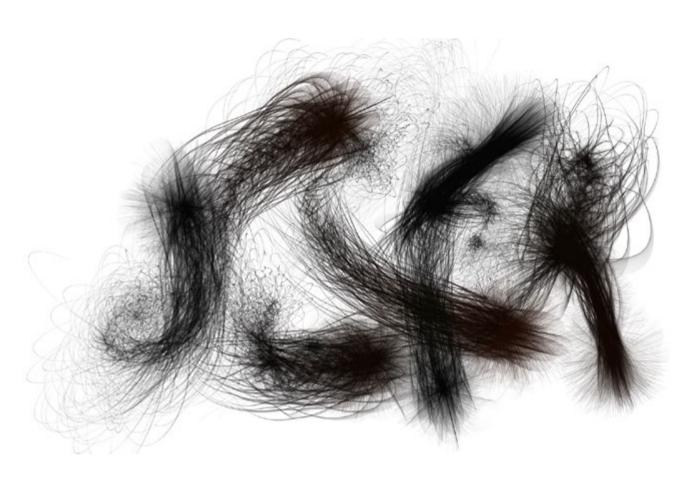
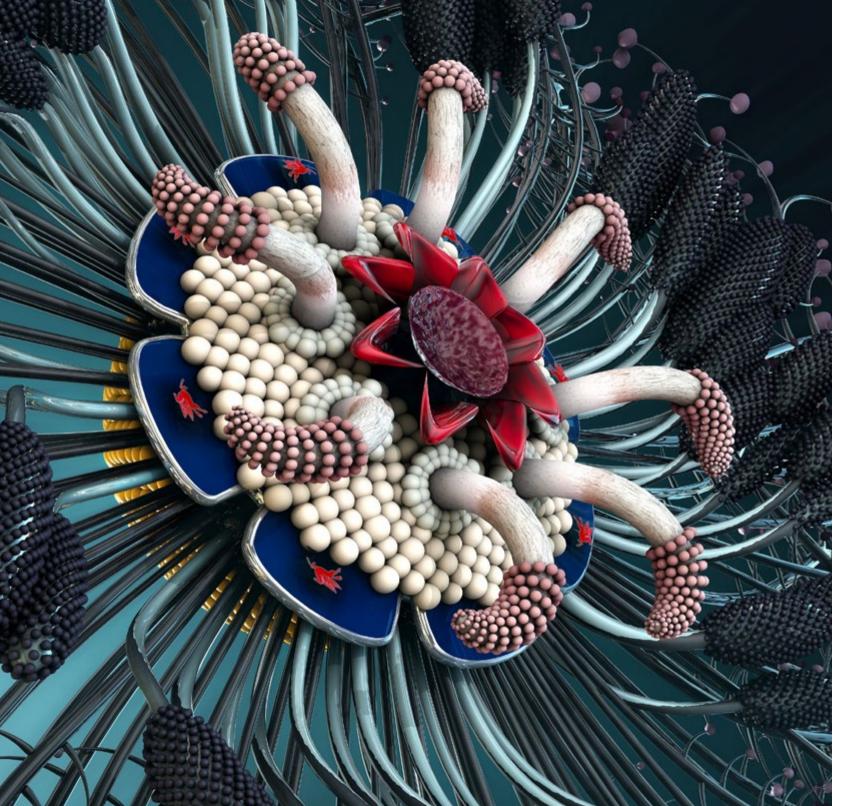


fig. 31, Tentashao, LIA, still image, 2016



fig. 32, Tentashao, LIA, installation at the Eden Project, 2019



## JON McCORMACK



fig. 33, Fifty Sisters, Jon McCormack, 2012

# BIO

Jon McCormack is an Australia-based artist and researcher in computing. He holds an Honours degree in Applied Mathematics and Computer Science from Monash University, a Graduate Diploma of Art (Film and Television) from Swinburne University and a PhD in Computer Science from Monash University. He is currently full Professor of Computer Science and director of SensiLab at Monash University in Melbourne, Australia. His research interests include generative art, design and music, evolutionary systems, computer creativity, visualisation, virtual reality, interaction design, physical computing, machine learning, L-systems and developmental models.

