emergence

an artistic exploration of quantum science

EQUS
Australian Research Council
Centre of Excellence for
Engineered Quantum Systems

Australian Government
Australian Research Council

about the exhibition

Emergence showcases the entries to the 2022 EQUS Quantum Art Competition.

Run by the Australian Research Council Centre of Excellence for Engineered Quantum Systems (EQUS), the 2022 Quantum Art Competition invited artists to explore quantum science through their medium of choice, drawing inspiration from the competition theme: 'emergence'.

Emergence includes 34 of the competition entries, including the winner, runner-up and all the finalists.

EQUS scientists and science communicators will be present throughout the exhibition, happy to answer any questions you may have!

We hope you enjoy the artworks, learn about quantum science, and vote for your favourite artwork for the People's Choice Prize (see back page).

emergence

Quantum physics tells us that our world, at the fundamental level, is alien to our intuitive reality in many ways.

The world with which we are familiar is governed by the rules of classical physics. These rules allow us to predict precisely the behaviour of large objects like grains of sand, soccer balls, and even planets.

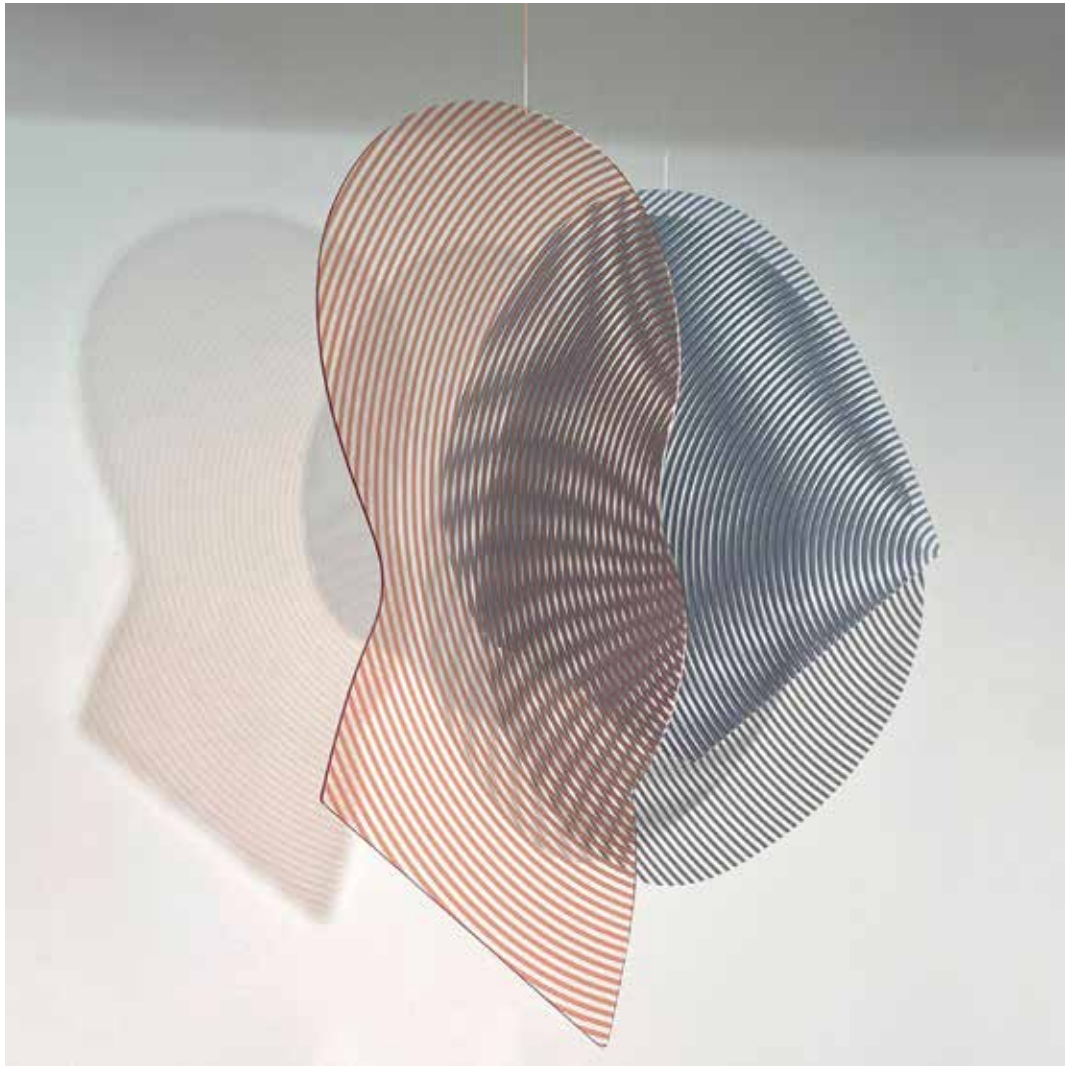
But on very small scales (such as the scales of electrons, photons and atoms) the Universe obeys different rules—the rules of quantum physics. In the quantum regime, the world is inherently fuzzy and probabilistic. There are many phenomena (such as superposition and entanglement) that challenge our classical intuitions.

Somewhere between these two scales, our intuitive world ***emerges*** from the strange quantum world. We know that the underlying physics is quantum, but it appears classical at large scales. Exactly how this happens is one of the biggest mysteries of modern physics.

Put another way: ***emergence*** is a phenomenon whereby the apparent behaviour of a system on a large scale appears vastly different from the true, underlying nature on a small scale.

exhibiting artists

Alicia Sometimes & Nat Bates (finalist)
Anh Vu
Aprille Chua
Bori Benkő (winner)
Danielle 'DMo' Oke
Danielle Chapman
Delta Venus
Eden Wilson (finalist)
Eleonora Pasti
Eunjoo Jang (finalist)
Fayroze Lutta
Francis Cai
Hayden Fletcher
Ilsa Hashmi
Jackson Used
Jefferson Vimana (finalist)
Jennifer Reid
Karalyn Shaw (finalist)
Kathryn Blumke
Ken Dallaston
Dr Kim Hamilton
LeAnne Vincent
Lorry Wedding-Marchioro (finalist)
Louise Walder
M C Ng (finalist)
Marni Artimarni
Maxime Banks
T. Michael Stephens
Patricia Malt
Paul Ledington (finalist)
Sandy Lidgett (runner-up)
Sébastien Clermont
Tanya Clark
Taylor Ritchie



EMERGENCE

Kinetic installation
Printed acrylic glass, polyethylene threads
150 cm × 150 cm × 150 cm

Art and quantum physics are two very complex realms and approaches to human inquiry about the world. Each is driven by discovery, curiosity, and a profound longing to know oneself and the surrounding world. When done successfully they can influence us to see the world in a different light; can change our fundamental truths.

Scientists do this through repeated experiments that attempt to reveal a novel aspect of reality. By contrast, artists often start with a new vision of reality, yet from that foundation, we also work through exploration and experimentation.

The kinetic installation I have created explores and celebrates the fascinating phenomenon of the moiré interference pattern.

The transparent acrylic glass objects, printed with very similar curved line patterns and hung at particular angles, gently rotate in response to air movement; when overlapping each other, new sinuous moving patterns emerge that seem to shimmer and flow.

The stunningly beautiful and suggestive accelerations of these patterns are not illusory. The emergence of the moving patterns occurs not based on the properties of the individual patterns but on the luminance modulations resulting from their superposition. In the moiré, small differences between spatial frequencies of the component patterns are magnified.

Emergence relates to quantum physics and technology in a significant way. Scientists developing new materials are actively studying moiré patterns in overlapping atomically thin materials, producing intriguing electronic phenomena that include unconventional superconductivity and ferromagnetism.

"When a layer of graphene, a sheet of carbon crystal with atoms arranged in a hexagonal one-atom-thick lattice, is dropped on another one and rotated to just the correct angle of about 1.1 degrees, the graphene magically acquires the ability to become superconductive when the requisite number of electrons are added. This concordance between the visual and the electrical in graphene almost seems to be an example of life imitating art right down to the quantum level."*

Besides the correlations with quantum physics, the artwork also inquires how the phenomenon of moiré interference relates to the overlapping of human mental, emotional, and physical vibrational patterns.

*https://www.quantamagazine.org/when-magic-is-seen-in-twisted-graphene-thats-a-moire-20190620/

Bori Benkő (winner)

Bori Benkő's overall practice concerns principles and phenomena of nature, founded upon an affinity with mathematics and physics.

Movement, displacement, perception, trauma and transformation – are recurring themes of her works.

Bori works with a variety of media, currently developing sculptural works in wood that incorporate flexible geometric configurations and unusual property shapes; kinetic installations that explore wave pattern formations and interference patterns propelled into movement by either natural elements or electrical motors. She is also creating 'light and shadow' based artworks that engage with the movement of the sun.

Common in the diversity of her works is an experimental and conceptual approach. Often engaging the language of metaphors and symbols, she is inviting different perspectives and focal points of internal/external landscapes – to reshape perceived realities and distil density into lightness.

Bori holds a Master's Degree from the Hungarian Academy of Fine Arts in Budapest (2003). She has travelled extensively with various international art grants and research projects, exhibited her works widely around Europe, South America and Asia.

from the judges

"Bori makes an interesting exploration about moving interface patterns that can contribute to the idea of emergence. It is a skilled production which can fascinate the viewers and make them think about the complexity of light and interference patterns. The shape that reminds us of a human head tends to distract one from concentrating on the hole phenomenon."

—Marille Hahne, Professor of Filmmaking at the University of the Arts (ZHDK), Zürich, and Documentary Filmmaker

"Bori did a great job at showing, in an almost tangible way, the concept of emergence, to be understood as a property of a large system that emerges in nontrivial ways from properties of its microscopic constituents. The way the forms move and create a visual appeal, starting from a fine comb of lines on a transparent platform, is very evocative of how I imagine emergence works in physical systems."

—Andrea Morello, Scientia Professor of Quantum Engineering at UNSW

from the judges

"Sandy's interpretation of the theme is not obvious at first sight; however, the painted shapes are mesmerising and are reminiscent of leaves that have randomly fallen onto the ground. With the theme emergence in mind, many thought-provoking ideas can be associated with this painting. The originality of this artwork is very high and very skillfully executed."

—Marille Hahne, Professor of Filmmaking at the University of the Arts (ZHDK), Zürich, and Documentary Filmmaker

"Sandy's work was very creative in the way it interpreted the theme and related it to biological processes. It is indeed the case that biology is seen as an emergent phenomenon. The way Sandy embodied it in her artwork and the way it was produced seems very original."

—Andrea Morello, Scientia Professor of Quantum Engineering at UNSW

Sandy Lidgett (runner-up)

As a biochemist Sandy Lidgett thinks about the body as a mystery of molecular geometries. As a visual artist she looks at how the fleshy exterior acts as an interface between internal and external space. Conceptually her work inhabits the borders between art and science, between the messy and the neat, the intricate and the brutal, the controlled and the chaotic. She is interested in the resolvable limits of the gaps where these borders become blurry.

Sandy is a postgraduate student at the Queensland College of Art, where drawing is at the core of her practice. Works are usually on paper and canvas or may expand into the exhibition space via projection. Materials are a mixture of dry, wet and greasy, and are combined to explore their interactions with each other, with the drawing ground, and with the support, where they often leave a traced history of the making process.

This work focuses on the somatic abstract, the emergent patterns and forms that arise from a body in a state of meditative creativity. It explores the limits of manual dexterity using a tiny brush and watercolour paint on paper. Was the focus on the solids or on the tiny gaps, on the red or the white?

Are the shapes generated by some decision-making mini-machine at the core of consciousness, a Maxwell Demon inside a room-temperature, wet quantum computer? Or are they suggested by each preceding and surrounding shape? Or by a mixture of expanding variables, that emerges as a trace of lived experience between subject and objects?

Demon in the Machine

W&N watercolours on Arches 300 gsm paper
56 cm × 76 cm

This work is an experiment in emergence using a 000 Cotman brush and Windsor & Newton watercolours, which grew out of shapes dictated by those around them as the work began to form.

I'm interested how the concept of emergent complexity relates to living systems that defy the second law of thermodynamics. Trained in biochemistry and molecular biology in the 1990s, I am surprised how mysterious life continues to be. I'm intrigued by the research Paul Davies is doing at the Beyond Centre in Arizona on the concepts of emergence, as outlined in his recent book, The Demon in the Machine. James Clerk Maxwell seems to me to be too little spoken of, and I like how Davies relates Maxwell to his own search for a physical law of information. I like Davies' discussions about how laws change as the playing field changes - as complexity emerges, new rules emerge. Studying biochemistry humbled me into realising that the reductive way we have of looking at living systems is limiting, especially in terms of tertiary and quaternary protein conformation and membrane function.

In terms of this work, I thought of myself as a wet, room-temperature quantum computer, making decisions in a semi-meditative state at the mercy, as it were, of my Maxwell Demons. The choice of colour has a mammalian connection, perhaps, some sort of fleshy shadow of an *a priori* somatic abstract that exists below our consciousness.

I'm also influenced by Roger Penrose's ideas on emergent complexity and feedback loops that have to do with pattern and scale. He recalls working, as a boy, with his father on the tribar design they sent to MC Escher, which Escher then used in various works. Penrose often comes back to the Angels and Demons (more demons!) work by Escher as an example of what might be happening at the edges of the very big and the very small, and how scale (or even entropy/enthalpy) might flip, where there are slow, bored photons at the end of the universe. Anyway, I don't pretend to understand all this, which is why I like to muse on these ideas while I paint, and it seems they often inform the way I make work.

