



A hybrid exhibition within the fields of art and chemistry

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Valency is defined as the capacity of elements to combine to form molecules and compounds. Without this ability the World would literally be a dust of single atoms. Each element has its own intrinsic ability to combine. This ability leads to the rich tapestry of the chemical world in which we live. The number of combinations approaches infinity and each has its own unique properties and signature. Throughout history there has been much exploration of this landscape and there remain untold avenues of complexity to discover.

Within Culture the property of valency has not gone unnoticed either. The bringing together of disparate objects in the concatenations of the Surrealist movement implies the construction of narratives. Apart from exploring metaphorical landscapes in the realm of consciousness, there is also the introduction of the 'axiomatic' in the field of objective philosophy. Then again, there is a simple expression in the 'curiosity in experimentation' and the 'what if' of creating new materials. These enquiries can be used to engage with, and interpret, our experience of the physical world, its energy fields and dynamics.

It is within the above context that this exhibition develops its metaphor. By bringing together diverse participants, a chemical reaction is encouraged within the imagination of the audience. Each researcher has evolved an understanding derived from their own experiences and observations of the chemical world. Visitors to the exhibition are invited to draw their own parallels and resonances and to integrate their own 'analogue' as they move within its space.

Research chemistry and contemporary art practice are often perceived as distant relatives occupying unique fields. Many of the experiments in chemistry are derived from observations of natural phenomena and then seen to be explored within the closed environment of the laboratory. Artists follow a similar path in the studio; although each has its own set of protocols. From an historical perspective both chemistry and art have been associated with magic, alchemy and the manufacture of unique compounds.



www.cipango.co.uk/valency

Valency was an exhibition which took place between the 23rd November to the 3rd of December 2023 at the APT Gallery, Deptford, London.

Curated by Paul Malone and Nicola Rae.
Curating assistance by Haoyue Chen.

Supported by: Wenquin Wang
Peter and Carol Wilkinson

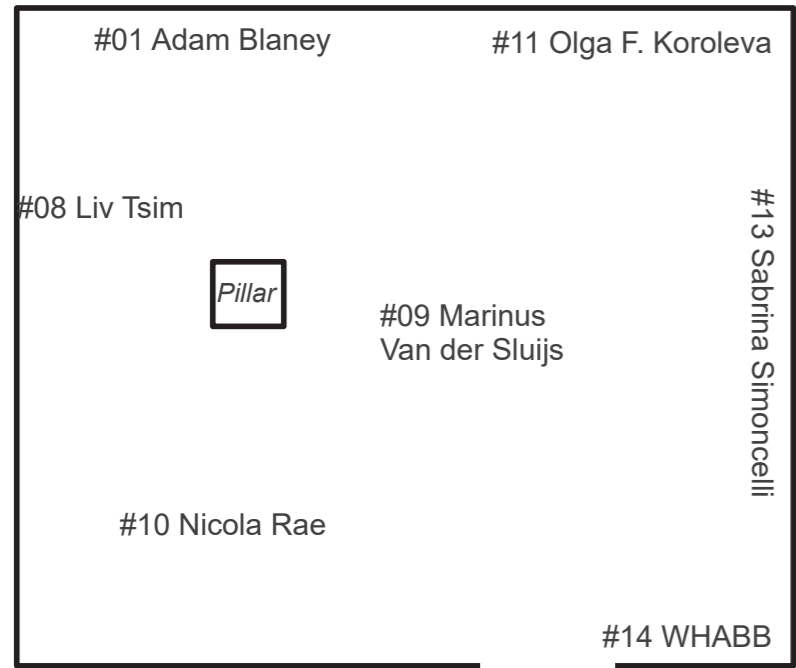
A·P·T
Art in Perpetuity Trust



Participants

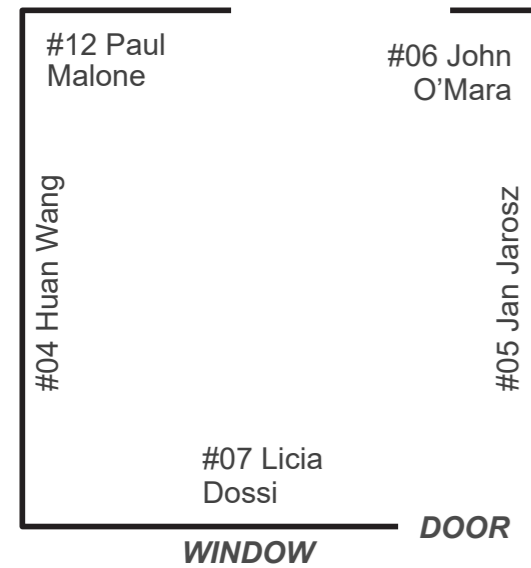
Adam Blaney	responsive materials
Cristina Giordano	colloids and nanomaterials
David Bloor	sound art
Huan Wang	textiles
Jan Jarosz	photography
John O'Mara	transitions
Licia Dossi	chemistry of colours
Liv Tsim	e-waste recycling
Marinus van der Sluijs	chemical mythology
Nicola Rae	interdisciplinary art
Olga F. Koroleva	video
Paul Malone	multimedia art
Sabrina Simoncelli	nano-bio photonics
WHABBstudios	environmental art

Layout of the exhibition

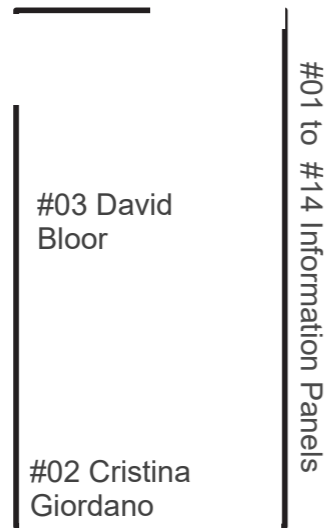


Above: Rear Gallery (blacked out)

Below: Front Gallery (with lights)



Below: Link Gallery



Valency: APT Gallery Plan



The APT Gallery, Creekside, Deptford, London



Valency at the APT Gallery

About the researcher

I am a researcher and a designer with a background in architecture. I joined Imagination Lancaster in January 2020. My research interest mainly focuses on rethinking and developing digital design and fabrication processes, through prototyping, that creates responsive, adaptive and self-healing objects, products and architectural structures. My ongoing work combines design, computation, hardware and chemistry to create radically new material abilities that explores the potentials of re-programmable matter.

Additionally, I am interested in documenting practice-based research in new and fun ways to enable a wider array of outputs. My work has been presented and published in a range of international conferences and journals.

This project explores the use of ferrofluid – a liquid material that responds to magnetic fields – as a basis for future state-changing materials and objects. The project aims to fundamentally re-think how materials might be interacted with, both during the fabrication and assembly process, but also with end-users when applied to products. We hope to demonstrate that materials can be grown or ‘guided’ using the concept of ‘tuneable environments’ and imbued with adaptive capacities that are universally present with biological structures such as the ability to heal, adapt in real-time to stimulus, and even evolve as part of augmented ecologies and physical environments.

imagination.lancaster.ac.uk/person/adam-blaney



‘HD-re-programmable matter project’. Exhibition movie - looking up

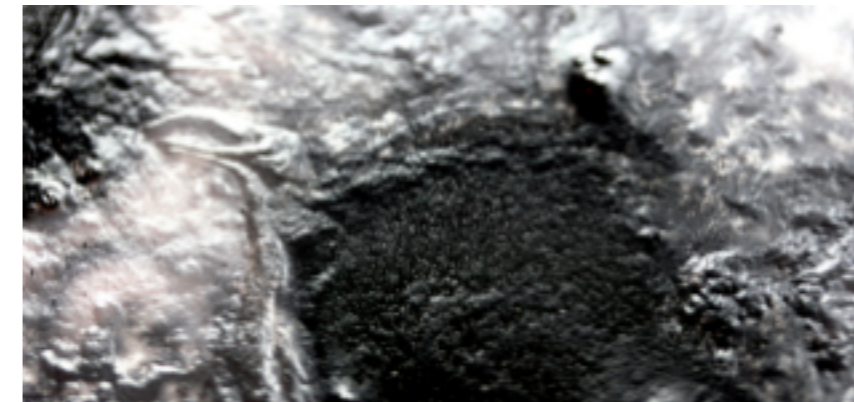
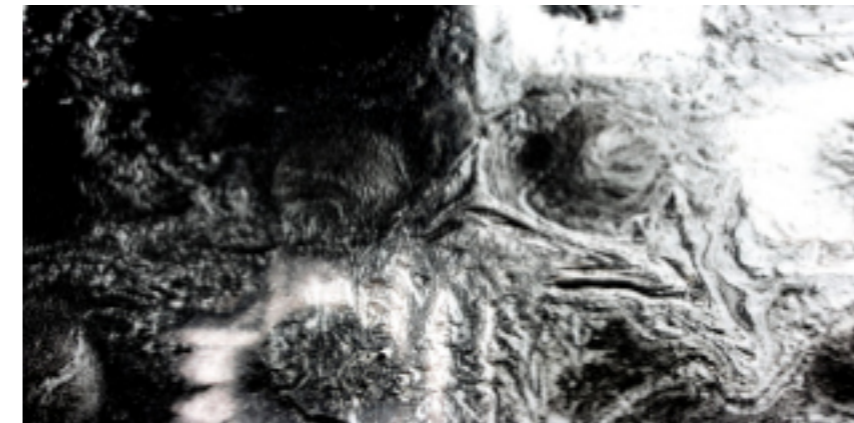
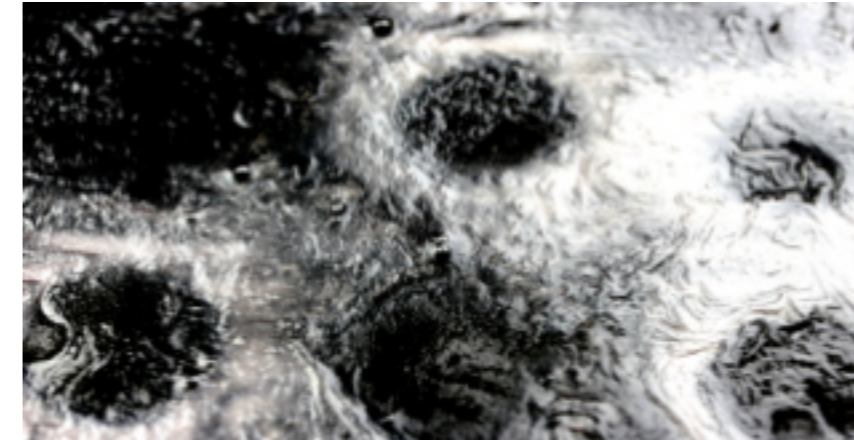
About the exhibit

The Developing HD-re-programmable matter project is a 6-month feasibility study project funded by Connected Everything ii, starting in October. The aim of the project is to prototype physical adaptive material samples that highlight the potential trajectory for the future of sportswear. The project opens up an exciting collaboration between Design and Chemistry at Lancaster and the project's industry consultant.

Currently, significant waste (financial, material, land) and pollution are generated from industrialised manufacturing and artificial materials because form is imposed upon materials/matter. As a result, our artificial objects, products, clothes and buildings can not physically adapt to fluctuating design demands, or, self-heal when damaged. Imagine instead, if we could physically adapt and update the materials that make up our material world. This project will develop how matter can be reprogrammed to create physically adaptive materials for the future of sportswear. The 6-month project will be developed through iterative prototyping, in collaboration with Lancaster's material science institute, as a means to investigate the implications and opportunities of what it would mean if matter that can be reprogrammed at high resolutions.

Led by Dr. Adam Blaney with his colleagues Dilan Ozkan and Dr. Mariana Fonseca Braga, this workshop will ask; What if materials could change and adapt to different conditions in response to the material crisis in the 21st century? For instance, what if athletes' clothes could change according to their needs in different circumstances (temperature, altitude etc.)? What if prosthetics could change to better adapt, providing bespoke comfort and performance? If we think on a larger scale, what if cities could grow and self-assemble like organisms? What if we could harness the use of bio-materials? What if building materials can self-heal?

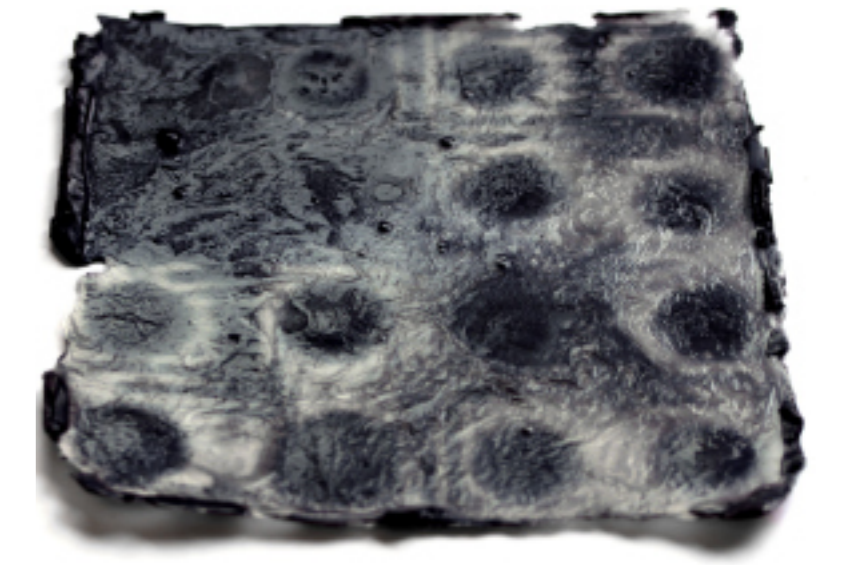
How do we deal with the unpredictable behaviour of living materials? These are some of the futures encompassed by adaptive materials and the role of design[ers]. We are engaging academics working on developing new design methods for fields such as emerging technologies, bio-technologies, digital fabrication, HCI and data physicalisation. We are also involving people from the sports industry and health professionals to look through promising ways of evolving this field.



Adam Blaney



'HD-re-programmable matter project'.
Results and from the workshop



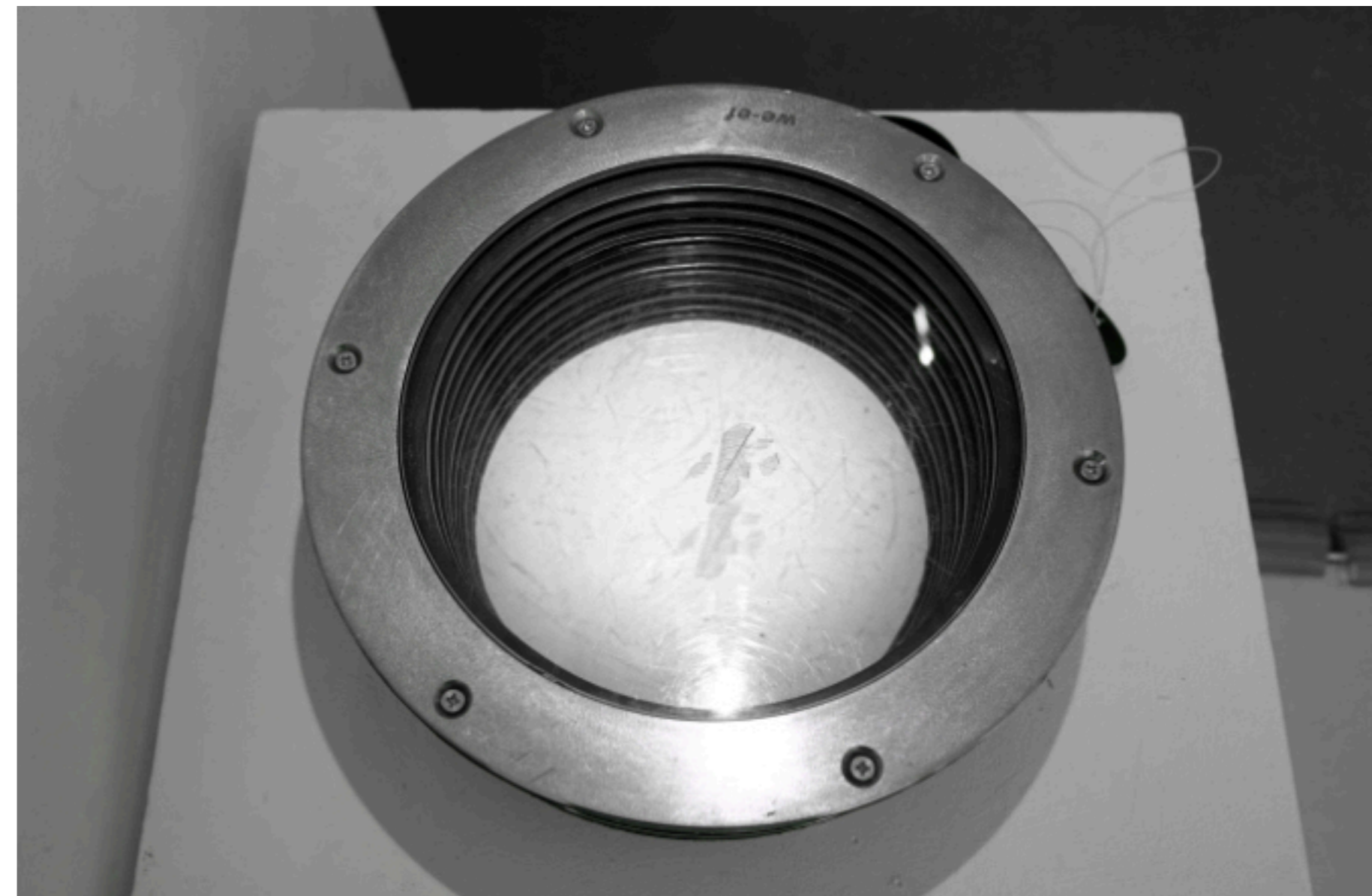
About the researcher

Cristina Giordano obtained her PhD in Physical Chemistry at the University of Palermo in 2006. After her PhD she won twice the 'assegno di ricerca' in the same University (Department of Inorganic Chemistry and Department of Physical Chemistry) as teaching assistant and post-graduated researcher. Between 2008 and 2014 she led the group of Inorganic Nanostructures at the Max Planck Institute of Colloids and Interfaces in Potsdam (Germany) where she also did her Habilitation.

