

Nuclear Aesthetics

4.368/9 Studio Seminar in Art and the
Public Sphere

MIT

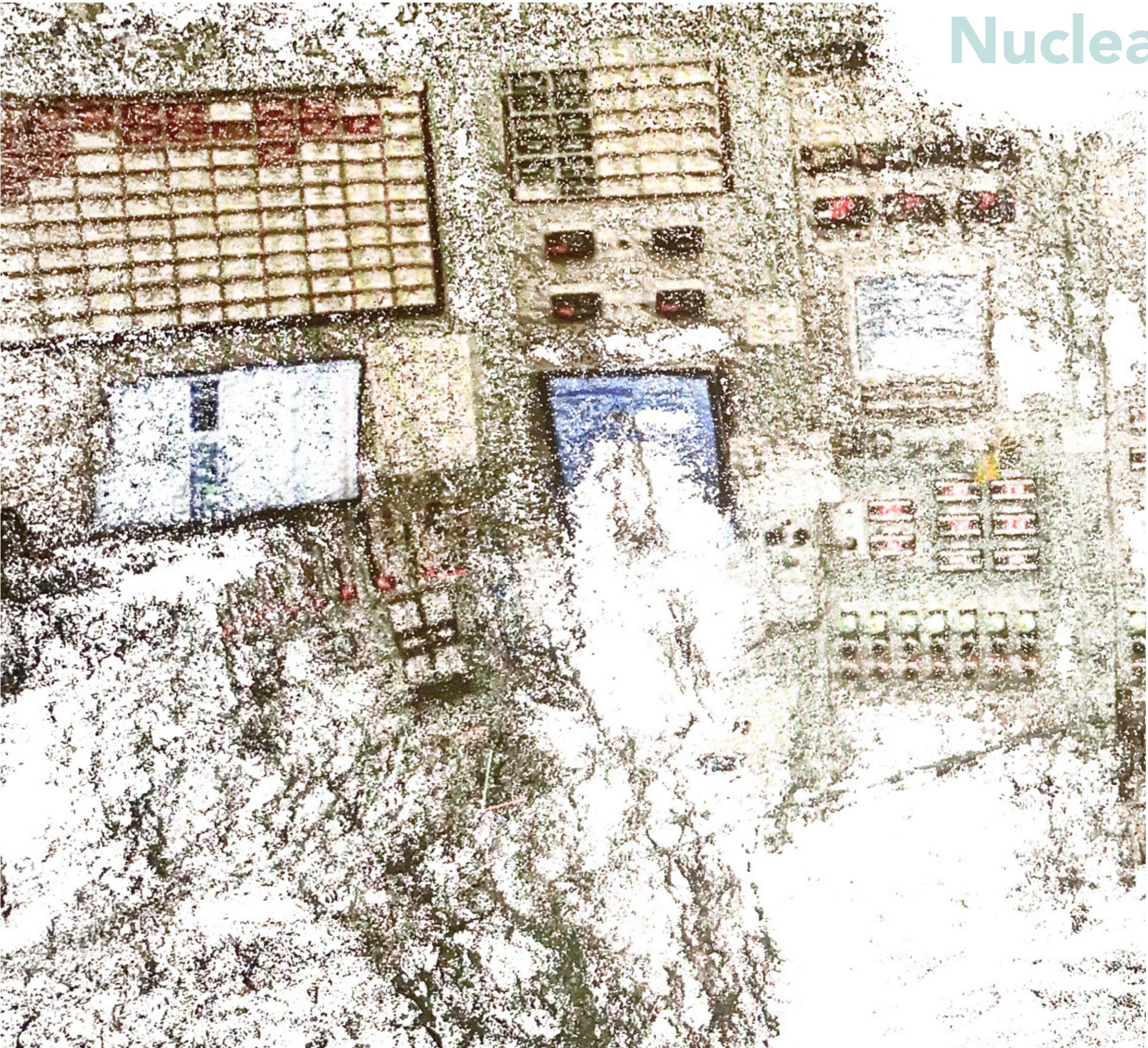
ACT

MIT program
in art, culture and
technology

School of Architecture + Planning



Nuclear Aesthetics



This course focuses on the production of art in the public sphere. Conceptually it deals with new modes of public art production that shift the discussion on public art towards critical engagement with the environment by questioning site specificity, materiality and public immersion in time of new climatic regime. The class aims at mapping the shifting notion of public art by probing critical edges and unexplored potentialities of hybrid space/time unfolding in AR/MR/VR technologies. Ultimately the research question in this class is what constitutes public as notion, as space and as audience today, in the time when technologies can access any site remotely, expand and augment it with an immersive experience, yet keeping its rationale under the lock of a black box.

This spring Studio in Public Art / Public Sphere is working with scholars at MIT's Nuclear Reactor Laboratory as partners to develop artistic proposals for intervention that consider AR/ MR/VR technology for the site of the Nuclear Reactor on MIT campus. Within this framework, the class participants deploy the lens of Nuclear Aesthetics to design artistic proposals. Visitors to the class supported the development of in class research with their lectures on concepts such as Nuclear Aesthetics, Critical Zone, Deep Time, Anthropocene Public Space, Nuclear Modernity, Ethereality, Experimental Aesthetics. Informed by in class discussion and readings from Andrew Pickering, Donna Haraway, Ursula K. Le Guin, Gilles Deleuze, Brian Holmes, Bruno Latour, Simon Sheikh, Sven-Olov Wallenstein, Sven Lütticken, Claire Bishop, Eleonor Carpenter, Esther Leslie and Karen Barad participants will probe artistic strategies to expand the way we feel and operate within the new climatic regime through anew set of intellectual, theoretical, aesthetic, and sensorial tools ("devices") for coping with it on different levels and spatio-temporal scales.

Prof. Gediminas Urbonas
Research Affiliate: Dr. Arianna Mazzeo
TA: Chucho Ocampo, SMACT'21

Site

This spring the members of the studio work on research informed by the visit to the Nuclear Reactor Laboratory at MIT to develop artistic proposals for interventions that consider AR/MR/VR technology for the site of the MIT Nuclear Reactor. Here the site is articulated not only as a geographically determined destination, but also as a conceptual place - a nexus of two clashing ontologies – the scientific informed by nuclear physics and the artistic one

that among other things considers metaphysics as well. Class projects engaged such concepts as experimental research, aesthetic regime, nuclear abstraction, nuclear materialism, vertical public space, embodied experience and technological prostheses.



