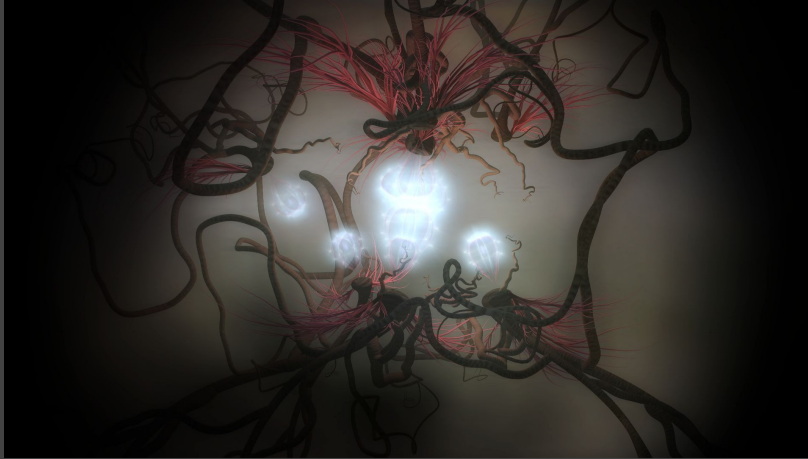


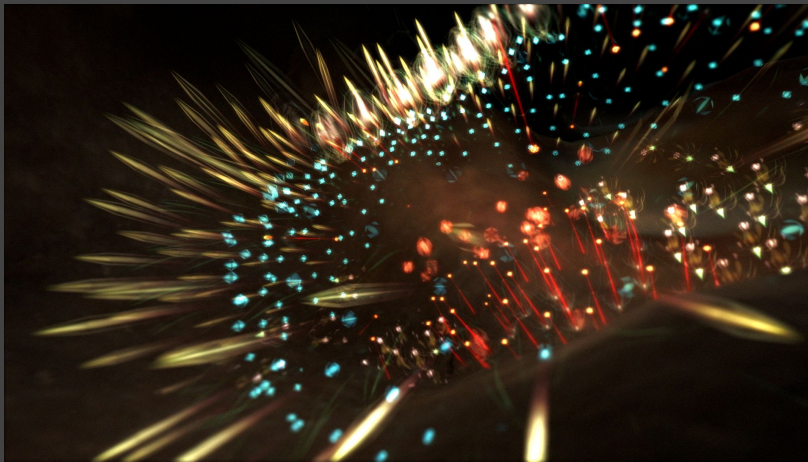
VOLUME II: PORTFOLIO OF
PRACTICE-BASED ARTEFACTS



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[Artefact II. AfterGlow](#)



[Artefact III: In Search of Chemozoa](#)



[Artefact IV: Call of the Silent Cell](#)

Vicky Isley - Volume II for PhD by Publication, Bournemouth University,
March 2022

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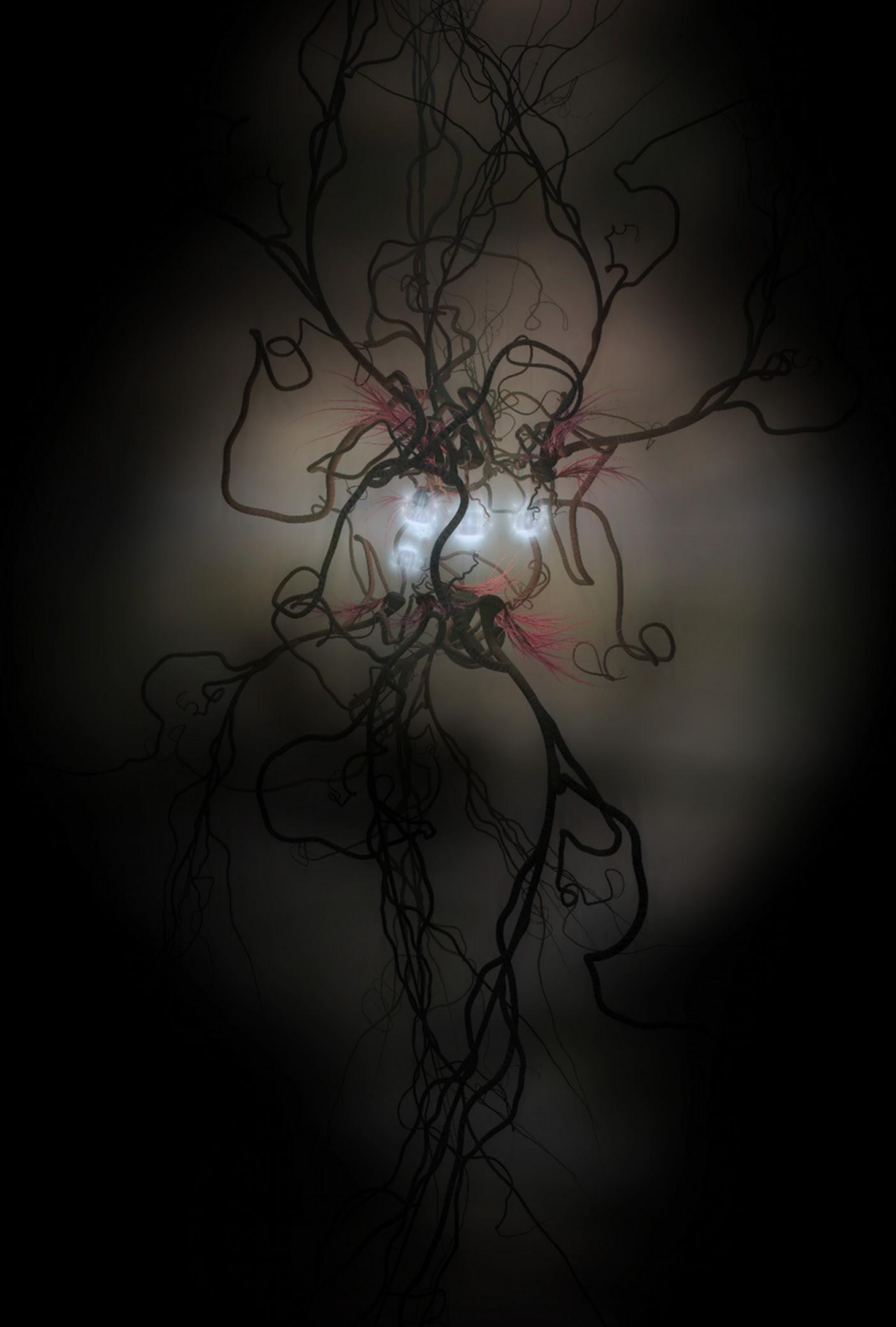
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CONTEXT

Boredomresearch was invited by Monica Bello (Head of Arts at CERN, The European Organization for Nuclear Research) to produce a new artwork for an exhibition she was curating at the Transito_MX 06 Festival de Artes Electrónicas y Video in Mexico City (2015). The artistic vision for this festival was themed around the notion of “*shared changes*” and a forum to “*transform reality not into an alienating fiction but rather, into a better, shared world*” (Farra 2015, p.2). Bello’s curatorial direction for the exhibition was to address notions of hidden layers socially and politically, “*building an imaginary membrane that defines limits between what is digital and what is material*” (Bello 2015, p.38).

The science partners Boredomresearch collaborated with on this project were Dr. Peter Oliver and Dr. Vladyslav Vyazovskiy from the Department of Physiology, Anatomy and Genetics at the University of Oxford. My aim was to produce an aesthetic expression of their research into sleep disturbance and circadian rhythms.



DESCRIPTION

Dreams of Mice enables complex processes to become visible over space and time. Through the process of data gradually unfolding where shifting patterns emerge within a three-dimensional animated landscape. This interdisciplinary collaboration enabled both artists and scientists to design a new creative expression on neurophysiological recordings of neural activity from the neocortex of a sleeping mouse within a visual aesthetic expression.

“boredomresearch extract the poetic dynamics of natural complex systems...where impulses recorded through a subdermal implant are translated into a visual and acoustic dynamic enlightened by firing neurons.” (CORDIS 2017)

The scientific data represented in this cultural artefact expresses the changing patterns of neural activity over time. Increases in amplitude consistent with firing neurons is the signal driving the core component of the artwork and a secondary structure responds both visually and acoustically to either synchronistic or inhibitory firing patterns.

As contemporary life demands permanent availability, the project enabled me to question the importance of the non-productive third of our lives we spend asleep. Brain activity during sleep reveals that far from downtime, sleep is complex and beautiful and art is a vehicle in which this can be portrayed.



METHODOLOGY & APPROACH

My collaborative scientist Vyazovskiy scientific research was investigating the value of sleep, especially as it is the first thing to become sporadic in mental health disorders. He records the sleep patterns of mice through nanowire implants to monitor neural firings. The sleep pattern data exists as highly abstract scientific representations of neural activity. This is primarily limited to use in data analysis solely from an expert perspective.