In the making of this painting, patterns and shapes emerged as it progressed. The supporting (white) space began to take on its own character as the work developed, and it was interesting to notice how difficult it was to see the white as a form in itself, especially where it was a thinly interlaced lattice in the mostly-red areas. The feedback idea was imposed by the edges of the paper, where the shapes no longer had the freedom to expand indefinitely and began to grow the entire form back inwards. It could also allude to enclosed systems reaching a point of equilibrium, or passing beyond the tipping point, whereupon the red (flesh) begins to exhaust the white substrate.

Liminal Ontology

and/or

once you say it out loud

the wave collapses

before: all probabilities in mosaic geometries
orchestras of possibility on crests of vibrations
amplitudes & resonant scales lapping on infinite shores
you, distinct telomeres & all the choice in the universe

and/or

information: amplified reality
the tree is itself // relative to the deepening red of the sky
also, folding assemblies of electrons, protons, neutrons
what we see, what we feel, what we know, what we don't

the tree as idea, seed, ascending, being & gone all at once

you sitting under the branches, scattered leaves as the sun
calibrates phrases of your book, reams of energised words

and/or

en/ tangle/ ment

spacetime's appliqué of communication
walks of abstractions, systems with multiple parts
how the connections hold awaited rungs of meaning

you, by the lake / me, on the edge of an oversized rock

and/or

echoes / synaptic scars / umbilicus

how everything interacts / loops of transformations
the photograph down to its final pixel
how we move as one & stand on our own
the symmetry of all numbers & the imbalance of sums

you, an asteroid in frame, the golden ratio

the boundless impossibility of time
but how we breathe within a Planck length

macro becomes micro becomes macro
a library of linked language

there is no and / without or

once you say it out loud

Liminal Ontology

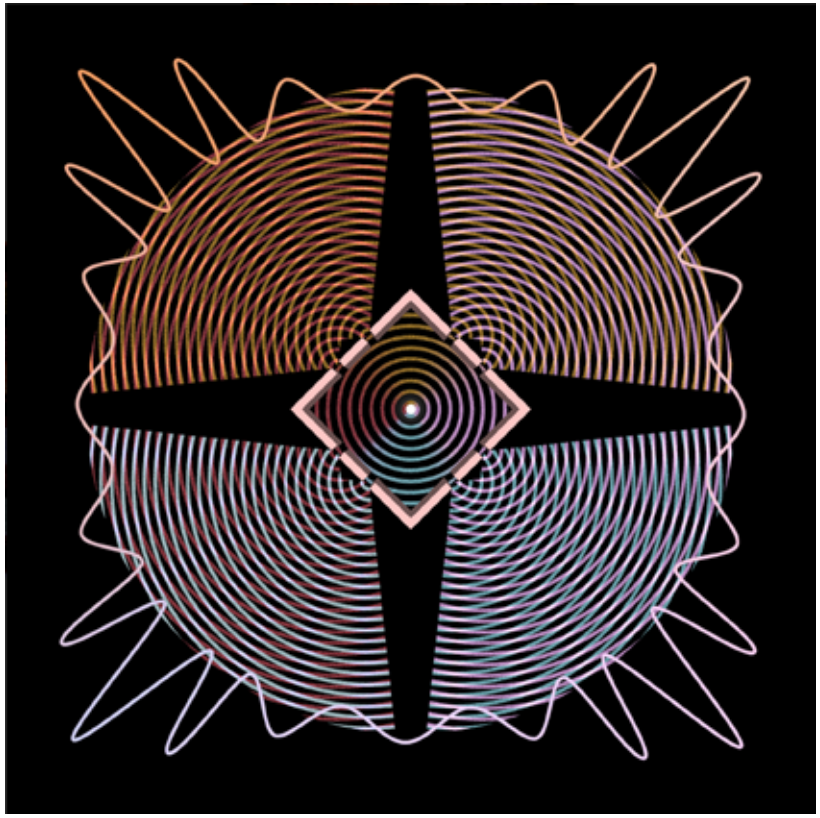
Audio

This poetic audio piece is inspired by the scales of both the quantum realm and the universe of the very large. We were particularly interested in the known and unknown languages between the two and how emergence looks at the applications and arrangements of information: how we understand symbols and codes, reality as information and perception. We also delved into conceptual dualities such as Schrödinger equations; wave/particle; entanglement; quantum/general relativity; and existing as physical and conscious entities who, at times, are in no need to understand the subatomic level, while also being curious creatures who explore the very small and are governed by the rules of both the macro and the micro. By experimenting with symbolist language and the ideas of emergence and playing around with the ideas behind the concepts, we wanted to create a lyrical conversation between both worlds.

Alicia Sometimes & Nat Bates (finalist)

Alicia Sometimes is an Australian poet, multi-media artist and broadcaster. She has performed her spoken word at many venues, festivals and events around the world. Her poems have been in Best Australian Science Writing, Best Australian Poems and more. She is director/co-writer of the art/science planetarium shows, Elemental and Particle/Wave. Recently she completed the Boyd Garret residency (City of Melbourne) and a Virtual Writer in Residency for Manchester City of Literature. This year she is the recipient of ANAT's Synapse Residency program (responding to Tamara Davis's work) and is co-creating work for the Dark Matters exhibition for Science Gallery Melbourne. Alicia's TedxUQ talk in 2019 was about combining art with science.

Nat Bates is a composer, musician and sound designer. He is Program Coordinator at RMIT for the Diploma of Digital Media Technologies / Advanced Diploma of Screen and Media. Nat has composed sound for ABC Radio, designed sound for the Melbourne Planetarium, performed live music and sound at the National Gallery of Australia, released recorded music through The Wire magazine and curated more than 10 years of the Liquid Architecture sound arts festival. Nat's many awards include sound design for the animation Love On The Line, directed by Nicole McKinnon, which won Best Animation at the 2017 Dublin International Short Film and Music Festival. Nat holds a PhD in Fine Art (Sound) from RMIT University.



Eden Wilson (finalist)

Eden is a student of Visual Communication and Architecture at the University of Newcastle, he has always found an interest in the physical world, it's formation and the many curiosities in-between.

His work is a visual representation of Thomas Young's famous 1802 experiment, now widely known as the double slit experiment, that attempts to define the physical properties of light as either a wave or a particle. This experiment was fundamental to the emergence of quantum mechanics as a theory and its significance is why Eden chose to represent this in his work.

In 1802 an experiment was conducted by Thomas Young in an attempt to define the physical properties of light as either a wave or a particle. This experiment is now widely known as the 'double slit experiment' and rather than demonstrating that light behaves as either a wave or a particle, the experiment showed that light behaved as both a wave and a particle depending on the role of the observer.

In many ways, this simple experiment lead to the 'emergence' of our modern understanding of quantum mechanics with it raising more questions than it had intended to answer.

This work is a simple representation of how the experiment demonstrated the wave nature of light. With a single source of light in the middle and two parallel openings on each side of the central box, each stream of light interferes with each other to create brighter sections, where the wavefronts are additive, and darker sections, where the wavefronts are subtractive. This causes a pattern of interference which can be seen as the line surrounding the outer edges. This interference pattern remains the same even when the light is measured as singular photon particles or as a wave probability and changes only when the observer detects where the light is going before it travels through the slits.

Eunjoo Jang (finalist)

Eunjoo Jang completed a Bachelor of Fine Arts (Hons Class 1) in 2013 and a Master of Fine Arts (Research) from the University of New South Wales Art & Design School in 2016. She was a recipient of the Australian Postgraduate Award (2014–2016).

Eunjoo commenced her exploration into scratch holography in her Honours year (2013) and has since developed a series of award-winning works in this medium. She was the Winner of the 2019 GreenWay Art Prize, and was also selected for several art prizes, including the Paddington Art Prize, the Ravenswood Australian Women's Art Prize, and the Macquarie Group Emerging Artist Award. Eunjoo's work was acquired for the Macquarie Group Collection, Art incubator and Council of The City of Sydney. In 2023, two solo exhibitions are planned, one in Sydney (Jul) and the other in Melbourne (Nov).

My practice explores the phenomenon of virtualisation and 'blended reality'. I am especially interested in how geospatial technologies such as Google Earth have influenced our perception of space and place.

Daily travel around Sydney can be a surreal experience for me because the architecture and the city planning is different from overlooking the suburbs on Google maps. Here I could perceive two spaces as multiple layers where the physical and virtual realities merge into the areas of Sydney in Australia.

In particular, the shapes of buildings and the layout of cities. The houses are closely packed with long rows of double-storey brick terraces that look like a series of building styles characteristic of the late 19th century and early 20th century. It is the intriguing exterior of the buildings that provokes my curiosity about the aerial view of the layout of these buildings.

On a daily basis I record the spaces I walk through using mapping technology, like Google Maps. I use these recordings as reference to create line drawings and paintings of Sydney onto the aluminium surface. I then superimpose these with my hand-drawn 'scratch holograms' to create the 'virtual' reality that you see move.

One interesting point of my artwork is the methodology; I use the hand-drawn scratch hologram technique. It can create a virtual image in a different way than lens-based media. Through light reflection, the scratch hologram creates a three-dimensional effect by providing a moving image, which is a free-floating form infinitely and independently on a trajectory. The images of scratch hologram simultaneously appear and disappear, depending on the viewer's position. This is a powerful representation of how human sensory responses are being affected by technology through manual equivalents such as the scratch hologram as a way of continually repositioning the human at the centre of the technological.

I feel that using geospatial technologies is a direct reflection of my thought, imagination and dream. Using Google Earth is like travelling in a virtual world(thought, imagination and dream) where the viewer becomes part of another dimension. I believe that we not only desire to replicate reality by utilising this technology, but we want to transition entirely into this dimension, where we can expand our worlds around us endlessly.

Jefferson Vimana (finalist)

Jefferson Vimana is a Sydney-based Australian American artist and musician. Visual works have been exhibited in often more progressive and DIY-minded artists galleries in various parts of the United States, France, Germany, the UK, and Australia. Any self-released vinyl and cassette tape music is generally intended as various extensions to the body of visual work.

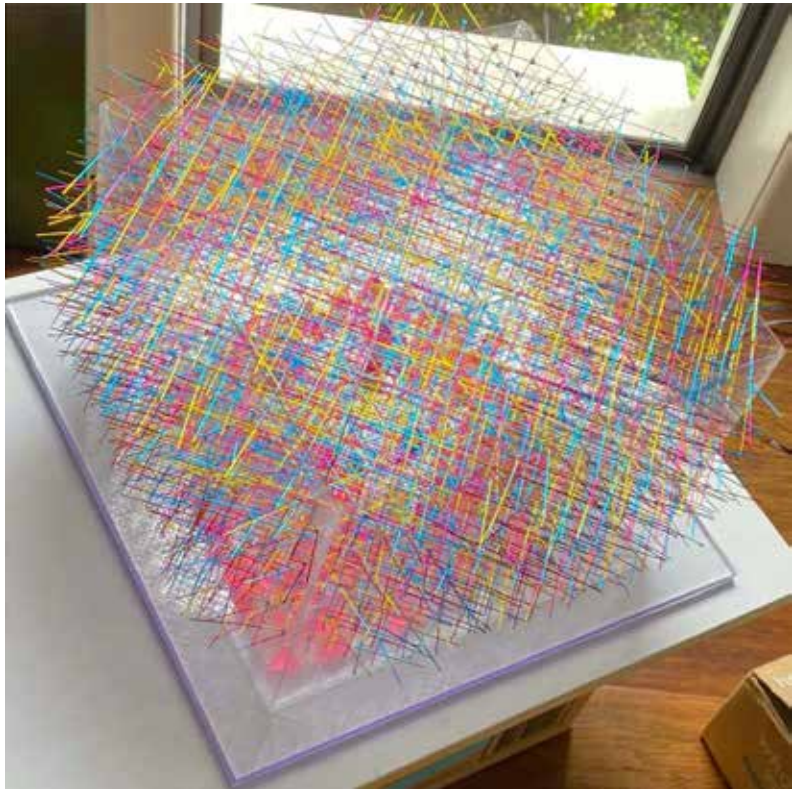
Jefferson's visual art specialises in a focus on drawing, collage, experimental video art, sculpture, clothes, and installation art often centred around interior decorating or catering. Much output is optical illusion minded work, particularly drawings that operate with chromadepth 3D glasses as well as ultraviolet 'black light' reactive ink. His visual art often references scientific themes or even calls upon it for means of its creation.

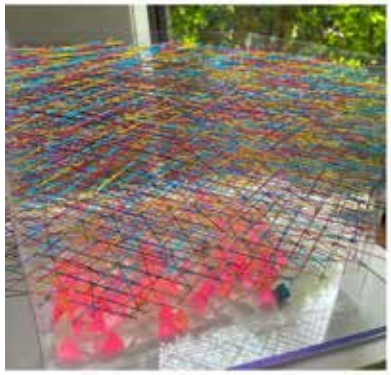
Jefferson's music focuses on experimental composition and improvisation heavy on synthesisers, percussion, and psychedelic guitar work, as well as automatic compositions through conceptual piano improvisations.

Jefferson teaches music full time, which he has worked in for 24 years. He also teaches art on occasion including helping start an arts college in the southeastern United States, as well as teaching science to children briefly for 3 years through a NASA education program.