Guests

Prof. Jacopo Buongiorno

TEPCO Professor of Nuclear Science and Engineering, director of Center for Advanced Nuclear Energy Systems (CANES) and Director of Science and Technology in the Nuclear Reactor Laboratory
<https://energy.mit.edu/profile/jacopo-buongiorno/>

Dr Silvia Casini

Senior lecturer at the University of Aberdeen, Undergraduate Program Coordinator for Film and Visual Culture in the School of Language, Literature, Music and Visual Culture, co-director of the George Washington Wilson Centre for Visual Culture, and author of the *Giving Bodies Back to Data* (MIT Press, 2021)
<https://www.abdn.ac.uk/sll/disciplines/film/profiles/silvia.casini>

Christian Skovbjerg Jensen

Professor at Lund University, curator and director of Inter Arts Center at Lund University in Sweden
<https://www.iac.lu.se>

Cristina Parreño

Lecturer at the Department of Architecture, MIT
<https://strelkamag.com/en/article/deep-timescales-of-our-most-urgent-crises>

Dr Ele Carpenter

Curator for Nuclear Culture
Professor of Interdisciplinary Art & Culture and a Director at UmArts, Umeå School of Architecture, Umeå University, Sweden
<https://www.artscatalyst.org/artist/ele-carpenter>

Sven Lütticken

Art historian and critic, prof. at Vrije Universiteit, Amsterdam and author of *Nuclear Aesthetics*.
<https://svenlutticken.org>

Reviewers

Eleonor Carpenter

Ele Carpenter is a curator and writer in politicised art and social networks of making. Her curatorial practice responds to interdisciplinary socio-political contexts such as the nuclear economy and the relationship between craft and code. Her curatorial research into nuclear culture investigates the contemporary aesthetics of living in the nuclear anthropocene through commissioning new work, field research, writing, and curating exhibitions, film screenings and roundtable discussions. In partnership with the Arts Catalyst the project is commissioning new work in response to the issues raised by dismantling British nuclear submarines in consultation with members of the Submarine Dismantling Project Advisory Group. Ele is an Associate Curator with Arts Catalyst London, and Bildmuseet, Sweden.

Silvia Cecilia Casini

Silvia Casini is senior lecturer in visual culture and film at the University of Aberdeen. She deploys visual culture, science and technology studies and critical theory to explore how images and perception work within systems of knowledge. Working across visual culture and the medical humanities, her main research interests regard the aesthetic, epistemological and societal implications of scientific visualization, particularly in the case of emerging technologies. Her second book "Giving Bodies back to Data. Image-makers, Bricolage and Reinvention in Magnetic Resonance Technology" is forthcoming with MIT Press in 2021.

Charles Stankievech

Charles Stankievech is a Canadian artist whose research has explored issues such as the notion of "fieldwork" in the embedded landscape, the military industrial complex, and the history of technology. His diverse body of work has been shown internationally at the Louisiana Museum, Copenhagen; Palais de Tokyo, Paris; Haus der Kulturen der Welt, Berlin; MassMoca, Massachusetts; Musée

Instructors

d'art contemporain de Montréal; Canadian Centre for Architecture; and the Venice Architecture and SITE Santa Fe Biennales. His lectures for Documenta 13 and the 8th Berlin Biennale were as much performance as pedagogy while his writing has been published in academic journals by MIT and Princeton Architectural Press.

Jacopo Buongiorno

Jacopo Buongiorno is the TEPCO Professor of Nuclear Science and Engineering at the Massachusetts Institute of Technology (MIT), and the Director of Science and Technology of the MIT Nuclear Reactor Laboratory. Jacopo is the Director of the Center for Advanced Nuclear Energy Systems (CANES). In 2016–2018 he led the MIT study on the Future of Nuclear Energy in a Carbon-Constrained World. Jacopo is a consultant for the nuclear industry in the area of reactor thermal-hydraulics, and a member of the Accrediting Board of the National Academy of Nuclear Training. He is also a member of the Secretary of Energy Advisory Board (SEAB) Space Working Group, a Fellow of the American Nuclear Society (including service on its Special Committee on Fukushima in 2011–2012).

Gordon E Kohse

Gordon E Kohse is a designer, builder, operator, administrator, and teacher, deputy director of research and services for MIT's Nuclear Research Laboratory (NRL). Kohse's NRL's participation ranges from efforts to solve the problem of radioactive corrosion product transport to improving the cladding used in nuclear fuel assemblies to prevent the possibility of hydrogen explosions and meltdowns of the type experienced at Fukushima in 2011. He also has a hand in developing next-generation molten salt-cooled reactors, always focused on operating safely, contributing to technology in places adopting nuclear power on a larger scale, and helping reduce the carbon intensity of electricity. Kohse received the 2015-2016 PAI Outstanding Faculty Award, presented by the student chapter of the American Nuclear Society.

Prof. Gediminas Urbonas

Artist, educator, researcher and co-founder (with Nomeda Urbonas) of US: the Urbonas Studio, an interdisciplinary research practice that facilitates exchange amongst diverse nodes of knowledge production and artistic practice in pursuit of projects that transform civic spaces and collective imaginaries. They also collaborate with experts in different cultural fields to develop practice-based artistic research models that allow participants—including their students—to pursue projects that merge urbanism, new media, social sciences and pedagogy to critically address the transformation of civic space and ecology.

Research Affiliate: Dr. Arianna Mazzeo

Artist, educator, and researcher and founder of the Design Fiction Design Studio, a creative studio for educational innovation. The DFS studio co-creates digital stories, documentary, performance and city design for all. She taught at Harvard University, Master Design Engineering Program and advised students for the final thesis projects introducing artistic intelligence and complex methodologies for societal challenges as interdisciplinary paths in between art, science, engineering and performance for public space and sphere. She also collaborated with experts of different fields to develop the concept of embodiment as a method and a format to apply to innovative education with particular attention to the VR/AR and AI technology for collaborative pedagogy to co-learning.

TA: Chucho Ocampo

Chucho (Jesús) Ocampo Aguilar is a Mexican artist and architect working in the intersection of art, architecture, and technology. At the heart of his practice lies the concern of how, through interfaces, workshops, walking, and appropriation of spaces can we misuse, misinterpret, and detour deterministic conceptions of our milieu. He is currently a second year SMACT candidate of the ACT program at MIT.

Students

Christopher "Bowties" Miller

Senior at MIT majoring in Physics and minoring in Art, Culture, & Technology. He currently works as a shop manager in the MIT Edgerton Center assisting students using fabrication experience across the spectrum of art, design, science, engineering, & craft. Combining nuanced views of artistic and scientific practices, his work focuses on presenting accessible representations of the scientific process developed beyond a popular deterministic understanding. He thus approaches the nuclear from this pedagogical and performative direction. Past work has explored walking aesthetics, contemporary urban exploration, coupled modern pressures, cybernetic playthings, scenic painting with prisoners, high-energy physics jet processing, and the geometric correspondence of classical and quantum mechanics.