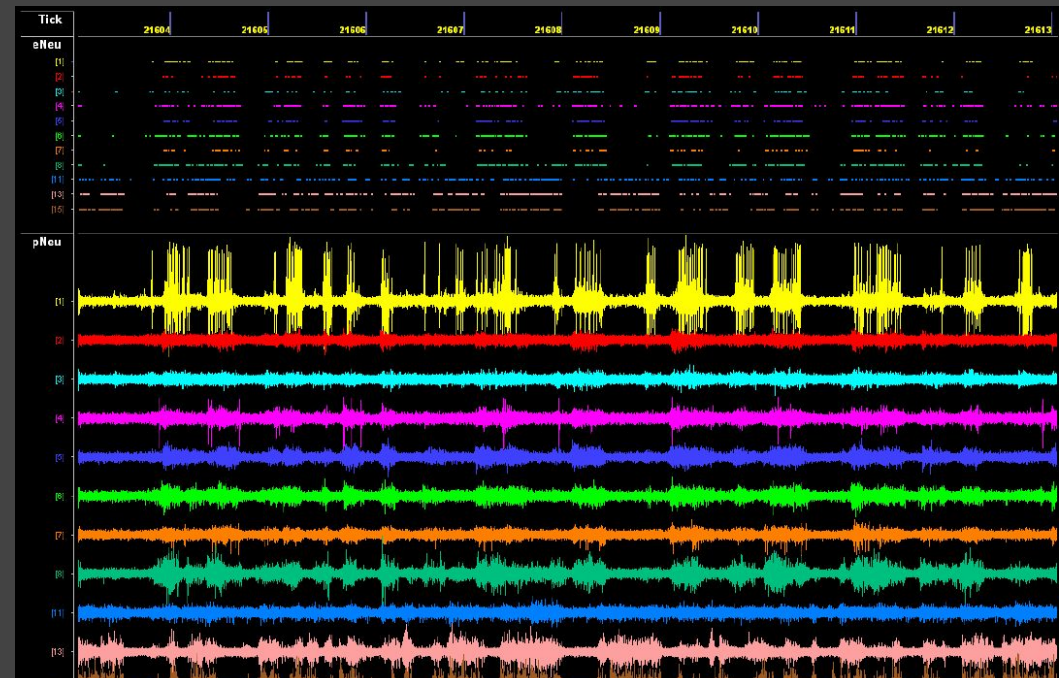
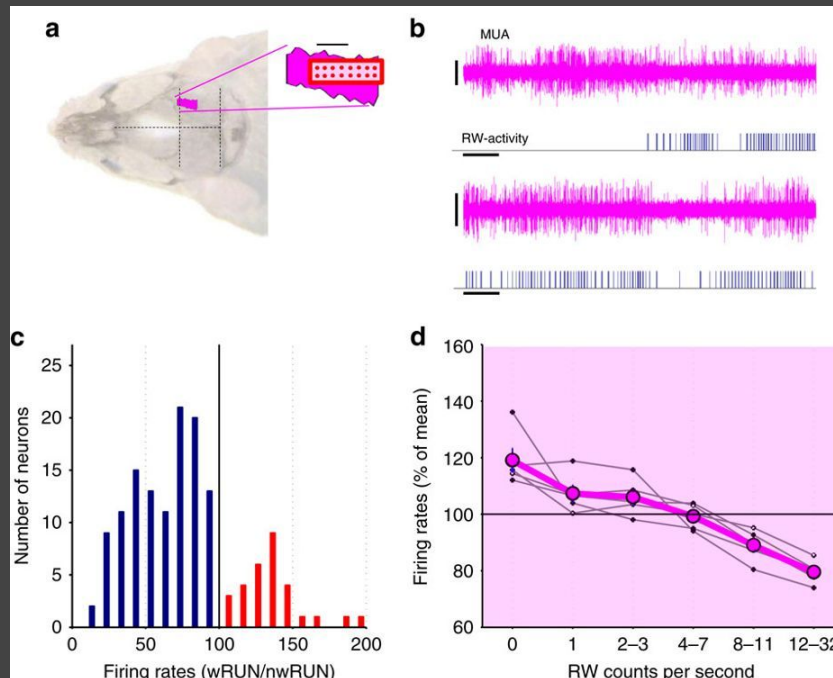
My reflection-in-action process during the interdisciplinary research stage was conducted through asking research questions to the scientists about the essence of the experiments that they were conducting, details on the environment of the mice and how the mice were being nurtured in the laboratory. This helped to gain a first-hand insight into the tools and the environment being implemented to capture the neuron data.

In *Dreams of Mice* myself and Smith created a system that could animate illuminated pulses, expressed at a slower speed so they become perceivable. We both prepared the science data of neuron spike timings and amplitude so it could be inputted into an animation system which we developed collectively. The artistic expression we created allowed light to be mapped to the amplitude of the neuron signal.

In this practice-based research it was my aim to create a highly visual expression of data that would create a sensorial experience of small scale neural activity. Filling a profound gap between the data visualisation valuable to science and those that can be experienced by a non-expert audience.



Creating a visual aesthetic expression underpinned by the scientific data

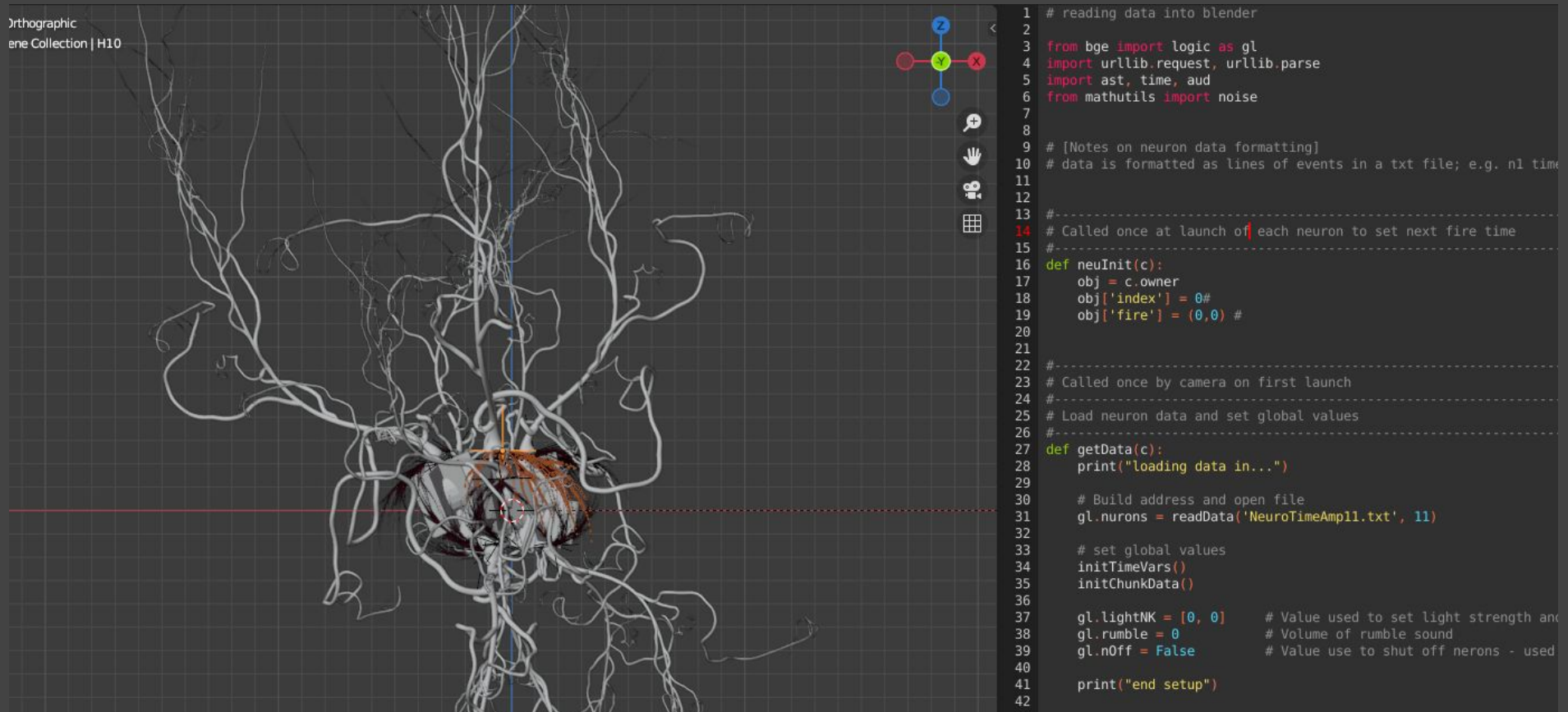


Producing our own generative system based on the above scientific data of neuron activity in sleeping mice.

Our generative system used the above neuron recording from Ron's brain whilst he was asleep.



Creating a system in Blender 3D for the data to effect the animation



Producing our own 3D generative system in Blender game engine - where the brightness of the light animation is set by the neuron amplitude data and the rotation of the 3D neural-like form is set to the mouse wheel data.



FINAL ARTEFACT

Artists: Vicky Isley & Paul Smith (boredomresearch)
Title: Dreams of Mice
Date: 2015
Medium: Single channel film
Duration: 2 minutes 14 seconds
Producer: Boredomresearch

NOTE: This is a single channel film documentation version of the *Dreams of Mice* generative artwork which runs in real-time. The format of the real-time version is portrait so some of the video footage has been cropped. This version of the film is on Boredomresearch Vimeo channel.



WATCH HERE:

<https://vimeo.com/130114366>



EXHIBITIONS

Dreams of Mice has been exhibited nationally and internationally in both scientific and artistic settings including:

- *Digital Intersections*, San Martino di Lupari, Italy (2018);
- *Science of the Unseen*, SIGGRAPH 2016 Online Exhibition –Anaheim, California (2016);
- *Transmission Symposium*, Bournemouth University (2015);
- *ACM Creativity and Cognition Exhibition*, the Glasgow School of Art (2015);
- *Transitio_MX*, Festival of Electronic & Video Art, National Arts Centre, Mexico City (2015).



Dreams of Mice in *Digital Intersections Exhibition*, San Martino di Lupari, Italy (2018).

A video expression of the work is being used to communicate the experiential qualities of neural activity on the Sleep and Circadian Neuroscience Institute, University of Oxford website for academic purposes.



A Selection of SUPPLEMENTARY MATERIAL

CONFERENCE PROCEEDINGS

ACM SIGGRAPH, 2016. *Boredomresearch: Dreams of Mice: Ron, 19 October 2014 at 2:48am*. USA: SIGGRAPH.

Available from:

<https://digitalartarchive.siggraph.org/artwork/boredomresearch-dreams-of-mice-ron-19-october-2014-at-248am/>

[Accessed 27 February 2022]

Isley, V. and Smith, P., 2015. Dreams of Mice. *Proceedings of the 2015 ACM SIGCHI Conference on Creativity and Cognition* [online], 353-254.

Available from: <https://doi.org/10.1145/2757226.2757366> [Accessed 27 February 2022]

EXHIBITION PRESS

Arte.go, 2018. *Digital Intersections - High Perception, Artistic Contamination in the Digital Age* [online]. Italy.