When looking into the crystal ball to understand 'emergence', questions regarding future science and technology's escalated integration into everyday life arise. Quantum concepts become spiritually adjacent, as we learn how to see hidden worlds over time. This ultraviolet-light-reactive drawing is scientifically enhanced by chromadepth 3D glasses, giving an illusion of depth emerging outwardly. A highlighted omnipresence of abundant human innovation breaks down to the subatomic level to illustrate where things emerge from. A model of our blooming time where fantasies and dreams constantly become realities now. This magical computer- and internet-inspired wizardry is a great orchestra conducted by a central figure who appears engulfed in a complex navigation software spell assisted by an AI spider on the monitor screen. This orchestra ranges in a myriad of voices. At one end of the spectrum a satellite beams information to a telescope that is printing out a spiral galaxy photo. At another end a robotic hand writing computer code is broken down to electricity, and onward to the atomic level, then further to the subatomic level where particles dance and even disappear. Where does it all arise from? Why do quantum mechanics animating everything behave lively? Whether the emergence of a singularity or a hive-mind Renaissance is in humanity's fate, the fact is much more is at play than plain sight.

This picture embodies the miraculous experience of enhancing the eye in an experimental setting to scrutinise reality for what it is and how it works. In our present day, years of scientific and artistic breakthroughs truly begin to take form by speaking and interacting with us. A new world emerges by perceiving us through its own optical understanding. Similarly, with special glasses, a three-dimensional image jumps out revealing a life of its own. The viewer debates hidden dimensions present on this flat surface without physical change. The viewer feels the electron's spark, quarks' curiosity, and senses mysterious forces from a Hadron-collision-inspired miniature black hole. In the foreground one breathes fresh air from a distant windmill emerging a green economy, viewed by escaping through a window with flowing curtains. An ultraviolet light allows a secret variation to emerge in glowing fluorescent neons similar to how flowers appear to the eyes of bees. The matter of emergence is represented in a 'question mark' upheld to a computer in the centre, which is being commanded by the figure's hand in an *X, Y, Z* grid. This waving our hands in the air to create magic lies before us here and now in the destiny of the seeker. The courage of the human heart and mind leads the way. It is this user logging on who waves the wand which weaves the spell. The emergent is conjured by those who adventure into such mysteries. While humans begin to understand the quantum world around us, this knowledge makes for a new emergence in human capabilities. Through these curiosities the fantasy can become the real.





Bucky's Indian Defence

'Bucky' is a nod to R. Buckminster Fuller who hypothesised the tetrahedron underpinned the universe and that the latter, could also be described as a game of chess (with the moves to be made stemming from the visible and non-visible vectors within the tetrahedra). This chess analogy also inspired my title as a Sicilian defence in chess, involving E8 (the black king (Bucky, as one of my heroes as the 'king', and the symbolic E8 mother crystal, herein) and C4 (reflective of a 4D quasicrystal which I've also tried to encapsulate in the work - the 'c'lear perspex board), is known as the 'Indian Defence'.

The box symbolises a time frame of the natural world - a snapshot of reality incorporating: an 'E8 crystal', a 'quasicrystal', 'pixels', 'information', 'causality loops', 'non-determinism' and the 'golden ratio', all which are subjectively perceived and analysed at any given moment, by the artwork viewer with an element of choice (consciousness).

The 8-layered, triangular lattice structure is symbolic of the E8 mother crystal (as it is impossible to visualise or construct an 8-dimensional form, other than mathematically via lie algebras) is constructed in a periodic pattern to reflect the above-mentioned tetrahedral vectors as the foundation of the universe. The wires extend outside the box, through the periodic holes (reflecting the 'plank length' or the lengths of the tetrahedral dice) to illustrate the infinite nature of the repetition. The variegated metallic tones, in daylight, give a celestial, fragile, ever-changing appearance befitting of the crystal.

The suspension of the E8 above a body of tetrahedra symbolises projection of the 'mother' crystal to a 4D quasicrystal (the 3D tetrahedra, plus the clear perspex base, which, as it connects all the particles and thus loops them - refers to 'time', and in totality, then, the base is not periodic (as the tetrahedra aren't fixed and can move about)). This looseness and dice, evidences non-determinism and that the state of one tetrahedron influences the state of another in any given moment and further, that the state is determined by how the viewer observes the work or our consciousness. The packing of tetrahedra reflects the golden ratio and, in their replicated forms, the dice also represent pixels comprising reality. Information is shown via these tetrahedra again - as geometric symbols in their own right - and also via the numbers on the surfaces. As they are free to change their positions but are 'connected' via the surface of the clear perspex base, representative of the flow time (4D), also, then, the tetrahedra illustrate causality loops. Further, here, the different colours of the resin tetrahedra are symbolic of the past (pink - some contain triangular photographs), the present (blue) and the future (yellowy-green). Their lumping-together on the perspex reflects all time affecting all time, all of the time! The colours are also loosely based on those ascribed to quarks and thus antiquarks and therefore, cumulatively, they produce 'no net colour' - like the concept of our universe. An analogy could also be drawn to roygbiv and white in the classical world.

The distinct layers of the work reflect the currently disparate worlds of quantum and classical mechanics which are bridged or unified (by emergence theory) in this work.

The luminescence also connects to emergence theory's quest to determine the speed of light and other fundamental constants. In darkness, the tetrahedra glow revealing only our ever-evolving 3D visible reality. This too is symbolic of emergence theory, stemming from the dark void between classical and quantum mechanics to unify and illuminate both in our visible, tangible realm of existence.

Karalyn Shaw (finalist)

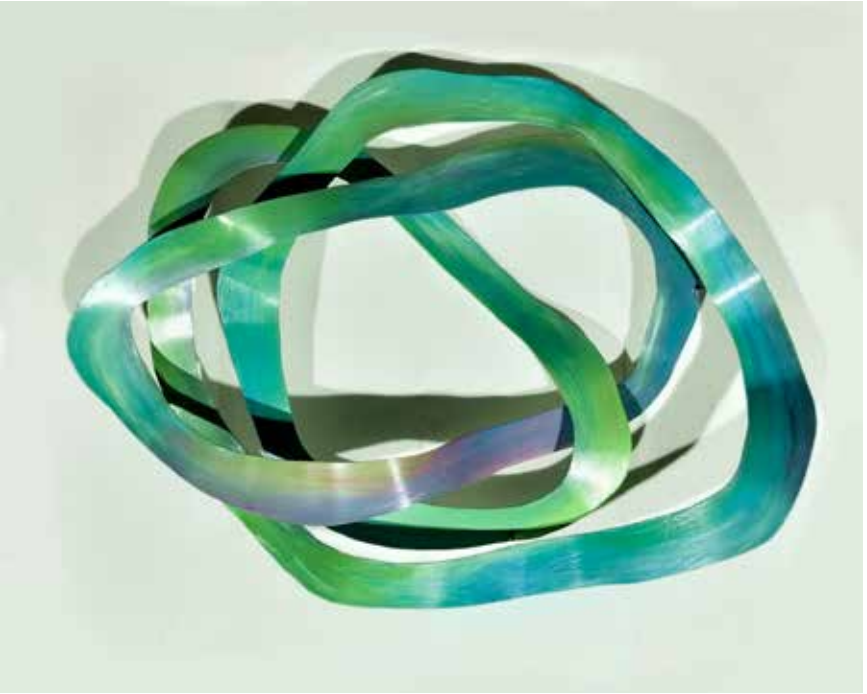
Karalyn Shaw is an interdisciplinary and intercultural contemporary artist from Brisbane, Australia, whose work parallels, and endeavours to capture and reflect upon, her life's multifaceted and interconnected intellectual and emotional experiences.

Evolving in an increasingly raw manner, she creates from her streams of consciousness, always seeking to meaning-make and better and more profoundly understand her thoughts and varied connections. She endeavours to utilise project-relevant materials and techniques and doesn't confine herself to a sole means of expression and constantly experiments with different media and methods.

Karalyn has a love of pattern and light and is strongly influenced by the visual: symmetry and geometry; words via word-play, philosophy, literature, poetry and vibrant, varied languages and cultures; her zeal for nature, science, engineering and technology; and her deep concern for humanity and our environment. She regularly sits at the nexus of science and art, drawing upon both realms, historically and contemporaneously, to inspire her creations.

Her creativity is often informed by her work and study in engineering, physics and design, presently; and previously, in international affairs, law, languages and psychology.

Karalyn's principal commercial clients have included the Westfield Scentre Group and Orb Hair in Brisbane, together with numerous personal commissions. She has a permanent exhibit at the Queensland Museum featuring a sample of work from a large-scale, community-collaborative, human-rights and peace-related installation she orchestrated in conjunction with the United Nations International Peace Day commemoration within St John's Cathedral in Brisbane in 2014. Karalyn was runner-up in the University of Queensland's Engineering, Architecture and Information Technology Faculty's Art Competition, 2022, with her mixed media work, 'The Kiss'.



Lorry Wedding-Marchioro (finalist)

Lorry Wedding-Marchioro is a sculptor based in the Adelaide Hills and is currently a PhD candidate at the University of South Australia. Contemplating the nature of reality and how we perceive ourselves in the world acts as a driving force behind the creation of her work. The theory of the observer effect in quantum physics remains a constant foundation for her sculpture. Often kinetic in nature, the pieces utilise shadows and reflections as playful interactions between elements, the qualities of explorative enquiry, randomness and fluidity combining to create sculpture that are spontaneous and interactive in nature.

Her practice encompasses Public Art, installation and exhibition pieces, and sculpture can be found in collections throughout Australia, Hong Kong and Singapore.

Assuming things are real

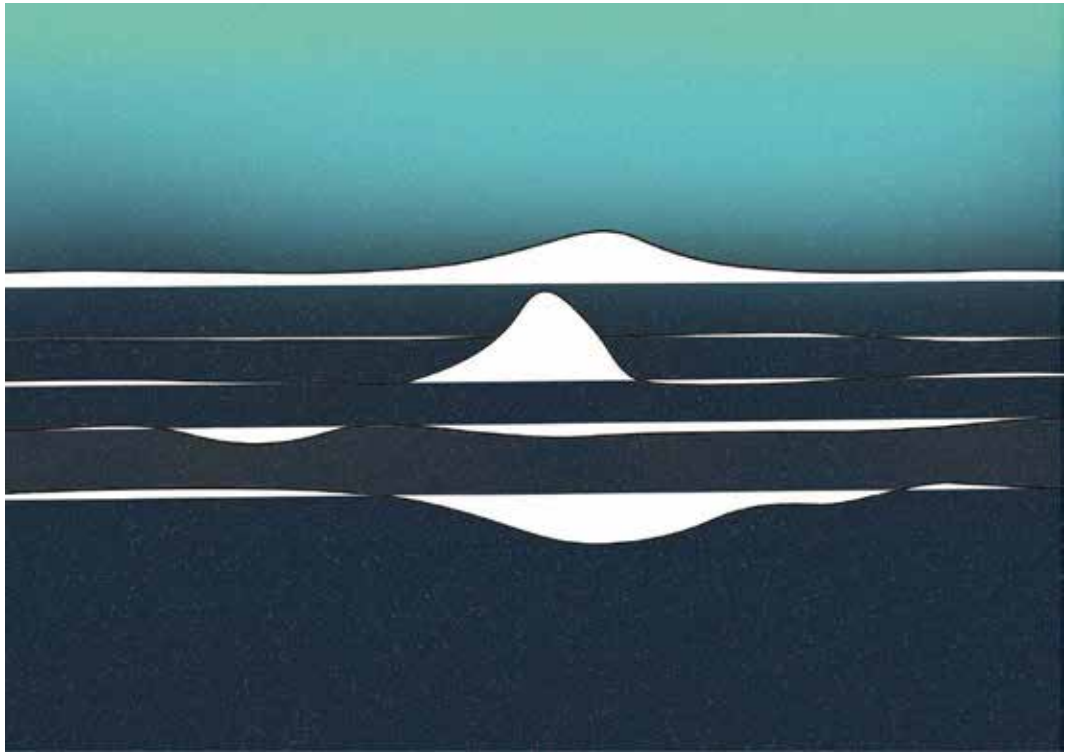
Wall sculpture
Metal, automotive paint
130 cm × 120 cm × 12 cm

Most of us live our lives in the benign expectation that reality surrounds us as a predictable, unchanging, and absolute experience.

What theories of quantum mechanics tell us is that reality is dependent on the observer. A phenomenon which materialises as an entirely subjective experience brought about by the active participation of the viewer. The attention of a measuring device whether human or other, conscious or unintentional is the catalyst for matter to emerge into this dimension, popping in and out of space in a nonlinear fashion, unpredictable, seemingly chaotic and playful.

This sculpture is part of a series of works created over the past few years as part of my investigation into the nature of reality and how scientific theories of quantum physics can be used as inspiration to create aesthetic artifacts. Artists can show us things that are in the world that we would not otherwise notice. Things that are in always there but due to a new perspective, suddenly become visible, or known in a perceptual or sensory manner. In this way there can be the emergence of a new knowledge and awareness which may enrich a person's appreciation of their surroundings.

The work is not meant to be a representation of a particular theory but a poetic response, channelling the playfulness inherent in quantum physics. The undulating structure causes the emergence of shadows and reflections which echo qualities of the fourth dimension. The crossing over of structure allowing for alternative readings of the work depending upon where the viewer stands.



M C Ng (finalist)

Sydney based, M C Ng has been cultivating visual arts and similes across various media for the past two decades.