Since the late 1980s, McCormack has worked with computer code as a medium for creative expression. Inspired by the complexity and wonder of a diminishing natural world, his work is concerned with electronic 'after natures' – alternate forms of artificial life that may one day replace biological nature lost through human progress and development.

His artworks have been widely exhibited at leading galleries, including the Museum of Modern Art (New York, USA), Tate Gallery (Liverpool, UK), ACM SIGGRAPH (USA), Prix Ars Electronica (Austria) and the Australian Centre for the Moving Image (Australia). He is the recipient of over 16 awards for new media art and computing research. This includes prizes at Ars Electronica (Austria), Images du Futur (Canada), New Voices, New Visions (USA), Alias/Wavefront (USA), The John Lansdown Award for Interactive Media (Europe/UK), Nagoya Biennial (Japan), the 2012 Eureka Prize for Innovation in Computer Science and the 2016 Lumen Prize for digital art (still images).



fig. 34, Fifty Sisters, installation at the Eden Project, Jon McCormack, 2019

#### FIFTY SISTERS

Fifty Sisters, Evolved plant images based on oil company logos, 2012, Digital format 4K video.

Fifty Sisters comprises computer-synthesised plant-forms, algorithmically 'grown' from computer code using artificial evolution and generative grammars. 'Digital genes' (computer equivalents of DNA), crafted to replicate the form of Mesozoic plants and their descendants, were used to 'grow' imaginary plant species subject to evolutionary processes of mutation and crossover.

Each plant-like form is derived from the primitive graphic elements of oil company logos that often subtly reference plants. The title refers to the original 'Seven Sisters' – a cartel of seven oil companies that dominated the global petrochemical industry from the mid-1940s until the 1970s oil crisis.

Fossil fuels began as plants and plankton that over millions of years were transformed into the coal and oil that powers modern civilisation and has driven its unprecedented growth over the last century. We have been seduced by the fuels, fertilisers, feedstocks, plastics and medicines provided by oil. But oil has also changed the environment, from the petrochemical haze that hangs over many a modern metropolis and the environmental damage of major oil spills, to the looming spectre of global climate change.

The 21st century is one of the most challenging times in our history. Dependence on fossil fuels has led to massive growth, but with the looming spectre of climate change, this dependence cannot continue.

This artwork was commissionned for the Ars Flectronica Museum, Linz, Austria.

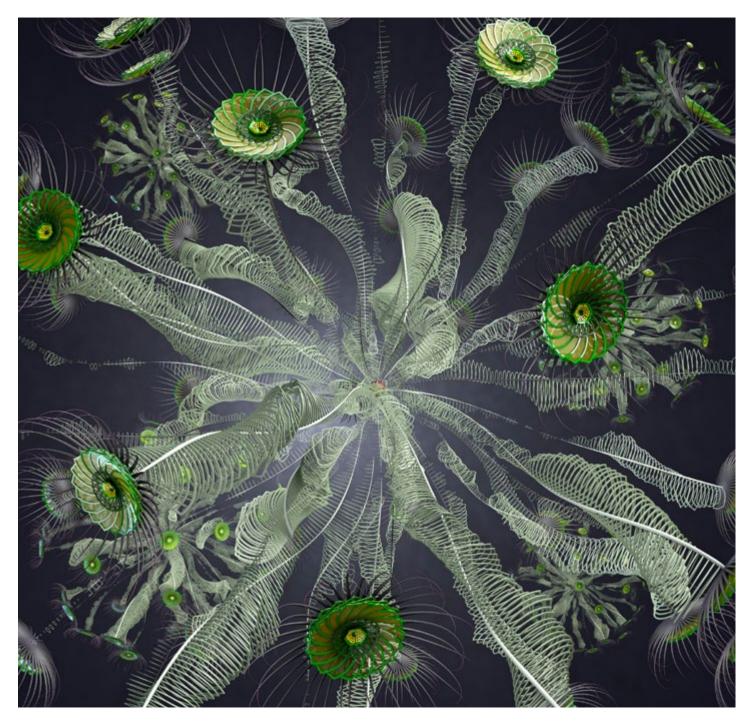
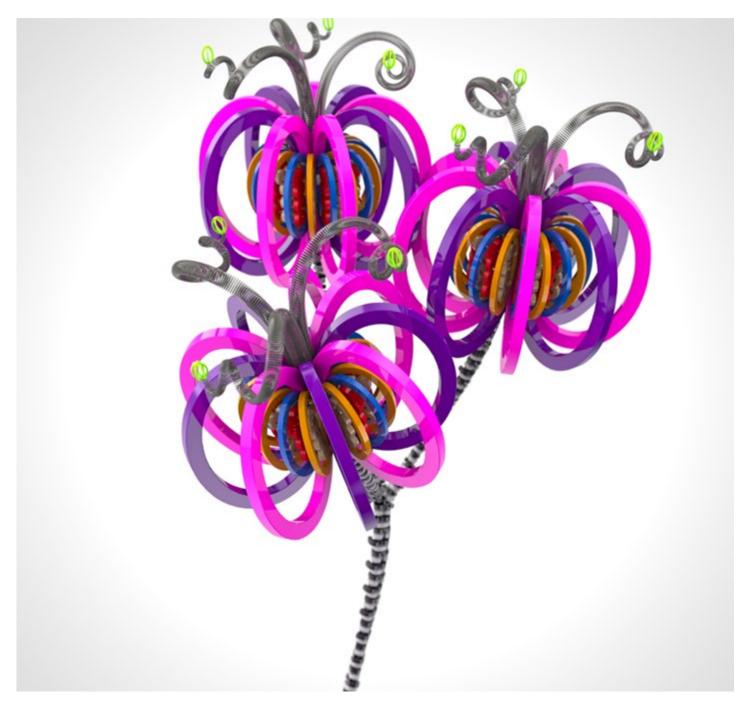
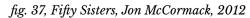