Available from:

https://www.arte.go.it/event/intersezioni-digitali-alta-percezione-contaminazioni-artistiche-nellera-digitale/?fbclid=IwAR1kh7jDfwwdEBBMu_DHH1BIc8GZx1LCo9Zp0DFD2qyhBbpa5PferYTHk84

[Accessed 27 February 2022].



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CONTEXT

Animate Projects, London, an art agency that “*has consistently facilitated cutting edge animation in the UK, making the UK an international focal point for animated filmmaking*” (Shrigley 2011), commissioned Boredomresearch in 2015 to create an experimental animation artwork that embeds cutting-edge biomedical research. This project was supported by a Large Arts Award from the Wellcome Trust. Boredomresearch collaborated with Dr. Paddy Brock, a mathematical modeller from the University of Glasgow to explore the bounds of current epidemiological practice.

The research for this project explored Brock’s computational models depicting malaria transmission dynamics on Bangii Island, Malaysia. This interdisciplinary collaboration allowed me to gain an understanding of the mechanisms, behaviours and patterns in Brock’s mathematical models. The outcome of this research was the creation of an aesthetic artefact, *AfterGlow*, which expresses the temporal and spatial dynamics of the scientific models into a sensorial experience.



DESCRIPTION

This award winning artwork *AfterGlow* is a new visual expression of a malaria infection transmission scenario which aesthetically depicts elements of scientific unknowns in a three-dimensional landscape.

Locked in perpetual twilight (prime mosquito blood-feeding time), the artefact presents a terrain progressively illuminated by glowing trails, evocative of mosquito flight paths. These spiralling forms represent packets of blood, carried by mosquitoes infected with *Plasmodium knowlesi*, a malaria parasite recently found to jump the species barrier from monkey to human.

The artwork captures the infection left in the wake of wandering macaques as they search the island for food and reveals the intimate relationship between disease and its environment.

During the infection scenario the island's empty dark mountains are quickly engulfed with glowing forms. The viewer journeys through the different stages of infection. Starting with delicately spiralling cells of colour that form clusters and then becoming turbulent when infectious. Where the infection is most dense, we see a blizzard of disease, vividly expressing the complexity of this dangerous scenario.



METHODOLOGY & APPROACH

The research for *AfterGlow* started with the question: *What is the shape, pattern and movement of a malaria infection scenario?* It was our aim to create a computer generated three-dimensional landscape that would reveal an infection transmission scenario and its shifting states from susceptible, exposed, infectious and recovered. Our primary objective was to create a temporal and spatial experience of the infection and aesthetically express the unknowns of the science in regards to the populations of mosquitoes and the movement of the macaques on the island.

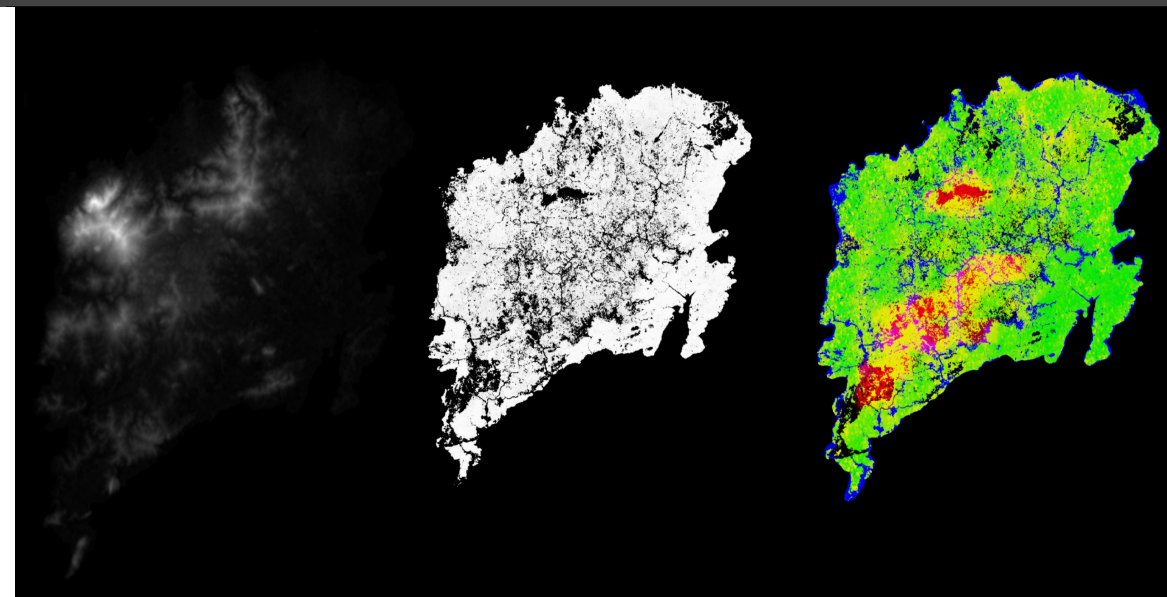
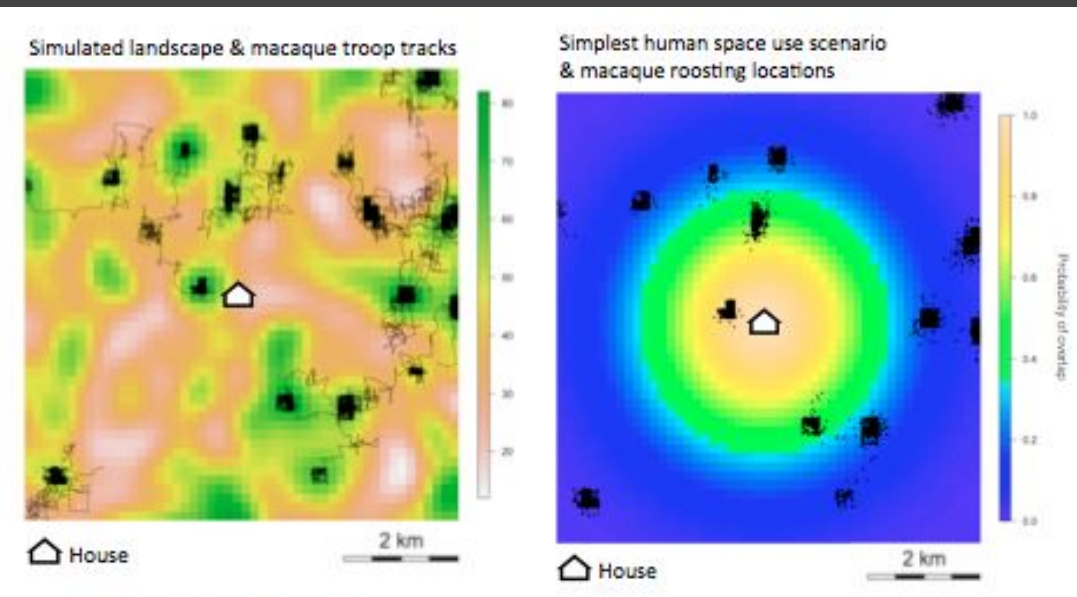
My early research and development considered the relationship between populations and landscape, exploring how we could make the patterns of this distribution visible through light. Asking questions such as: *What would the landscape look like if we illuminated the infection?*

Lighting is expensive in a game engine so both myself and Smith devised a method of creating textures so it looked like the forms were emitting a glow. Then we collectively produced a generative system for thousands of lights to be dynamically added and removed in the landscape. We both animated the colourful light spirals to express the different stages of the infection so the terrain gradually becomes illuminated by glowing trails evocative of mosquito flight paths.

Mosquitoes don't live very long on average, but the parasite needs a minimum period to develop inside them - and to bite at least one infectious host and at least one susceptible host at the right times to transmit. Unlike the abstract graphs and charts of science the data in *AfterGlow* takes a form immediately familiar to an audience using the medium of moving image, enabling non-expert spectators to experience when the mosquitoes are infectious. When the colourful spirals go black and turbulent this is the point at which the mosquitoes are infectious.



The scientific computational models and maps were embedded in the aesthetic expression

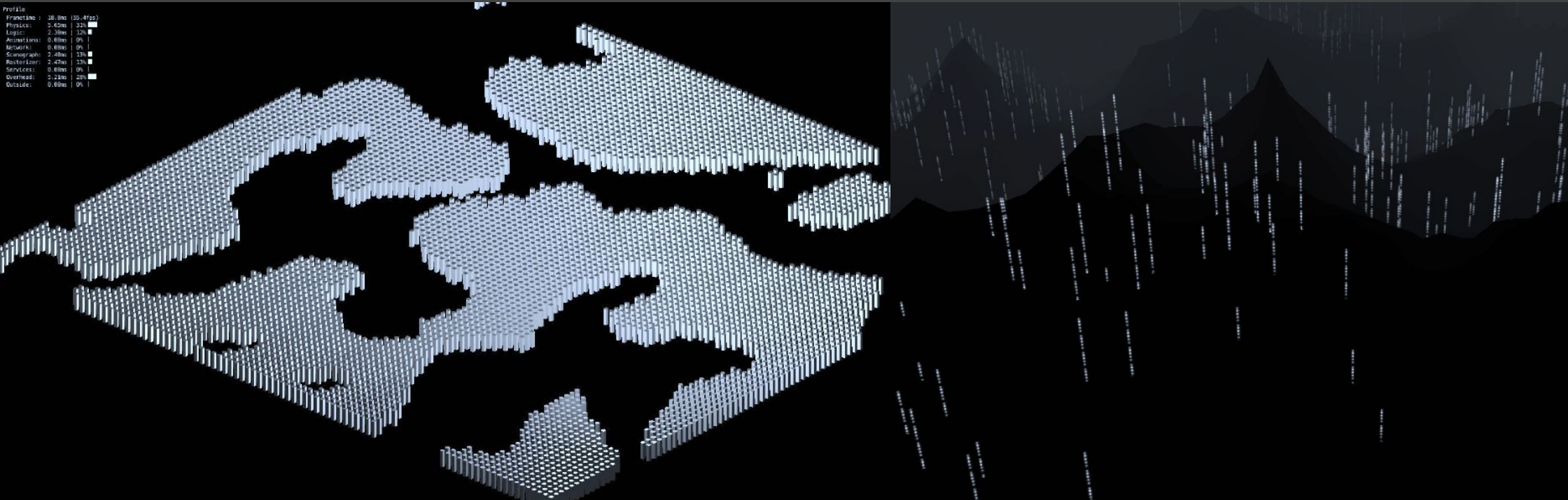


Boredomresearch produced our own generative system based on the above scientific computational models of macaque movement and roosting locations on the island.