At the end of 2014 she joined the Technical University of Berlin as independent researcher, to intensify her teaching, also receiving the title of 'Privatdozent' (July 2015) from the TU-Berlin. Since September 2015 Dr Giordano is Reader in Chemistry at Queen Mary University of London.

Dr Giordano is the author of almost 60 publications in the field of colloids and nanomaterial chemistry, ranging from synthesis of advanced materials to characterisation and wide ranging applications. For her research, 2011, Dr Giordano was awarded with the 'Zsigmondy Stipendium' from the German Colloid Society, as best promising young researcher in the field of Colloids.

www.giordanogroup.org

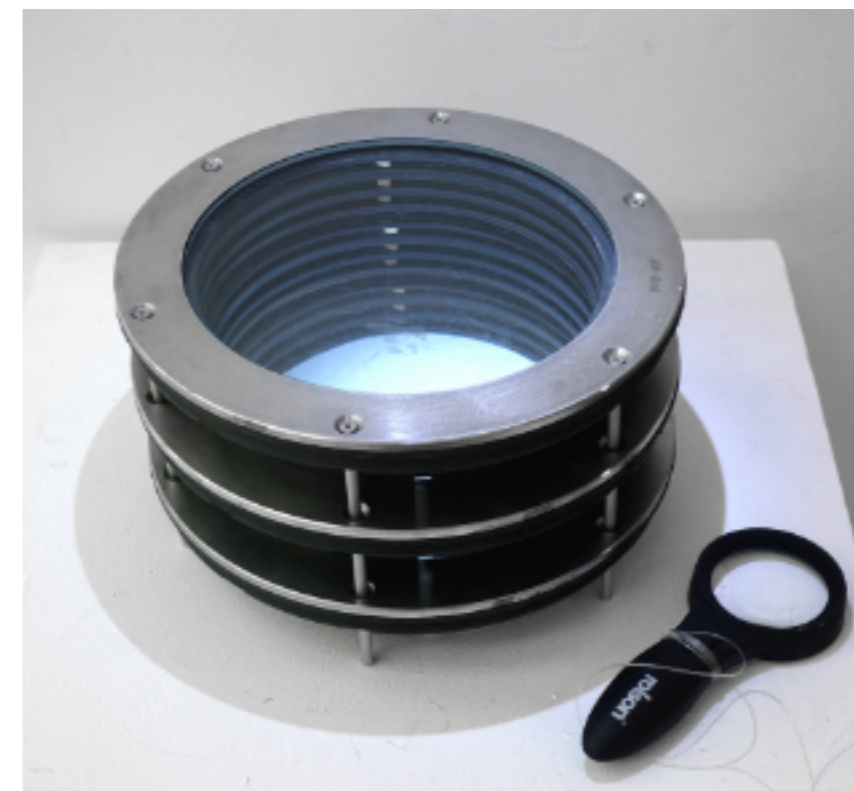


Nanomaterial Transformation: Fragmented Leaf

About the exhibit

The aim of the Nanostructures Design and Shaping Group (ND&S) is to function as central core for creating alternative pathways toward a wide range of nanomaterials, bridging our research with other fields of nanoscience, applied and theoretical, improving nanomaterials practical applications for the well-being of the society. Our synthetic designs encompass nanomaterials from simpler structures to complex ones, from mere spherical nanoparticles to nanofibers, nanocomposites and nanohybrids, reaching sophisticated hierarchical structures.

Nanomaterial Transformation: Fragmented Leaf
Oblique and detail



Cristina Giordano



About the artist

David Bloor is an artist and musician interested in how people respond to limitations, each other and their environment. His work includes installations, performance and recordings under the name 'Dirch Blewn'. He works with kinetic sculpture, analogue assemblage, modular synthesizers and a self-built, 63 channel, 8-bit, surround-sound, off-grid recording studio which formed the basis of '24hr Community Composition' which was in residence at Sanctuary Lab in the Galloway Forest in 2017.

Besides his performance and sculptural work, he has produced many albums, issued by labels such as Linear Obsessional from London and Game of Life from Athens. In 2018, the album Care Work was released by Soft Error, UK. Much of his recorded work is available on Bandcamp.com or through his website dirchblewn.com.

In 2017, reflecting on the visual and the auditory experience, David Bloor wrote: "Sound is a slippery thing, I've often felt the auditory is not as ordered as the visual, although our ears are as important as our eyes. Being around predominantly visual artists has informed my practice greatly during this year. Placing sound related objects within the context of a gallery can be a challenge but I feel a strong visual element can inform the audience even if the sound is abstract.

Sound spilling out, it's like hanging a wet painting on a wall, the canvas cannot contain it however the canvas remains our initial focus. The origin of action can be abstract, ideas, thoughts, feelings and senses but we are always pulled back to the canvas and the paint on its surface... Apply a layer, wait until dry, apply a layer, disrupt. Layer upon layer, stand back, make tea, drink tea, obliterate. Visual art depends on light, light reveals, reflects and creates movement, the paint dries but the work remains fluid. Sound is the same, it moves and changes as it interacts with surface, they both spill out like ideas."

www.dirchblewn.com



'Nontraditional Activation Method'

About the exhibit

Chemistry is fundamentally the interaction of energy and matter. Chemical reactions require energy in one form or another to proceed: chemistry stops as the temperature approaches absolute zero. Chemists have only limited control, however, over the nature of this interaction. In large part, the properties of a specific energy source determine the course of a chemical reaction. Ultrasonic irradiation differs from traditional energy sources (such as heat, light or ionizing radiation) in duration, pressure and energy per molecule. The immense local temperatures and pressures together with the extraordinary heating and cooling rates generated by cavitation bubble collapse mean that ultrasound provides a unique mechanism for generating high energy chemistry.

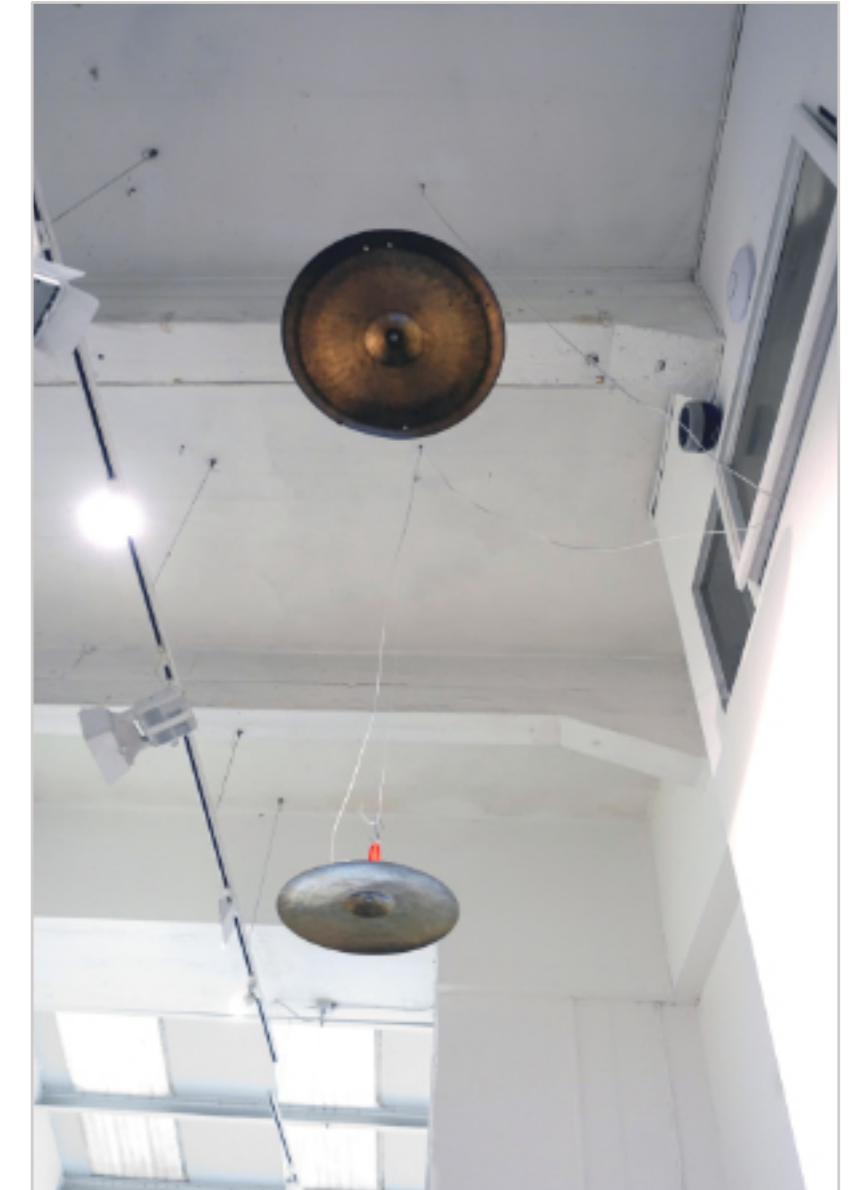
Exhibit: *'Nontraditional Activation Method'*

For Valency I was interested in exploring ultrasound as a means to vibrate a set of cymbals. Modular synthesis is an interesting tool for studying a range of subjects, including physics, mathematics, cybernetics and chaos theory. You're not limited to producing audible frequencies or logical, linear processes.

A cymbal displays non-linear behaviour in sound production, fundamental frequencies, harmonics and inaudible frequencies that can be felt all play a part in how we experience sound.



'Nontraditional Activation Method'



About the artist

Huan Wang works across text, textiles, installation and film. She studies and lives in London as a cultural traveller, telling the connection between human and other existences in the modern urban space in the way of poetry and material narrative. Her artistic practice conveys the sense of being as a human and explores the intersection of strength and fragility. While carefully and equally approaching the fragile fringes of the natural world, pointing to the neglected marginal and subaltern existence of human society is a common theme in her textile work.

Wang's textile works are partly emotional fragments and partly document her natural experiences in urban spaces. Sometimes it is a line of poetry, or a name, calling for a past that has not gone far. During the creative process, Huan maintains a genuine, physical connection with the collected objects, allowing her to preserve their inherent sense of time. By touching the materials, she solidifies her personal narrative, infusing it with a tangible quality.

2023.rca.ac.uk/students/huan-wang

About the exhibit

How do you know that the edge of today is the edge of yesterday? In September, I travelled from London to Orkney, the northern edge of British land. For the first time I felt my gaze was different from the gaze of the people of this land. There are no unoccupied edges on this land; everything is in human time. They always look towards the sea. But my hometown is a small coastal town

in southeastern China, and we have always been drawn to the inland. The edge on the other side of the land seemed unreachable. In London, we have the impression that the sea is to the south or east. But Orkney's narrative exists in a circle, about comes and goes. I walked along the edge of the land guided by raw physical experience. But the Orkney waves confounded me, they came from all directions and crashed towards the land. Hearing the sound of the sea and walking towards the seaside can not help to identify the direction.



'Pours in a yellow heart, Orkney'

And It was so windy and cold that standing and walking became a tiring task:

'Rest in the Gap'
To survive in strong winds,
When living at the edge of the world,
Just lie down together,
Layers by layers,
Be clever,
Be lazy.
Rest in the gap,
Rest by circle.

The posture and perspective of lying down allow us to discover the same intelligent lives - the grass lying together with the wind, the limpets spending their lives in the crevices of the rocks, the seaweed floating in the shape of the waves... We move in the gap when the wind leaves, and hug in a warm and yellow circle. All things are born and live in the gaps, die and sleep under the land and water.

Today the uneasiness of missing direction disappears because we have a bird's eye view of the world thanks to satellite technology. We don't care how complex the urban landscape is built because we no longer rely on it for orientation. But we cannot bear to lose technology. Original physical experience is suppressed in today's urban landscape.

We lost a yellow heart.



'Pours in a yellow heart, Orkney' - details of the installation

Huan Wang

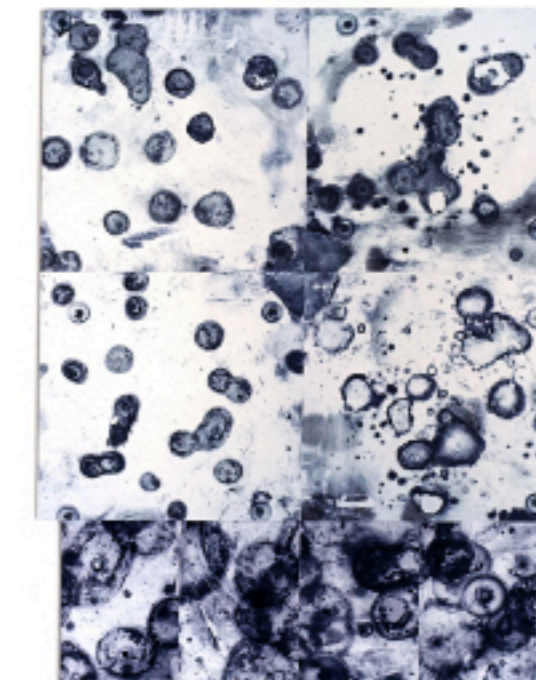


About the artist

My current work explores the relationship between analogue and digital photography and how they can be combined with other materials, mark-making, and 'found' surfaces within the 'digital space' to create digital collage, the final output being digital print. My work has also included experimental film, panoramic and HDR photography, analogue film processing and print making, digital aesthetics, creativity, and digital printmaking.

www.jaroszj.com

Jan Jarosz



Experiments and Composites

About the exhibit

I had explored the Valency/Affinities theme applying different methods and starting points.

In this piece I attempted to reference some of the resultant imagery in an improvisatory manner.

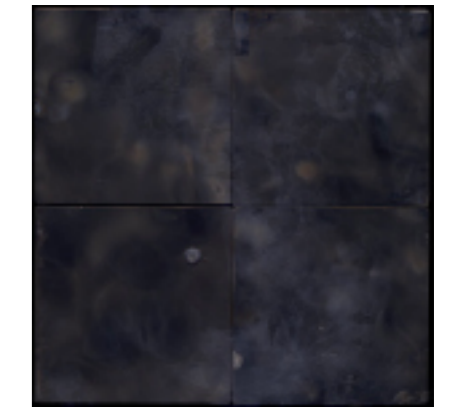
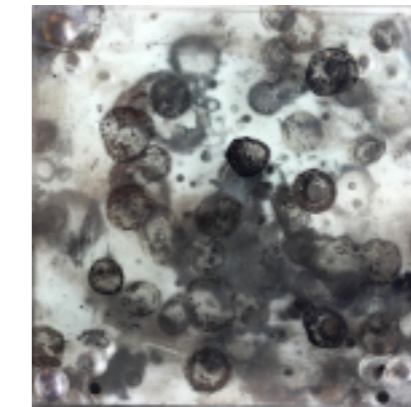
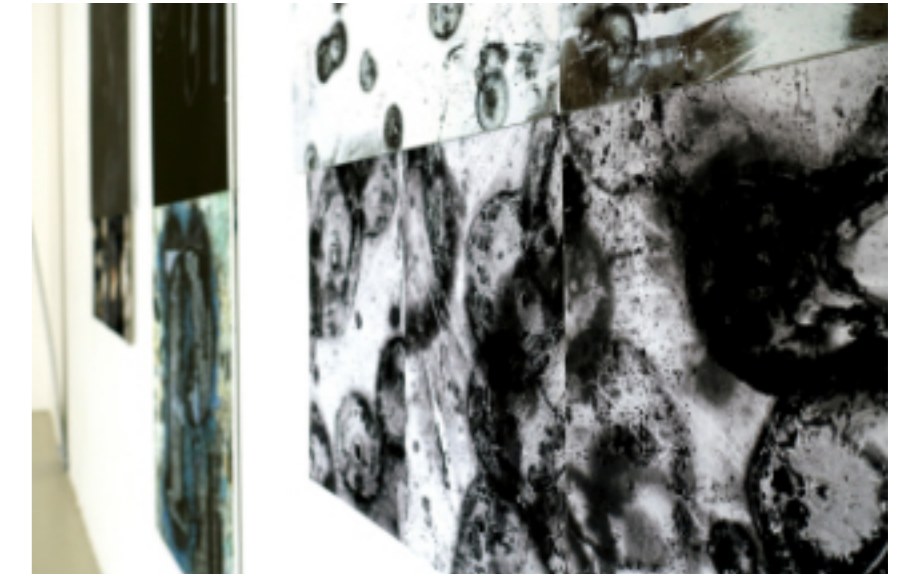
As in life accident and chance play determining roles. The 'four glass squares with wax droplet' occurred accidentally whilst preparing the surface for some other purpose. It had the effect however of starting of a chain of experiments involving different liquids from isopropyl alcohol to gum Arabic and the recording of the interactions with the carbon surface.