fig. 35, Fifty Sisters, Jon McCormack, 2012



fig. 36, Fifty Sisters, Jon McCormack, 2012









figs. 38 & 39, Fifty Sisters, installation at the Eden project, Jon McCormack, 2019





# ANNA RIDLER

# BIO

Anna Ridler, artist and researcher, lives and works in London. She has degrees from the Royal College of Art, Oxford University and University of Arts London, and has shown at a variety of cultural institutions and galleries including the Barbican, HeK Basel, Ars Electronica, Sheffield Documentary Festival, Leverhulme Centre for Future Intelligence, Tate Modern and the V&A. She was a European Union EMAP fellow and the winner of the 2018-2019 Dare Art Prize, and has been commissioned by Opera North, Live Cinema UK and Impakt Festival to create works.

She is interested in working with collections of information or data, particularly self-generated data sets, to create new and unusual narratives in a variety of mediums, and how new technologies, such as machine learning, can be used to translate them to an audience. She is currently working with, and researching, the creative potential of machine learning, and how it relates to drawing and painting.

## DAVID PFAU

David Pfau is an US-American research scientist who investigates artificial intelligence, machine learning and computational neuroscience, and is interested in exploring complexity within a scientific and artistic context. He has a PhD. from Columbia University in computational neuroscience working with Liam Paninski. His research in unsupervised machine learning has been published in top conferences in the field like NeurIPS and ICLR as well as journals like IEEE Transactions on Pattern Analysis and Machine Intelligence. He was part of the first symposium on machine learning, AI and creativity at the Gray Area Foundation for the Arts in 2016, where he spoke about the neuroscience of artistic style transfer.



fig. 41, Bloemenveiling (flower-auction), Anna Ridler and David Pfau, 2019



figs. 42, Bloemenveiling (flower-auction), Anna Ridler and David Pfau, installation at the Eden Project, 2019