Our generative system used different maps of the Banggi Island in Malaysia where the science fieldwork was conducted to create our three-dimensional environment. The maps included from left to right: height map, forest cover, food and water sources.



A method was developed to map population distribution and illuminate the 3D terrain



Boredomresearch explored different methods of mapping the population of mosquitoes and macaques in the 3D environment.

A still from an early sketch experimenting with mapping the infection as light in the terrain.



Created animations of spirals to express mosquito flight paths

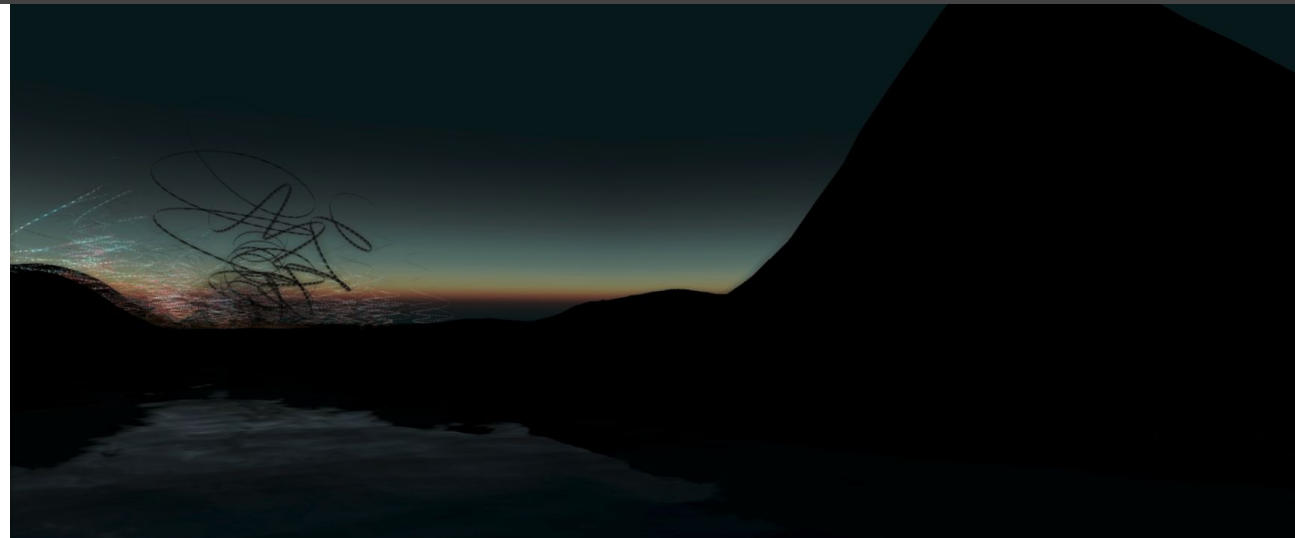
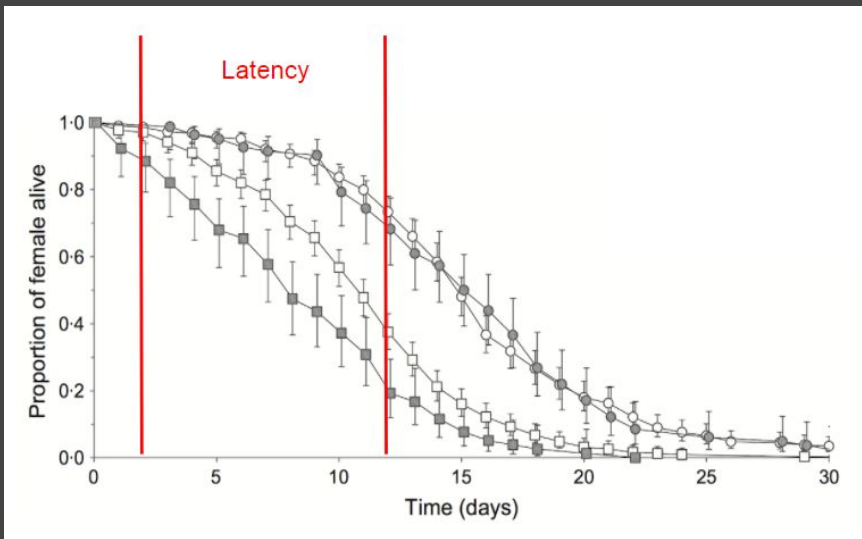


Boredomresearch created several spirals to have the quality of flight paths and packets of data. Designing them so they could be stable (colourful) & turbulent (black).

[Further development: page 4](#)



Producing a method to visually show when the mosquitoes are infectious



Here both images show latency and the time in which the mosquitoes are infectious. On the left is the scientific graph representing this period and on the right is the artistic expression which visually shows the infectious period when the colourful spirals go black and animate in a turbulent manner.



FINAL ARTEFACT

Artists: Vicky Isley & Paul Smith (boredomresearch)
Title: AfterGlow (Susceptible, Exposed, Infected, ~~Recovered~~)
Date: 2016
Medium: Single channel film
Duration: 4 minutes 37 seconds
Producer: Abigail Addison, Animate Projects

NOTE: This is a single channel video version of the generative *AfterGlow* artwork which takes you through the different infection transmission states more rapidly from susceptible, exposed, infectious and recovered. In this artistic expression there is no recovery. This is the archived version of the film on the Animate Projects Vimeo channel.



WATCH HERE:

<https://www.silentsignal.org/Collaborations/afterglow/>





EXHIBITIONS & AWARDS

AfterGlow has been exhibited widely in international art and science venues including: ASU Art Museum, Arizona (2021); Jing'an Sculpture Park Art Center, Shanghai (2018) and ArtScience Museum, Singapore (2018). The artwork was exhibited in the Animate Projects, *Silent Signal* exhibition (2016-17) which toured to: QUAD, Derby; Vivid Projects, Birmingham; Wellcome Genome Campus, Hinxton; Wellcome Collection, London; LifeSpace, Dundee; Phoenix, Leicester and Daejeon Artist House, Daejeon, South Korea.

The artwork was exhibited at *Balance Unbalance Conference*, Manizales Colombia in 2016 within the context of the theme *Data Science and Eco Action* with artworks selected to respond to questions such as: how can we extract knowledge from large volumes of environmental and related data?

It was the first artistic model of disease transmission to win a prestigious digital art award which “*celebrates the very best art created with technology*” (Lumen Prize Website 2022), receiving first prize in the Lumen Prize moving image category in 2016. As part of the Lumen Prize there was a touring exhibition in 2016-17 where *AfterGlow* was screened in: Canary Wharf London; Berlin Electronic Visualisation of the Arts Conference and Caerphilly Castle in Wales.

The film version of the artwork has been screened in several film festivals including: Vienna Independent Shorts Festival (2016); Oberhausen International Short Film Festival, Germany (2016) and 3rd Culture Film Festival, Hong Kong (2017).



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CONFERENCE PAPER

Isley, V. and Smith, P., 2017. *Artistic Interpretation of a Malaria Transmission Scenario. Electronic Visualisation and the Arts in EVA 2017 proceedings* [online], 335-339.

Available from: <http://dx.doi.org/10.14236/ewic/EVA2017.68> [Accessed 27 February 2022]

EXHIBITION PRESS

Both Sides Now, 2018. *Boredomresearch* [online]. UK, Hong Kong and China: Videotage and VideoClub.
Available from: <https://both-sides-now.org/2018/04/boredomresearch/> [Accessed 27 February 2022].

British Council, 2017. *Artience Daejeon 17 UK Focus: Silent Signal* [online]. UK/Korea: British Council
Available from: <https://www.britishcouncil.kr/en/uk-korea-2017-18/events/artience> [Accessed 27 February 2022].

The Lumen Prize, 2016. *Boredomresearch* [online]. Wales: Lumen Prize.
Available from: <https://www.lumenprize.com/2016winners/strongboredomresearchstrong> [Accessed 27 February 2022].

VideoClub, 2018. *Seeing Systems at ArtScience Museum, Singapore* [online]. Brighton: VideoClub.
Available from: <https://videoclub.org.uk/seeing-systems-at-artscience-museum-singapore/> [Accessed 27 February 2022].

Waag Technology & Society, 2016. *Data Aesthetics Exhibition* [online]. Amsterdam: Netherlands.
Available from: <https://waag.org/en/event/data-aesthetics-exhibition> [Accessed 27 February 2022].



A Selection of SUPPLEMENTARY MATERIAL [Page 2]

ONLINE INTERVIEWS AND PRESS

Addison, A., 2017. Silent Signal: Exploring Visionary Science Through Experimental Animation [online]. *LABOCINE* [online], 27 April 2017. Available from: <https://www.labocine.com/spotlights/silent-signal-exploring-visionary-science-through-experimental-animation> [Accessed 27 February 2022].

Forum Design, 2021. *Interview de Vicky Isley et Paul Smith (Boredom Research) par Zoé Sfez, journaliste à France Culture* [online]. YouTube. Play from 3 mins 51secs. Available from: <https://www.youtube.com/watch?v=vFiCLbBYLJY&t=7s> [Accessed 27 February 2022].

Zagvozkina, E., 2022. How to Combine Science and Art? Five Contemporary British Artists Answer. *PostNauka* [online], 17 February 2022. Available from: <https://postnauka.ru/longreads/157023> [Accessed 27 February 2022].

PRESENTATIONS

Animate Projects SoundCloud, 2016. *Silent Signal Symposium 2016* [podcast, online]. SoundCloud. Available from: <https://soundcloud.com/animateprojects/sets/silent-signal-symposium-2016> [Accessed 27 February 2022].

iMAL Brussels, 2017. *Silent Signal Symposium 2016* [video, online]. YouTube. Available from: <https://www.youtube.com/watch?v=mCT0feZGmJ4&t=5s> [Accessed 27 February 2022].