Through her imaginative reinterpretations, she crafts artworks based on her admiration for everyday landscapes, with the cultural zeitgeist, whilst paying tribute to the iconic imageries by legendary artists of the past.

Memories of Waves

This artwork takes inspiration from wave mechanics in quantum and Hokusai's piece The Great Wave of Kanagawa.

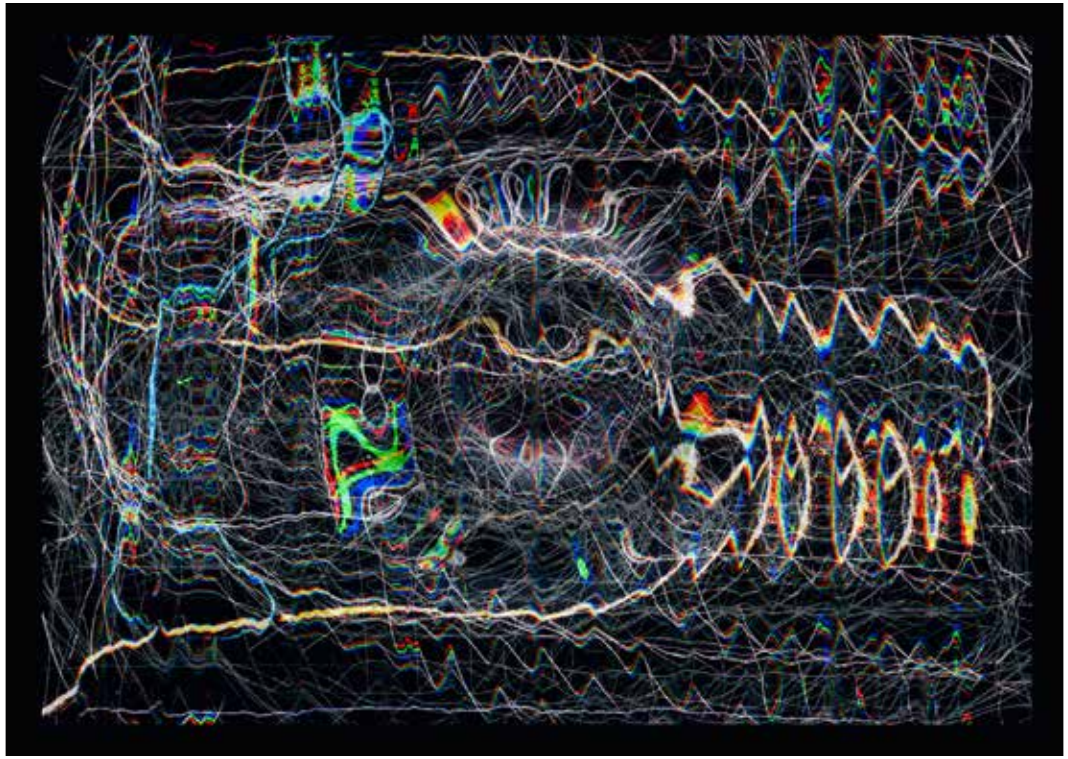
Between vastly different worlds with diverse scales, we seek to reorientate ourselves in how we could view the world as a whole.

We have wavefunctions interfering in the microscopic quantum mechanical world. Yet on the other, we have colliding ocean waves in the macroscopic classical world.

While the underlying principles in these two worlds differ, an intuitive connection emerges.

This work also abstracts the Wigner quasiprobability function, a commonly used method for representing mechanical objects in the quantum domain, by depicting positive and negative values of the Wigner function as the 'upright' and 'inverted' ocean waves.

The smooth waves and sea foams captivate the mind, abstracting continuous variables of classical objects; while the white bubbles emerging from colliding waves signify noises in the quantum mechanical world.



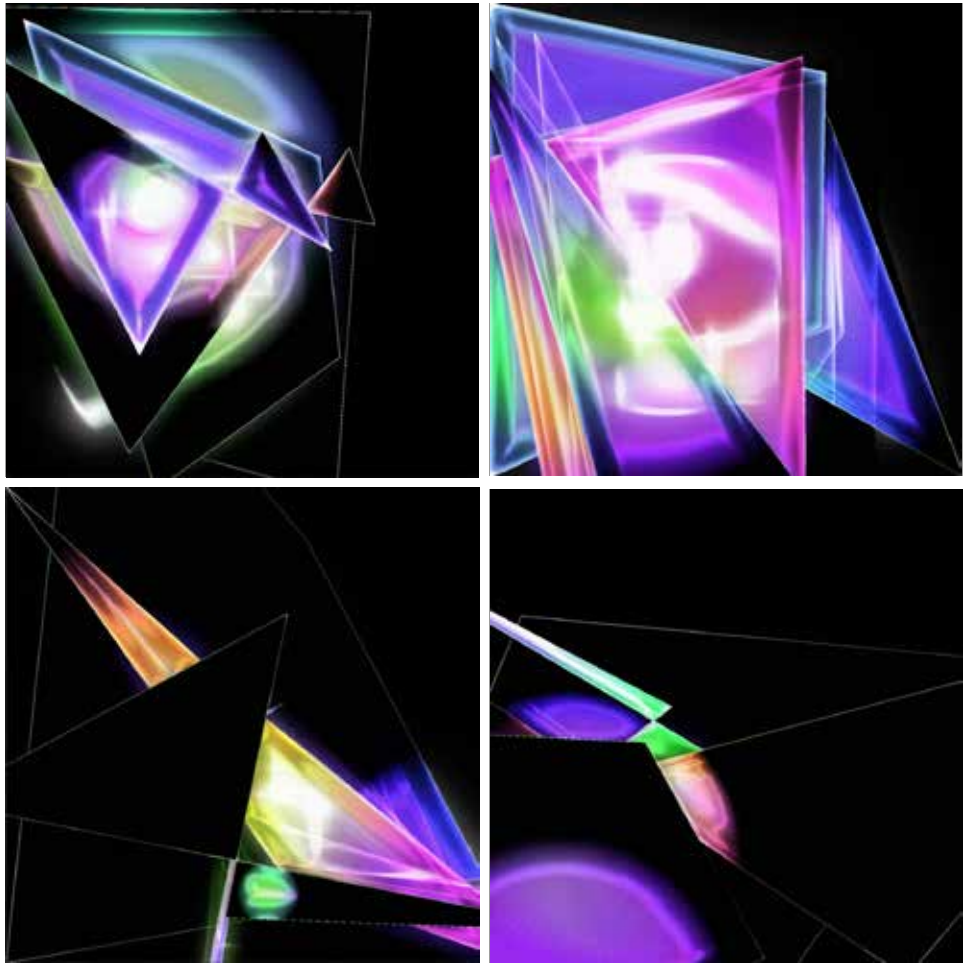
Transience and emergence are the twin foci of this work. It reflects upon a moment of unreality when time is stopped (which cannot be). This is the emergence of pattern from an ongoing dynamic process in which the elements are interacting as one. The work responds to the idea of 'quantum string' and its perpetual vibration from which all else emerges.

Paul Ledington (finalist)

Born UK 1950, Australian by choice. Live and work in the Redlands (Quandamooka country). First career as a management systems academic. Completed Master of Visual Arts (MVA) at Queensland College of Art (QCA) Griffith University 2022.

Early-career artist. Paul Ledington's practice is varied but focuses on digital works; he explores emergence and complexity introducing serendipity and chance into his artistic process. Paul is interested in transition zones between objects and systems. Between say light and dark, land and sky, the digital and the physical, and how these shape and form our experiences in the World. He uses these elements to explore and shape his reaction to the physical, emotional, social, and cultural forms that he lives and shares. Paul's masters exegesis was the 'digital image in digital space'.

The 'digital' creates challenges for our notion of 'the image' and innovative ways of exploring the image as a system with the expression/meaning/art arising from the emergent properties of the elements of the image.



Video

This work is inspired by the mystery within quantum physics - how we have yet to understand the transition between the quantum realm and reality, from a wavefunction to a particle. It explores the relationship between these two 'spaces', between position and momentum - two properties of a particle in the quantum state. The corners of these shapes are coded to probabilistically snap to each of the 4 corners of the frame, or move continuously inside or outside of the frame. Altogether, forming my visual interpretation for wave-particle duality phenomena that exist in quantum physics, and for the theme *Emergence*.

Anh Vu

Anh Vu is a Vietnamese motion designer currently working and studying at UniSA, Adelaide. His work uses harmonious colours and wavy movements to explore the intertwining theme of human senses and identity. His main inspiration stems from the desire to connect his digital diaspora experiences with his traditional Vietnamese values. For more of his work, follow @octomundo on Instagram.

Aprille Chua

Aprille Chua is a PhD candidate at the University of South Australia (Creative).

Aprille's research focuses on 'Design for health and wellbeing' using augmented technologies. Her previous teaching experience led her to investigate how graphics and artifacts in 3D environments with Augmented Reality (AR) can enhance mental health and wellbeing. She has received several awards for her research and is committed to applying her research (through design and creative practices) to improve people's lives around the world. Among her interests are exploring hybrid communication platforms, creating infographics and other learning materials for training and development, and mentoring others.

In this artwork, the theme *Emergence* is interpreted by three aspects of quantum physics. These ideas are aligned to create an atmosphere of vitality and vigour in our universe. First, the dynamic lines constantly transform into irregular and regular forms (the regular forms are man-made, whereas the irregular ones are natural), which constitute the fundamental elements of all objects in the universe. Second, energy flows are represented by a superimposition of irregular and regular (dynamic) lines (shapes) that produce universal energies. A final note on the background; the letters and numbers represent quantum, which is derived from Latin and is an expression of the meaning 'an amount' or 'how much'? Taking into account the artist's perspective, the artwork illustrates how we intuitively perceive our world as a dynamic endeavour filled with vim and vigour.

Delta Venus

Delta Venus (Paige Hasaballah) is a multidisciplinary visionary artist exploring consciousness, non-dualism and the sacred language of archetypal patterns and symbols. She explores visually expressing the unseen through a unique combination of colour, form, light and symbol. The frequency she connects to dictates the medium. Delta's process is highly intuitive in which she acts as a conduit for the energy she channels.

This artwork is a reflection of quantum consciousness and how quantum leaps alter the evolution of consciousness. I experience visual synethesia and see subtle changes in energy visualised in colour and form. This piece is a reflection on how the quantum shifts in thought can drastically alter the physical experience of reality. This piece was created in response to a group in meditation and witnessing how the subtle shift in breath, focus and brainwave activity changed the physical expression of the group and their dynamic. This artwork explores the emergence of higher states of consciousness from quantum shifts in thought.

Galaxy person

This painting plays with the idea that what we think of as a macrosystem is really just a microsystem in an otherwise larger universe. The very atoms that make us and everything around us are universal. It is created so the viewer can challenge their thinking of their current physical world and see it as a microuniverse. This will then allow them to see the ongoing microsystems surrounding us. Because really, aren't we all just small specks of dust when compared to the whole universe?

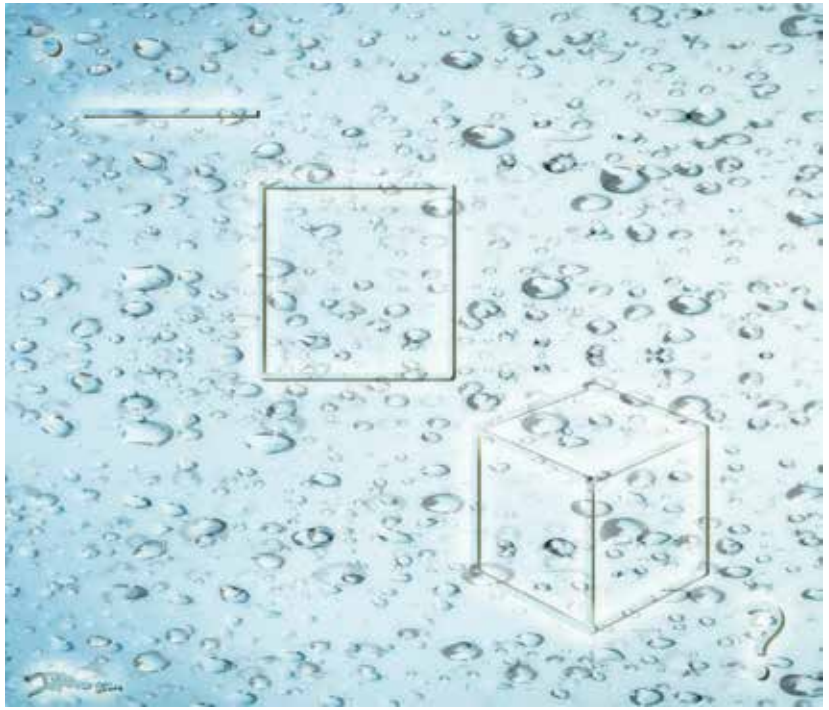
But... What if we were one with the universe, what if classic physics and quantum physics merged and the lines were blurred. And the very building blocks of nature are what make us, and the whole universe, less fuzzy, less probabilistic, but also less predictable.

Life itself is a major source of complexity. All of reality is made of information usually governed by rules. But where do the rules start and finish. Galaxy person is presented, to help us see the larger picture within a group of stars. And the intricacy the universe, on such a large scale, can provide within itself.