Wa Liu

Wa Liu is an artist whose work encompasses installation, moving image and painting. Trained in anthropology, she deploys neurotechnology to construct immersive and interactive environments, exploring the subjectivity and plasticity of human emotions and perceptions. Built upon post - humanism, her multidisciplinary practices reimagine human agency at a time when feelings and desires could be quantified, predicted and affected by neuroscience. Her works adopt fluid and decentralized perspectives to interrogate the power dynamics between humanity and technology.

Snow Xu

Snow Xu makes interactive art experiences focused on inclusive body politics and the processing of trauma through multi-sensory experiences. Her work focuses on devising body-oriented technology to redefine pleasure, vulnerability, therapy, and wellness. She is currently a Master in Design Studies candidate at the Harvard Graduate School of Design. In addition, Snow is a program manager that leads the R&D at Open Style Lab,

a NYC-based non-profit that works with the disability community to design inclusive fashion and organize educational programming. Snow's artwork has exhibited at Ars Electronica Festival and Museum of Contemporary Art Chicago

Yutong Jiang

Artist and interdisciplinary designer. She received her bachelor degree from Architecture department, Tsinghua University, and currently pursuing Master of Design studies in Art,Design and Public Domain from Harvard GSD. She had the experience to work with Olafur Eliasson, Ei Arakawa, Harvard University Chinese Media Art Laboratory, etc. Her research direction is in complex geometry, optical materials research, interaction installations.

Joanna Wright

Joanna Wright is a documentarian and interdisciplinary artist from Wales, UK, and current fellow in the Open Documentary Lab at MIT. Joanna's work has been shown internationally, including at the Institute for Contemporary Art London, Today's Documents Beijing, The British Film Institute, British Council Collection, Channel 4 UK, BBC, IDFA, True/ False and at the United Nations. She has worked as a visiting teacher at the European Film College, and Alfred University, New York, where she was awarded the 2015 Randall Chair in Art and Design. She is currently a senior lecturer in the School of Languages, Literature, Linguistics and Media at Bangor University, Wales.

Lexicon

Nuclear

Relating to the nuclei of atoms, or to the energy released when these nuclei are split or combined.. Nuclear means relating to weapons that explode by using the energy released when the nuclei of atoms are split or combined.

Neutron Beam

a stream of charged or neutral particles, in many cases moving at near the speed of light.

Fiction

invention or fabrication as opposed to fact

Paradoxical

seemingly absurd or self-contradictory

Public Space

a space of conflict between different positions, as a paradoxical space in which opposing arguments can play themselves out and defined by the paradox

Public Sphere

is an area in social life where individuals can come together to freely discuss and identify societal problems, and through that discussion influence political action

Tacit Knowledge

is the knowledge that we possess that is garnered from personal experience and context.

Embodiment

the representation or expression of something in a tangible or visible form

Performativity

Performativity is the concept that language can function as a form of social action and have the effect of change

Nuclear Aesthetics

Architecture, industrial design, commercial design (including advertising), interior design, and fine arts were all influenced by the themes of atomic science, as well as the Nuclear Age.

Phantom limb

A phantom limb is the sensation that an amputated or missing limb is still attached.

Deep time

The multimillion year time frame within which scientists believe the earth has existed, and which is supported by the observation of natural, mostly geological, phenomena.

Virtual Reality

Refers to a computer-generated simulation in which a person can interact within an artificial three-dimensional environment using electronic devices, such as special goggles with a screen or gloves fitted with sensors.

Augmented Reality

Refers to an interactive experience of a real-world environment where the objects that reside in the real world are enhanced by computer-generated perceptual information, sometimes across multiple sensory modalities, including visual, auditory, haptic, somatosensory and olfactory.

Christopher "Bowties" Miller

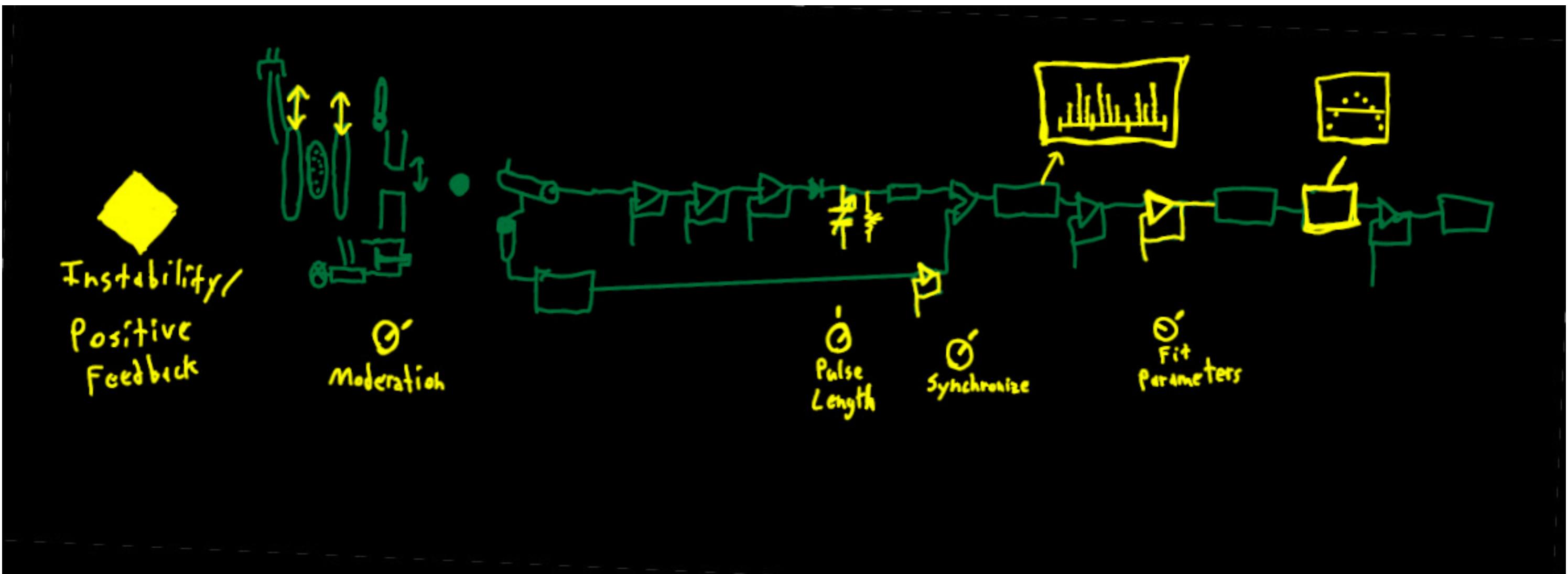
Nuclear Unfolding

I propose to deploy a public space attempting to invite a nuanced dialogue around experimental apparatuses for sensing the invisible. In a sense, the piece facilitates discussion around the nuclear by inserting speculative narratives tied to an embodied experience of the interactions between black boxes.