After taking photographs of these 'interactions', I began cleaning the glass plates, the dried liquids were proving surprisingly difficult to move. I wondered if these half-obliterated images could provide further images to reinforce the accidental force of the process.

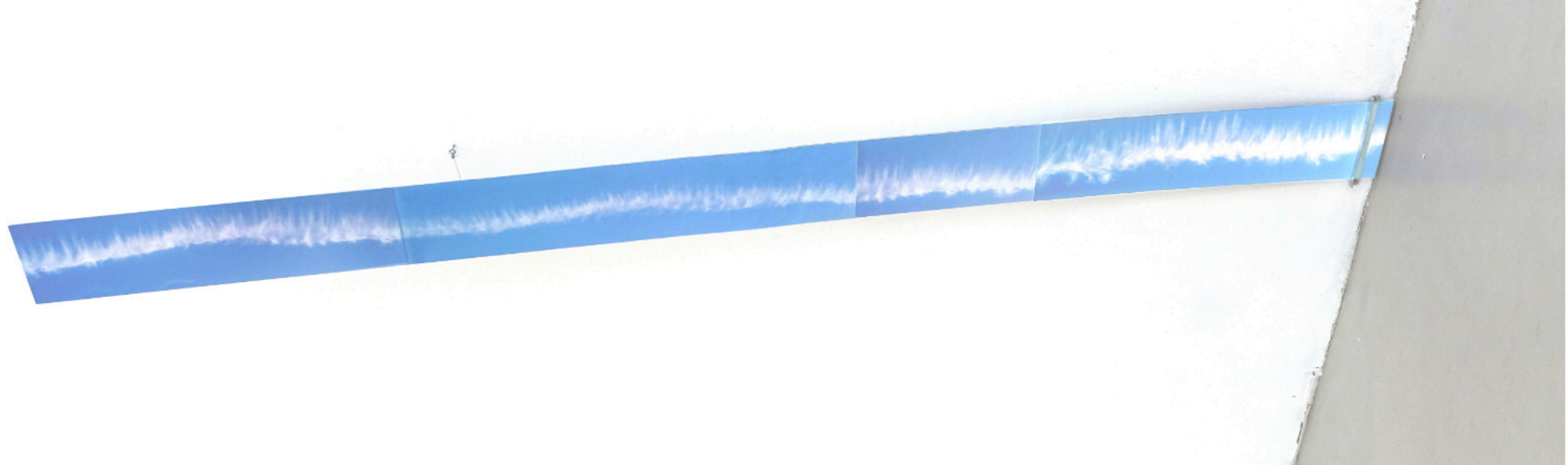
This 'accident' proved significant in the other starting points. Instead of consciously thinking to apply this with that to achieve this effect, I adopted a much more open-ended approach, relying more on intuition and improvisation. (for the first time for as long as I can remember I felt at 'home' with this process.)

This resulted in the 'excavations' series of images which had begun as experiments cutting back through physically layered groups of printed digital images, which were burned and abraded to a series of photographs and scans that examined the interaction of the view through various groups of aluminium letter and number stencils.

The 'Dartflight/Chemistry' began as the image capture concerning the deconstruction of a dartflight, which then moved to the freezing of photographic chemicals which when thawed on photographic paper would create aleatoric images.



Experiments and Composites - details



Transitions

About the artist

I have always had a fascination with water. I was born in the spa town of Cheltenham. My family and I settled in various houses, that circumnavigated the Malvern hills. Another source of spring water. The Malverns igneous rocks, naturally filter the spring water that pushes its way to the surface. This cyclical process forms part of the hydrosphere. It's water has no minerals, no bacteria, lumps or bumps. It is totally pure.

Many of my pieces have facilitated surface tension, as does the aquatic insect, the waterboatman, when he or she, skitters across the water, never breaking it's surface but using it as a means to propel its way forward. I continue to be intrigued by water in all of its chemical guises whether that be, droplets of vapour in the air, steam, ice or just plain water.

api.whatsapp.com/qr/XHZEOJISYRD7M1

About the exhibit

'Transitions'

'Outside. It is pouring. Threaded beads of it shatter as it's dropped from the flat porch roof. The sky is steel blue, dull and low. And then, a little later, it is gone. Pushed out by light, and something fresh. High above, a passenger planes vapour trail, rolls, and, piece by piece, teases itself apart.'



About the researcher

I am a Senior Lecturer at Cranfield University and Chartered Chemist and Chartered Scientist by the Royal Society of Chemistry, with expertise in materials chemistry gained from more than 30 years' experience in UK and European Academic institutions. I have a MSc and PhD degree in Chemistry from Pisa University in Italy, and I work at the Shrivenham Campus of Cranfield University since 2008. I deliver lectures at Master and PhD levels on a variety of themes, and I am active researcher and co-author on more than 60 scientific peer reviewed contributions. One of my research themes is the detection of vapours of illicit chemicals by using a 'mechanical sniffer dog'. The technology uses a colourimetric sensor system which is monitoring chromic dyes changing colour when in contact with the vapours of illicit molecules. Our new detection device is designed to aid Law Enforcement Agencies such as police forces and security agencies, as well as tax and customs border services on the prevention of the development, production, stockpiling, transport, and use of illicit materials.

www.cranfield.ac.uk/case-studies/crim-track

'Chemistry of Colours'

The 'dog' model on display has the form of a molecule of ethanol ($\text{CH}_3\text{CH}_2\text{OH}$) which just happens to take on the form of a dog with its carbon (C), hydrogen (H), and oxygen (O) atoms disposed in a 3-dimensional structure. Molecular structures of some of the illicit chemicals that the detection device is intended to "sniff" are drawn in the transparent spheres and tubes of the 'dog'.

On the 'nose' of the 'dog' is attached one of the colourimetric detection chips which contains the chromic dyes that change colours over time when in contact with the vapours of illicit molecules. The model stands in the top of a 'screen' that shows a picture of the colourimetric chip with a dynamic response of the chromic dyes – changes of colours. The different colours are linked with the chemistry of the structures under examination.



'Chemistry of Colours'

Construction by Paul Malone

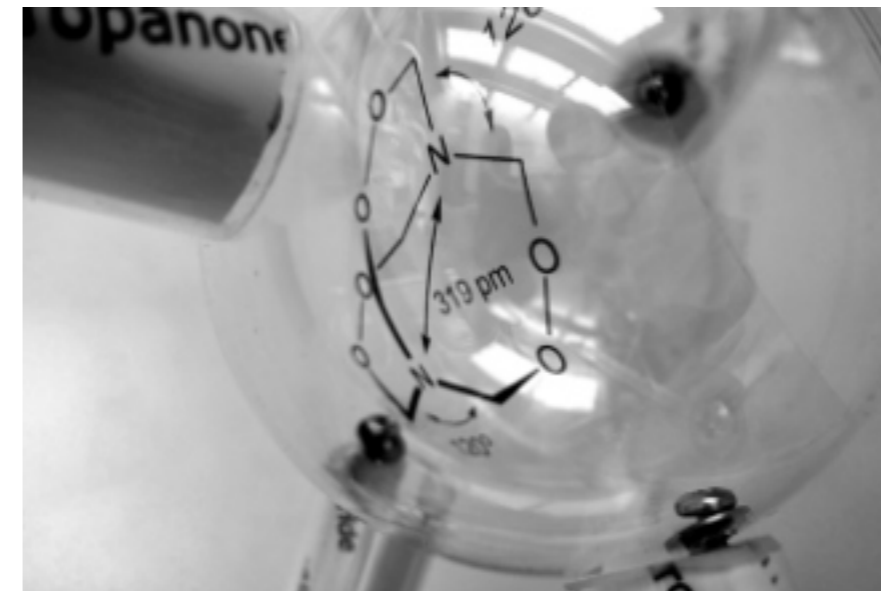
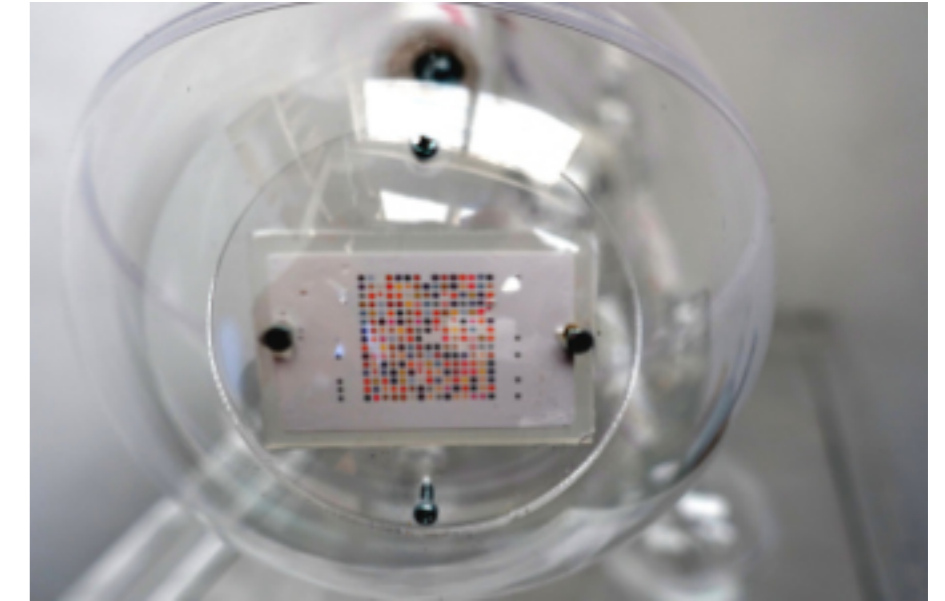
About the research

Law Enforcement Agencies around the world are under constant pressure to control the movement of criminal chemical substances more efficiently. This has led to a growing demand for detection equipment that is quick and easy to use, low cost to produce and maintain, and with the flexibility to identify a range of different substances. Cranfield University have collaborated on the development of CRIM-TRACK, a prototype 'mechanical sniffer dog' that can support the fight against organised crime and terrorism and contribute to global security. This device is designed to detect traces of illegal drugs and explosives and associated chemicals, as parts-per-trillion, in near real-time and with no operator threat from contact.

It works by sniffing the air to detect the vapours given off by the chemicals. The device is loaded with a microchip printed with preselected dyes based on their chemo-selective nature. Using a technique known as colorimetric sensing, these dyes will undergo colour changes if exposed to vapours from the corresponding chemical. This colour change is captured by an algorithm developed by the team. The data collected by CRIM-TRACK sniffer trials are organised into datasets, visualised in various difference maps for inspection and interpretation of results. Machine learning models are used to learn the signature of the unknown chemicals and perform the detection.

Dr Licia Dossi, a materials scientist and Senior Lecturer at Cranfield University's Centre for Defence Chemistry, worked together with Dr Mogens Jakobson and his team at the Technical University of Denmark (DTU) and CRIM-TRACK Aps, to produce a compact, user friendly and portable prototype. Further development towards the optimisation and commercialisation of the CRIM-TRACK detector was undertaken through a Cranfield sponsored PhD studentship and additional funding from the Danish Defence Ministry.

The CRIM-TRACK project has specifically focused on areas where there is a growing safety risk to society, and the benefits of its use at locations such as airports and border inspection stations are clear to see. Current proposals for alternative uses for the sniffer device include both the detection of infectious airborne diseases and the presence of pesticides in National Archives items. The technology could also be applied in areas such as food production, manufacturing processes and environmental monitoring.



'Chemistry of Colours' details

About the artist

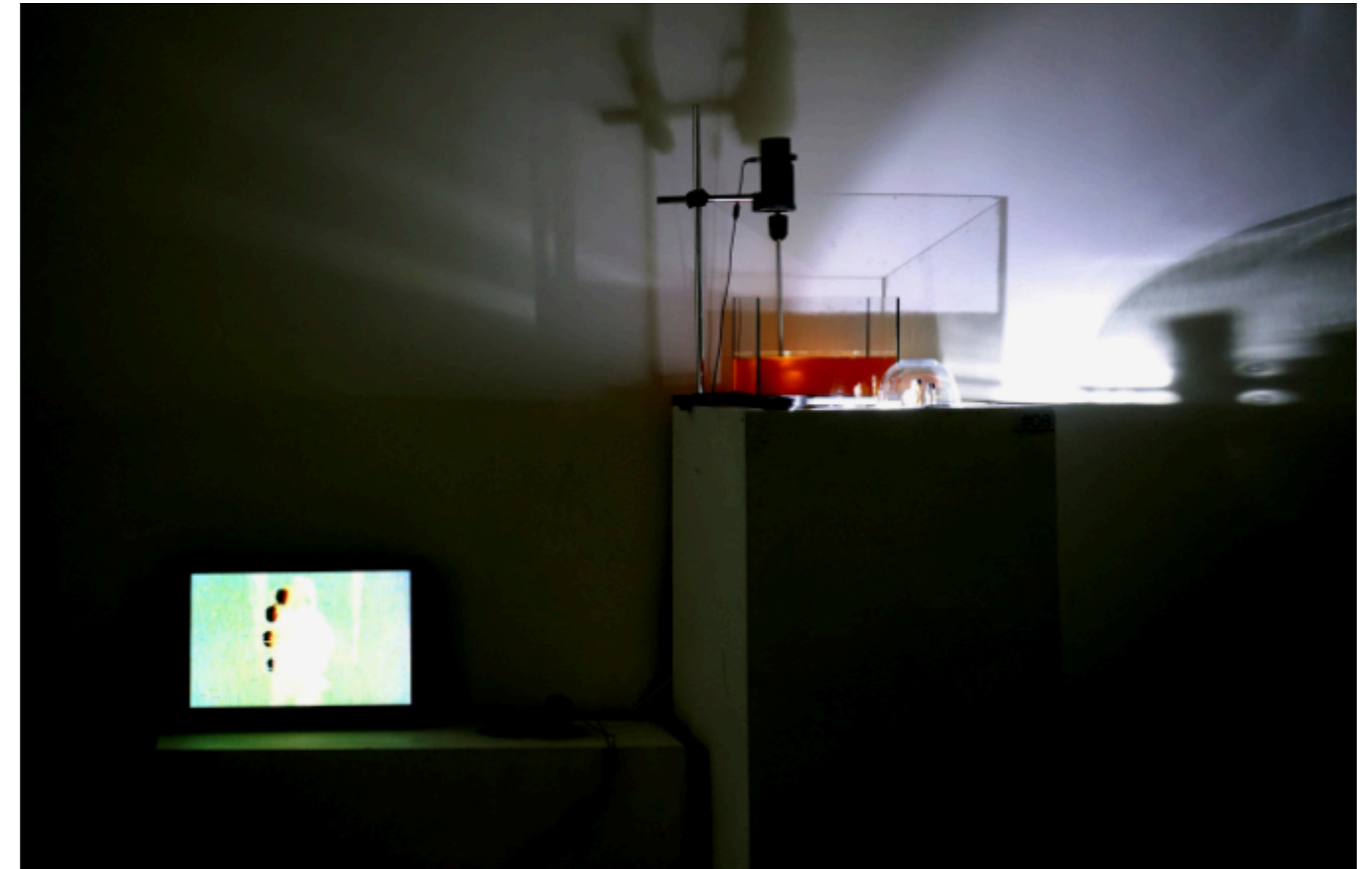
Based in Hong Kong and London, Tsim received training in BA Fine Arts and MA Biodesign respectively at the Academy of Visual Arts, Hong Kong Baptist University, and Central Saint Martins, University of Arts London. Her artworks were exhibited in London, Hong Kong, Berlin, Brisbane, Sydney, Budapest and Shenzhen.

The core of Tsim's artistic approach lies in the exploration of the interplay among biotic material, bioethics, collectiveness, and environmental justice. Her work delves into how humans can thoughtfully mediate possible conflicts between different species in the context of a comprehensive ecosystem.

In a physical world defined by interconnected ecosystems, global atmospheric patterns, and shared resource dependence, humans can impossibly consider themselves exceptional from the impacts of the Anthropocene. The imperative for cohesive global activism to confront this issue becomes all the more evident, ensuring a sustainable future for generations ahead.

Her questions have been transformed into dynamic kinetic installations, biomaterial-based sculptures, videos, and performances, all while inviting viewers to partake in co-learning experiences. Employing mixed media techniques, she broadens her narrative approach and cultivates a distinct methodology of self-expression. Previous undertakings had her collaborating harmoniously with media designers, scientists, performers, and general communities, resulting in artworks that thoughtfully manifest collective power and challenge conventional limitations.

www.livtsim.com



The Sweet Side

About the exhibit

Our world is powered by electronics, but its chemical pollution is becoming a new colonialism of our environment.

This speculative design project entitled "The Sweet Side", is a candy system operated by humans and bacteria, together creating candy consisting of wasted pure copper by a bioleaching and cooking process. The consumers are encouraged to recycle their e-waste as the new currency, witness the bioleaching and cooking process, and enjoy the tasting experience as a reward. This project aims to raise the possibility of connecting the material flow of the metals from the industrial system and our future food chain, as a sustainable interconnected ecosystem.

If we have the alternative of managing E-waste, future urban mining would go beyond simply handling industrial obsolete left from our digital society, instead, generating a new food resource that humans physically need.