Danielle Chapman

Danielle Phelicity Chapman (https://www.facebook.com/DaniellePhelicityArt, https://www.facebook.com/Daniellechapmanarttherapyandcounselling/) was born in Sydney in 1977, raised on the South Coast and moved to Brisbane in her early 20s. She is an artist, art therapist and counsellor, passionate about using art to help improve people's mental health. Danielle has previously had artworks sold in the Sunlight Centre's Anon Art Show and does commissions. She finds her inspiration in nature and expresses art through the styles of realism and Painterly however doesn't limit herself only to those. She continually challenges herself to discover new techniques and styles.

Danielle is self-taught, always having a talent but getting serious about art later in life as a way to express herself and maintain her own mental health. She found she could lose herself in art and lift her mood just by picking up a paint brush. She describes herself as incredibly lucky, getting to share her love of art with those vulnerable in the community. She runs weekly workshops in aged care and in her personal studio, loving when her attendees leave lighter and happier with their new artwork held in their hands. Danielle works mainly with acrylic, but also uses alcohol ink, watercolour, sculpture, 3D paintings, sketching and pastels. Her personal style radiates joy and relaxation while expressing the beauty of the natural world. Her motto is "Never stop looking for the wonders in life."



Danielle ‘DMo’ Oke

Danielle M. Oke is an independent artist, writer, director who creates across film, art, music and other creative streams under the signature seal DMo. She is an internationally exhibited artist of painting and video art, an award-winning scriptwriter, and a published songwriter and poet. Drawn to the below-the-surface stuff that often guides and determines our surface level realities, her work lends to a subrealist tone. This is seen in her art and design, where her work is noted for its use of simple inclusive imagery, bold lined designs, vibrant colours, conscious text and symbology, featuring across painting, installation, digital and video art experimentia. Overall her work is both universal and intimate, playful and deep, and has been presented in a wide range of contexts including gallery, theatre, urban screens and film festival. www.tapdmo.com

Cross sections

‘Cross sections’ is a quantum musing of scale, space and multi-level reality derived from the simple contemplation of cross-sections. The artwork visually presents the question - if a dot is a cross-section of a line, and a line is a cross-section of a surface, and a surface is a cross-section of a 3D object, then what is a 3D object a cross-section of?

We begin with a dot, as most experiments in physics consist of sending a particle to collide with another, to look at the results. We also have cross-sections appearing in the fundamentals of quantum scattering theory whereby the quantity that can usually be measured is the scattering cross-section. Multiplied we can think of numerous particles scattered into elements of solid angle, being divided by particle flux.

Each element in the design can be considered alone, or in the context of their interconnection. This presents a way to consider the phenomenon of emergence from a slightly different angle. Here we can look at each shape separately together, and hence as a collective group of interacting objects, yet see how they relate and form one overall structure, and hence point out how they can have vastly different behaviour as isolated objects. It also shows how by changing one’s angle things appear different, changing our understanding of what we are looking at, and even experiencing.

Lastly, by using common shapes, and having them emerge from the base design, we are able to consider our movement between seen and unseen worlds, deriving an expression for a multi-scaled, multi-angled, multi-aspect reality. The use of multi-layered bubbles as the dominant visual for the base design, from which these progressive shapes emerge, represents the fundamental elements of life as we know it, in oxygen and water.

A yellow lichen in the centre and two rocks, one dark and the other red.

The Aboriginal flag, symbol of a culture that has understood the interconnectedness of every being and substance in the universe. Emergence, a concept that for those cultures that consider themselves part of the ecosystem, is an evidence and a necessity.

The lichen consists of two completely different and complementary living species an algae and a fungus, without one the other cannot survive.

Eleonora Pasti

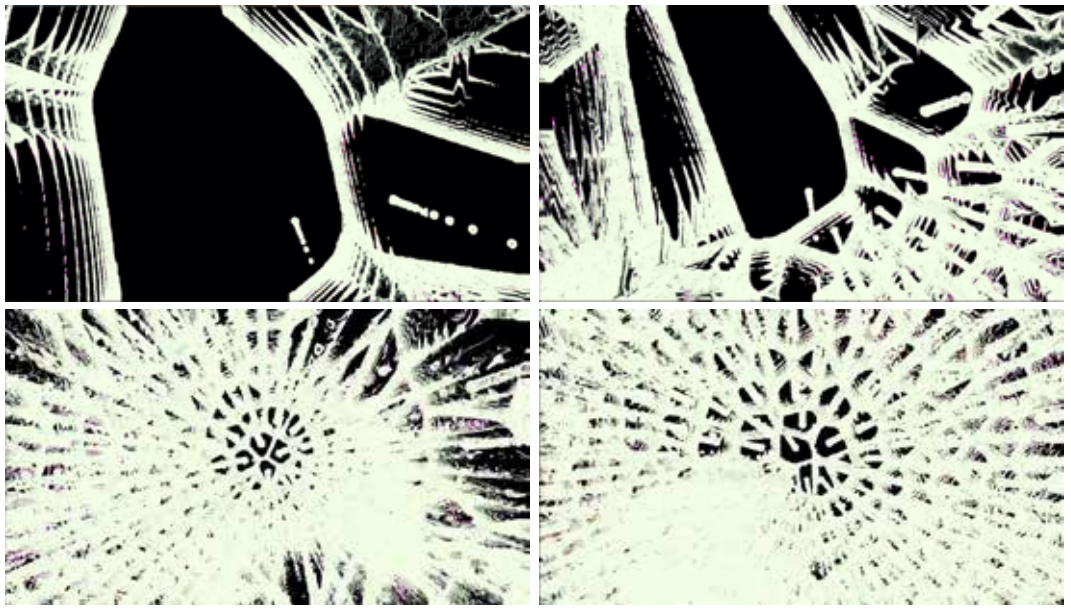
A professional artist in Luxembourg and France for 15 years, Eleonora Pasti arrived in Australia in November 2021. While her art is constantly evolving, it invariably reflects and evokes themes and notions that make it recognisable, personal and autobiographical. She defines herself as an artivist; an artist who is deeply engaged in feminist and gender issues. Art for Eleonora is always political.

Her studies at the University of Bologna, under the guidance of Umberto Eco, led her to search for connections between different disciplines. Language, culture, architecture and fashion are just a few examples where the semiotics of art can 'play'.

Now that she lives in Sydney (Redfern), she is inspired by the strong presence of nature in the city and also by the political battles of the Indigenous Peoples in modern Australian society.

Her new works in Australia reflect these themes.

With a sustainable art (natural materials, natural pigments, environmentally friendly process), she engages with the Indigenous Peoples of Australia through the creation of works that want to reflect the connection between the modern urban layers and nature.



Video

Fayroze Lutta

Fayroze Lutta works as a Sustainability Coordinator to assist in the achieving of Net Zero for the residential entity in the retirement sector. Her creative expression an artist and writer with explores a range of artistic contexts such as art and design, photographic, poetry writing and zines. She extends beyond traditional mediums, with contributions that evoke a deep contemplation and reflection of the modern world and the rapid changes undergoing in her home town of Sydney, inviting viewers and readers to explore and engage with a range of social and environmental issues.

Emergence occurs in entities such as non-living, physical systems. In physics, emergence is used to describe a property, law, or phenomenon which occurs at macroscopic scales but not at microscopic scales.

An emergent property does not need to be more complicated than the underlying non-emergent properties which generate it. Hence nothing can be calculated exactly from the microscopic equations. Macroscopic systems are characterised by a broken symmetry meaning the symmetry present in the microscopic equations is not present in the macroscopic system.

My work embodies the emergence theory by animating a parametric pentagonal shaped diagram into a Voronoi fractal geometric pattern that occurs again and again as it emerges in an explosive animation at different sizes and scales, within the same object. The resulting self-similarity can be seen throughout nature, for example in a snowflake's edge, a river network, the splitting veins in a fern, and the crackling forks of lightning. The same way lightning emerges so does the art piece which erupts emerges as a phenomenon akin to a lightning strike or rogue wave.

The Voronoi's non-static malleable state can move in another plane in a non-local behaviour, in the same way that quantum physics has the phenomena occurring in phase transitions, where the unexpected is occurring. This work displays a probabilistic array, taking a two-dimensional shape, and turning it into three dimensions utilising a non-principle state as the theory comes to life from the broken symmetry.

Francis Cai

Francis Cai is a 24-year-old fine art photographer and an XR film director based in Sydney, Australia. He has a Bachelor of Fine Arts degree from Whitecliffe College of Arts and Design and a Master of Moving Image degree from the University of Sydney.

His works focus on individual confusion and rising self-awareness in the post-pandemic era. He won the Photo Media Prize at Whitecliffe college in the final year of his BFA degree. His image 'Moving Out' stood out from over 200 entries and won the 3rd Alex Mao Youth Photographer Award in 2021. His latest work, 'Stardust', was shortlisted for the Blacktown City Art Prize. The immersive short film 'Sinking into the Afterglow', directed during his master's degree, won the ROMA Short Film Festival in Virtual Reality. The film was also shortlisted for the VR competition unit of the 18th Italian Terni Film Festival in 2022 and the upcoming 6th Berlin Sunlight International Film Festival.

As a young artist with a unique perspective, he sensitively examines the differences in diverse living environments and cultures in the uncertain era he experienced from the heart. His works show a distinctive personal style and have been exhibited locally and internationally at Leo Kelly Art Centre, Verge Gallery, Auckland Photography Festival, and Shanghai National Convention Centre, gradually catching public attention. His published photobook 'The Daylight Moon' is included in the National Library of Australia Catalogue. His artworks are in private and public collections.

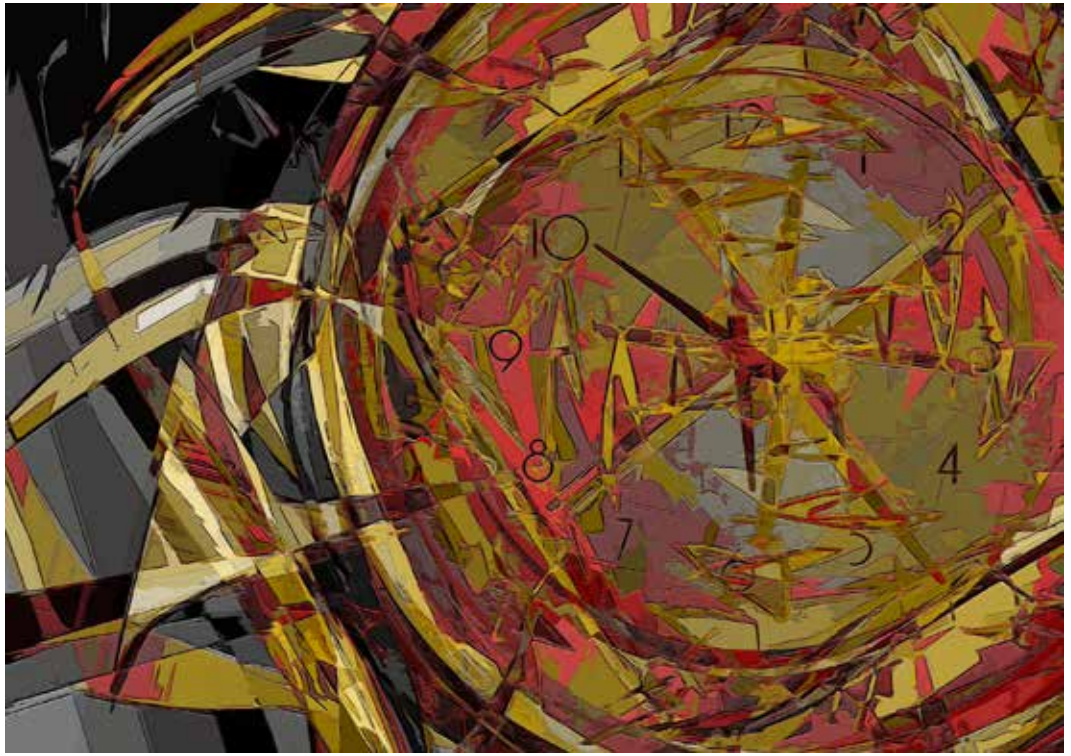
Aphelios 1

Moving image

'Aphelios 1' is a one-minute lopped surrealistic moving image installation artwork about the visual assumption of emergent space-time theory, partly empowered by an AI graphic program and overlaying visual elements from my still images. 'Gravity is a hologram', inspired by Monica Jinwoo Kang, a Sherman Fairchild Postdoctoral Fellow in Theoretical Physics at Caltech when explaining the holographic principle, a central tenet of Zurek's model. This principle, realised using string theory in the 1990s, implies that phenomena in 3D, such as gravity, can emerge out of a flat 2D surface. More specifically, gravity and space-time are thought to emerge from the entanglement of particles taking place on the 2D surface. Entanglement occurs when subatomic particles are connected across space; the particles act as a single entity without direct contact with each other, somewhat like a flock of starlings.

In Zurek and Adhikari's proposed experiment, they explain that gravity and space-time emerge out of the quantum horizon. That fuzziness would represent the pixelation of space-time, and 'Aphelios 1' is an abstract piece showing where time differs between the macroscopic and microscopic worlds of physics but also merges between the two realities. Aphelios comes from Greek, 'apo' means 'far apart, away', and 'Helios' is the Titan god of the sun. In astronomy, 'aphelion' means 'the point in the orbit of an object where it is farthest from the sun', which has the same origin. I programmed a self-rotating eye in the middle to symbolise human beings' craving for knowledge of the universe's deepest secrets.