It attempts to reclaim the nuclear in its aesthetic form as a system by which the invisible becomes visible rather than as an association with the exceptional (bomb, reactor). We thus fixate on the aesthetic of a nuclear research apparatus: knobs, boxes, & readouts as in my conceptual prototype box.

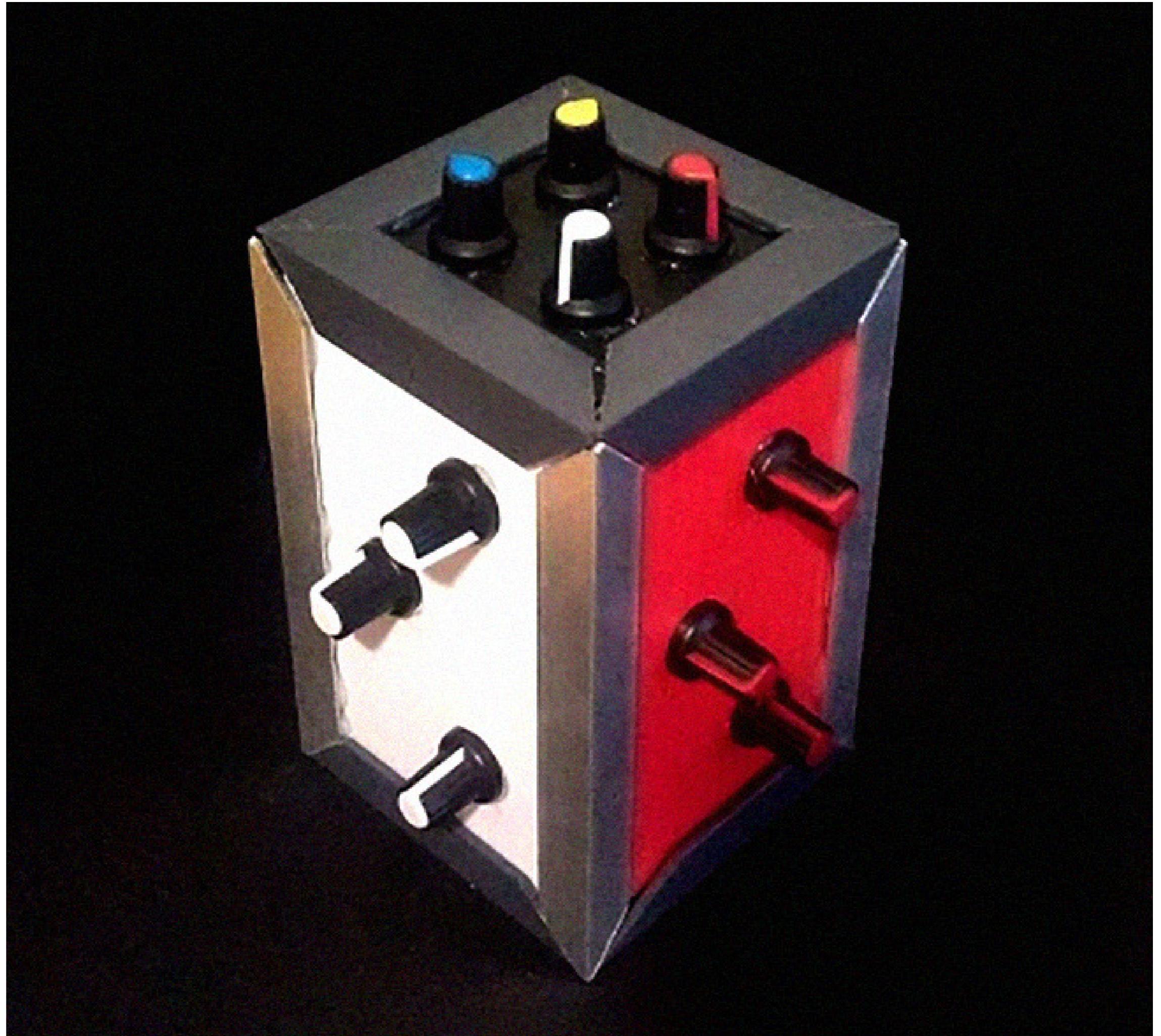
The knob as a continuous input device with direct feedback should invite participants into an embodied experience of seeing. The resulting play should reveal the dimensions of criticality & uncertainty in the experimentalist's approach to science, and, for those familiar, a space to engage with more metaphysical inputs and revelatory entanglements.

A key paradox of representation in public space is explored: transparency vs. accessibility – how much to include or hide inside a black box. The textbook/museum approach tends towards accessibility – to provide succinct statements of



fact next to a curated piece of an apparatus, a simplified diagrammatic analogy, or a portrait of a scientist to memorize/identify as the face of an idea. This canonical/paradigmatic route provides one entryway into techno-science via widely-applicable predictions but hides much of the experimentality – the uncertainty and nuance – the matters of concern. On the other hand, full transparency with its mess of boxes, wires, and scribbles appears cryptic and uninviting to the non-expert. Worse, a direct push to explain the role of uncertainty in results may simply introduce distrust in scientific institutions.

The proposed solution is to provide a complete apparatus with curated storytelling modes exploring sorts of tacit knowledge behind setting an array of knobs to produce an experimental output. Intentionally, these aspects are distanced from the apparatus to allow dialogue between the expert and non-expert. Each provides a selection of notes/prompts containing speculative considerations around setting knobs, inviting role-playing as a scientist and demanding coordination to operate the apparatus. These explore different matters but are ultimately coupled together which departs from the cybernetic regime into an understanding of dialogues between ways of seeing/being embodied in the apparatus. I've based this prototype around a neutron scattering experiment as it involves constructing a measurement using the invisible as a tool and shares components with physics experiments I have performed in-person. It could easily be adapted to intervene in other experimental workflows even outside the realm of science.



Wa Liu

LATE NIGHT SAVAGE

"Late Night Savage" focuses on the day and night of three plants (tumbleweed, sunflower and camel grass) at nuclear sites developed during the Cold War in the United States, the former Soviet Union and China.

My collaborator and I embarked on an 11,000-mile journey to conduct field research at the sites in Washington state, U.S. and Gansu, China, and lived among these plants.