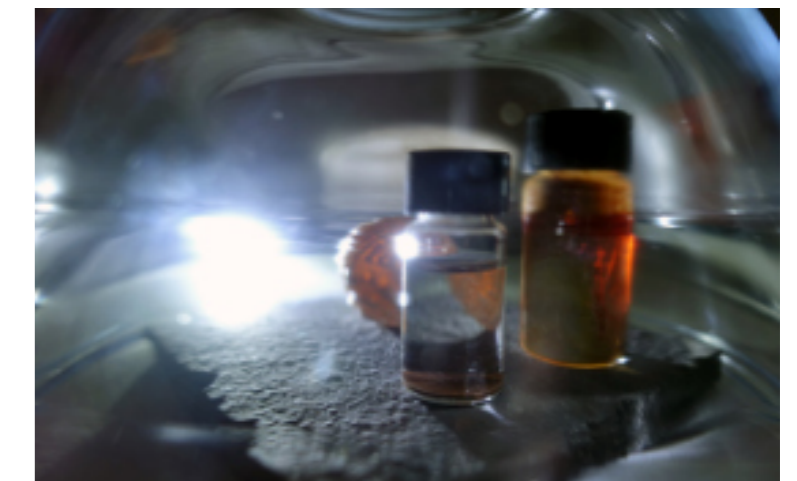
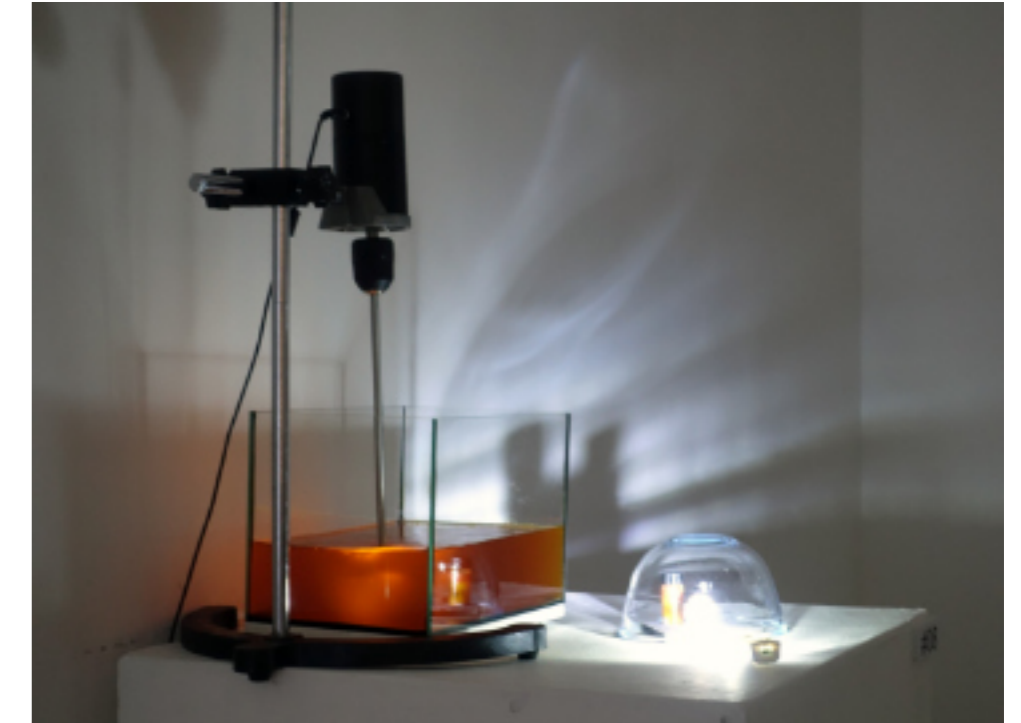
To combat E-waste will be a long journey but you are cordially invited to experience its sweet side. Our world is powered by electronics, but its chemical pollution is becoming contamination in our food chain.

This speculative design project is a sweet system operated by humans and bacteria *Acidithiobacillus Ferrooxidans*, together creating sweets consisting of wasted pure copper through Bioleaching. The bio-integrated process extracts and purifies the pure copper from the e-waste. It aims to raise the possibility of connecting the material flow of the metals between the industrial system and food chain, as an interconnected ecosystem.

To combat E-waste is a long journey. We can start imagining our sustainable future with a small but sweet bite.



The Sweet Side - details



About the researcher

Marinus is a historical and comparative linguist who strayed from the fold with his wide-ranging independent research in the history of science and comparative mythology. He is currently based in South Korea, following periods in Canada and the United Kingdom. One of many projects in the works is a monograph on the *ouroboros*.

<https://mythopedia.info>

About the theory

Science, art and myth have chemistry

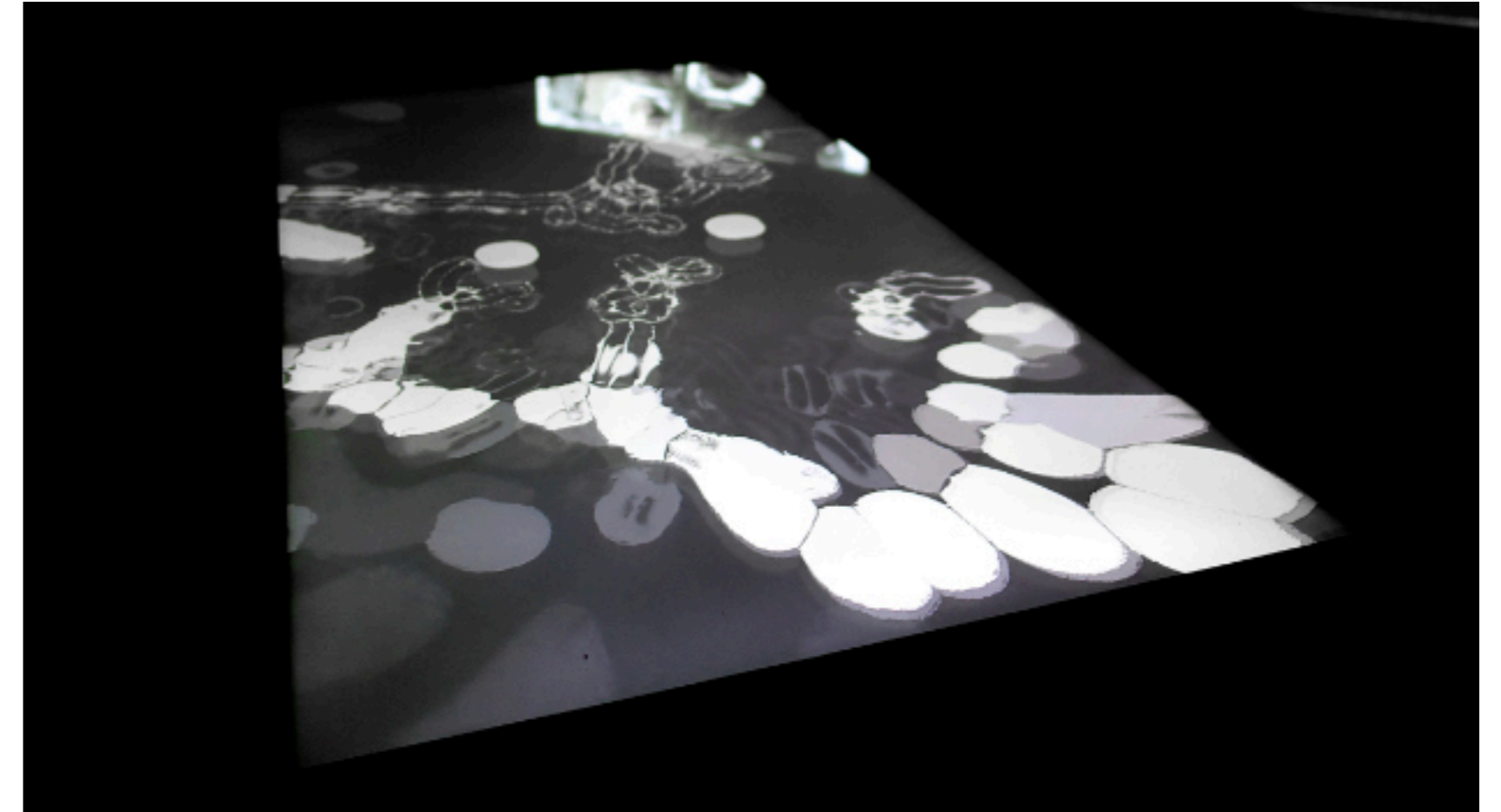
Myth is multivalent in that it operates on multiple levels, including social and psychological functions. Myths were artistic in terms of their creative narration and performative aspects. They were also protohistory and protoscience – the very first attempts to make sense of the past and how nature works.

Myth was art at the cradle of science. When the Greek philosophers started building knowledge from scratch with the tool of rational discourse, hoary myths still provided the starting point for some of their cosmological theories. For example, when Thales identified water as the first and fundamental element, he was repurposing the old mythical motif of the primordial ocean. As for chemistry, the alchemists at a much later stage in history persistently represented some stage in the *magnum opus* of gold-making by the emblem of the snake that eats its own tail – the *ouroboros*. This motif occurred in places as far apart as Amazonia and Japan, but the alchemists specifically drew on its Egyptian expression, which originated in solar symbolism and was much used in magic. And the circular serpent did not end its influence there. It also ushered in the birth of structural chemistry. Enter Kekulé.



- (1) Theodoros Pelecanos, Byzantine [Wikimedia]
- (2) St Brendan and the whale [ed.Sollbach]
- (3) al-Simawi, Iraqi [de Pascalis, Alchemy]

Still from the movie installation: August Kekule and the Ouroboros
Videography by Paul Malone



About the artwork

Here the imagery of the *ouroboros* is presented in the form of a series of organic molecule diagrams sequenced in the form of a continuous movie. This has been processed to give the appearance of a serpent and animated so that it appears to be appearing and disappearing into its own tail. The whole is presented on a horizontal TV enclosed within a box.

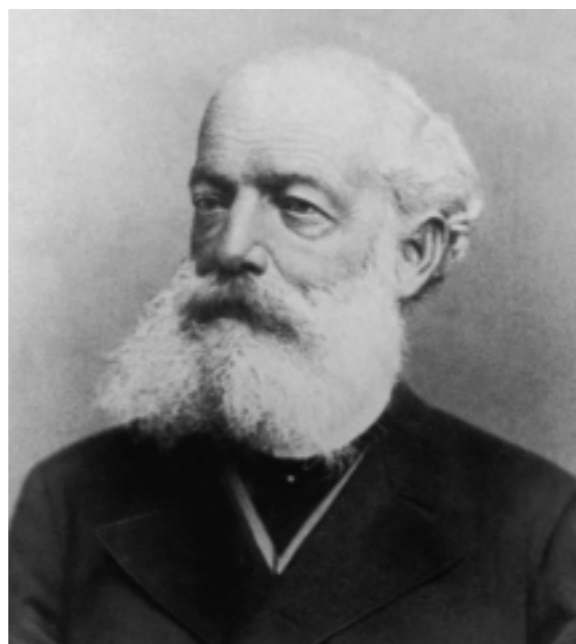
Kekulé's dreams

In chemistry, the structural theory provides the framework for understanding the positioning and state of atoms within a molecule. Its chief architect was the German scientist Friedrich August Kekulé (1829-1896). He later revealed that the seeds had been sown with a daydream on a London omnibus:

I fell into a reverie ..., and lo, the atoms were gamboling before my eyes! ... I saw how, frequently, two smaller atoms united to form a pair; how a larger one embraced the two smaller ones; how still larger ones kept hold of three or even four of the smaller; whilst the whole kept whirling in a giddy dance. I saw how the larger ones formed a chain, dragging the smaller ones after them but only at the ends of the chain.

His first successes were the discoveries that carbon atoms are tetravalent and can bond with each other. This opened the door for Kekulé's most remembered contribution to science. Until then, all known types of atomic bonding involved open, linear arrangements. Benzene (C₆H₆) was highly unsaturated yet slow to react, counter to normal expectations. Kekulé figured out its molecular structure: a ring of six carbon atoms, with alternating single and double bonds, and a hydrogen atom attached to each carbon atom by a single bond. This realisation came to him through a second reverie:

I turned my chair to the fire and dozed. Again the atoms were gamboling before my eyes. ... long rows, sometimes more closely fitted together all twining and twisting in snake-like motion. But look! What was that? One of the snakes had seized hold of its own tail, and the form whirled mockingly before my eyes. As if by a flash of lightning I awoke ...



Kekulé

How did it happen?

Over time, Kekulé's dreams have elicited a wealth of diverse opinions. Had he been truly asleep or not? And what was the tail-biting snake he saw? A returning memory from past reading about the *ouroboros* without him recognising it as such (cryptomnesia)? An archetypal manifestation from the collective unconscious, as Jung claimed? Or was Kekulé's subconscious recycling something it had absorbed much more recently?

Half awake with eyes shut, the pioneer surely entered the *alpha-thēta* ($\alpha-\theta$) range of brainwave frequencies. Trance-like, this corresponds to the hypnagogic state or transition into sleep. A Jungian psychologist felt that the round snake was the archetype surfacing in that mental stage. Pareidolia might also play a part. This is the tendency to find false patterns in things seen. In that case, Kekulé should have observed something else that somehow *resembled* snakes. What could have set these wheels in motion?

In the eye of the beholder

The cavorting 'atoms' could be entoptic phenomena, which are visual effects produced within the eye, like 'floaters'. If Kekulé had had his eyes closed, he may in particular have seen phosphenes – light forms perceived while no light enters the eye. Only the obscure Joseph Aloysius Mast (1914-1993) seems to have suggested that, but it rings true. Phosphenes often make up the hallucinations in the early stages of trance. They are also a well-known hypnagogic effect.

Entoptics can even produce a circle, but no one so far linked this with the *ouroboros*. Was it by pareidolia that Kekulé's brain read the tail-biter into a phosphene circle? Or did the age-old symbol pop into his awareness as an afterthought, as soon as watching one 'snake' bend opened his eyes to the solution of the benzene problem?

One way or another, the *ouroboros* through this timely 'brainwave' consolidated the shift from alchemical pseudoscience to the pure science of structural chemistry.

For the full version of this story visit: <https://mythopedia.info/Kekule--.pdf>

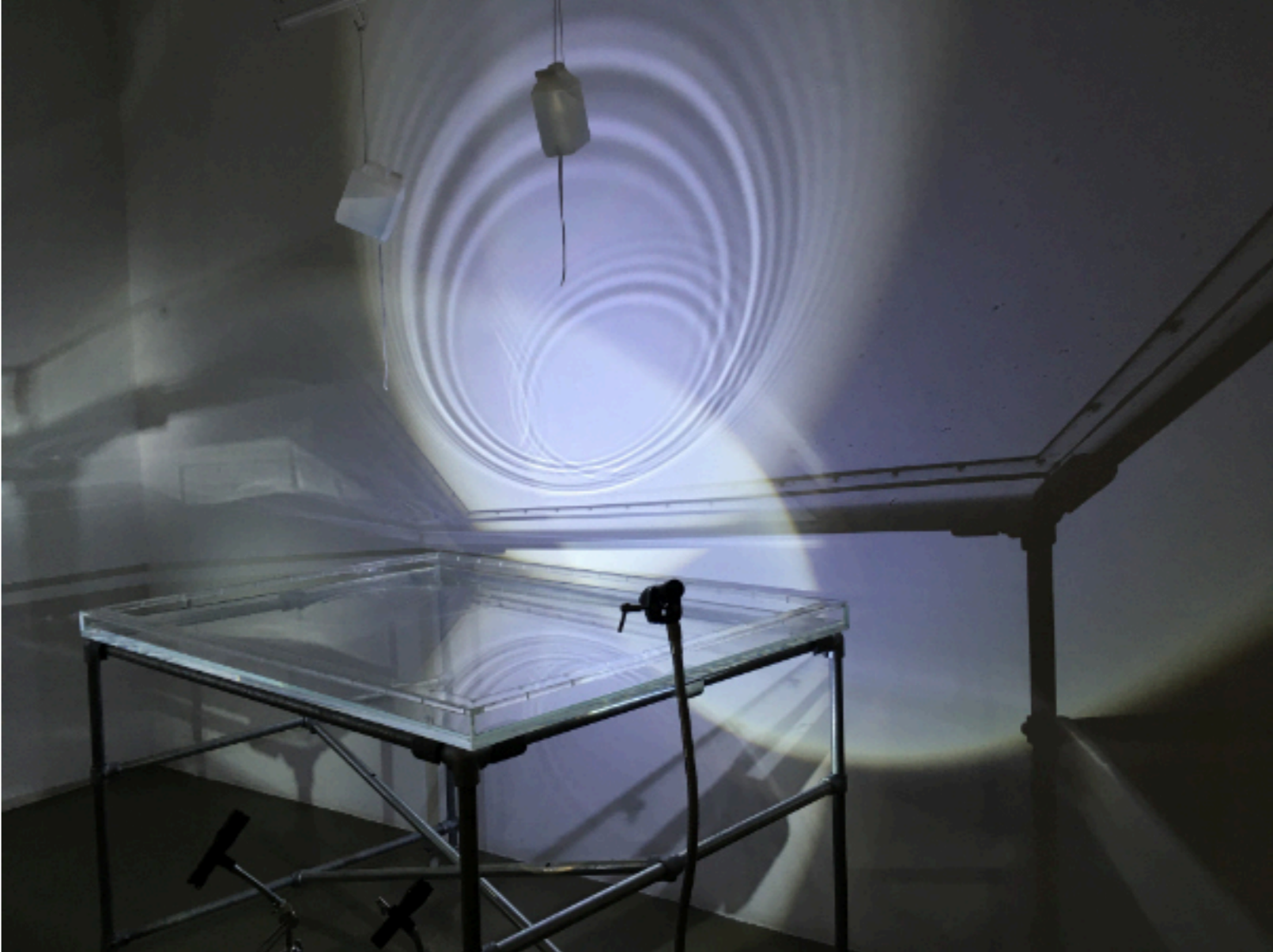
About the artist

My interdisciplinary art practice engages with an expanded field of experiments through investigating scientific processes, phenomena and environmental change. Sonic visualisation, acoustic equivalence, sonification and feedback loops of acoustic synthesis have all been included in recent experiments.