The emergence phenomenon is magical but not uncommon in our daily life. We see flocks of birds and schools of fish undertake coherent motion in groups, though made up of individual animals. We say that the group behaviour is emergent. Gravity might be something that arises from the pixelation of space-time. But are we ready to unify these two seemly irreconcilable worlds? Are we ready for this challenge?



Hayden Fletcher

Hayden Fletcher is from a small rural town in the New England region of Australia, specialising in creating artwork through the Adobe Creative Suite (Photoshop, Illustrator). Primarily Contemporary Abstract art distinguished by brightly multicoloured with a black background, symmetry and are based upon intangible subjects or themes.

His goal is to create a new style using innovations in technology in order to create artwork for both the general public and the art world. To make something new and exciting in a world of severe commercialism and safe ideas. With technology, artwork can be elevated in terms of colour, shape and the canvas itself.

My artwork is based upon the idea of Einstein's space-time model, how time is represented where the future and past exist simultaneously.

Using a clock as my design, the very basis for how everyone in the modern era tells time, will result in a design in which laypersons such as myself might understand the emergence theory.

Multiple hands of the clock are outstretched in multiple directions all pointing to different points in time. With zigzagging lines connecting them together.

This zigzagging repeats along with more numbers outside the circular frame far more obscured and less legible. Past that leads to the unknown swirling vestiges which we are still deciphering into tangible forms.

For the colours, based upon my research, it was quite difficult to decide but ultimately gold was needed due to the golden ratio, the 'divine proportion' throughout art and history repeatable occurs. For example, the Great Pyramid of Giza, the human body and the '600-cell'. Red was chosen due to it being at the end of the visible spectrum of light and its history of being used in prehistoric times for cave paintings and body paint. Sundials used light in order to help understand time hence the choices in colour. Lastly, the blacks and greys represent the future information which we will inevitably discover in the future but don't simply have in the present.

This is how I interpreted the theory of emergence.

(This design is intended to function as a clock as well.)

HOLISM

J.K. USED

Jackson Used

Jackson Used is an interdisciplinary artist from Perth, Western Australia, working across the media of stage, screen, aural storytelling and poetry. Jackson is a lecturer at the National Institute of Dramatic Art, working with students in the MFA Writing Program, teaching the Aural Storytelling & Podcasting syllabus he curated. He has worked extensively in Perth, Brisbane and Sydney, as a writer, director, producer and dramaturg, having worked as a dramaturg on Mel Ree's Mother May We at Griffin Theatre Company in 2022. Much of this work has been done with sandpaperplane, the theatre company he co-founded in 2014. Recent writing credits include Delta Sierra Juliet (NIDA & 107 Projects, Redfern), Lilac (KXT, Kings Cross) and PIT (Old 505, Newtown). In 2021 Jackson and Elliot Vella were selected for SoundWAves - an Audible and Screenwest Audio Development and Production Initiative to create a narrative podcast that can be adapted to television, developing Received At Murchison, a Sci-Fi Horror story.

pre-reduction

how many ideas have played out
from planted seed to spoken word
given form through action
events with distant heritage to this
idea

a row of houses on an urban street
inspired by a cottage near the ocean
answering the design of a levee
trying in vain to spite nature
the city won't remember this

and if our streets are a microcosm of urbanism
a physical metaphor
that bear little recognition to the intent
what sits within us
in lower lying waters than our hearts

giants causeway

let us capture time through our words
in our often foiled plans
years before seeking an escape
chasing colour in ireland
gutted fish in scotland
freezing appendages in brack
catching falling snow
crystalline ecstasy
laughter as it lands upon eyelash
fingertip
and volcanic stone
what would have called us there
why didn't we go
oxygen expelled from my chest
roaring cavity
settling into weather patterns

protest

days in class dragged on when stuck with textbooks of theatre and lacanian philosophy and trying to unpack the reasoning and necessity of the lack of comprehension incomprehensibility of language in the endless and meaningless chain of signifiers but I have to wonder there it is I constantly returning to the most important letter and the significance I give to it and again why does that deserve more attention than the depiction of a river or the tunnelling of a particle through an obstacle or the overwhelming submission to the tide of love and romance that is a question that begs and continues to plead but it is the I of it all the observer and the measurement for without measurement we have a meaningless world right that has to be correct because if a tree falls in a forest denotes the idea that well perhaps it continues without us if our existence is rendered absent without the correct employment of time then the meaning continues just not for our satisfaction should there be a sense of joy in understanding something or do we ultimately return to accepting that the more we know the less we know and why the constant curiosity the need to answer something outside of ourselves when the internal remains unknown the oceans undiscovered the link between the classical and the quantum unquantified unless we are just not standing in the right spot when we are looking perhaps it is just the lens or the eye or the time of day that gives that answer the time required to elude us and so it comes back to time and measurement and curiosity and then you wonder how to keep looking when you don't know who to talk to about it all and so is language meaningless or did this sing for you despite not giving you the breath required to vibrate those notes for you

emergent phenomena

how much of our collective thought champions our free will
and is that derived of spirit
or physiology
the pangs and moans of our bodies
given justification as actualisation
when actually it was a hot afternoon
hungry at 3pm
and the next phase of your life is guided by a mood
perhaps that flavour was a quark
bonded in hadron
granting a sense of self

is it unsettling to consider
these microprocesses that govern existence
unseen in their movements
or does the act of asking the question
scratch an itch
is the uncertainty an invitation
to lean into colour
not just to observe but to participate
to send a message from london to perth
ricocheting from planet to planet
sinking into cosmic radiation

HOLISM

HOLISM is a suite of five poems that interrogate form and the stimulus of 'emergence'. The poems explore the perspective of the narrator who, immersed in inertia, examines their world through the lens of urban design, a failed relationship, the breakdown of language and the emergent phenomena of hope. The suite looks at emergence not just as a concept with relation to classical/quantum mechanics, but rather the broader attempts to study emergence across various disciplines, before ultimately tying these ideas back to the micro processes of the quantum influence macro phenomena in the universe. The language used in this suits is imagistic and playful, exploring hope and loss within the human condition, while proposing an eco-spiritual understanding of how nature impacts the subjective elements of our existence.

Jennifer Reid

Jennifer Reid makes paintings, drawings and mixed media artworks and small sculptures. Her subjects include city, suburban and harbour scenes as well as figure and portrait works, and recently she has taken to drawing birds. Jen regularly exhibits work in a variety of solo and group exhibitions, and has contributed to performance and community art projects.

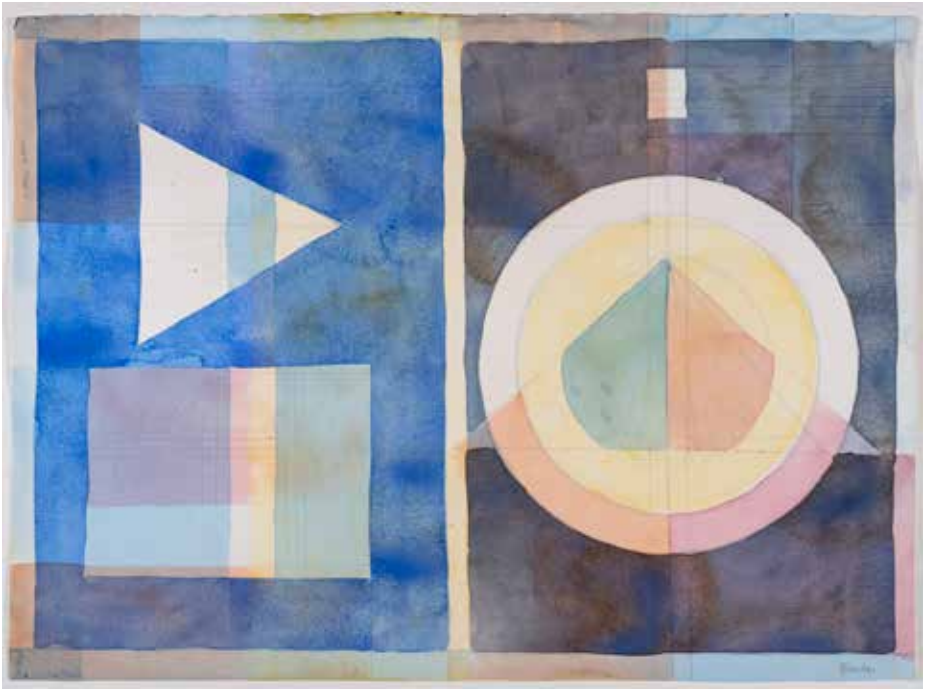
In the early 2000s I took a photo of a small group of yellow nubs in the leaf litter at the base of a lovely spotted gum tree. I took another photo of the same group a week later after they had blossomed and grown into an attractive bunch of fungi. I was attracted to the pleasing arrangement of shapes and colours and the miracle of plant growth. The week after that they had been dug out and the photos were absorbed into my subconscious.

When I began thinking about how to interpret the theme of emergence for the 2022 EQUS Art Competition I had just begun exploring monoprinting as a method for image making. As I read about emergence in quantum physics alongside researching monoprint techniques it occurred to me that they are conceptually related: a specific form emerges from a field of possibilities. Iterative exploration of a new printing method led to a series of images emerging from the field of possibilities that I had put in place.

The photos of the fungi resurfaced in my consciousness. The images of fungi growing from leaf litter combined with development of the process became my metaphor for emergence. The image elements altered and through trial and error the process transformed from random to purposeful mark making. Even as I refined the technique, uncertainty of the result was persistent through each version. This is one of the challenges and pleasures of this type of printing: even within the increasingly defined set of possibilities, the reveal of each new version was a surprise.

I can't pretend to understand quantum thinking but a parallel with the creative process now seems apparent. It has something to do with that mysterious transition from the imagination, to the formation of an intention, to the action and its result. It's a transfer between potential and outcome, between randomness and purpose. The field of possibilities may be collapsed into a specific piece of work, maybe in ways the maker had not considered, but the same possibilities remain and will emerge differently in a new work.

At the beginning of this project my goal was to make prints on paper to be mounted in a frame. As the process developed and the images emerged from each iteration I considered alternative presentations. The day before the *Emergence* deadline I decided to offer as my entry the penultimate image of the series as a testament to this field of possibility being not yet fully defined.



Kathryn Blumke

Kathryn Blumke is a contemporary abstract painter and a Doctorate of Visual Arts candidate at the Griffith University. Having completed an undergraduate degree in Physiotherapy and a Masters in Arts Visual Arts she is interested in conversations of healing at the intersect between science, art, and philosophy. Her geometric abstract paintings investigate conversations of more than human entanglements in material experience with nature, drawing upon ideas in quantum physics, the post human, and Deleuze's philosophical concept of affect. Her art has been short-listed for the following awards: Paddington Art Award, National Works on Paper Award, Blacktown Art Awards, Fleurieu Art Awards, Moreton Bay Art Awards, Redlands Art Awards, Stanthorpe Art Awards, Churchie Art Awards.

I gratefully acknowledge the Traditional Custodians of the land to which we gather, the Turrbal and Jagera peoples, and to which my research is based, the Kedron Brook, and pay my respects to Elders past and present.

In regards to the theme *Emergence*, Deleuze and Guattari write of an emergence of a 'people to come', which summons forth a time where philosophy, science and art will become one in their 1991 book What is Philosophy. In October 2022 the Noble Prize for physics was awarded to three scientists that proved that entanglements in nature exist. Philosophically, Deleuze writes of such ideas of entanglements in describing his notions of affect and non-human becomings based on both the writings of the 17th century philosopher Spinoza and the 19th century Nietzsche.

With backgrounds in both visual art and physiotherapy, and as a Doctor of Visual Art candidate, I am interested in conversations concerning the emergence of art, science, and philosophy in conversations of how art heals, at both an individual and a community level. My research investigates methods in abstract painting exploring narratives of entanglements, more than human experiences, materiality, transformation, and healing. I base my research upon a philosophical post humanistic, new materialistic perspective, grounded upon a Deleuzian Guattarian affective framework.

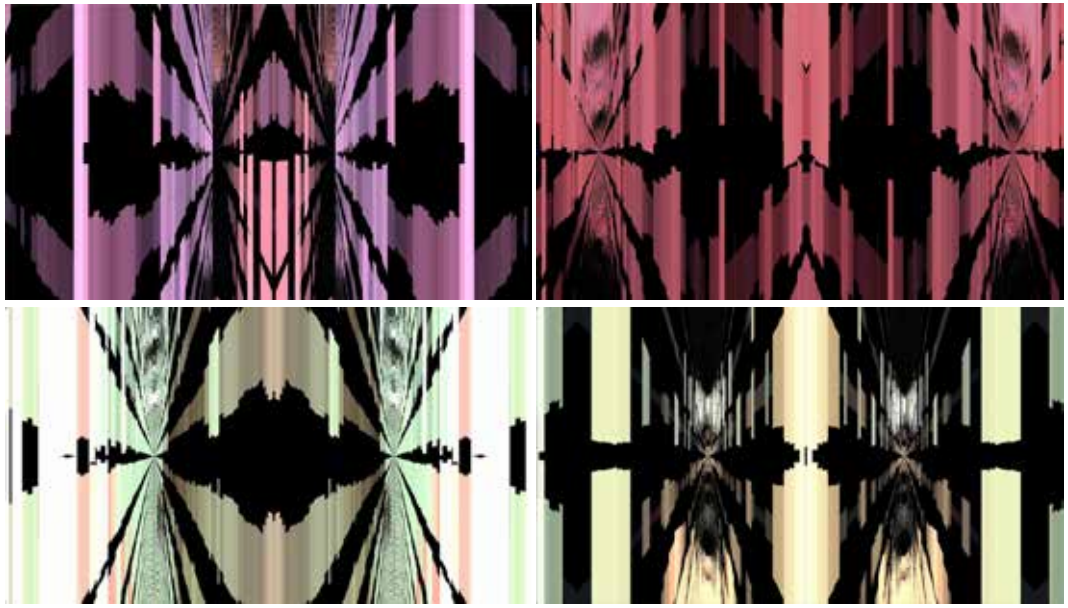
My beloved sister-in-law, Annie, died last year. Though it was one-month post-surgery after the removal of a brain tumour, her death was sudden and unexpected. The day after she died, as I walked in a daze, a butterfly flew past me. I was enchanted by how it slowly flapped its huge wings. Its flash of colours of red, white, and black was like a force of power to me. I experienced joy for that fleeting moment. I felt Annie's presence.