As a symbol for the American West, tumbleweeds, propelled by the force of the wind, tumble around to spread radioactive seeds at the nuclear reactor in Washington State. Sunflowers are planted at Chernobyl and then harvested and disposed of, as a cheap corrective method to clean up the contamination. Camel grass at the nuclear city in Gansu, China, embodies the patriotic zeitgeist for dedicating one's life to the motherland. However, both camel grass and tumbleweeds are in fact invasive species from Russia that disregard land borders, freely traversing the landscapes.

Genetic mutation caused by ionizing radiation speeds up the plants' irreversible aging process, leading to an increase in its entropy. While living means fighting a losing battle against nature, the short-lived plants still display incredible resilience and savagery.

Built upon field research and artistic imagination, the project consists of four paintings and music experienced through AR-enabled devices. On each painting, a black geometric shape compresses the eruptive life force into a deafening void. When the audience scan the shape on the painting with the app,

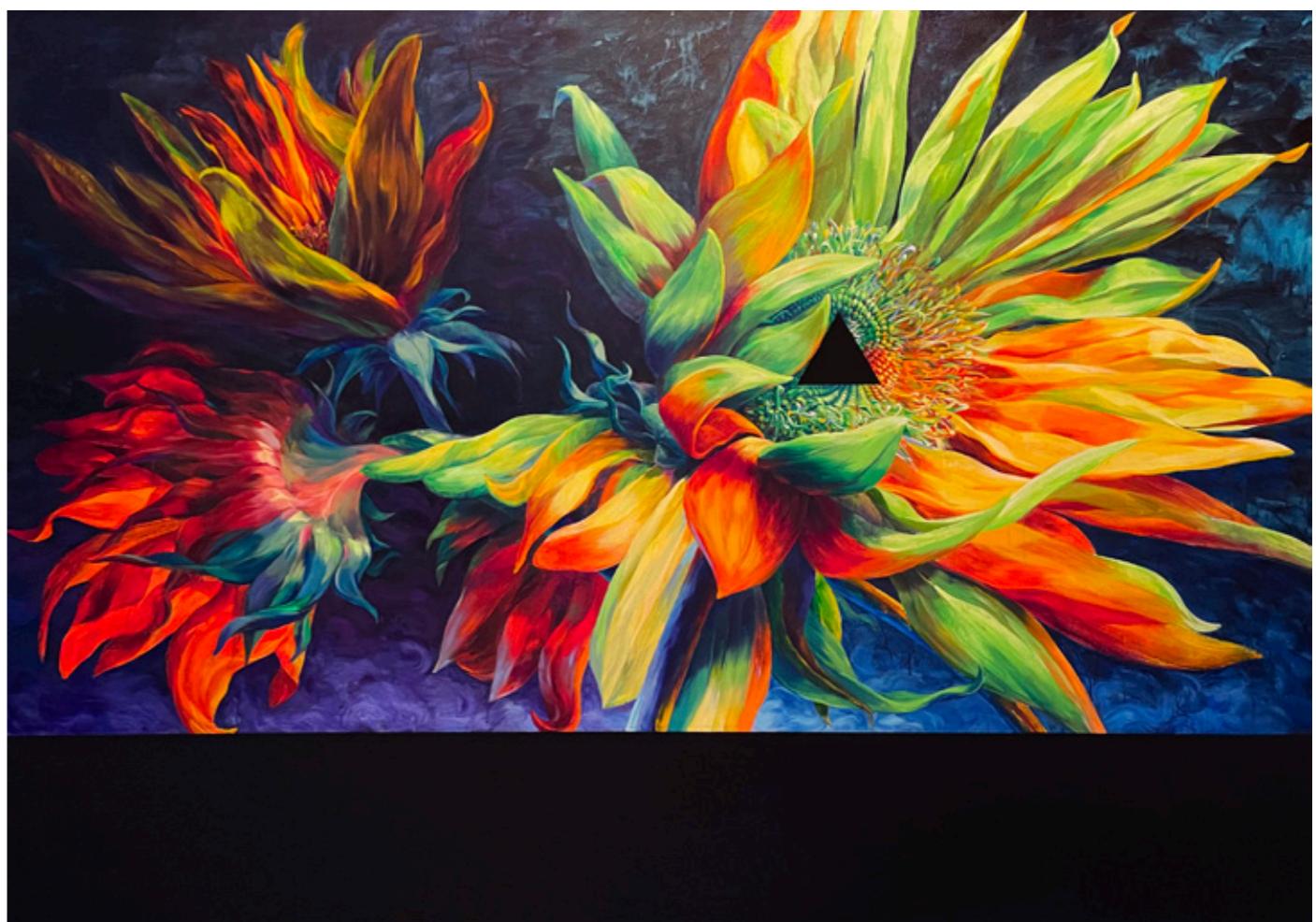
the painted plant will appear to flourish and decay in its unique "speculative habitat" in and around the canvas.

A piece of music inspired by each element in the painting (soil, water, smoke, seeds, etc) will emanate from the AR app and gradually mutate and refract in infinity. Moreover, the viewer can interact with the virtual plant by shifting her position in the physical space.

According to Einstein's theory of relativity, the momentum of the observer bends the fabric of space-time to cause time to travel at different speeds in the perspective of the observer. On the AR app, similarly, the viewer can speed up or slow down the life cycles of the virtual plants by moving slower or faster around it—the faster she moves, the slower the plants burgeon and wither, and vice versa. When multiple viewers scan the four paintings at the same time, the four pieces of music are experienced in both chaos and synchrony, resembling the endless echoes in the canyon.

The ever-evolving visuals and adaptive soundscape construct a multi-sensory soundscape, seeking to heighten the audience's sensuous receptivity to the more-than-human world. The intent of this AR app is not so much to anthropomorphize the plants, but to transcend and "vegetalize" our human perceptions, calling attention to the vibrant lives that have been easily overlooked.

The silent carnival of these nameless actors has never been alien to us. We are all savages.





Snow Xu

Footless Human & Wasteless Land

When it comes to the human handling of hazardous nuclear waste, our current approach to disposal can seem abruptly simple - we seal them in repositories and bury them deep under the surface of the land. These methods conveniently remove the unwanted or unusable waste away from the site of our daily activities. However, are we overly optimistic about the deep geological disposal of nuclear waste and overlook its possible impact on the ecosystem that surrounds the site? How can we adapt a more responsible and creative mindset for waste management for our present and future generations?

Footless Human & Wasteless Land is a speculative video essay that explores our relationship to the hazardous waste management and the public sphere that can be impacted by reckless waste disposal.

The video begins by adapting the analogy of a phantom limb, a medical syndrome characterized by the neurological sensation that an amputated limb is still present and functional as usual. The disjointed body limb causes uncontrolled sensations of tickle, pain, numbness, or even pleasure.