Collaborating with scientists and their research data has become an important part of my practice both as an artist and as a curator. During 2022 - 2023, I co-curated SPACE Lab [co-creative art astronomy experiments] with astrophysicist Ulrike Kuchner in a year long process of artist-scientist collaborations including workshops with local schools. This was funded by the Science & Technologies Facilities Council and Lewisham Creative Change. Collectively initiating and co-curating exhibitions with others has led to encouraging longer development and set up times that allow for on-site experimentation.

My art practice has been based at the Art in Perpetuity Trust, APT Studios, Deptford since 1995. More recent studies have included an MA in Contemporary Art Theory at Goldsmiths (2009-11), and an MA Art & Design Education at the Institute of Education (2006-8). As a member of the Digital Maker Collective, I co-developed collaborative workshops at TATE EXCHANGE: Tate Modern during 2017, 2018 and 2019. Since 2006 I have been employed at University of the Arts London, working at Camberwell, Chelsea and Wimbledon Colleges of Art in a variety of roles.

www.nicolarae.co.uk



Nicola Rae: 'Covalency'. 2023

About the exhibit

'Covalency'

A series of drips falling into shallow tanks of water create surface waves that interact in complex overlapping patterns. Using focused rays of light, these ripples are refracted and reflected onto the surrounding walls. A speculative analogy is proposed concerning the visualisation of subatomic particle processes as interacting clouds of probability orbiting the nucleus of an atom. The drips generating the ripples could be seen as protons within the nucleus and the waves as a series of nested orbits that radiate to form interacting electron clouds. Valency is the capacity to combine to form molecules and compounds. In this context, valency could be analogised visually as an interacting exchange of electron 'clouds of probability' binding compounds together.

The water molecule is a covalent compound as its oxygen atom shares a pair of electrons with two hydrogens. Covalency reflects the shared nature of the conceptualisation of this project as speculative analogy for 'Valency', through observation and discussion with Paul M. Covalency also refers to the two concepts for this work. The second concept references the calculated probability that dripping taps in the UK lead to the loss of 460 million litres of water per year (or 184 Olympic-sized swimming pools). Using recycled bottle drip irrigation systems developed for watering plants, the physics of altering the speed of the drips has been experimented with over a length of time.



Details of the Installation

About the artist

Olga F. Koroleva (she / her; white-passing neurodivergent planthuman living and working with hidden disabilities) is a UK-based artist – curator – un-academic researcher – forager – lecturer. Her work honours slow practice and self-care while exploring ways of non-exploitative cohabitation with multiple others on this planet. She works primarily with expanded research cinema, and is the founder of the international peer group The Political Animal.

She has taught at The Royal College of Art, London, The School of Art, Architecture and Design at London Metropolitan University, Wimbledon College of Arts, Chelsea College of Art and Design, and Bucknell University, PA, US. Her recent work has been made possible with funding from the Arts Council England.

Her moving image work has been exhibited nationally and internationally, including at UCL Museum of Art, and V&A Museum, and The Showroom, London. Her original written work has been commissioned for Ocean Archive, TBA21-Academy and CSPA Quarterly. She was a Film Practice Fellow at the Centre for Film and Ethics, Queen Mary University of London (2019 - 2022), and Research Affiliate at FEELed Lab, University of British Columbia, Okanagan, Canada (2023).

Olga is currently taking a self-lead PhD by plant practice (2020 onwards) unaffiliated with any institution. She is the Treasurer at Medway Urban Green Spaces Forum, and the founder of Meditate Medway - a disability and queer friendly wellbeing initiative teaching breathing practices and meditation based in Medway, Kent.

www.olgakoroleva.com

Olga F. Koroleva



© Olga F. Koroleva (2022), Hidden, still from dual screen film.
Microscopic footage by Sonia Levy.

About the film

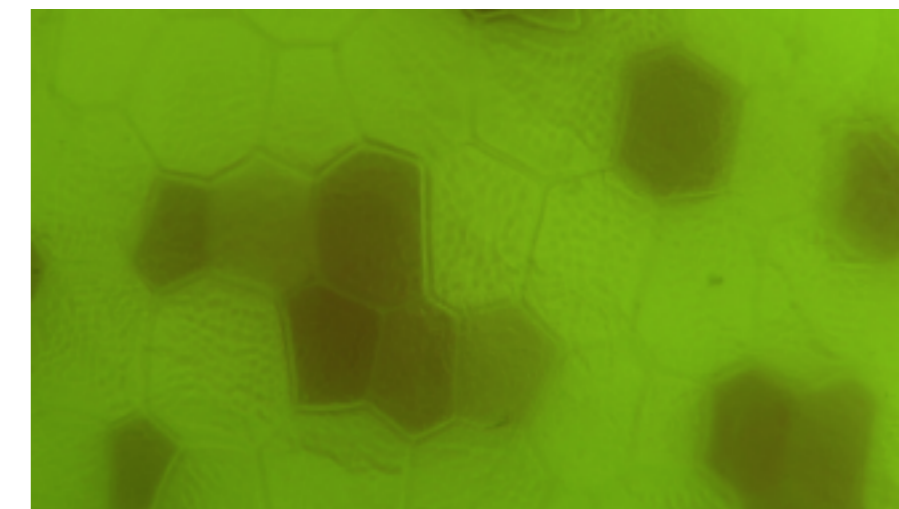
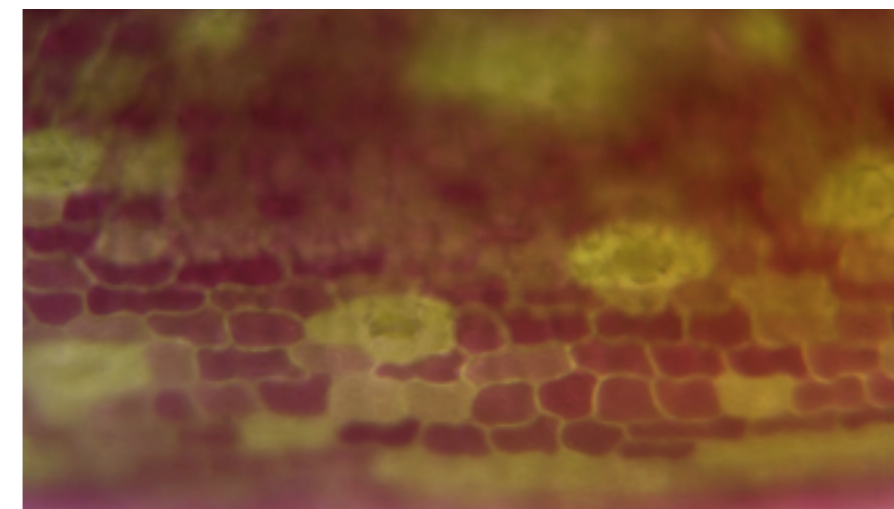
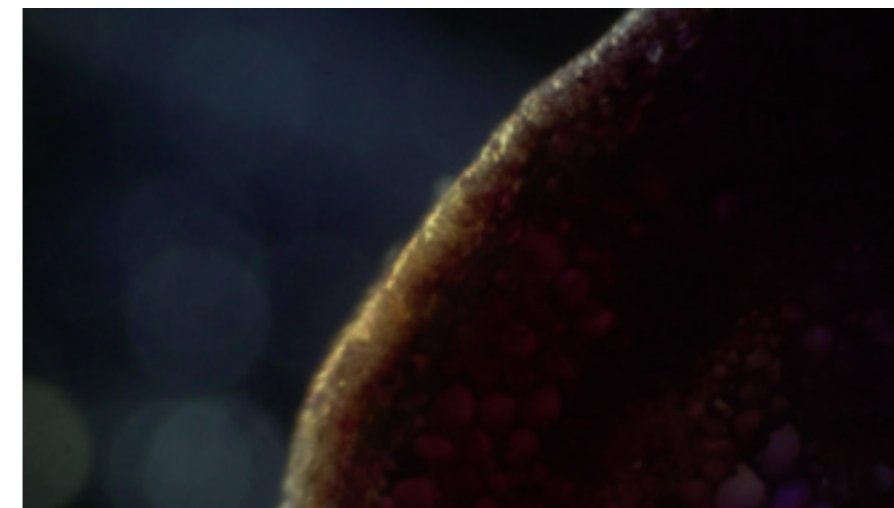
'Hidden' (2022) is the dual-screen iteration of my research and moving image project on the relationship between hidden disability and the companion-working plant. When it first emerged in 2020, it marked a new trajectory in my practice that explores vegetal narratives concurrent in humans and plants, tracing colonial patterns of medicinal plant extraction in the longer term. The film is based on my personal experience and life practice of managing fibromyalgia, a neurological condition that manifests in muscle and nerve pain all over the body, by working closely with the plant *Callisia Fragrans*, while both of us experience displacement, encounter and adapt together to less than hospitable places of habitation.

The work is both a marvel at the plant's medicinal properties and beauty, and a critique of the western scientific approaches favouring observation and empirical evidence, including the need to dissect and see in order to believe over intuitive and embodied knowledges inherent in indigenous worldviews. One of the most difficult challenges that people with hidden disabilities, myself included, face is explaining one's needs to others since this difficulty is not seen. 'Hidden' is an ongoing project that aims to make the existence of fibromyalgia and the challenges that come with it more visible by working with the plant *Callisia Fragrans*, or basket plant. Although *Callisia* is endemic to Mexico (and this relationship is not uncomplex) I arrived at being able to use the knowledge the plant shares by remembering my granddad's teaching while in his birth place.

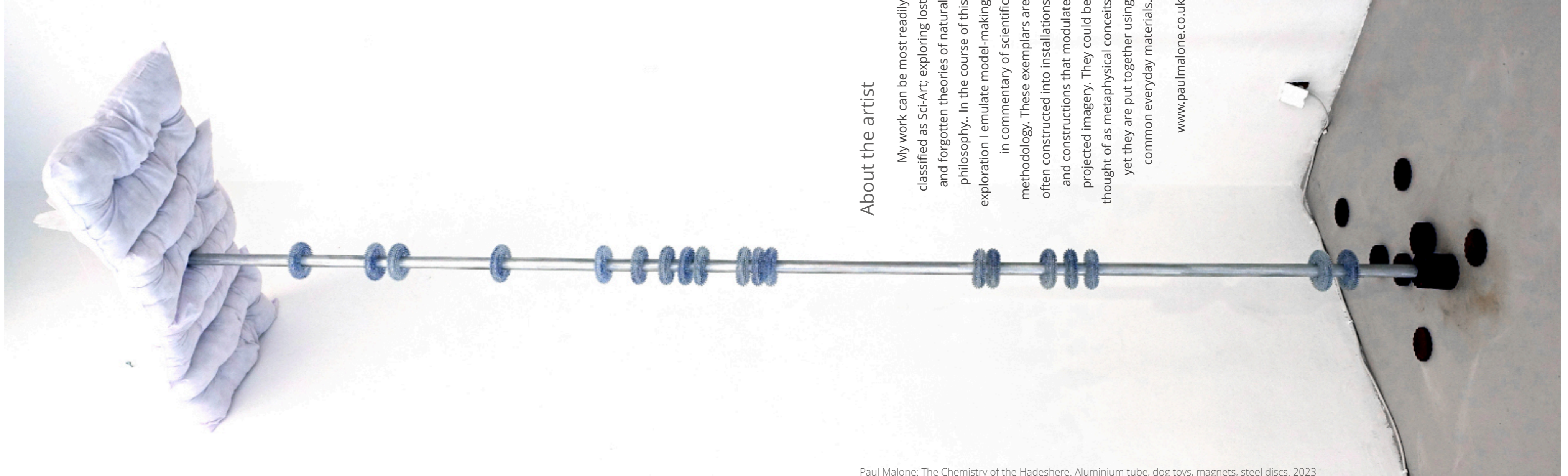
It sits within the larger with-plants research and cinematic practice whereby I work with medicinal plants using embodied knowledge passed down from my grandfather, an ethnic Tatar (Bashkortostan, Urals). By re-remembering my own connection to land*, the basis for 'Hidden' narrative, I was able to begin working with storytelling as a means of learning and sharing intuitive indigenous and embodied knowledge, which is still seen as secondary to scientific knowledge in western-bias places and fields. Longer-term still, I hope to be able to contribute to collective and community re-remembering of herbal medicine, especially as healthcare is being increasingly privatised and made inaccessible worldwide.

**this began with recognising the plant called wormwood, which I talk about in my text for FEELed Lab 'Planthuman reflections' (2023), and in the text Soft Forest' (2019)*

© Olga F. Koroleva, December 2023



© Olga F. Koroleva (2022), Hidden, still from dual screen film.
Microscopic footage by Sonia Levy.



About the artist

My work can be most readily classified as Sci-Art; exploring lost and forgotten theories of natural philosophy. In the course of this exploration I emulate model-making in commentary of scientific methodology. These exemplars are often constructed into installations and constructions that modulate projected imagery. They could be thought of as metaphysical conceits yet they are put together using common everyday materials.

www.paulmalone.co.uk

Paul Malone: The Chemistry of the Hadeshere. Aluminium tube, dog toys, magnets, steel discs. 2023

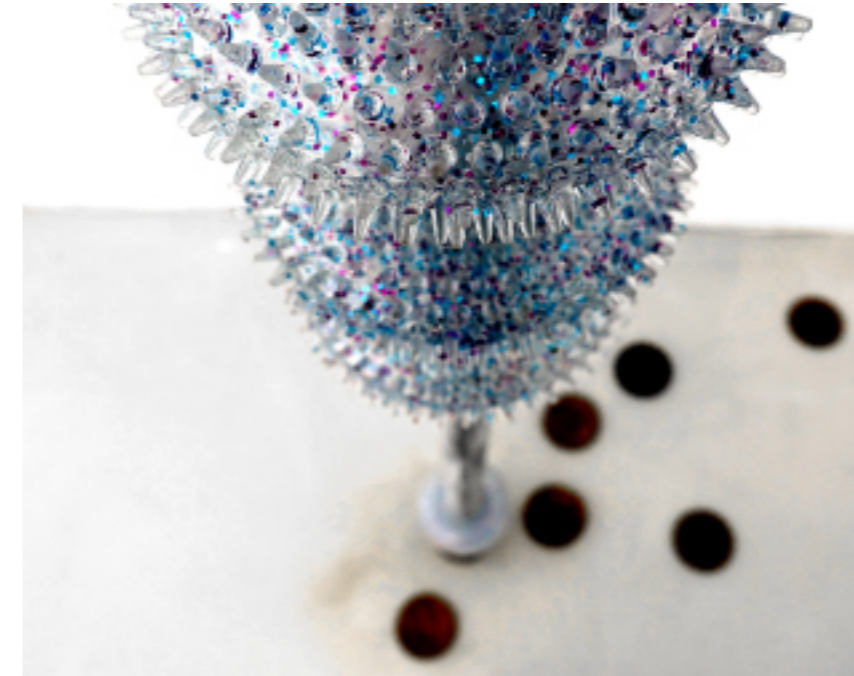
About the exhibit

The surface of the planet Venus lies beneath a dense cloud layer that has only recently been penetrated by landers visiting the surface and radar by orbiters. Before this time there was extensive speculation about what we would find there. This ranged from dense tropical forests, an oceanic water world or even an Earth-like emulation. In the 1950's there were some theories that Venus was very hot. These were based on the 'Ashen Light' phenomenon on the night side of the planet. This was thought to be global fires raging uncontrollably. Apart from these theorists no one predicted that the atmosphere was hot enough to melt lead and fewer still that the pressure would be similar to that of the bottom of the Earth's oceans.

Current consensus proposes that these features are the result of 'runaway global warming', however this does not fulfil all of the observations. The artwork in this exhibition illustrates a model of the atmosphere (John Ackerman - 'An Alternative Venus', 2006) where the high temperatures and pressures of the atmosphere are induced by a large component of the ring molecule Sulfur-8. This is the high temperature variant of sulphur which, at its sublimation temperature, exactly matches that of the Venusian surface. Combined with carbon, this molecule (CS) has a molecular weight of 44 - the same as Carbon Dioxide. This is vented from the 200,000+ volcanic 'pancake' features scattered across Venus in ballistic plumes. These add to the high density.

In the playful spirit of model making, this artwork has the ring Sulfur-8 molecule represented by beautifully iridescent dog toys. These are arrayed in the pattern of the absorption lines of sulfur along the length of a suspended tube. The column is off-set against the gravity of the planet and disappears into the clouds of sulphuric acid aloft at 50 miles. This incorporates the additional electro-magnetic charge field component which, in opposition to that of the Sun, is simultaneously slowing down the rotation of the planet. Venus will come to a stop in 1m years and then start to spin in synch with the Sun and other planets. At this point the Earth-like upper atmosphere will collapse onto the surface and start the evolution of life.