Annie adored butterflies. The butterfly I saw was the Orchard Swallowtail Butterfly. The streak of red indicated it was the female of the species. This was the first of many entanglements with butterflies I would experience over the past 18 months since Annie's passing. Many of these experiences would occur as I walked along the Kedron Brook.

In my paintings, I consider Deleuze's idea of art as the nonrepresentational and ways in which the visual material can capture non visible forces. As I go walking along the brook, I become the flow and vitality of the water, I become the lightness and transformation of the butterfly. In this way I use abstraction, as the nonrepresentational, the image of thought without an image to transfer these entangled states of being.

In making further entanglements with the brook, I collect water from the brook to add to my watercolour paint.

In my painting and drawing I become entangled too with my materials. I become the flow of the watercolour, the power of geometry, the joy and force of sensations of colour and the rhythms of harmony. These processes were transforming and healing for me.



Ken Dallaston

In his artistic practice, Ken Dallaston delves into the relationship between materiality and the digital landscape. His work explores the interplay of various media and techniques, using both traditional and contemporary approaches. His work is inevitably experimental and engages in a continuous dialogue between the digital and analogue realms. He is drawn to the tactile qualities of physical media and their ability to convey meaning through texture and colour as well as the immediacy and flexibility of the virtual. When these approaches interact, he finds new avenues for artistic expression.

All the Time

Video

My entry for the 2022 EQUS Quantum Art competition consists of a five-minute video work that was created using a medium and process that are analogous to parts of both quantum and emergence theory. The chosen medium is digital technology and the creative process involved a series of algorithmic manipulations of information embedded in an arbitrarily selected 15-second video. Digital technology and its many manifestations, for example, computers, smart phones, the internet, communication and entertainment systems, can be regarded as an example of emergence. The probabilistic meanderings of atomic particles in small pieces of silicon have, in the last few decades, changed the life of just about everyone on the planet.

The choice of a finite data stream in the form of a file on a computer disc is analogous to quantum ideas of time. It has an arbitrarily allocated beginning and end but can be processed in any direction and at any speed. Its recognition as a recording of some past event relies entirely on the symbolism or meaning we apply to individual strings of information.

The algorithms used to manipulate the information consisted of sets of rules that were applied to the data stream. The rules included parameters whose initial values were chosen by the artist - an entity exhibiting consciousness! Some of these parameters were randomised at the start of each iteration so that the process could be said to be non-deterministic. The information could be manipulated as single binary digits or as inter-related groups in the form of bytes, pixels or frames. The fact that the source of the binary digits was recognised, in our reality, as a digital video is irrelevant given that all the creative process required was a stream of binary information. The output of each algorithmic manipulation was then input as information to the next and could be fed back into the process thus creating causality loops. The video's soundtrack was created in a simultaneous process using the same source file but a different set of algorithms.

Finally, the information that emerged from the creative process was reconstituted into a format that could be 'understood' by a computer as a video file and could be displayed on a screen in the form of pixels made up of bytes and binary digits.

It should be noted that the final product, the video and its soundtrack, bear no resemblance to the original video. The result of the rules-based manipulations could not have been anticipated by an observer from knowledge of the rules or the content of the information stream. It is that final product that observers experience.

Quantum Law, Emergence

The quantum realm is inconceivably strange and hidden - breaking the laws of reality as we experience them. Quantum Law, Emergence melds the law-breaking nature of quantum physics with the iconic Australian outlaw persona of Ned Kelly.

Dr Kim Hamilton

Dr Kim Hamilton is a Barrington Coast artist who creates artwork inspired by her science background and fascination with the natural world. She creates a variety of artworks, from electron microscopy images to large-scale digital pieces. Her work often combines elements from different media, such as photography and sculpture, to create unique and beautiful pieces. With interdisciplinary experience in the visual arts, digital design, science and conservation, her science-inspired artworks have been exhibited in international, national and local art galleries and festivals.

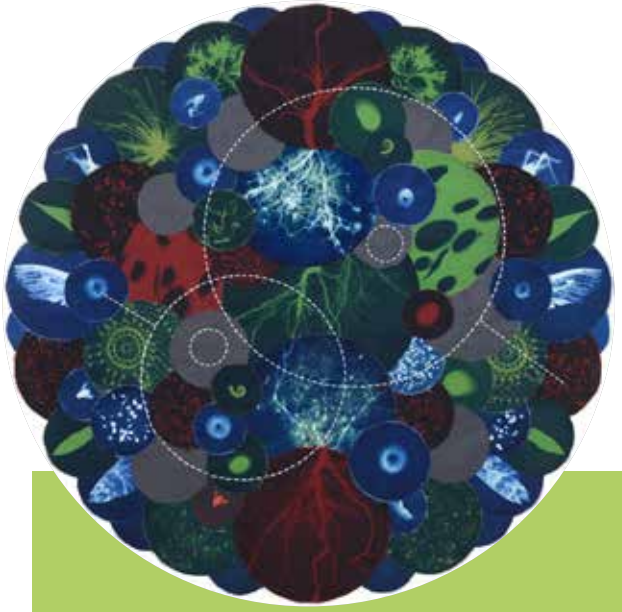
The emergence of a subconscious from what seem to be hundreds of millions of independently operating systems as observed by the resulting subconscious onlooker

Watercolours and acrylic

The aim of this piece was to represent the collective creation of a subconscious and the way it emerges from the group effort of trillions of smaller individual strands of cells and DNA as shown by the curling strands at the bottom left converging at what looks to be the heart of the finally conscious observer.

Isla Hashmi

Ilsa Hashmi is currently a Brisbane-based university student at Queensland College of Art hoping to complete a bachelor's in Visual Arts. She specialises in creating stylised character works with the use of both digital and traditional painting mediums. She hopes to become proficient enough in her works to be able to create works that centre around surrealism and horror art while remaining stylised. She aims to become a self-sufficient freelancing online artist as well as to someday work in art direction for animation and gaming.



LeAnne Vincent

LeAnne Vincent is a photography-based environmental artist originally from the Nambucca Valley on Gumbaynggirr country, New South Wales. She was raised on land at the base of Mount Yarrahapinni where she developed a love for nature and connection to the bush, waterways, and the ocean. Since then, she's resided in Queensland on Yuggera country for several years and practices art in her Ipswich studio and surrounds.

Her work is engaged with the landscape and relies on experiences within anthropogenic biomes to investigate human behaviour, natural heritage, and collective memories. Natural and urban environments provide unlimited stimuli, and her work is often informed by upheaval in these environments, from the forces of nature or human interaction and habitation. Her photography practice began with black and white film and working in the darkroom and has developed into a much broader practice working across digital, film, video, and alternative photographic processes. In the last five years her practice has evolved further, finding new ways to use images and express environmental concerns using stitching and cyanotype photograms on various textiles.

She holds a Bachelor of Photography from Griffith University, Queensland College of Art, where she studied art theory and majored in photographic art practice. She has exhibited for the past 17 years in solo and group exhibitions and has achieved several awards. Her work has been shown in numerous exhibitions nationally and is held in public and private collections.

Quantum biome

Multiple cyanotype photograms on cotton fabric with thread
60 cm diameter, 74 cm × 74 cm framed

My photo-based art practice is engaged with the landscape and relies on my travels and experiences to investigate human behaviour, natural heritage, and shared memories within Anthropogenic biomes. Natural and urban environments provide unlimited stimuli, and my work is often informed by upheaval in these environments -destruction from the forces of nature or human interaction and habitation.

Working in the 'quantum landscape' is somewhat different, where things don't always function as expected. After studying existing depictions and diagrams of quantum physics and emergence theory, I sought to create my own visual interpretation by drawing on emergent properties in our natural ecosystems. I created an imagined 'quantum biome' revealing a macro view of subatomic particles and wave-particle function, and where lifeforms emerge at the outer rim. However, my quantum biome doesn't function like a normal, natural ecosystem – things aren't quite as they seem. Through the cyanotype process my photograms of everyday objects can take on an otherworldly appearance.

Influenced by the first known female photographer Anna Atkins, who published a book of algae photograms using the cyanotype process in 1843, I use the same technique to construct a visual impression of the quantum ecosystem on fabric. Mixing measured amounts of ferric ammonium citrate and potassium ferricyanide with water and then combining in equal amounts, I created a photo sensitive solution that I applied to fabric. Objects are placed on the photo sensitive fabric and exposed to UV light for varying lengths of time and the chemicals are then washed away leaving an impression of the object. This impression or photogram is considered a form of camera-less photography and is commonly known as blueprints. I created multiple cyanotype photograms of organic matter (flora, seeds, soil, stones, feathers, and insects) and engineered objects of glass marbles and doilies to represent my imagined ecosystem.

Using a red, green, and blue colour palette represents colour force in quantum chromodynamics and allows me to connect the work to my digital photography practice where I use the Adobe RGB colour profile in my everyday work. The layered circles allude to multiple layers of reality, exposing their emergent properties that are presented to us as everyday phenomena. The blank circles represent the unknown, and discoveries yet to be made, and the stitched circles, like walking trails marked on a map, represent infinite exploration.

www.leannevincent.com.au
0439647445

Louise Walder

Louise Walder's attention is drawn to the rediscovery of the ordinary in the everyday. She's inspired by the textural differences between natural and manufactured structures and surfaces. She's intrigued with capturing fragments of time, using the medium of photography to record patterns and lines; as well as shadows created by nature through architectural spaces which produce spatial forms.

Fragments of phenomena

Before commencing painting, I wanted to grasp a rough understanding of quantum physics. I considered how the study of matter and energy at the most fundamental level and the examination of the very basics of nature on a scale much smaller than microscopic, could be interpreted through an artistic lens. I thought about the interaction between the various mediums, substrate and painter, the energy created in this process is visceral, but not a tangible object. The materials of painting (matter) and the process of the artist producing (energy) can be likened to the study of quantum physics.

I considered the energy expended in creating initial lines across the canvas, using oil and wax pastels. I wanted to explore the entanglement phenomenon and chose the unpredictable medium of acrylic ink, in fluid form. I could not foresee whether the ink would be repelled by the oil and wax pastel lines I initially produced, and whilst I could guide the ink, I could not control the outcome. The effect of using my body to move and direct the canvas, guiding the ink but unable to fully predict where it would stain, created an impetus that has been captured on the canvas. The ink stains and the lines connect in areas, whilst also remaining individual entities, similar to the entanglement phenomenon in the quantum world.

I added a final layer of brush strokes of oil paint, in a variety of shades, to surround but not touch the ink and line composition. Intuitively layered, they help convey the feeling of small particles overlapping and connected to one another yet creating a paradigm or foundational patterning, much like the predictability of the classical world in quantum physics.

'Fragments of phenomena' explores the theme of Emergence through the resultant play between materials, their behaviour towards the other and the dynamic energy expelled by me, the artist during the process of creating this painting.

Space-time frame

Acrylic on canvas

This abstract painting by Marni Artimarni explores the themes of quantum and the universe. Created using acrylic colours on a vertical canvas, the artwork captures the essence of the universe through a series of 12 frames of time.

The background of the painting consists of 12 vertical sections in black and grey, representing the time frames in space-time. These sections play a dominant role in the composition, symbolising the significance of time in the universe.

In the foreground, a vibrant blue colour portrays the manifested part of the universe, the visible realm perceivable by our physical eyes. This area represents both space and time that are observable to us.

The shiny silver elements in the artwork represent parts of the universe that are yet to be manifested, existing in the form of energy rather than matter. The intensity of the shine reflects the energy and vibrancy of these elements. The colour palette predominantly features cold tones, reflecting the overall temperature of the universe, while the silver parts stand out with their luminosity, representing their energetic nature.

The dark background colour represents the inherent darkness that permeates the universe.