The video then proposes a speculative narrative that reflects on our current approaches to hazardous waste disposal. In this speculative narrative, the human foot, the lowest parts of the human body that serve as an anchor of contact to the planet earth, is voluntarily amputated as a means to eliminate body contact with the "contaminated" earth. The footless body and the homeless foot then both become ghostly existences on the planetary surface: the footless body loses its anchor on earth and becomes dis-oriented, and the dispossessed foot radiates a ghostly pain, hoping to be recognized and reunited

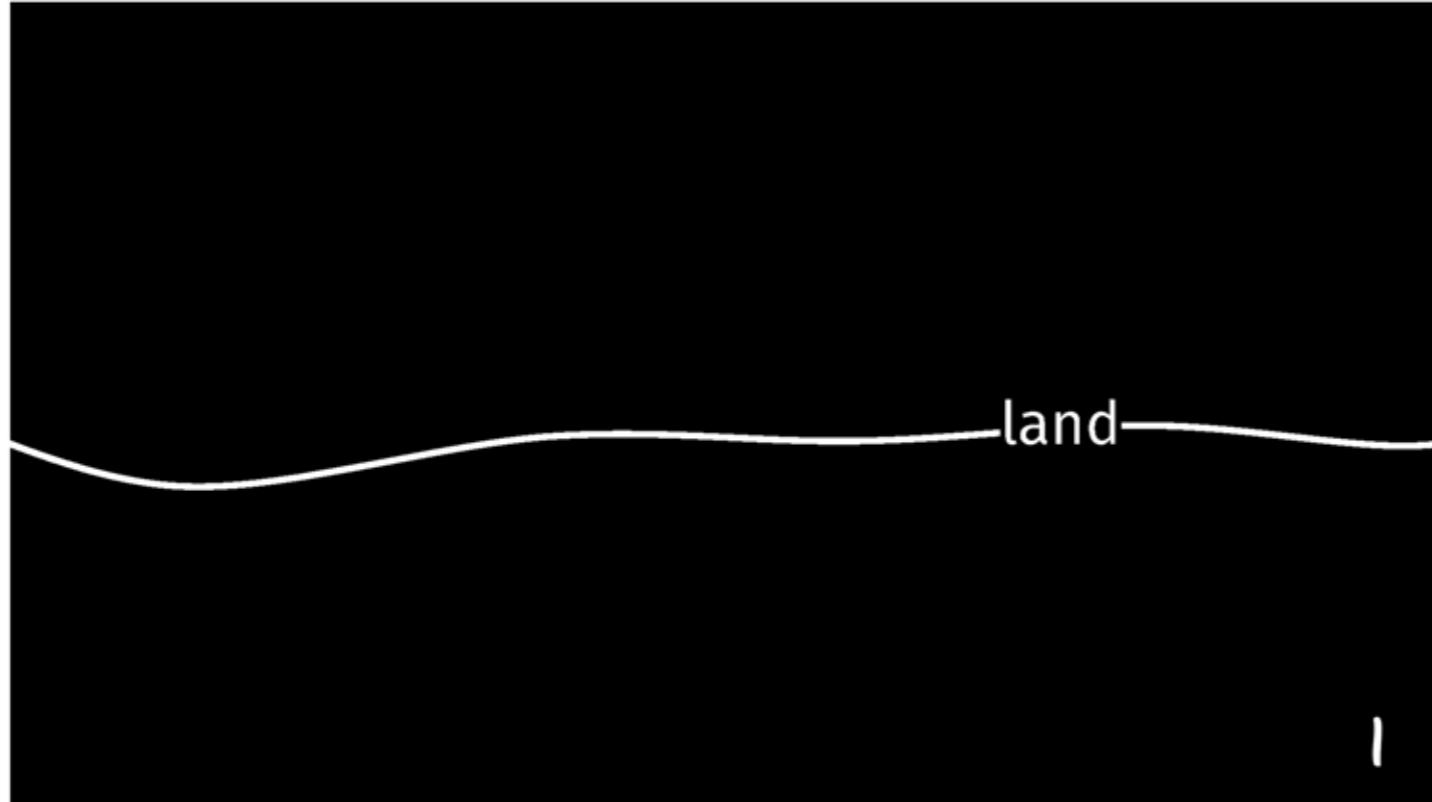
with its original body again.

This speculative narrative thus establishes a parallel between how the amputation of one's foot continues to haunt the owner's body and how the hazardous waste that is supposed to be "out of sight, out of mind" can still impact the land and the ecosystem where it is disposed. The amputated foot and the discarded hazardous waste becomes something that's both present and absent, everywhere and nowhere, stable and unstable, something that intertwines the past and now of time, and something that is inherently both humane and monstrous.