London LASER, 2015. *London LASER 12 University of Westminster: Silent Signal and Paddy Hartley* [video, online]. Available from: <https://www.londonlaser.net/archive/2015-archive/> [Accessed 27 February 2022].

VIDEO INTERVIEW

Animate Projects, 2015. *Boredomresearch and Dr Paddy Brock on AfterGlow* [video, online]. Vimeo. Available from: <https://vimeo.com/148991931> [Accessed 23 February 2022].



Artefact III
In Search of Chemozoa



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CONTEXT

Boredomresearch was commissioned by Arizona Cancer Evolution Center (ACE) to create a new artwork responding to their scientific research on new therapeutic approaches centred on managing rather than curing cancer. This interdisciplinary collaboration was initiated by Pamela Winfrey, Director of the ACE Cancer Arts Program. Winfrey invited Boredomresearch in 2018 to be the inaugural ACE artists-in-residence with the aim to provide new ways to shed light on the science of cancer. The ACE residency and artwork was funded through an award from the National Institute of Health/National Cancer Institute and production of the artwork was supported by the National Lottery through Arts Council England.

The artwork combines computer animation with film from inside laboratories and in natural environments, where Boredomresearch present ideas for an alternative cultural understanding of cancer.



DESCRIPTION

Boredomresearch explores new perspectives in response to the first study of cancer across species, in their poetic expression of an in silico model organism, called *Chemozoa*. The artwork responds to mythical creatures documented in scientific literature to reveal tensions and interconnections between human and planetary health. *In Search of Chemozoa* weaves a poetic narrative that introduces new ideas emerging from cancer research through combining computer animation, filmed environments and scientific speculation.

The artificial physiology of *Chemozoa* does not differentiate between healthy and unhealthy cells and therefore no clear distinction can be made between cancer and body. As such the *Chemozoan* escaped the existential crisis of experiencing an internal conflict between healthy and unhealthy, self and other characteristics of cancer.

The *Chemozoa* allows us to reflect on our own relationship with conflict, foregrounding the benefits of balance in the management of singular identities made of conflicting parts. A philosophy that extends beyond the health of the individual to encompass the health of our societies and our sustaining natural environment.

In Search of Chemozoa offers us an opportunity to consider the increasing importance of ecological perspective in areas of research relating to human health where we are encouraged to acknowledge that to live long healthy lives we first need to accept a fragile balance that plays out at the level of the cell. New insights benefit from acknowledging that the conflict between cells in the body, as seen in cancer, is the same as the conflict in ecosystems made from beings whose interests are not always aligned. In doing so we move from an aggressive 'war on cancer' dialogue to one that prioritises values of peace and stability.



METHODOLOGY & APPROACH

Boredomresearch was artists-in-residence at the Arizona Cancer Evolution Center in 2018 where we witnessed the beauty of the *Placozoa* being studied by Dr. Angelo Fortunato who is developing novel model organisms to understand cancer across species. It was the complex web of ideas radiating from this simple organism that inspired our imaginary *Chemozoa*; a fictional organism that experiences the same disease process that touches so many lives. Myself and Smith designed a generative system where the dynamics of cancer is programmed into the *Chemozoa* cells where we allow the virtual organism to survive in toxic environments that act as an analogue for chemotherapy.

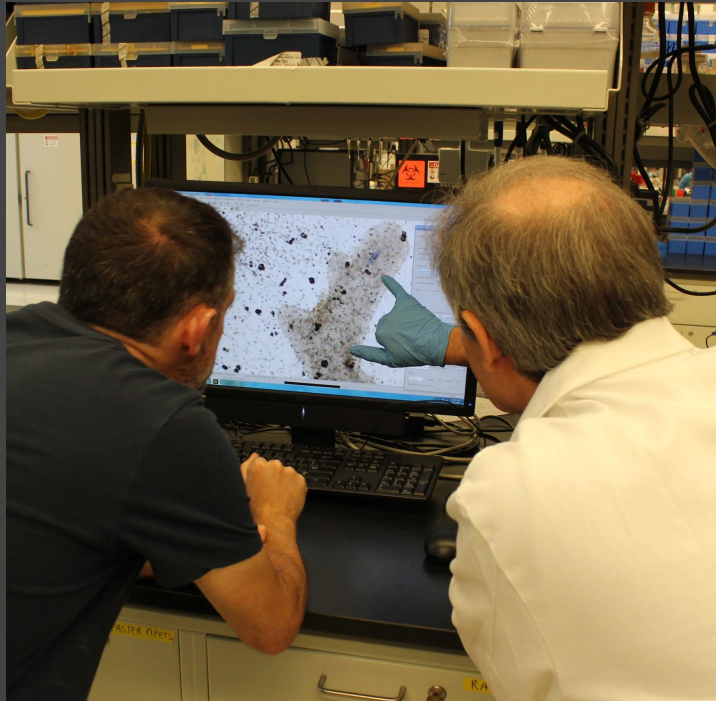
Boredomresearch interviewed over 20 cancer researchers, at ACE and the Barts Cancer Institute, London to enable an original perspective of the relationship between the latest cancer research and developing theories about human and ecological health.

We created the narrative as a way of bringing in all the different perspectives from the two different labs we collaborated with at Biodesign both Carlo Maley's evolution lab & Athena Aktipis's Cooperation & Conflict Lab. The script narrates the struggle of these small multi-celled organisms affecting their own chemotherapeutic treatment by feeding on toxic algae but also how they help balance their own environment. The film narrative addresses the importance of health as a holistic part of a wider philosophical awareness of the interrelatedness and symbiosis that is not just confined to looking inside an organism's body but also how it is subject to the health of the environment outside the body and the value that flows in both directions i.e using nature as a point of inspiration in a biomedical context and biomedical insight into health to better understand our connection with nature outside the body.

The storyboarding, script, filming, computational art, audio sampling and editing has been produced collectively by myself and Smith from 2018 to 2020.



First steps to building an in silico organism from the cell up (2018)



Fortunato describing cell mechanics to Smith during our residency at ACE, Biodesign



Boredomresearch early simulation of cell distribution

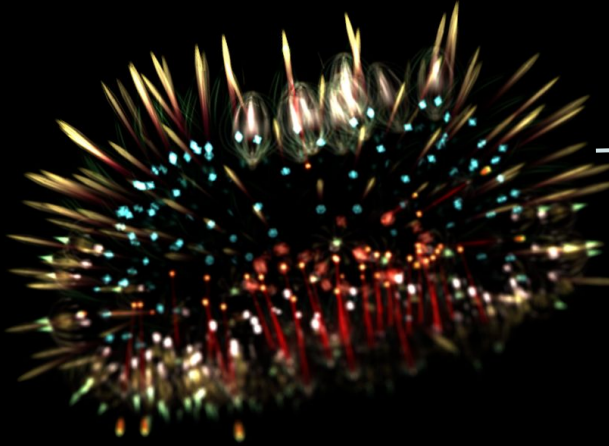


Boredomresearch early simulation of cell growth



The Placozoa inspire a new in silico model organism (2018-20)

Placozoa



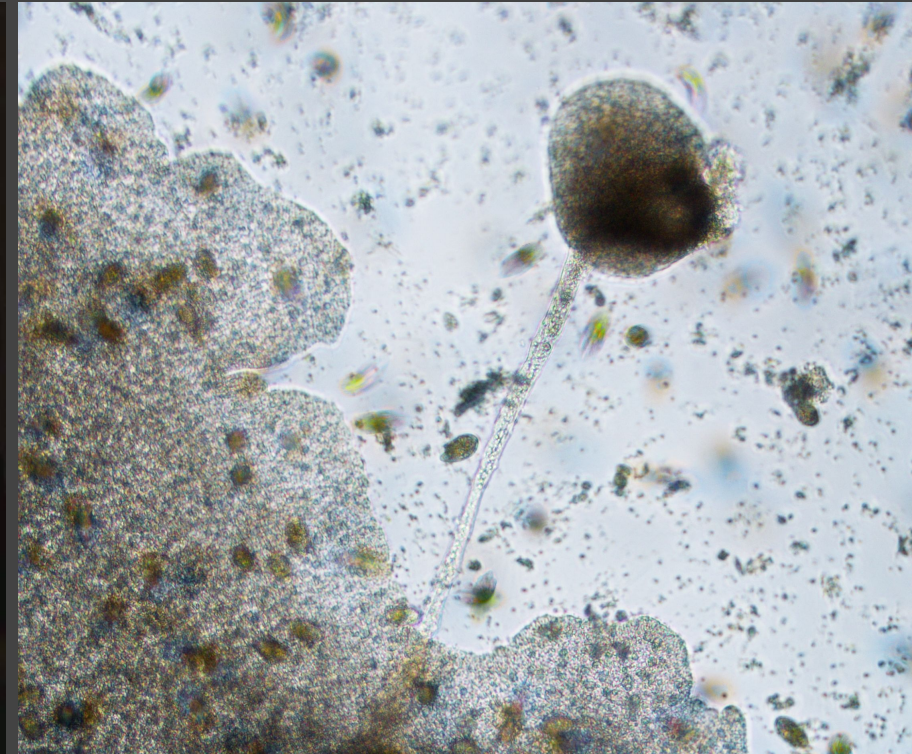
Chemozoa



The Chemozoa are inspired by the *Placozoa* we experienced in Dr. Angelo Fortunato's laboratory. They are the simplest non parasitic multicellular organism, of which there are no reports of cancer. In contrast our *Chemozoa* are programmed to have cancer. Their life is spent poisoning their cells to try and maintain a balance between aggressive and benign mutant clones. They can never cure themselves but live in a permanent state of restless balance.



Producing a creature that copes with cancer (2019-20)



Boredomresearch programmed the mechanics of cancer into the *Chemozoa* cells. Each cell has a genome that is duplicated with errors. We then designed a strategy for them to deal with this, where the *Chemozoa* poison their cells by feeding on toxic algae - dosing their own chemotherapy.