Paul Malone



'Chemistry of the Hadesphere'. Details of the installation

About the researchers

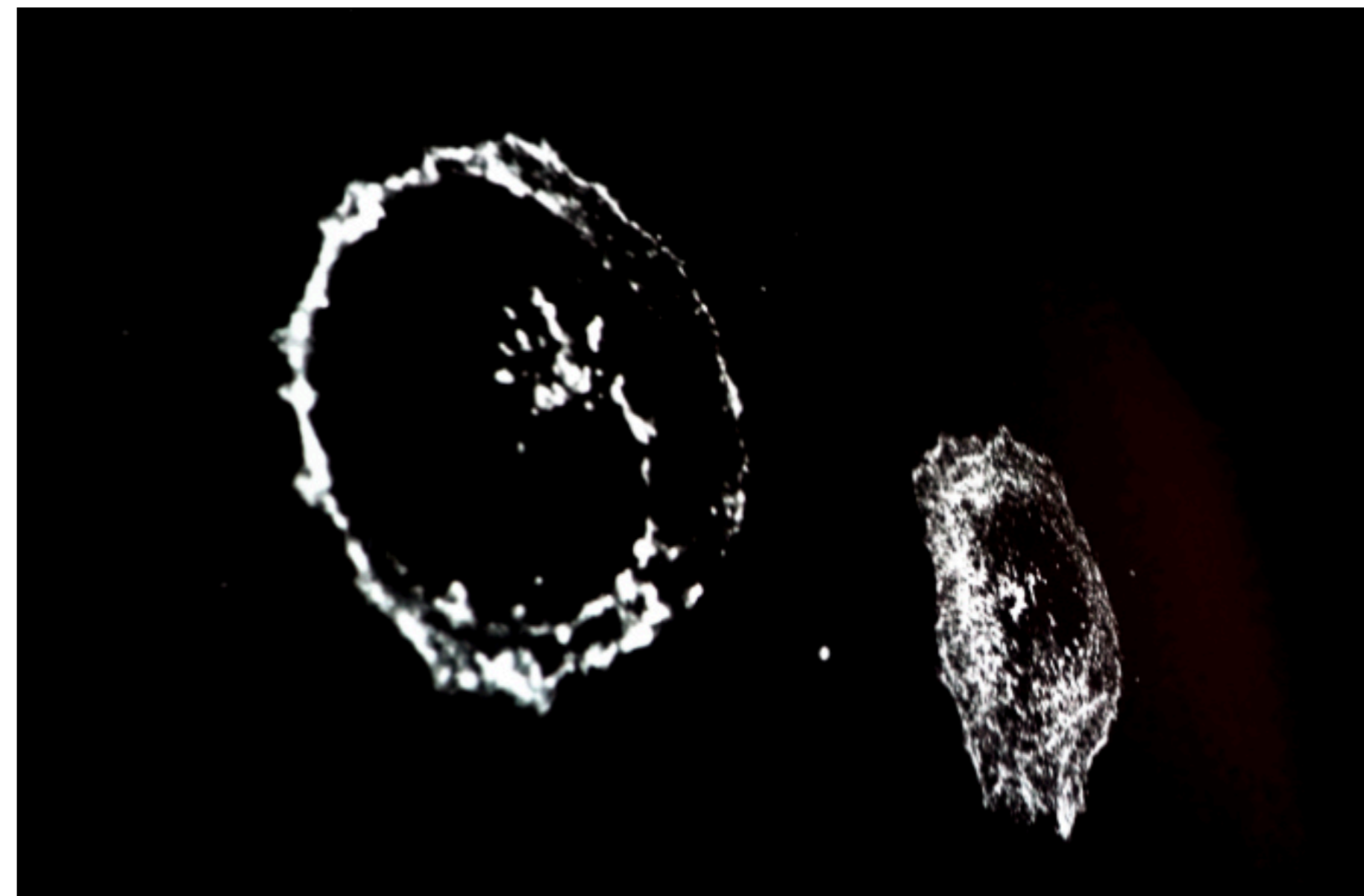
Dr. Sabrina Simoncelli, born in Buenos Aires, Argentina, is a Royal Society Dorothy Hodgkin Fellow and Associate Professor in Nanoscale Characterization, joint between the London Centre for Nanotechnology and the Department of Chemistry at University College London, UK (2020-to present).

Since her PhD (2010-2014) at University of Buenos Aires (Argentina), Sabrina developed single-molecule localization microscopy techniques to enable quantitative measurements of processes in the field of nanotechnology, material sciences and biology. She deepened and broader her expertise during her post-doctoral positions at Ludwig-Maximilian-University, Germany (2014–2016), Imperial College London, UK (2016–2018) and King's College London, UK (2018-2020).

Since 2020, her group's research focuses on the application and development of physical and chemical approaches to study biological phenomena at the nano-scale, particularly in the field of T cell immunology.

Megan Joseph was born in East London and received her degree in Biological Sciences and Masters in Immunology from Imperial College London. She then started work on her PhD with the London Interdisciplinary Doctoral Program. Working in the Simoncelli Lab, alongside Sabrina, her PhD focuses on using super resolution microscopy techniques to study T cell biology with a focus on understanding auto-immune disease mechanisms.

simoncelli-lab.com



Sabrina Simoncelli: 'Actin re-modeling in WT and KO T cells'.

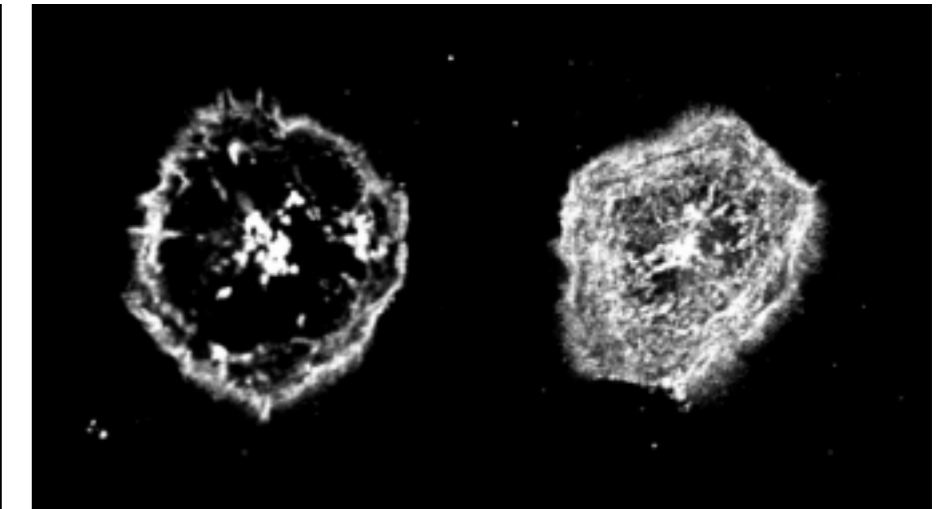
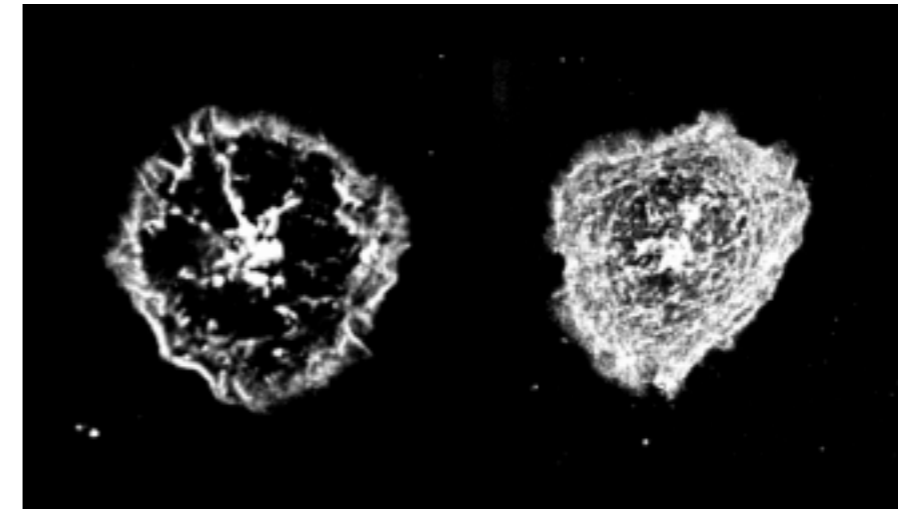
About the research

Breakthroughs in biological sciences are often accompanied with advances in imaging. Over the past two decades, several innovations in instrumentation, data analysis and dye design powered the resolution revolution in fluorescence microscopy, allowing to see beyond the diffraction limit of light.

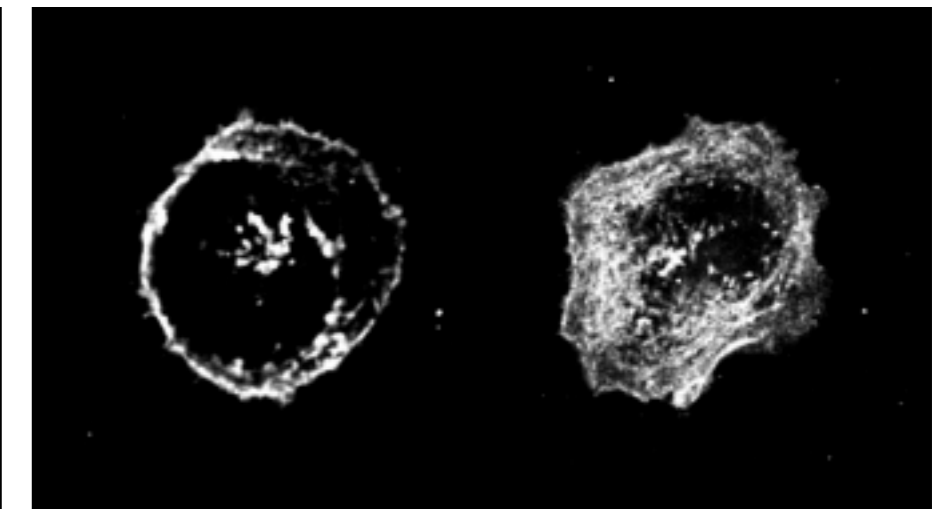
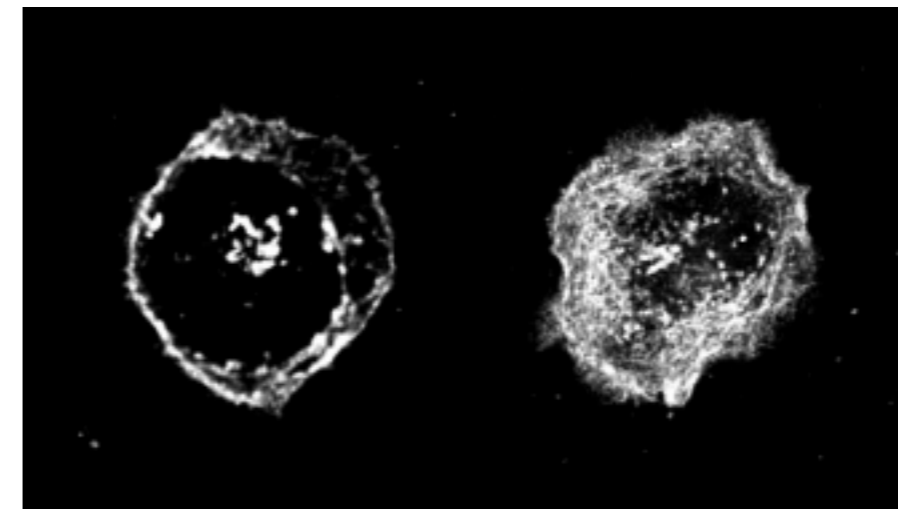
While there currently are many nanoscopy methods that circumvent this limitation, they all have trade-offs between resolution, speed, field of view, biocompatibility, sensitivity, and experimental complexity. To push the technology further, the lab explores new approaches ranging from image analysis routines (to extract richer structural and mechanistic information of protein complexes, interactions and assemblies); to the synergistic integration of photonic nano-structures.

We use a combination of experimental and computational techniques, including microscopy, optics, spatial statistics, nano-fabrication and image processing. We are particularly interested in super-resolution microscopy (also known as nanoscopy), which are fluorescence microscopy techniques that allow us to visualise the spatial organisation of single molecules and molecular assemblies, with the highest level of resolution and specificity. Our main biological application is in T cells, which are white blood cells that are essential for human immunity.

The exhibition features some super-resolved microscopy videos from Megan Joseph's PhD to understand the role of a particular protein, known as PTPN22, in T cell activation. This protein can harbour a mutation that is associated with over 15 different autoimmune diseases such as type 1 diabetes, systemic lupus erythematosus, and rheumatoid arthritis. Her work could help to elucidate the mutated protein's role within autoimmune disease.



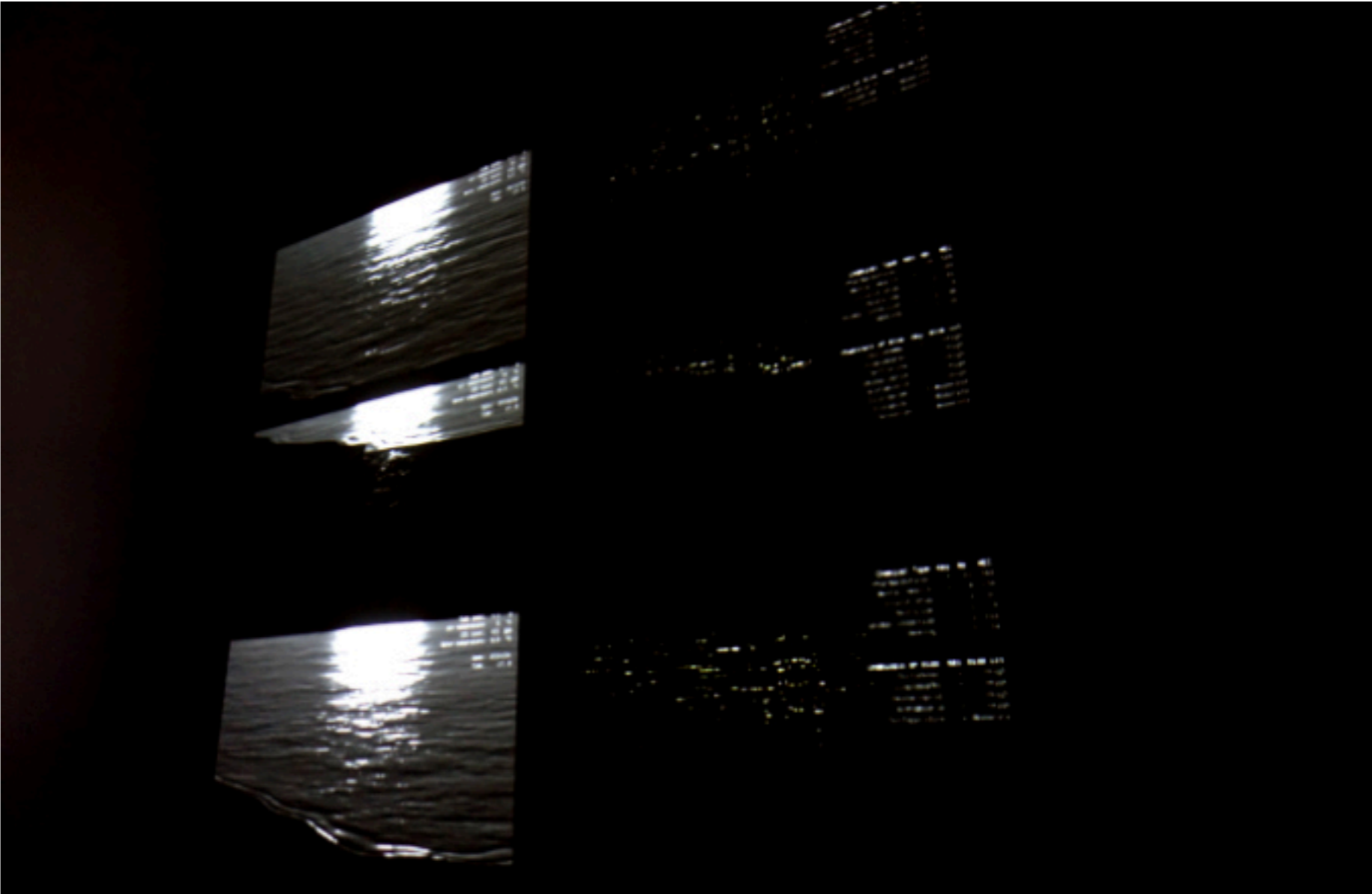
'Actin re-modeling in WT and KO T cells'.. Sequence of stills from the movie - clockwise



About the artists

WHABBstudio is a creative duo working collaboratively to explore our changing world and our impact on the environment, using emerging technologies and scientific research. Drawing from experience of living on a boat in Nine Elms, India Gabb & Zoe Wheeler create works to connect Londoners with the River Thames. WHABBstudio is active in engaging local communities with topical issues such as the focus on planetary health. The duo have collaborated with organisations such as Nine Elms on the South Bank, Troy House Art Foundation, Tate Exchange and Uniqlo Tate Lates, Tate Modern and Wandsworth Council.

whabbstudio.org/



"Undertow"

About the exhibit

'Undertow' is a data visualisation of how chemical pollutants in London's rivers changed over the pandemic. The work explores how the river can be used as a forensic analysis on the urban population's health & well being. It draws attention to the interconnected relationship between nature and people, illustrating how the natural environment can be a living record of the urban population.