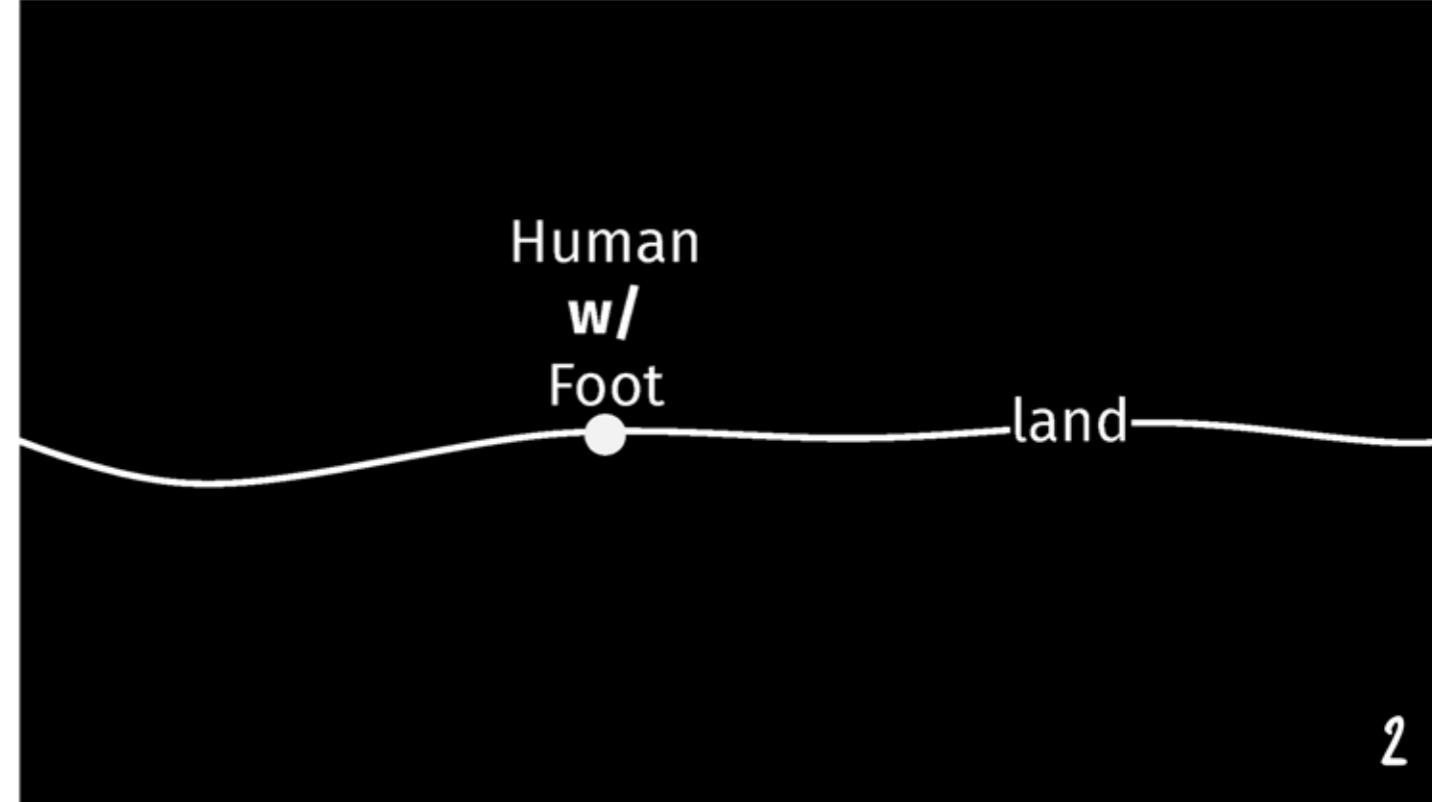
In the end of the video, the speculative narrative imagines the development of a new monster limb in place of the amputated foot. The limb is nimble and tentacular, without structured bones and a flat bottom surface to serve as the anchor to the planetary surface for stable movement. In addition, the

development of the monster limb ceases to erase the ghostly pain caused by the previous amputation, as the phantom foot is still wandering homeless somewhere. Regardless, the monster limb enables new possibilities to sense and mobilize on the planetary surface. In light of the newly developed monster limb, it is anticipated that the re-footed human can move forward surely and wobbly, and hopefully be less disoriented and detached from the earth.