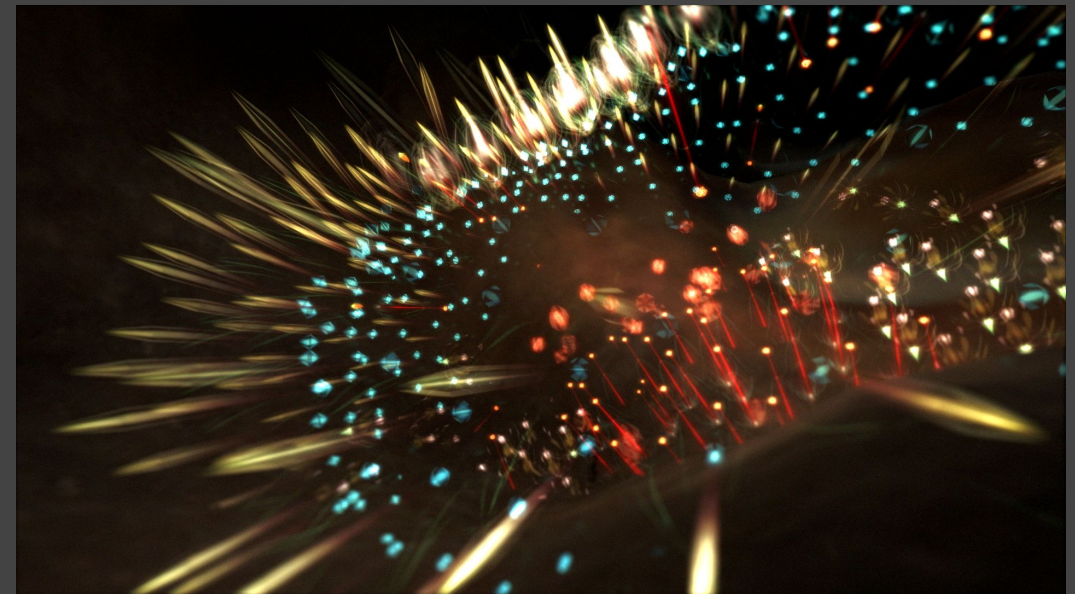
The method that Boredomresearch designed for the *Chemozoa* to cope with cancer was inspired by the scientific research that has been studying how the Placozoa bud off damaged cells.



FINAL ARTEFACT

Artists: Vicky Isley & Paul Smith (boredomresearch)
Title: In Search of Chemozoa
Date: 2020
Medium: Single channel film
Duration: 10 minutes 27 seconds
Producer: Pamela Winfrey, Arizona Cancer Evolution Center

NOTE: This is a single channel film version of the *In Search of Chemozoa* artwork which is edited from the three channel video installation version of the artwork which was exhibited in our solo exhibition at: ASU Art Museum, Arizona (2020-21) and ASPEX Portsmouth (2021). This version of the film is on Boredomresearch Vimeo channel.



WATCH HERE:

<https://vimeo.com/640618200>





EXHIBITIONS

[In Search of Chemozoa](#),
Solo Exhibition, ASPEX Portsmouth (2021);
[Restless Balance](#),
Solo Exhibition, ASU Art Museum Arizona (2020-21).

AWARDS

Best Experimental Short Award, [Europe Film Festival](#) (2021);
Best Film Award, [Sigma XI STEM Art and Film Festival](#) (2021).

[View: Video Documentation of Video Installation](#)



A film documenting the three channel video installation of *In Search of Chemozoa* at ASPEX Portsmouth (2021)

[View Video Online](#)



A Selection of SUPPLEMENTARY MATERIAL [Page 1]

DOCUMENTARY AND MAKING OF VIDEO [ONLINE]

Boredomresearch, 2021. *For We Are But A Single Cell* [video, online]. Southampton: Boredomresearch, YouTube. Available from: <https://vimeo.com/640625444> [Accessed 27 February 2022].

Boredomresearch, 2021. *Making of In Search of Chemozoa* [video, online]. Southampton: Boredomresearch, YouTube. Available from: <https://vimeo.com/567677912> [Accessed 27 February 2022].

EXHIBITION [ONLINE]

VideoClub, 2021. *Exhibition: In Search of Chemozoa by Boredomresearch* [exhibition, online]. Brighton: VideoClub, 30 June - 31 August 2021.

Available from: <https://videoclub.org.uk/exhibition-in-search-of-chemozoa-by-boredomresearch/> [Accessed 27 February 2022].

EXHIBITION PRESS

Arizona State University, 2021. *In Search of Chemozoa* [online]. USA: Arizona State University. Available from: <https://cancer-insights.asu.edu/2020/09/in-search-of-chemozoa/> [Accessed 23 February 2022].

Arizona State University, 2021. *Restless Balance: Boredomresearch* [online]. USA: Arizona State University. Available from: <https://asuartmuseum.asu.edu/content/restless-balance-boredomresearch> [Accessed 23 February 2022].

Thompson-Bell, S., 2021. In Search of Chemozoa - Boredomresearch - Aspex Gallery - Portsmouth - 19 May - 25 July 2021. *Transjuice* [online]. Available from: <http://www.transjuice.org/page108.htm> [Accessed 27 February 2022].



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INTERVIEWS [ONLINE]

Forum Design, 2021. *Interview de Vicky Isley et Paul Smith (Boredom Research) par Zoé Sfez, journaliste à France Culture* [online]. YouTube. Play from 8 mins 10 secs. Available from: <https://www.youtube.com/watch?v=vFiCLbBYLJY&t=7s> [Accessed 27 February 2022].

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Aspex Portsmouth, 2021. *Boredomresearch Artists in Conversation* [video, online]. YouTube. Available from: https://www.youtube.com/watch?v=_er94fqwpz4&t=1637s [Accessed 27 February 2022].

University of Brighton, 2021. *Collaborative Research in the Arts and Science: Boredomresearch Keynote* [online]. University of Brighton. Available from: <https://blogs.brighton.ac.uk/collaborative/> [Accessed 27 February 2022].

Computer Art Society (CAS), 2020. *Elephants Don't Love Peanuts But Humans Do by Boredomresearch* [video, online]. YouTube. Available from: <https://www.youtube.com/watch?v=IB-l-on82II> [Accessed 27 February 2022].

LEONARDO/ISAST, 2021. *LASER Talk at ASU-Tempe: How Thinking in New Ways Can Inspire New Questions* [online]. YouTube. Available from: <https://www.youtube.com/watch?v=LRaby2quqsc&t=149s> [Accessed 27 February 2022].

LEONARDO/ISAST, 2021. *Futurecasting: How to Envision Possible Futures?* [online]. YouTube. Available from: <https://www.youtube.com/watch?v=HIWmpZEGHoI> [Accessed 27 February 2022].



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CONTEXT

Boredomresearch was commissioned in 2020 by the Wellcome Sanger Institute to produce a new visual cinematic expression for their *Human Cell Atlas* engagement project *One Cell At A Time*. “*The Human Cell Atlas is a global scientific research initiative aiming to map every cell type in the human body.*” (One Cell At A Time Website 2021).

Boredomresearch partnered with immunologists, Dr. Marcin Pekalski and Dr. Melanie Dunstan at the Wellcome Centre for Human Genetics, University of Oxford to explore scientific research on single cell analysis of immune cells for their *Call of the Silent Cell* film.

The research for this project was delivered in partnership with Fusion Arts, Oxford where Boredomresearch run a series of online community workshops with interactive media Oxford college students in 2021. Participants used Boredomresearch’s *Cytokine Storm* software to create aesthetic simulations of cellular interactions inspired by cytokine storms common to autoimmune disease and Covid-19. The research from these simulations was incorporated into the simulation for the final film.



DESCRIPTION

Call of the Silent Cell is an experimental film of cellular behaviour centred on the interplay between the gut microbiome, the immune system and wider concerns regarding the symbiosis of human and environmental health. Journeying with an old man who wanders through a forest, meditating on the fragility of his body and the environment. A storm arrives, *not of breath and air but of cells and their signals*, revealing a disturbance in the body, an immune system in overdrive. Emerging from the storm the old man gains a new wisdom that his bodily health is deeply intertwined with the life of the forest.

Call of the Silent Cell reflects on the latest insights revealed by single cell analysis, sharing the speculation that the ecological crisis that has become so normal to our ears, is much closer to home that we think.

In the film you are transported into the body during a storm of cellular behaviour known as a *cytokine storm*. Cytokines are substances that are made in our cells and signal to the immune system. For example they may indicate an infection is under way so that your immune system can launch a response.

Changes in our microbial flora can disorient the immune system where things suddenly can become visible to the immune system that would have otherwise been hidden. This can cause the immune system to become confused and attack healthy parts of the body. In the film you see a sequence where there are peppered moths hidden on a birch tree where their wings are camouflaged. This is symbolising mimicry present in immune systems where some microbes that are important to us may look like or mimic other parts of us so they can hide from our immune system.