Marni Artimarni

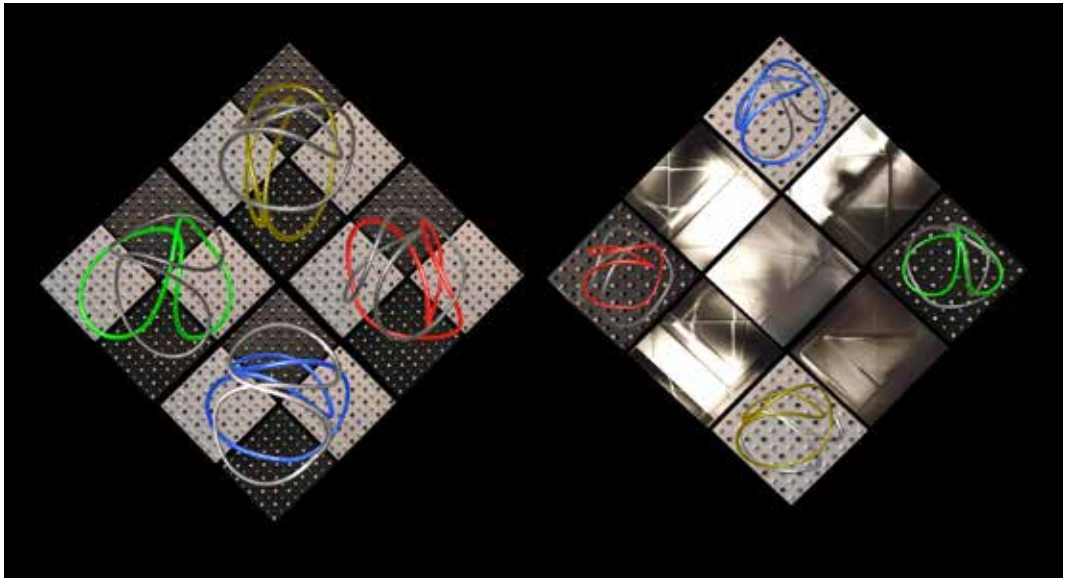
Marni Artimarni is an electronics/photonics engineer by profession, who channels her passion for the mysteries of the universe and her strong interest in quantum physics through her captivating paintings. Painting serves as a powerful medium for Marni to explore the depths of her imagination and express her fascination with the undiscovered problems in physics.

Through her art, Marni predominantly delves into the realm of abstract painting, infusing each stroke with the inspiration she draws from the world of physics. Her deep admiration for the field, coupled with her belief that the answers to unsolved mysteries lie within our own minds, motivates her to translate her profound ideas onto the canvas. With a desire to unravel the enigmas of the universe, Marni aims to offer her own interpretations and solutions to the unanswered questions that captivate physicists and scientists alike. Each painting by Marni is a unique reflection of her imagination intertwined with scientific concepts. Her artwork seeks to provoke curiosity and invite viewers to contemplate the mysteries that surround us. By harnessing the power of art, Marni aspires to contribute to the exploration of uncharted territories in physics and spark meaningful conversations that transcend the boundaries of conventional understanding. Marni's passion for physics and her artistic endeavours culminate in an inspiring fusion, where her technical expertise as an engineer converges with her creative spirit. With her paintings, Marni endeavours to bridge the gap between art and science, offering glimpses into the profound connections that lie within the intricate fabric of our universe.

Maxime Banks

As matter collapses into a black hole, it leaves a faint imprint in its gravitational field. This imprint is 'quantum hair'. As my painting collapses into a black hole, the conservation of quantum information obtains. An imprint as a metaphor of memory. Imprint as handprint. The quantum memory sustained in my hair in the painting is/as quantum hair. Gravitational field quantum hair imprint. The instability of my hair's kinky coils on or near the event horizon.

My Afronaut self-portrait painting collapsing into a black hole is inspired by the research of Stephen Hawking's black hole information paradox. A black hole preservation of information as the emergence of memory of the universe. According to the laws of quantum mechanics, information that exists in the universe cannot be destroyed, showing that black holes have a property known as quantum hair thus retaining some information about the black hole's past.



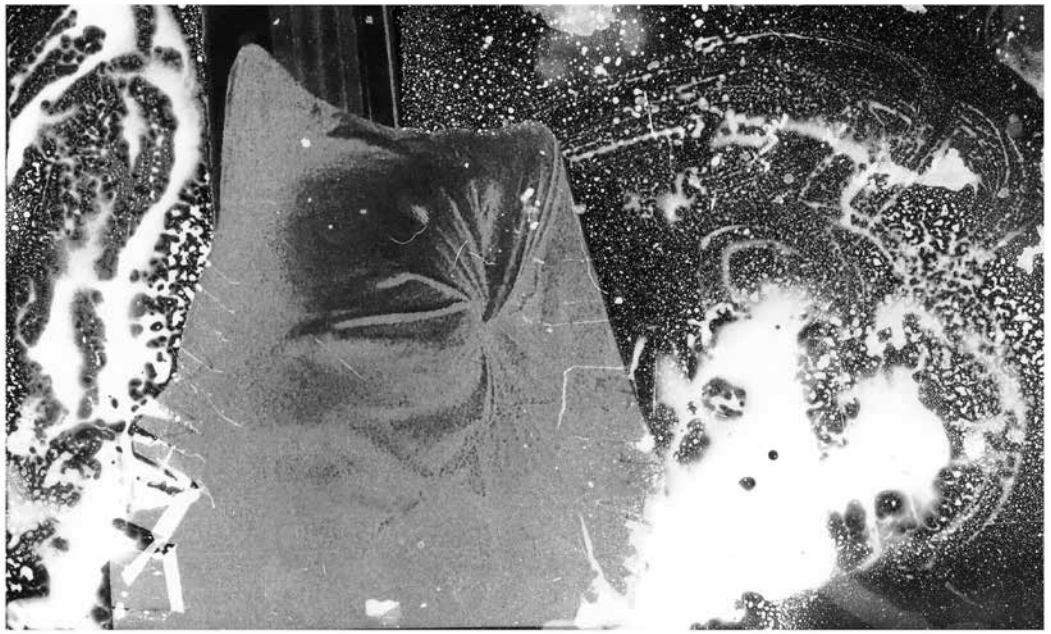
(LEFT) 16- & (RIGHT) 9-PART LOZENGE DIPTYCH WALL CONSTRUCTIONS: [32" × 32" × 5/8", Complex Curve-Topped]

16 - 4 low-relief: b/w polyurethane peg boards (10.6 × 10.6 × 5/8) with 8 sets of B, W & G spherical-headed 1/4"–1/2" dia each & 4 (1/2"–3/4" dia)

& (vinyl tubing colour/silver metal-flake-filled 9"–14" x 9"–14") (right) 5 black-framed 'photogram' prints

T. Michael Stephens

Constructive artist and co-founder of Art Research Center and the International Institute of Modern Structural Art, Michael Stephens has produced events and collaborated with other artists internationally for more than 50 years.



Patricia Malt

Patricia Malt is a final-year undergraduate at Queensland College of Art. She works in painting, drawing and lately exploring the unpredictable medium of the chemigram – a type of 'light drawing' darkroom process.

The Phantasmagoria of Kaon LeStrange (she/her) Emergent

Chemigram and cliché verre on Ilford Multigrade photographic emulsion paper

This cameraless photographic process is carried out in the darkroom. A contact print is made using a handmade trace paper negative of an image of my masked self (cliché verre). Photographic emulsions are applied directly to the paper (chemigram) before immersion in developer, stop and fix baths to reveal the final image. The result cannot be predicted as the process is done 'blind'; that is, in the dark without any image or mark making visible until the final development process. Trial and error is the overarching principle in this every experimental practice.

My work is analogous to the 'measurement barrier' where my conscious observations and experimentations enable the emergence of the invisible (quantum) dimension into the visible (classical) realm.

The aleatory nature of the chemigram/cliché verre or light drawing process enables the expression of a fragile in-betweenness, a place where the uncanny and surreal may emerge as hermeneutic reflections of our flickering lives in a flickering universe.

I live in a state of fuzzy uncertainty and confusion – and by focussing my consciousness on that confusion, I sometimes achieve a kind of lucidity, or an emergence of the 'anti-fragile'. I have made a photographic artefact, not documentary of intuitive Newtonian phenomena, but rather a glimpse of the alien that may challenge our rigid pursuit of certainty.

"We choose to examine a phenomenon which is impossible, absolutely impossible, to explain in any classical way (. . .). In reality it contains the only mystery." (Richard Feynman)

From chaos to order, only for a moment in time, the synchronous emergence of various elements form an entity we recognise. Something we are formed by evolution to pay attention to, a face, that is in the end but a conglomeration of molecules that is ever-changing. This ephemeral manifestation of various elements coming together, out of which emerges a familiar sight, is what I am intending to represent with this artwork.

Sébastien Clermont

Sébastien is a multidisciplinary artist based in Montreal. After obtaining a BFA in cinema with a collection of films on spiritual and psychological themes, he turned to visual art and mixed-media techniques to create work delving further into those ideas. He draws inspiration from world mythologies and visionary experiences provoked by psychedelics/plant medicines; as well as archetypal symbols such as those of the Tarot and Jungian psychoanalysis.

Taylor Ritchie

Emergence

My quantum art 'emergence' is supposed to be a representation of the E8 lattice in an eight-dimensional form, which is related to quantum mechanics and the theory of emergence. I found this specific theory fascinating due to the focus on projecting the E8 crystal from 8D to 4D to 3D. When the underlying 8D cell of the E8 lattice is projected to 4D, two identical 4D shapes of different sizes are created. The ratio of their sizes is the golden ratio.

E8 lattice is a shape with 240 vertices known as the 'Gosset polytope'. My interpretation of emergence is it's an occurrence whereby the apparent behaviour of a system on a large scale particularly appears different from the fundamental nature on a small scale.

My imagery is that if E8 theory was the theory of everything and was one hundred per cent proven, the beauty of space is created by these non-visible forms. My artwork is supposed to express the projections of the E8 lattice, through balance with cool colour tones for the background. The use of distance and depth creates the illusion of perspective, repetition of the E8 lattice creates a visually appealing effect and composition provides the 8D shape to be emphasised.

Emergence

91 cm × 91 cm × 3.6 cm

This piece engulfs the viewer into a void of nothing but a single apple spontaneously appearing from the abyss, evoking the idea of an emergence from the quantum world to our view. The allure of colour captivates the eye, emphasising the notion of an object appearing in our reality only when observed. Enticed by the apple's realism, the gaze gracefully drifts around the luscious shape, only to lead to the realisation that the emergence derives from something beyond our comprehension. The slightly off centre, floating position of the apple accentuates the isolation and vulnerability of the object if unseen. Yet a divine light touches the apple providing a sense of immunity from the foreboding darkness.

The viewer's gaze then proceeds outwards into the abyss and leaves you questioning the mysterious and remarkable ability of quantum particles. Entertaining thoughts of how this apple will soon fade into the abyss itself as countless have done before. Thus, leaving the atoms to birth a new unpredictable form in an endless cycle of deconstruction and reconstruction.

Tanya Clark

Brisbane-based artist Tanya Clark possesses a deep reverence for the power of storytelling through art. From an early age, Tanya discovered her boundless love for artistic expression, and has since become celebrated for her ability to breathe life into narratives through a mesmerising array of media and materials. While she explores various creative avenues, her heart has an undeniable affinity for the brushstroke and the evocative world of painting.

Tania's captivating artwork has graced the walls of galleries in Brisbane, Melbourne, and now Sydney, leaving a trail of wonder and intrigue in its wake. Her pieces delve into the intricate beauty and complexities of life, unearthing the delicate dance between vulnerability and strength, identity and belonging. With a mastery of light and colour, she captures fleeting moments, summoning a profound sense of tranquillity and wonder that stirs the depths of the soul. Through her art, Tania aims to awaken dormant emotions, challenge preconceived notions, and elicit a profound emotional response from her audience.

Fuelled by an unyielding passion for art, Tania's artistic journey has been shaped by a deep connection with the exquisite beauty in the little details of life. She weaves elements of realism with traces of abstraction, inviting viewers to immerse themselves in a multilayered experience that resonates on both emotional and intellectual planes. Each work carries the weight of intention and purpose, leading the observer on a voyage of contemplation.

To learn more about Tanya Clark and her captivating artwork, and for updates on her latest creations and exhibition news, follow her on Instagram (@tmcs_art).

About EQUS

EQUS is the Australian Research Council Centre of Excellence for Engineered Quantum Systems. Our mission is to engineer the quantum future by building quantum machines that harness the quantum world for practical applications.

Quantum technology is here. It's used in smart phones and cars, medical imaging, manufacturing and engineering, navigation and much more. But today's technology captures only a small fraction of the potential of quantum physics. New developments in research and engineering mean a new generation of technologies.

We are solving the most challenging research problems at the interface of basic quantum physics and engineering, working with partners in industry to translate our discoveries into practical applications and devices, and training a new generation of scientists in cutting-edge research, innovation and entrepreneurialism.

We engage the community in quantum and its potential for our future through public events, competitions and outreach activities. By engaging with artists and communities, we hope to inspire new people to think about quantum science and technology, and how we can all help to engineer an ethical quantum future.

people's choice prize

Scan the QR code to vote for your favourite finalist (limited to one vote per person):

Alicia Sometimes & Nat Bates
Eden Wilson
Eunjoo Jang
Jefferson Vimana
Karalyn Shaw
Lorry Wedding-Marchioro
M C Ng
Paul Ledington

EQUS
Australian Research Council
Centre of Excellence for
Engineered Quantum Systems

web: equs.org
email: comms@equs.org

twitter: @ARC_EQUS
insta: @engineeredquantumsystems

In the spirit of reconciliation, EQUS acknowledges the Gadigal People of the Eora Nation as the Traditional Custodians of the land on which this exhibition is held, and their connections to land, sea and community. We pay our respect to their Elders past and present, and extend that respect to all Aboriginal and Torres Strait Islander Peoples. We honour and respect the long tradition of knowledge-making, including in the STEM disciplines of science, technology, engineering and mathematics, of First Nations People. We acknowledge First Nations art as the longest unbroken tradition of art, and honour and respect the historical and ongoing contributions to art of First Nations People.