Surface Tension (2025)
Karyn Nakamura

Installation Archive
Press Release

Interview with Nick Knight
Process Film

Surface Tension confronts the condition of being human in a world increasingly mediated by machines, as entire fields now revolve around interpreting the inner workings of black-boxed AI systems. It traces the double-edged power of media's ability to traverse between physical reality and representation, simulation and experiment, model and metaphor. In meticulously animating neurons to form the word "THOUGHT," the work both literalizes and interrogates the notion of human agency in the future - what does it mean to choreograph the very matter that constitutes consciousness? The installation becomes not only a reflection on vision, but a deeper inquiry into the fragile, constructed nature of what it means to see, know, and be.

1. Description

When we rely on technology as an intermediary for vision, how do we validate its interpretations? Surface Tension is an installation that explores the power of visual media in shaping our realities, probing the tensions between visibility and authority in the media through which we produce and share knowledge.

At its core lies the installation's kernel of truth - raw footage from a microscope capturing a meticulous process of animating individual neurons (cellular matter of human brains) through physical manipulation. Using optical tweezers, neurons are lifted and orchestrated into movement by the energy of a light beam, drifting in and out of formations that attempt to spell out the word "THOUGHT."

Throughout the part live-generated, part pre-sequenced 15 minute experience, the microscopic footage undergoes visual transformations through computational processes from color inversions to textures generated with diffusion models. These textures cycle through the duration of the piece - each one concealing and revealing different facets, filtering and molding our perception of the neurons. Images at various stages in the technological reconstruction of the absurd reality morph in and out, slide over and under each other, wearing the traces of their own making like a skin.

The installation unfolds across five screens, a wall of projection, and a slide projector modified into a microscope that projects the actual specimens on the slides used under the optical tweezers, creating a meta-animation of its own process. On top of this, a choreographed drone weaves through the space capturing a single, curated perspective of the work. This is broadcasted on a TV in the front gallery, where a large mirror sculpture obscures full view of the main space. Like the microscope that lets us peek into microscopic world, the drone's eye becomes the only way to see inside the gallery - another mediated gaze, filtering reality through a particular perspective, shaping what can be seen and what remains hidden.

2. Technical Production Details

The microscopic footage was produced at the Center for Soft Matter Research at NYU under the guidance of Prof. David Grier. SH-SY5Y neuroblast samples, cultured and preserved by Yitong Tseo (MIT), were prepared as 10 µL droplets on glass slides and sealed with a secondary glass layer. Using a 2.4W holographic optical tweezers setup, I manually manipulated ("puppeteered") the neurons by trapping them and physically dragging them across the slide with the optical trap. This labor-intensive process spanned ten days, with approximately eight hours of animation conducted on a freshly prepared slide each day. As this movement is extremely slow in real time, the resulting footage was accelerated over 40× to produce the "ground truth" video around which the installation was built.

The final multi-channel video unfolds as a series of vignettes, each capturing a moment of optically animated neurons. Over the course of the video, the raw bright-field microscopy footage undergoes a series of transformations through computational processes, including body-like textures generated using diffusion models. Computational neural networks - modeled after an abstraction of the brain - are used to reimagine and embellish the image of the material form of neurons themselves.

To construct these layers, I developed custom pipelines using multiple Stable Diffusion 1.5 models. Depth maps and edge-detected frames from the original microscope footage were used to guide the generation of skin-like textures. While typical SD1.5 workflows follow a 30-step sampling process that gradually refines noise into an image, I intervened in this process early (around steps 3 - 10) extracting partially formed latent representations and converting them directly into RGB images, bypassing the conventional decoding phase. These early-stage, "half-baked" generations reveal the underlying mechanics of image formation, offering a raw, speculative glimpse into computational imagination. They are woven into the video, layering the neurons physical movements with their imagined forms via computational neural networks and the visual residue of their digital construction.

The physical installation is a 15-minute composition - part pre-rendered, part generative - choreographed in real-time through a custom TouchDesigner program. This program acts as the central control system, synchronizing seven channels of video, three live camera feeds, laser modules, a modified slide projector, a choreographed drone, and the live composition broadcasted to a CRT television.

3. Artist Profile

Website: https://karynnakamura.com
Press: *SHOWStudio*   *Boston Art Review*   *MIT News*

Karyn Nakamura, also known as @frog_spit_simulation, is a Tokyo-born, New York-based artist and visual forensics researcher. Her work explores the interplay between media, technology, and human agency and the social and technical infrastructures that shape communication. Nakamura started her career studying physics at Massachusetts Institute of Technology, before graduating with a BS in Art and Design. A recipient of the Schnitzer Prize, Wiesner Award, and Everingham Award, Karyn Nakamura was named a 2024 Steve Jobs Archive Fellow.

She has produced several large-scale works combining software and hardware such as :

- An abandoned Frank Gehry pub filled with 60 screens and a 20ft tall, 20 channel video sculpture presented as a 1 hour performance for 3 months. Built during a 1 year residency in the space.
- A sculpture of disassembled music hardware and 8 channels of live generative video manipulating 2 camera inputs through computer vision and code encapsulating a NY jazz duo performing live from inside.
- A 400 ft wide, 10-story building interactive projection installation on a dorm built by Steven Holl Architects.

Exhibiting in galleries worldwide, her work has appeared at Singapore International Festival of Arts, SHOWStudio, Mother's Tank Station (London), DOMICILE Tokyo, MAPP Montreal, Space Edge (Tokyo), Lower Cavity (Holyoke MA), and Simmons Hall (MIT) and the Ray and Maria Stata Center (MIT).

In parallel with her artistic practice, Karyn has worked on AI generated image identification research with the Human AI Collaboration Lab, and using computer vision for the investigation of human rights violations with SITU Research and was previously part of the Civic Data Design Lab.