METHODOLOGY & APPROACH

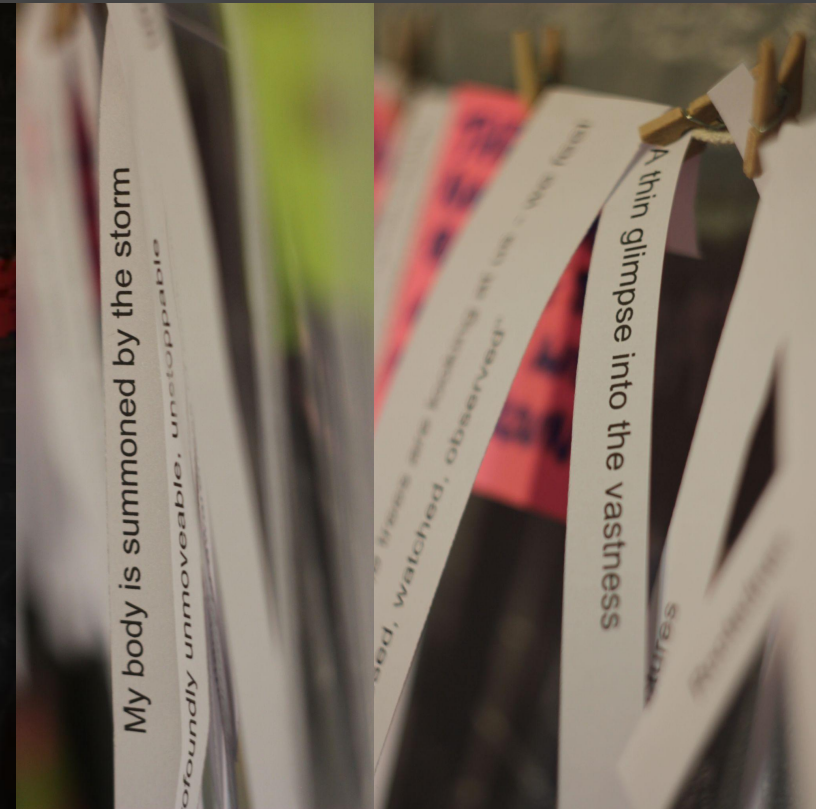
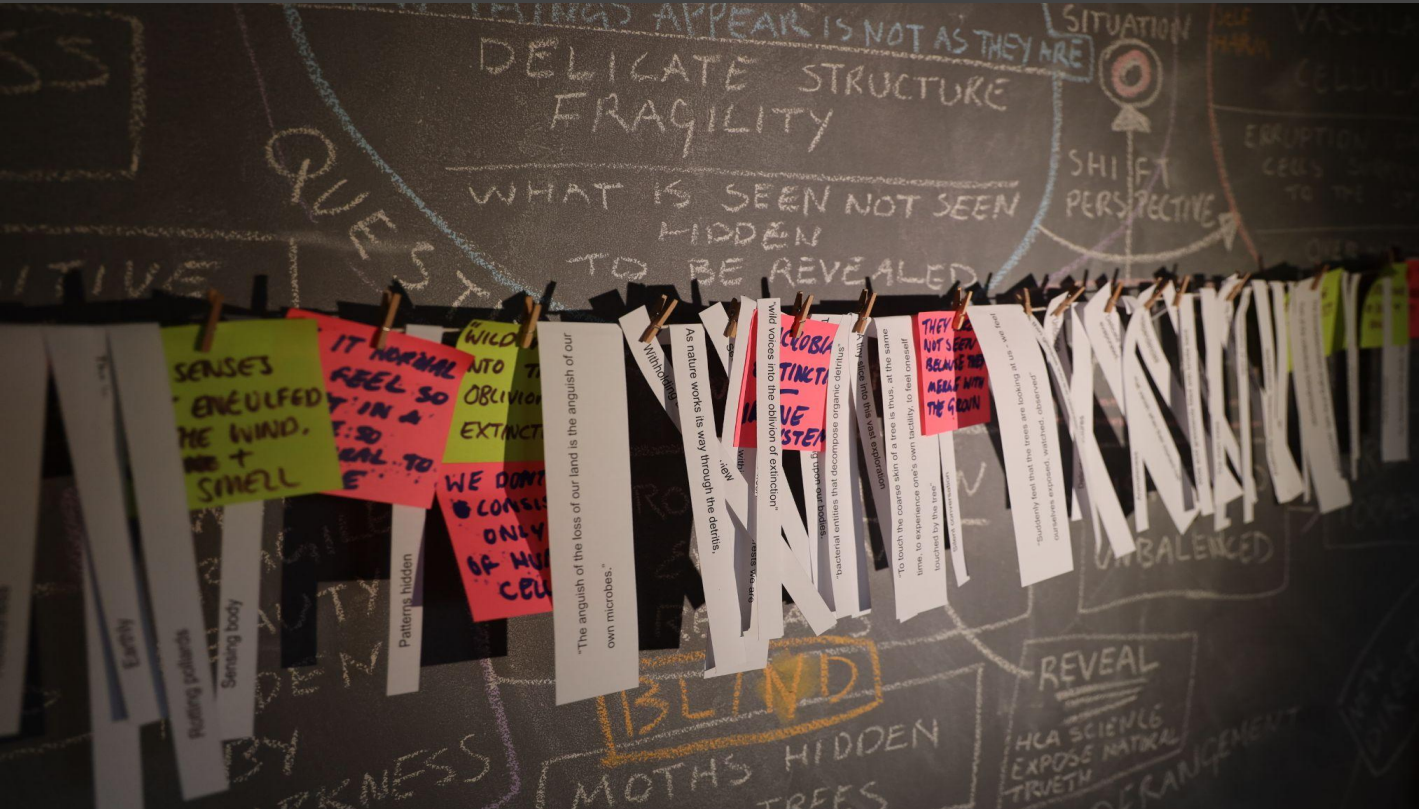
As part of the research for this project Boredomresearch produced a piece of custom software called *Cytokine Storm* to use in Oxford college student workshops. We explored this software with the students to create a number of two-dimensional colourful simulations of immune responses with the following different cell types: healthy, infected, activator and killer cells. In the Boredomresearch workshops students could change the balance between the four cell states to observe how they affected the overall behaviour of the immune response. We took our findings from these workshops and produced a generative system to create a three-dimensional expression of a *cytokine storm* in the film.

The script for the film was written by myself and Smith and took key extracts from our discourse with Dr. Marcin Pekalski. We kept the language non scientific and aimed for the vocals to be poetic.

We both storyboarded and developed the narrative of the film. All of the external film footage was shot by myself and Smith in the New Forest. We collectively worked on the film lighting, foley audio recording and night-time camera tracking for the computer graphics integration shots. We took macro shots of forest debris in our studio with a custom rig that we made. I produced the three-dimensional model, rig and texture for the peppered moths and we collectively worked on the animation. Smith produced the simulation for the wave of intestinal villi, depicting a stormy sea of infection and the sequence where the camera takes the viewer through the gastrointestinal tract. We colour graded and edited the film and audio together.



Boredomresearch devised a new method of writing the script (2021)



Isley and Smith both wrote the script by compiling their key extracts with excerpts from their discourse with Dr. Marcin Pekalski. These images show how we strung these together in our studio.



The original film acquisition from the New Forest (2020-21)

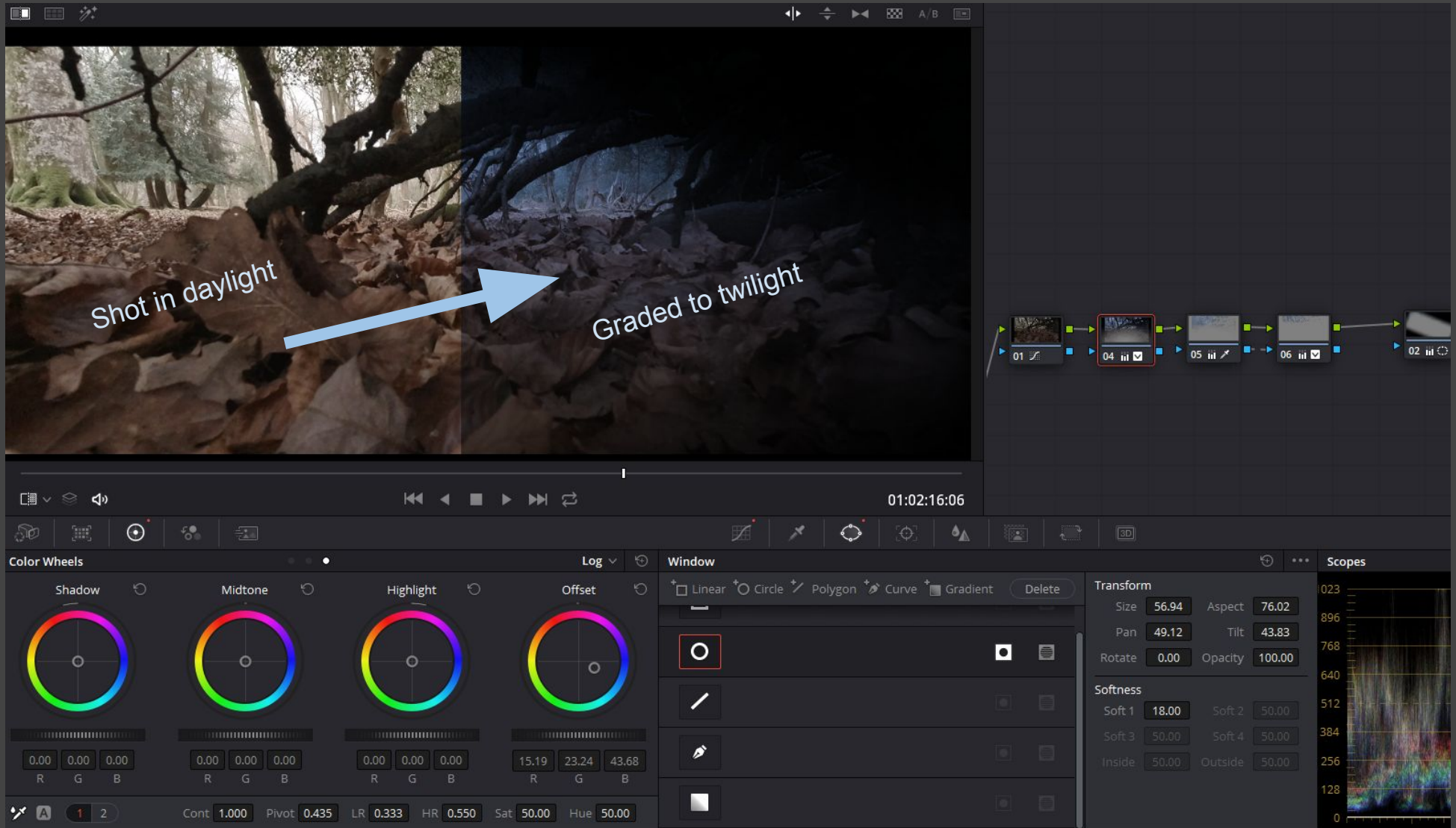


Stills taken from the ungraded Boredomresearch video footage in late 2020 - early 2021.