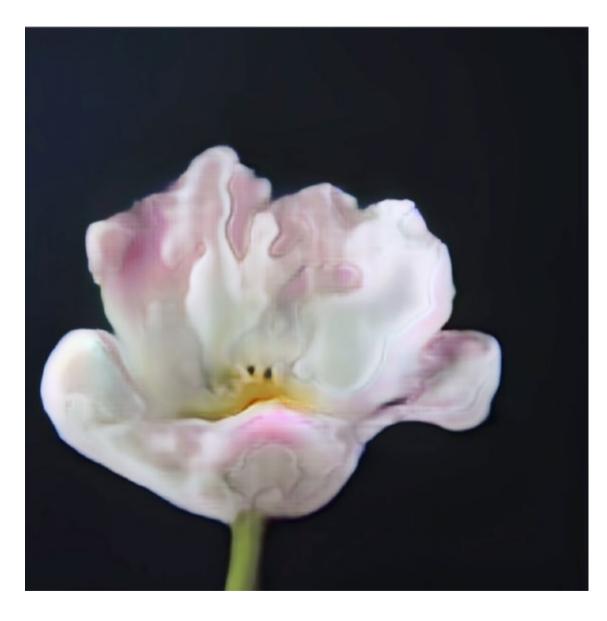


fig. 43, Bloemenveiling (flower-auction), Anna Ridler and David Pfau, 2019

#### **BLOEMENVEILING (FLOWER-AUCTION) 2019**

Website; smart contracts; GAN generated video; AI bots

Bloemenveiling is the creation of a technological marketplace for artificial tulips, echoing the auctions that sprung up in taverns throughout Holland at the height of tulipmania. The project examines not only value and desire and economic dynamics, but also human and machine interaction.

Short moving image pieces of tulips created by artificial intelligence will be sold at an auction using smart contracts on the Ethereum blockchain. There will be a selection of videoworks from different aspects of the latent space from the neural model that has been created for this project, creating a range of uncanny and eerie tulips. The smart contracts that define the work and how it can be sold will contain code to make the videowork mirror how real tulip bulbs behave: it will show the video, or bloom, for a week (approximately the amount of time a cut tulip lasts for) and then either generate a new work (which again will bloom for a finite amount of time) or become corrupted and then die. This process will repeat. The more times a work blooms, the more likely it is to become corrupted.

In the same way that tulips at the height of the mania were not bought or sold as objects but as paper contracts without the knowledge of what would bloom, purchasers in this marketplace will similarly not be certain of what exactly the video work will be until the contract is unlocked. This creates an element of chance in the auction. This chance is further heightened by the introduction of non-human agents into the bloemenveiling: at the same time that anyone could be bidding or buying a piece, there will also be a reinforcement learning agent here, which will be bidding up the price in an adaptive manner that learns from experience. This addition of an artificially intelligent algorithm that can potentially manipulate prices brings the auction from being governed by the rules of the seventeenth century to that of the twenty-first as more and more frequently online auctions are being manipulated by machine learning.

This project is the third in a series of work that looks at the relationship of the tulip to speculation and value (others being Myriad (Tulips) and Mosaic Virus). This piece builds on the previous works, but introduces an interactive element and allows the piece not just to be experienced in a gallery setting, but places it in the real world, engaging with what it also critiques.



fig. 44, Bloemenveiling (flower-auction), Anna Ridler and David Pfau, installation at the Eden Project, 2019



fig. 45, Bloemenveiling (flower-auction), Anna Ridler and David Pfau, installation at the Eden Project, 2019



# **EPILOGUE**

Nowhere is nature celebrated more than at the Eden Project in Cornwall, where an outstanding achievement of human creativity and endeavour houses myriad creative achievements of Mother Nature. There are now among us creators which supplement and compliment the processes of the natural world and of human intellect: artificial intelligence systems which can independently create, critique and curate works of art.

This exhibition brings together six artists working at the intersection of natural, human and machine creativity, who have built artificially creative systems and used them to produce beautiful, thought provoking and disruptive pieces of art. These systems are made by people, inspired by nature and driven by AI. They foreshadow the great adventure ahead where software and machines graduate from muses and tools to creative partners and important individual makers.

Artificial Creators Inspired by Nature and the close collaboration with the Eden Project which brought it about, is one of the major achievements of the project entitled "Games Research Opportunities", undertaken at Falmouth University and funded by the European Commission's ERA programme. I had the pleasure to lead this project for a number of years, working with a great team investigating the potential for AI systems to impact arts and entertainment cultures in the near future. I can think of no more fitting culmination of the project than an exhibition on the border of AI science and the arts, bringing together two cultural powerhouses in Cornwall to lead the discussion around our technological futures.

Simon Colton Professor of Computational Creativity, Games and Al Queen Mary University, UK and Monash University, Australia London, August 2019

#### CREDITS

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