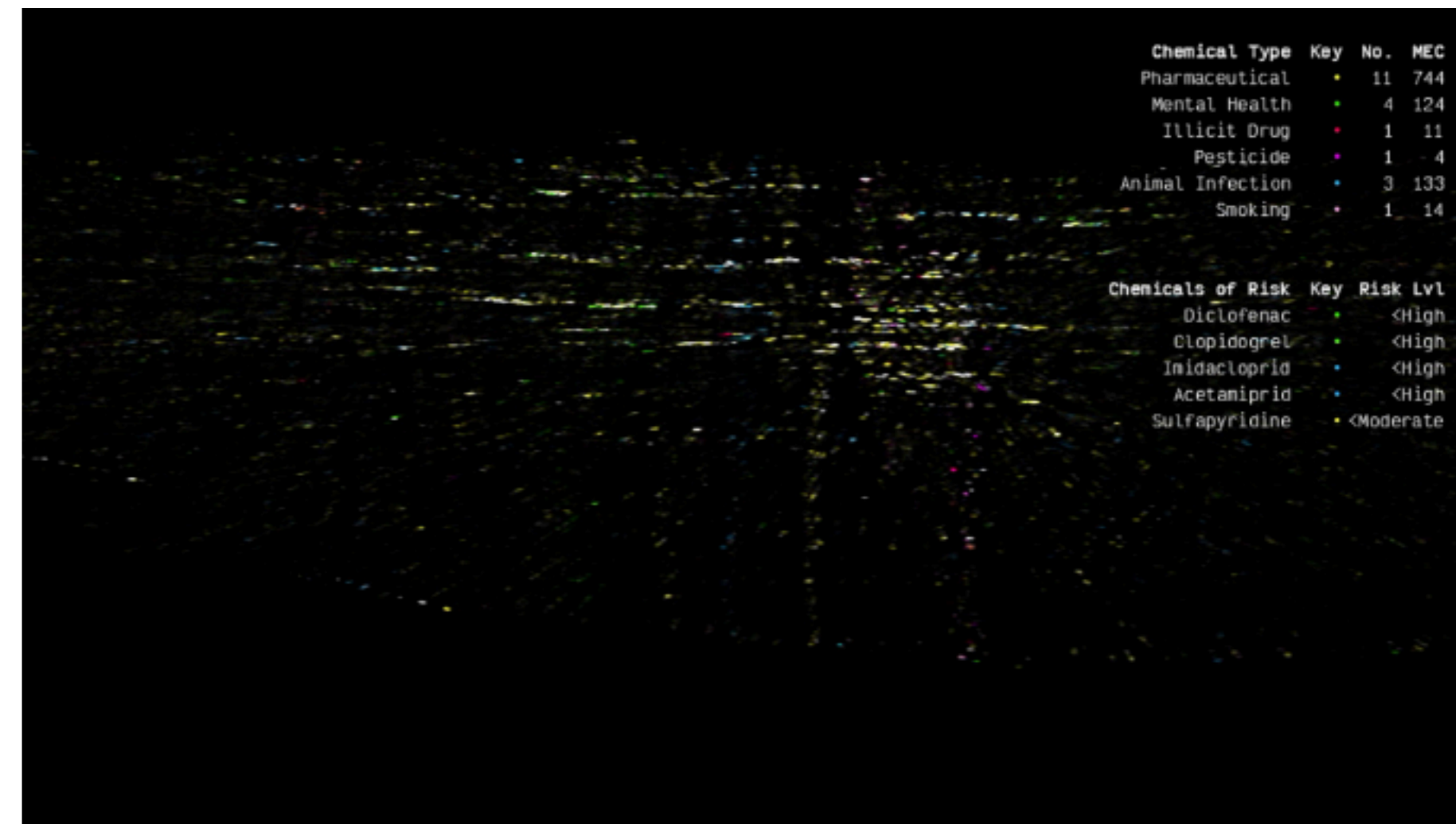
'Undertow' uses generative visualisation to form an experiential way of viewing data, making scientific information accessible and promoting inclusion in ecological issues.

The coloured glare of the water visualises the varying concentrations of chemicals found in a local area of Nine Elms Pier over the pandemic (with sampling taken from Battersea Park East). Categories of chemicals found in the River Thames include: pharmaceuticals, pesticides, illicit drugs, nicotine & substances used to treat animal infections.

The data displayed in Undertow has been taken from the study: 'A One-Health environmental risk assessment of contaminants of emerging concern in London's waterways throughout the SARS-CoV-2 pandemic' led by Imperial College researchers. Conclusions of the study found: 'In the R. Thames pharmaceutical MECs (Measured Environmental Concentration) decreased significantly during the 2020 lockdown period, with riverine concentrations exceeding pre-pandemic levels the following year'.

Undertow builds on the concept of the 'one-health' approach, highlighting the importance of gaining a deeper understanding of how human activities (and use of potentially harmful chemicals), can impact an urban ecosystem that supports the health of people, wildlife, and the environment.

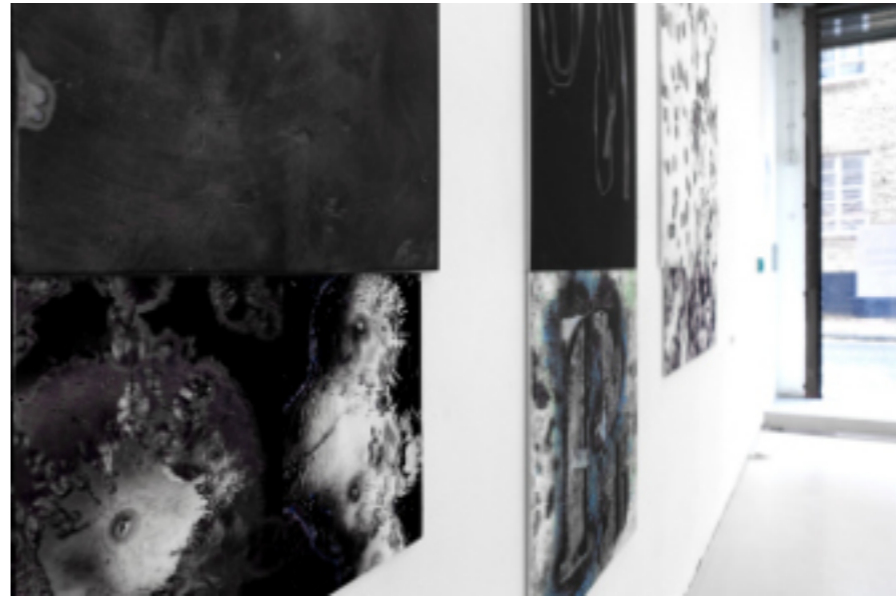
Sisterwork, 'Ebb & Flow', displayed adjacent to Undertow, visualises tidal data and climatic conditions, on the same dates sampling took place in the 'One Health' study.



Still from 'Undertow'



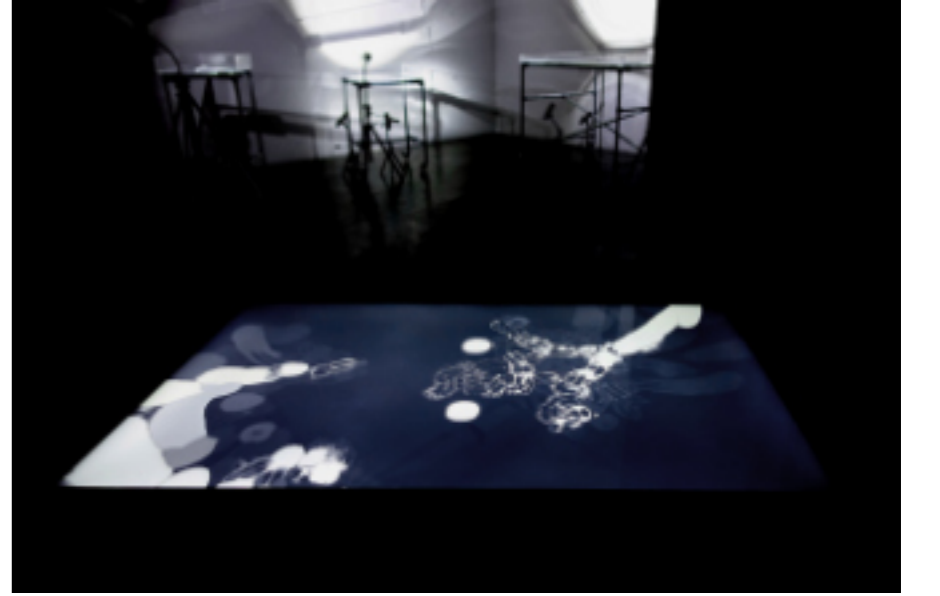
Private view



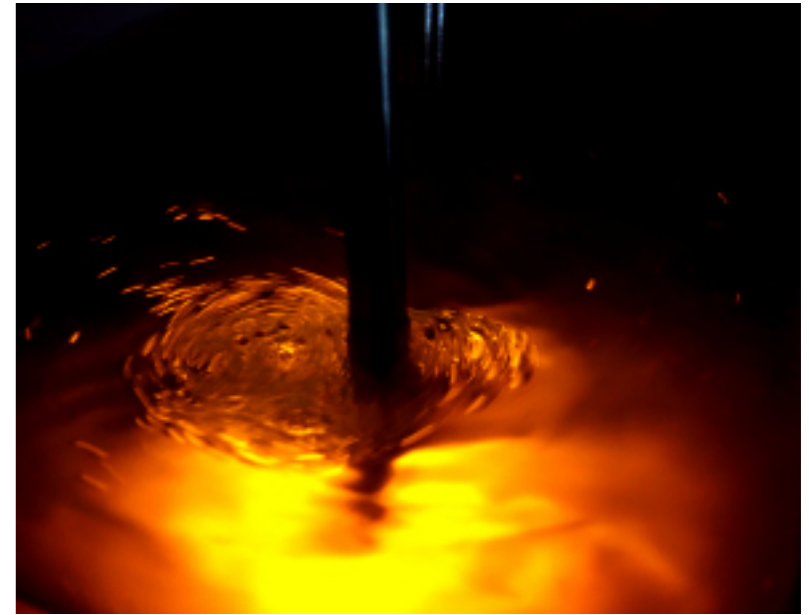
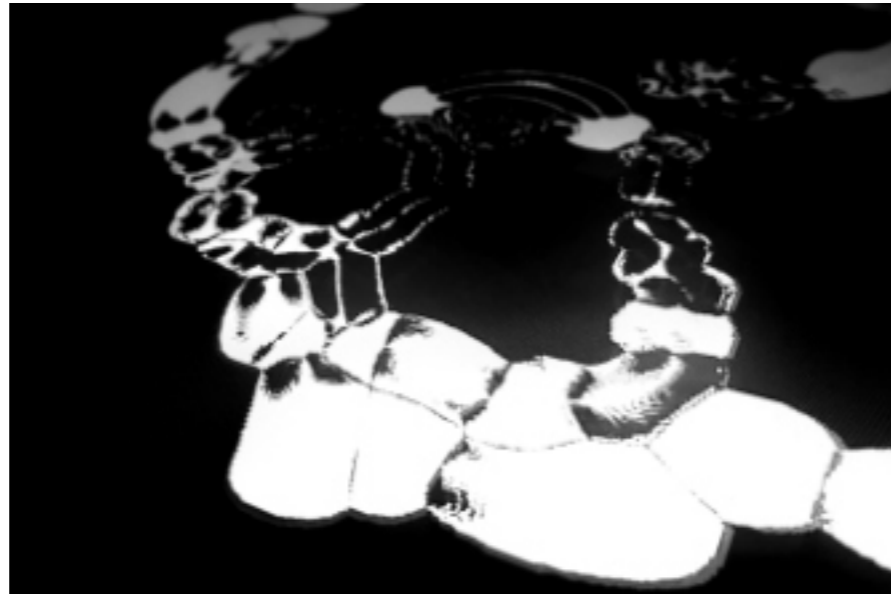
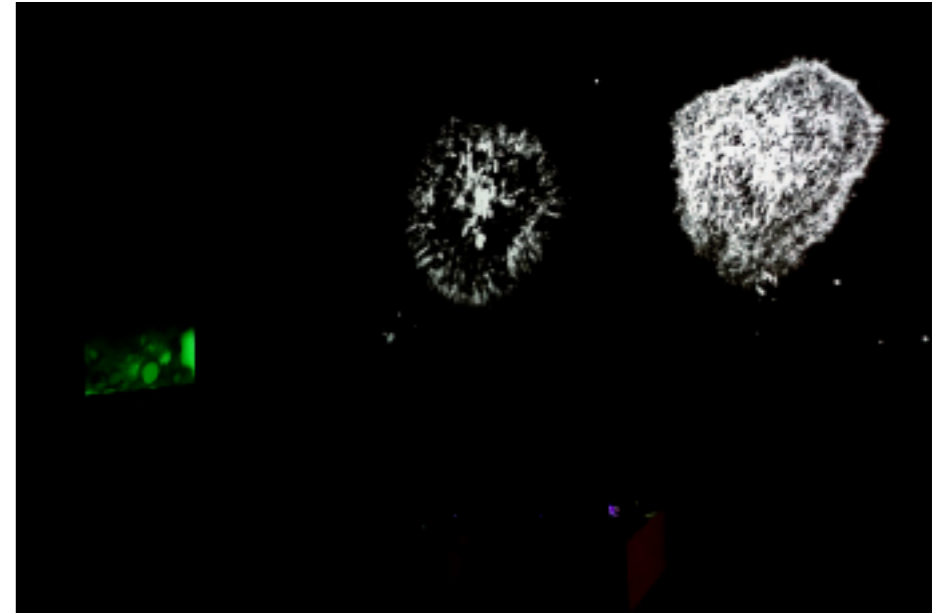
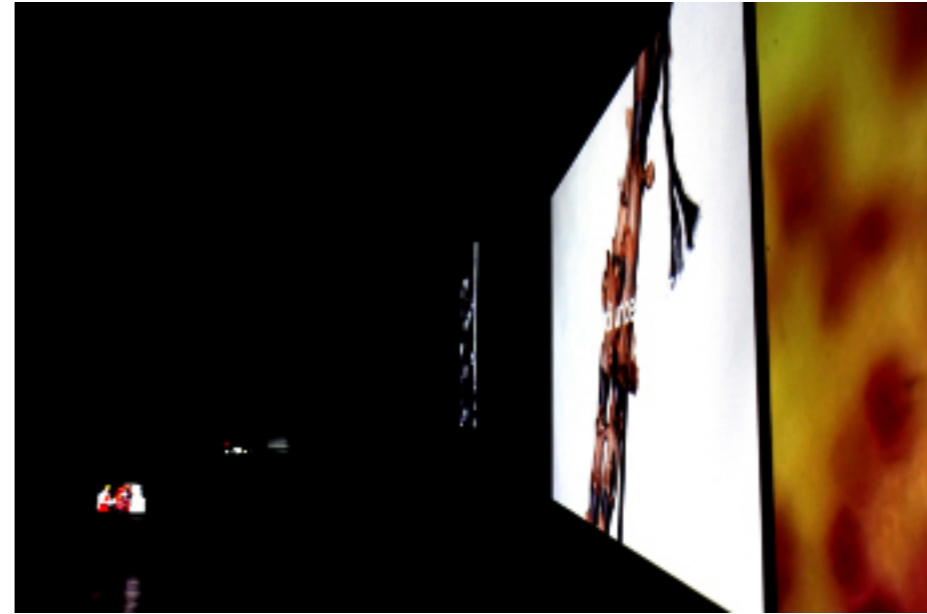
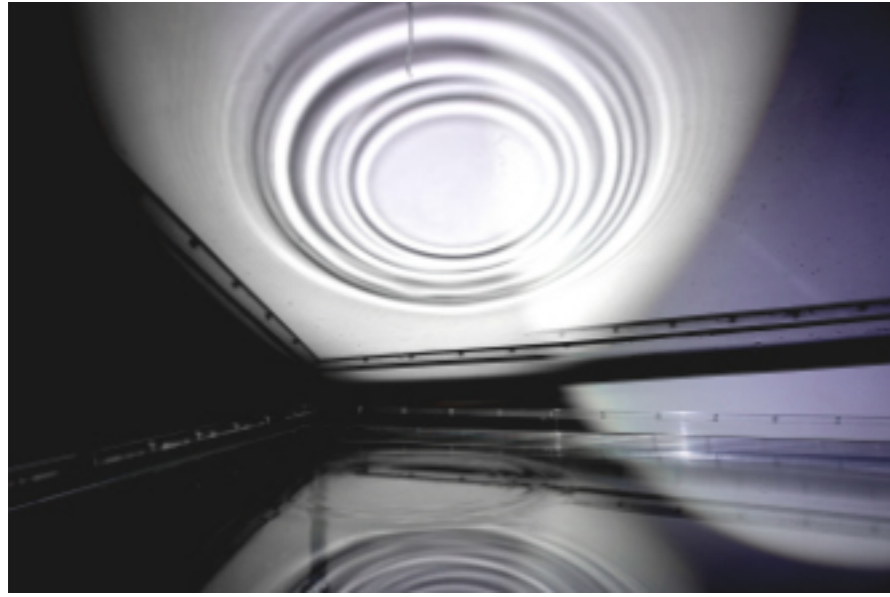
general views: front