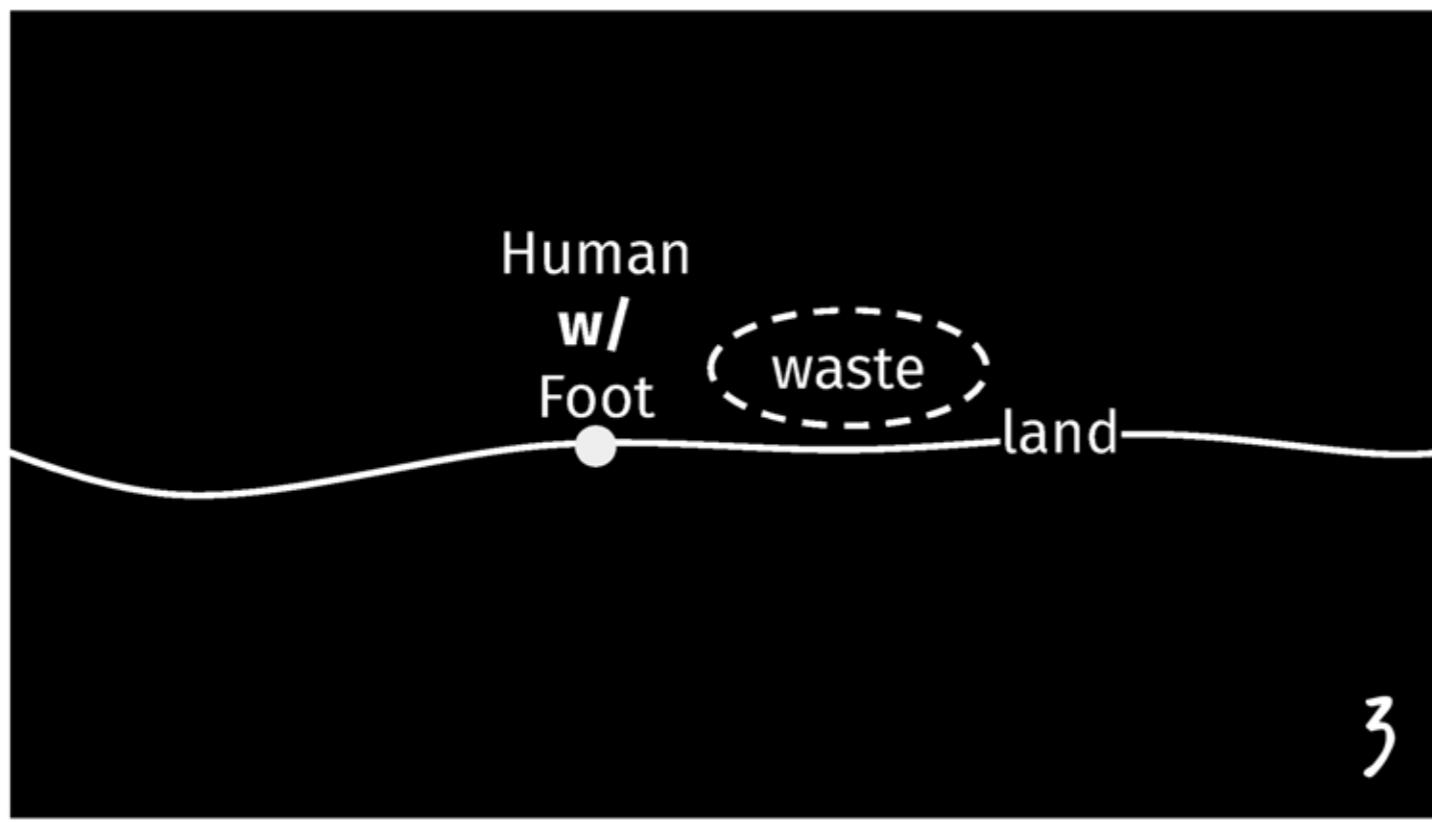




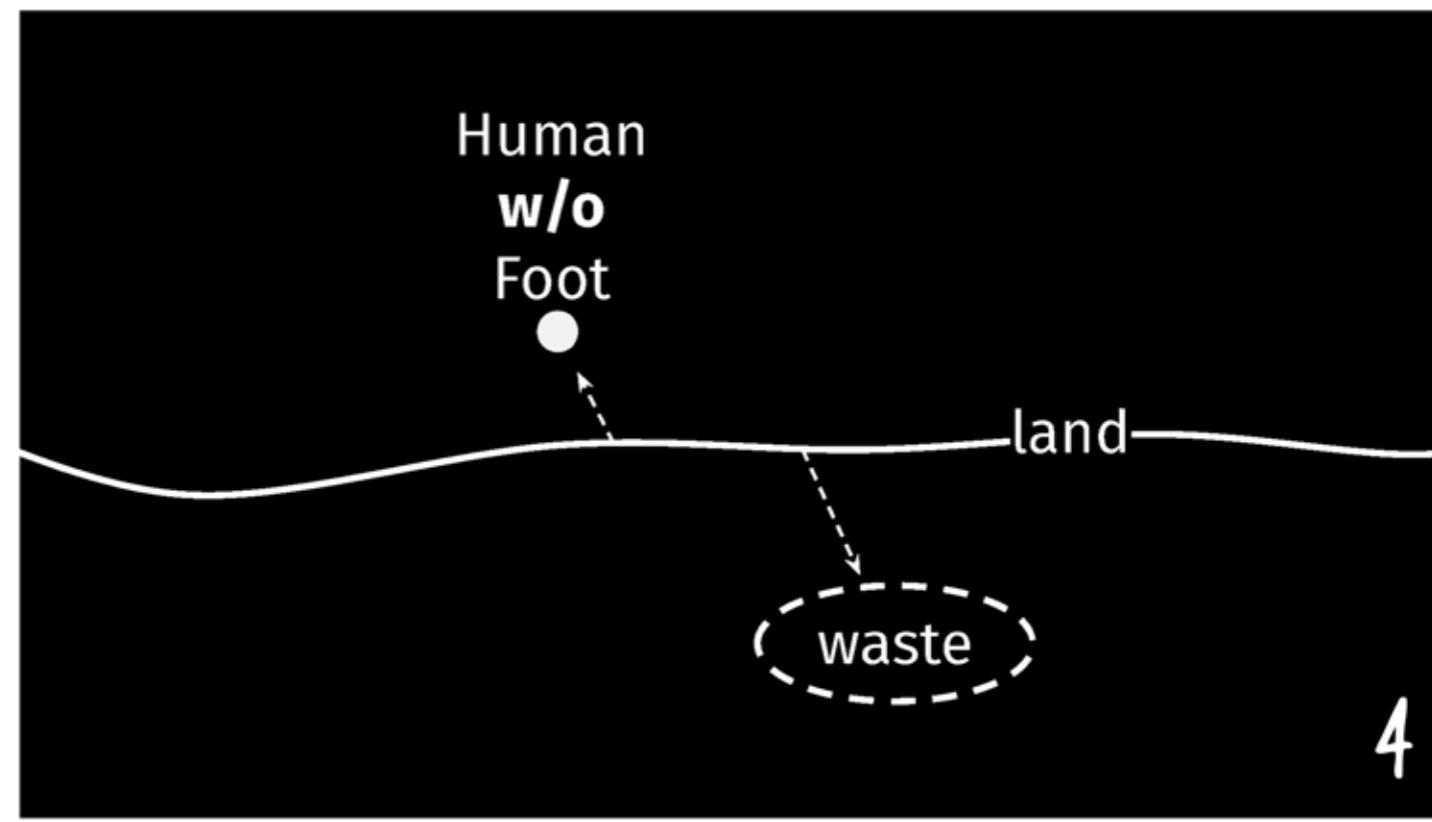
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Yutong Jiang

Nuclear fission and fusion creates energy. Nuclear process also happens in celestial bodies to prevent them from collapse by providing pressure. If a star has too little "fuel" left to maintain its temperature through stellar nucleosynthesis. Gravitational collapse will occur because the internal pressure is insufficient to resist the object's own gravity. That is how blackholes are formed, according to general relativity there is a gravitational singularity in a blackhole, spacetime singularity or simply singularity is a location in spacetime where the density and gravitational field of a celestial body is predicted to become infinite by general relativity in a way that does not depend on the coordinate system. The quantities used to measure gravitational field strength are the scalar invariant curvatures of spacetime, which includes a measure of the density of matter. Since such quantities become infinite at the singularity point, the laws of normal spacetime break down.

This is the starting point of the project. From a human perspective, we may never be able to perceive the singularity and the time and space in the black hole, because we are far limited by the limited life time. If our life can have hundreds of times like celestial bodies Ten thousand years, then our literacy of time and space will be completely different. Similarly, if we only have one day's life, like mayfly, how would we perceive time and the world?



In the virtual VR space, the most dominant perception of vision is used to allow viewers to experience different time and space experiences, and to deconstruct and reconstruct time and space through the perspective of different species. In VR space, the life span of the mayfly with a few hours of life and the stars with trillion years of life are stretched and extremely compressed. From the perspective of stars, geological changes are only fleeting, and in the time and space of mayfly, Man already has eternal life. The installation of the installation allows people to re-establish a new concept of time and space in the public space, hoping to provide some reflections on time and space.



Joanna Wright

Atomfa (and other stories)

The Nuclear Power station in Trawsfynydd, in north west Wales is an iconic structure in the mountains of Eryri (Snowdonia) National Park. Designed by architect Sir Basil Spence, the twin reactor buildings were intended to represent a castle in the landscape. It is the most prominent landmark on the main route between north and south Wales. Commissioned by the UK Ministry of Power in 1958 this power station went offline in 1993. Since that time, it has been decommissioning, a process that won't be completed in my lifetime.

In 2011 I was asked to advise on documenting the socio-cultural history of this nuclear power station. Two things were happening at that time that had some urgency, one was that the first generation of people who had worked at and seen the coming of the nuclear site were elderly and the other was that the records from the site, that were considered "non-essential" were being destroyed: A major, unloved, but important part of Welsh and international nuclear history was being dismantled, with little evidence of the site's cultural impact being retained.

For the last decade I have been working at the site as unofficial documentary maker in residence. I see my role as witness, informal archivist and organiser of storytelling. The project has been iterative, intergenerational, participatory, is ongoing, and has a number of different outputs, including use of augmented reality storytelling in the landscape around the station.

I have welcomed the opportunity to be a guest in this class this semester, to interrogate collectively themes of Nuclear Aesthetics, and to think deeply about embodied knowledge, archive and memory at nuclear sites.





Acknowledgements

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Prof. Gediminas Urbonas
Research Affiliate: Dr. Arianna Mazzeo
TA: Chucho Ocampo

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