It was our intention to capture the trees in winter so you can see their bodily form before the trees are in leaf (2020)

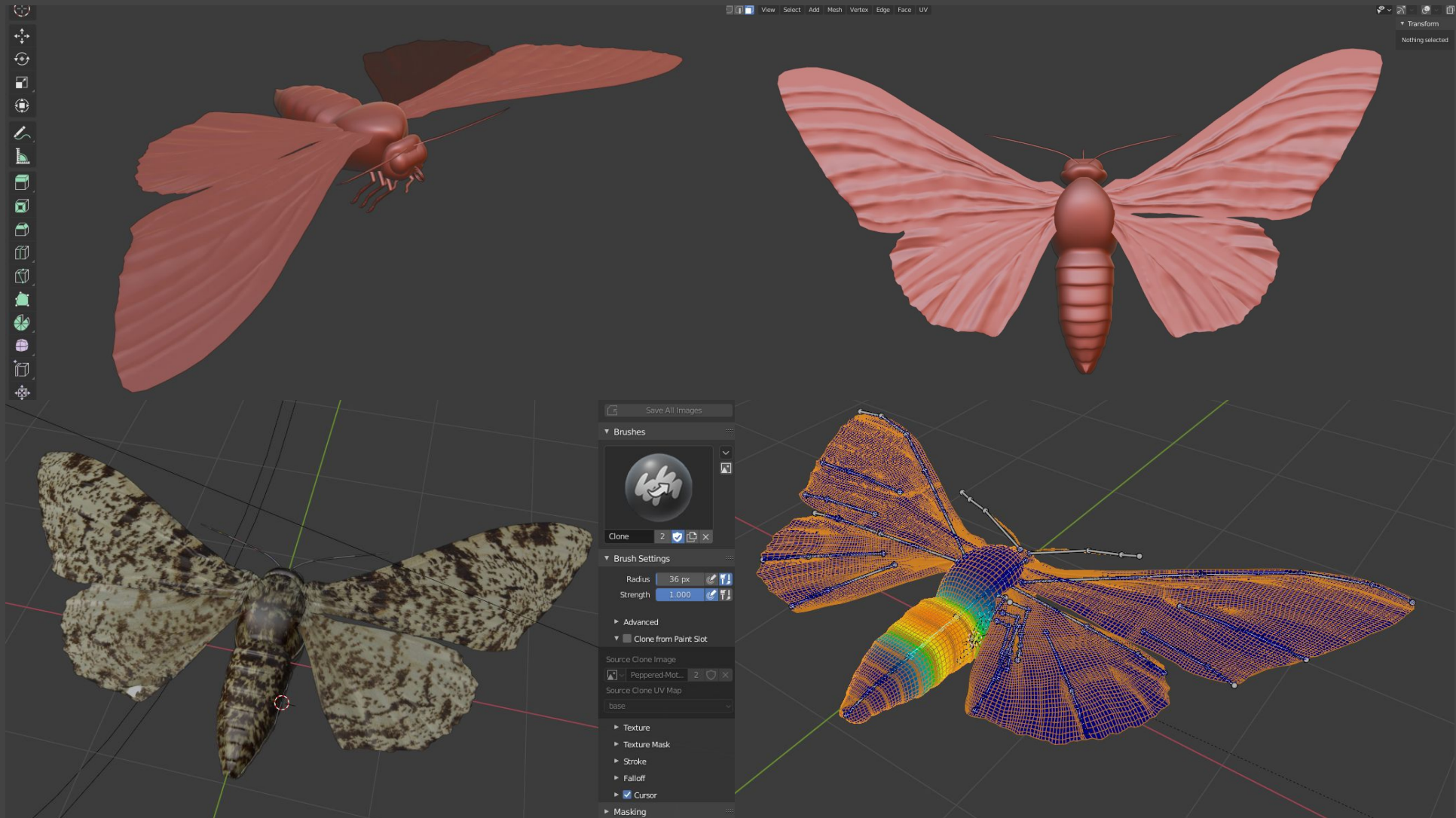


Boredomresearch colour graded the original footage from day to night (2021)





Isley modelled, textured and rigged the peppered-moth in Blender 3D (2021)



Boredomresearch *Cytokine Storm* Software (2021)

Two-dimensional simulations that were produced by Oxford college students in Boredomresearch workshops in 2021. Participants created their own 2D cells and environments and run different immune system responses that contained healthy, damaged, activator and killer cells.



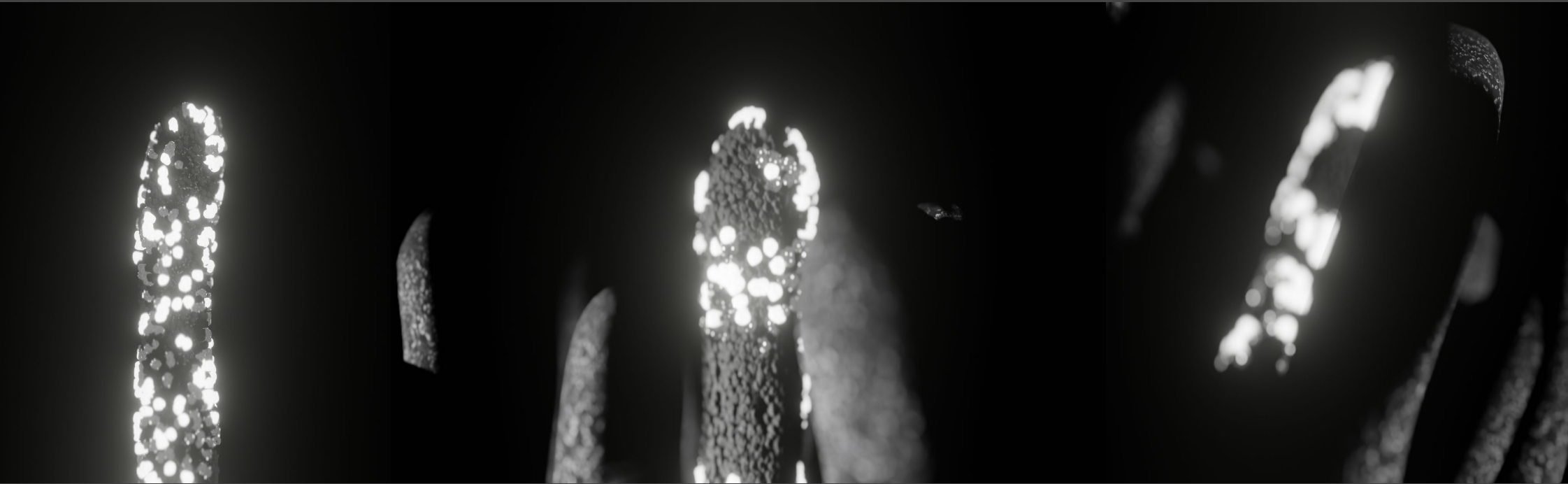
Simulation developed following workshop for animated villi texture (2021)

```
253 //----- SIMULATION AND ASSAY -----
254 //
255 // process_cell_space() - check each cell in turn
256 // assay_neighbourhood(x, y) - counts the numbers of each cell type in the 8 cells around the given cell
257 //-----
258
259
260 void process_cell_space(){
261 // create a state buffer the size of the map
262 int[] cell_buffer = new int[cells.length];
263
264 // iterate over map and set buffer state by applying rule at each location
265 for (int x = 0; x < width; x++)
266 {
267   for (int y = 0; y < height; y++)
268   {
269     //cell_buffer[y + x*cellspace_height] = assay_neighbourhood(x,y);
270     cell_buffer[y * width+x] = assay_neighbourhood(x,y);
271   }
272 }
273
274 arrayCopy(cell_buffer, cells);
275
276 }
277
278
279
280
281
282
```

Boredomresearch devised a Processing script to output animated texture for medium long shots with infected villi (2021)



Test renders of cell signalling simulation (2021)



Epithelium cells are generated on the surface of the villi. Each cell checks the state of its neighbourhood for: healthy - infected - activator or killer cells. These stills were rendered from Boredomresearch's Blender 3D model (2021)



FINAL ARTEFACT & EXHIBITIONS

Artists: Vicky Isley & Paul Smith (boredomresearch)
Title: Call of the Silent Cell
Date: 2021
Medium: Single channel film
Duration: 10 minutes 22 seconds
Producer: Suzy O'Hara, Wellcome Sanger Institute
and Fusion Arts, Oxford

NOTE: This film was produced for the *One Cell At A Time* art and science online exhibition which launched in November 2021. This version of the film is on the One Cell At A Time online exhibition.



WATCH HERE:

<https://www.onecellatotime.org/exhibits/call-of-the-silent-cell/artwork/>

EXHIBITION

[One Cell At A Time](#)

Online Exhibition, Human Cell Atlas Public Engagement Project,
Wellcome Sanger Institute (2021-ongoing).



A Selection of SUPPLEMENTARY MATERIAL

INTERVIEWS AND PRESS [ONLINE]

Forum Design, 2021. *Interview de Vicky Isley et Paul Smith (Boredom Research) par Zoé Sfez, journaliste à France Culture* [online]. YouTube. Play from 15 mins 43 secs. Available from: <https://www.youtube.com/watch?v=vFiCLbBYLJY&t=7s> [Accessed 27 February 2022].

Wellcome Sanger Institute, 2021. A Cellular Landscape. *Sanger Institute Blog* [online]. Available from: <https://sangerinstitute.blog/2021/11/03/a-cellular-landscape/> [Accessed 14 February 2022].

PRESENTATIONS

Human Cell Atlas, 2020. *Speculative Normality (Oxford): Call of the Silent Cell Working Title by Boredomresearch* [video, online]. YouTube. Play from 3 mins 19 secs. Available from: <https://www.youtube.com/watch?v=fvgWaHj3Bqw&t=1s> [Accessed 27 February 2022].

Human Cell Atlas, 2021. *Embodying, Performing, Sensing and Speculative Normality with the Human Cell Atlas* [video, online]. YouTube. Play from 1 hr 17 mins 44 secs. Available from: <https://www.youtube.com/watch?v=3VTi9EPcHhg> [Accessed 27 February 2022].

Human Cell Atlas, 2021. *Maker Jam Launch Night* [video, online]. YouTube. Play from 49 mins 50 secs. Available from: <https://www.youtube.com/watch?v=2AOGJSWrGCg&t=4110s> [Accessed 27 February 2022].