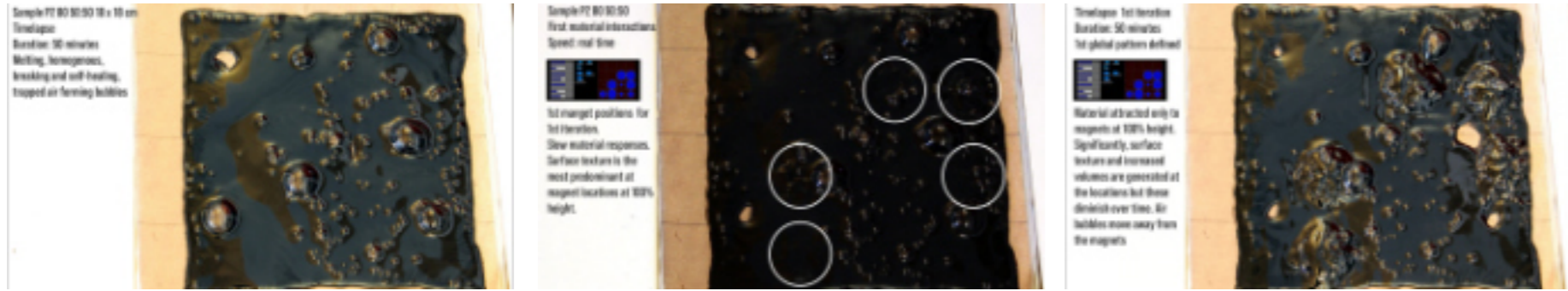
general views: front



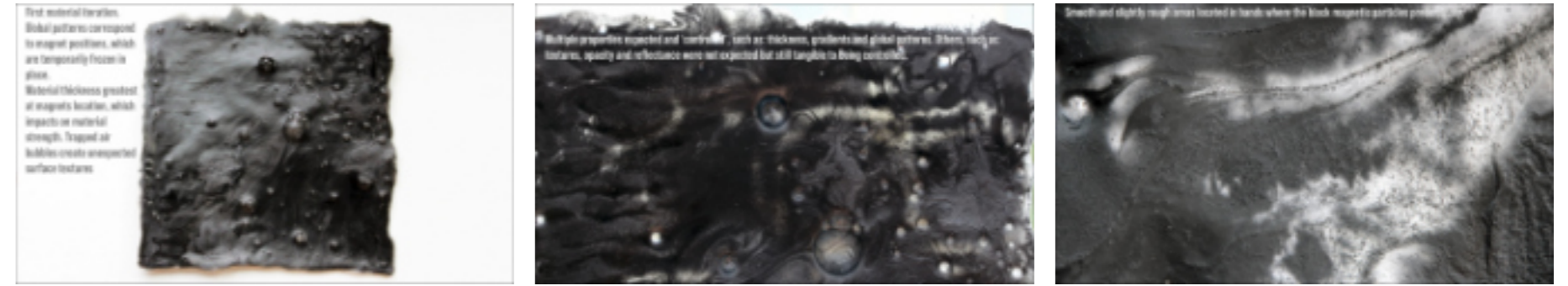
general views: rear



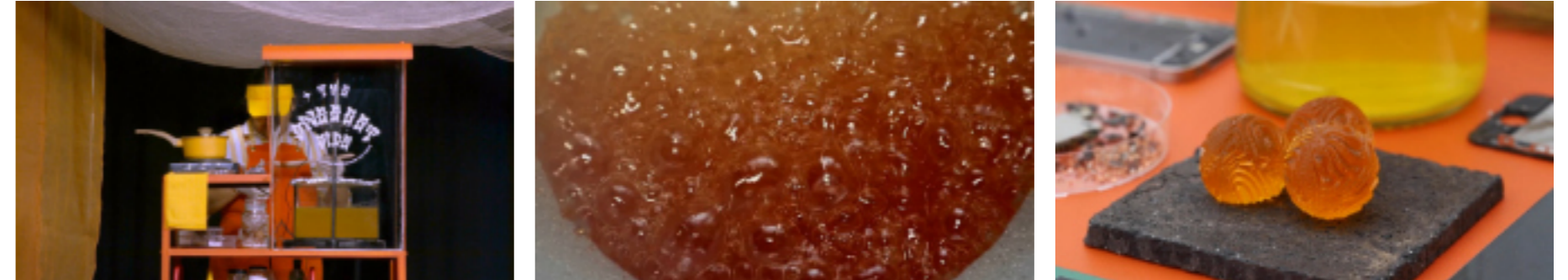
general views: rear



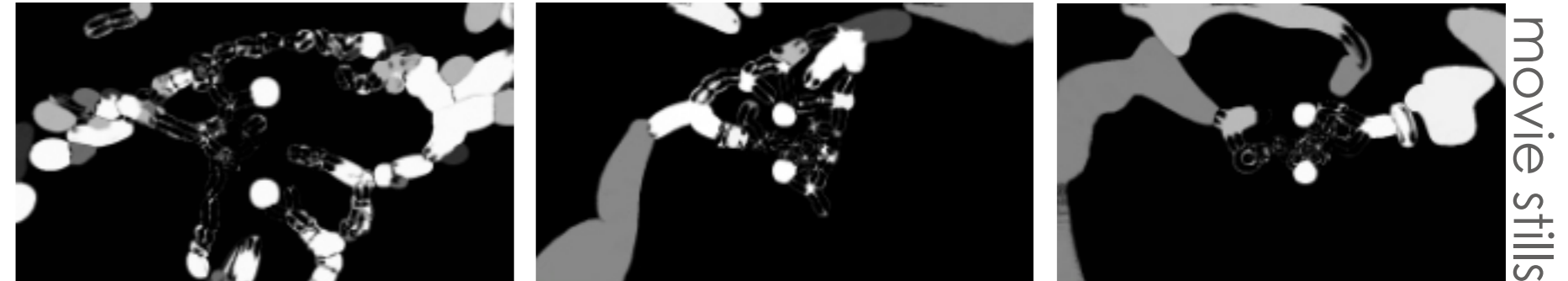
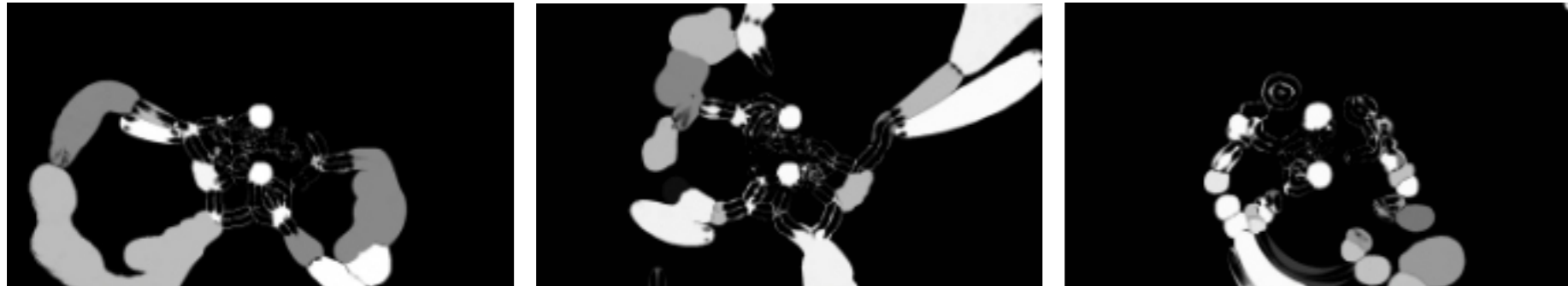
Adam Blaney: 'HD-re-programmable matter project' descriptive movie



Liv Tsim: 'The Sweet Side'



Marinus van der Sluijs: ouroboros movie



movie stills

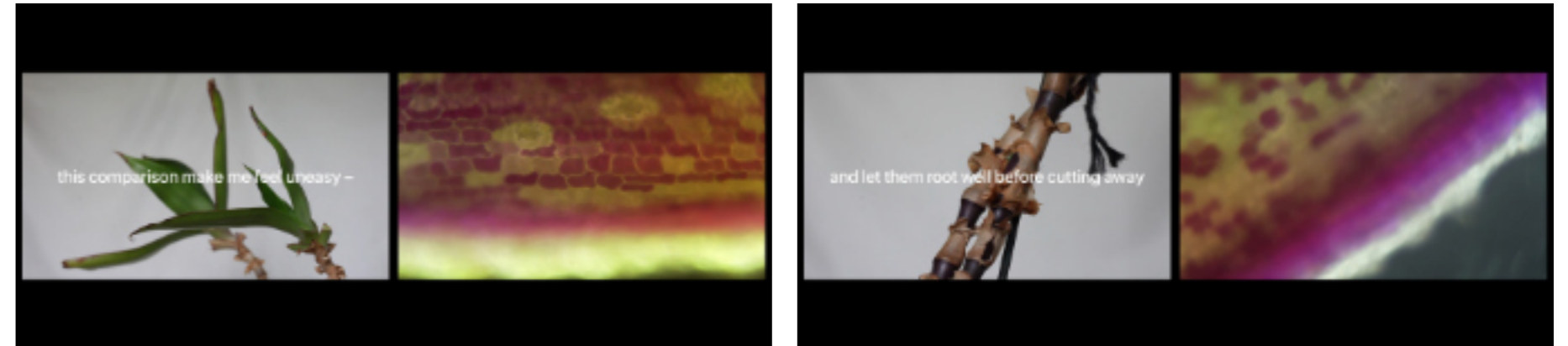
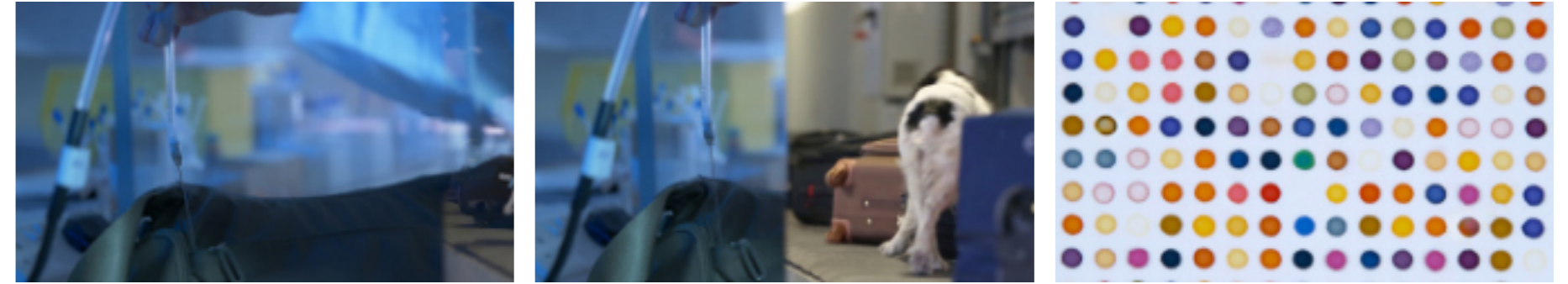


Licia Dossi: CrimTrak movie

© Olga F. Koroleva (2022), Hidden, still from dual screen film Microscopic footage by Sonia Levy.



Huan Wang: 'Pours in a Yellow heart, Orkney'



movie stills

DAVID BLOOR (CYMBALS)



POWER SOCKET FOR WORK LOCATED AT TOP OF STAIRS ON LEFT - ORANGE PLUG

TO GET WORK STARTED

- MAINS POWER ON
- POWER ON WHITE BOX, SWITCH TO LEFT POSITION
- PRESS RED (POWER) BUTTON
- PRESS BLACK (PLAY) BUTTON
- TURN ON BLACK AMPLIFIER (BLACK BUTTON)

TO STOP WORK

- PRESS RED BUTTON
- TURN OFF AMP
- POWER OFF WHITE BOX (SWITCH TO RIGHT POSITION)
- TURN OFF MAINS ELECTRICITY.

THE AUDIO SHOULD LOOP (APPROX 5 1/2 MINS), IF AUDIO TOO LOUD OR 2 QUIET YOU CAN ADJUST VOLUME ON AMP. NOTE - THERE ARE BITS OF SILENCE !!

Here is one of the invigilator instructions for the exhibition. As you can see, starting up and shutting down exhibitions of this kind can be technically challenging!

There were many exhibits using audio, video and special considerations in setting up. The gallery itself had several requirements to have it ready to receive the first visitors, in terms of access, lighting and printed material.

On average it took 30 minutes to start up the Valency exhibition from 'cold and dark'.

Left; Instructions by David Bloor for his audio piece 'Nontraditional Activation Method'



Above are photographs of the discussion group hosted by David Bloor, Huan Wang and Olga F. Koroleva on the 30th November 2023. The meeting was Chaired by Haoyue Chen.



The exhibition was also visited by groups from:

Hertfordshire University, School of Creative Art.
Goldsmiths University curating students
Queen Mary University, Chemistry department
RCA Textiles students

Altogether there were 257 visitors over 8 days

"We were impressed with the sleek, economical curation and how welcoming the curators were"

The exhibition was accompanied by an Information Hub with further information about the projects on display

Curator's Coda

After Periastra in 2022 I was looking for another theme with which to assemble a follow-on art / science hybrid exhibition. I received a random email from the ASCUS art and science facility in Edinburgh to attend a Zoom meeting on chemistry. At first sceptical, I was impressed with the enthusiasm the researchers were bringing to their fields of study. I became hooked on the idea of presenting a show that would demonstrate the different ways of working that I had observed and to get in touch with some of the artists I knew that had a similar approach to their aesthetic enquiries.

Previous exhibitions at APT had been very much last minute affairs – sometimes offering just a few weeks to prepare everything. This time we had the luxury of an exhibition slot that was over a year from the application date. I started to research potential participants. One thing quickly presented itself. In contrast to astronomy there were very few amateur chemists I could contact. I assumed anyone engaged as an individual would be frowned upon as conducting hazardous or illegal activity. I've since found a few on YouTube but at the inception I would concentrate on researchers in institutions. I originally sent out 30-odd invitations of which I received 10 initial replies. Given the length of the run-in, not everyone was able to commit so I ended up with the 5 chemists you see in the exhibition. Along with the 7 artists there were also 2 recent graduates and a further graduate who came in to offer curatorial support.

The Periastra template was being used for the exhibition so this meant time was available to assist the chemistry participants in realising the ideas they were proposing. Many of them had never taken part in an exhibition of this kind so it was a learning curve in several ways. For exhibitions of this kind, where there are people from all kinds of backgrounds, skill levels and

locations, it is useful to adopt a kind of 'air traffic control' method. This is where they are inbound globally, assembled into a holding pattern and then brought in to their 'gates' individually. This requires a fair bit of co-ordination and clarity of communication to get it to work. In this, the adoption of a website early on was an essential. Everyone could see what everyone else was doing and a page of FAQs could be compiled as an aide memoire and for newcomers to the system. This did save a considerable amount time otherwise spent on emails and conference calls.

As the date of the exhibition approached attention turned to how the ideas that were being proposed could be incorporated. It was very useful having a workshop on site and a quantity of 1mm aluminium sheet that proved very useful in providing a consistency of look to the design. By the beginning of November most exhibitors had finalised their projects and the focus could turn to sending out invites and generating audiences. The design of the printed material and information panels was in place and ready to promote the education element.

The idea as far as visitor user experience was that the exhibition should initially present itself as an enigma. The exhibits would just have numbers placed beside them but if they excited interest then there would be set in train an information cascade where enquiries could be resolved and curiosity satisfied. This trailed from the website through the panels and eventually to the URLs of the exhibitors and their research papers. This would also act as a legacy record along with this catalogue

Paul Malone 2024

Exhibitor's Coda

I first met Paul at my RCA show in July 2023, but it was through his website that I truly got to know him. His pure-hearted expression of thoughts prompted me to reach out. Surprisingly, he responded and invited me to be a part of the Valency exhibition.

Initially, some scientific concepts and research on the exhibition page were complex and puzzled me, leading to doubts about my connections with fellow participants. However, this was later eased by sharing ideas with the curator. The Valency website page also served as a form of 'air dialogue' among participants' projects, aiding me in quickly constructing a mental image of the exhibition. Echoing the concept of 'Valency,' there was an energy / ability that brought us together— all participants were active and developing elements. The final presentation of the exhibition still held many possibilities.

During setup, works were adjusted daily, gradually harmonising with each other. Though we didn't engage in extensive conversations, communication happened through the movement of our pieces. John's cirrus curve extended along the gallery ceiling towards Paul's pillow cloud. Their works pointed to or came from the sky, while mine originated from the earth. The materiality of Licia's sniffer dog and the colours of Jan's work added weight to the floor space. This inspired me to hang my quilt piece with yellow twine, pointing to other works. The pieces finally danced together.

Both science and art share a mystical experience that goes beyond language.

Huan Wang 2024

Thanks to:

The Curators would like to thank all those who took part in Valency and to Art in Perpetuity Trust for the gallery and equipment support.

Special thanks to those who sponsored the exhibition

Wenqin Wang

Peter and Carol Wilkinson

A·P·T
Art in Perpetuity Trust



Nicola, Paul and Haoyue: Coffee and Chat



Information

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First published January 2024 by Plasmazine Publishing

Catalogue design by Paul Malone ©2023

Website of the exhibition at:

www.cipango.co.uk/valency

Curated by Paul Malone and Nicola Rae 2023.

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Plasmazine Publishing
www.plasmazine.co.uk

ISBN 978-1-7396878-2-3

