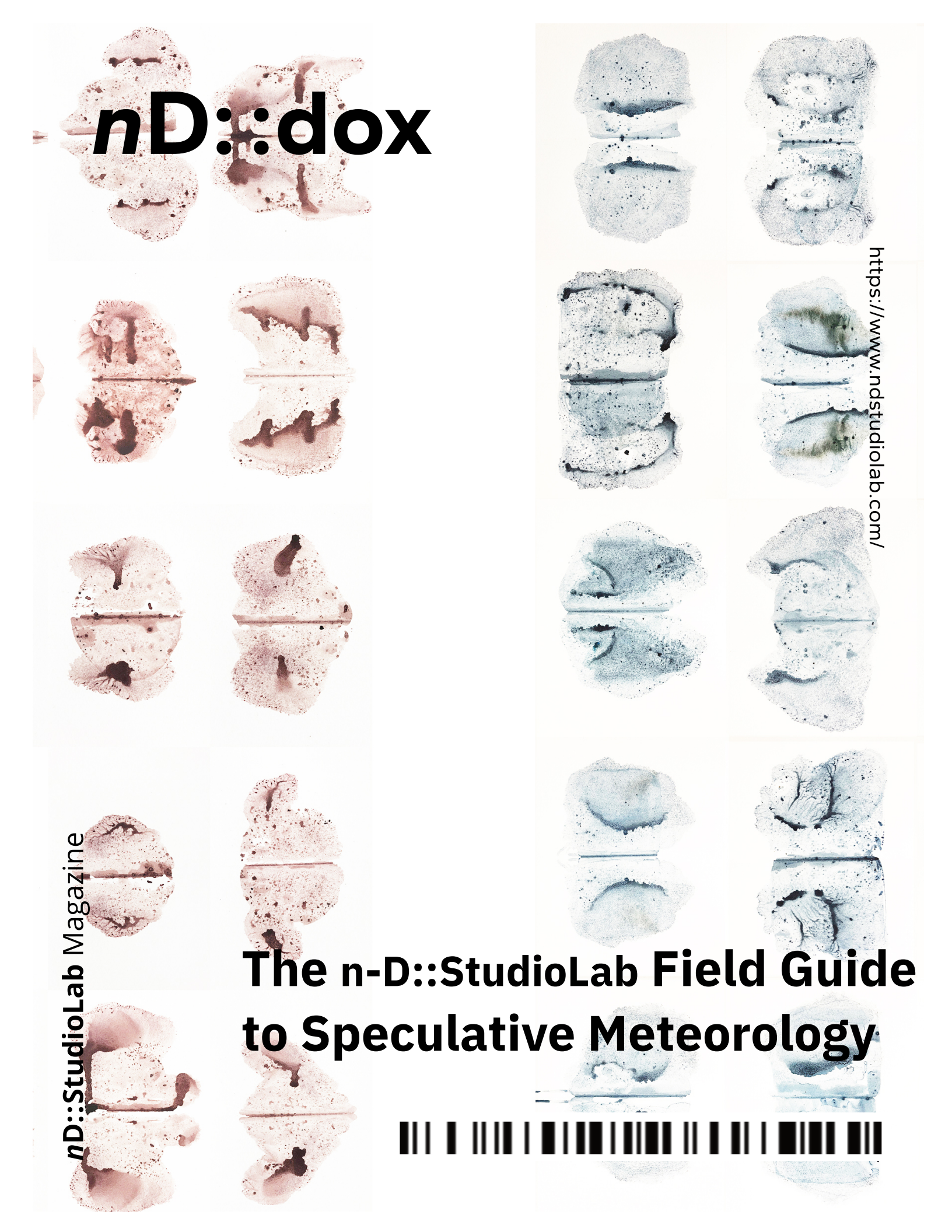




nD::dox

<https://www.ndstudiolab.com/>

nD::StudioLab Magazine

The n-D::StudioLab Field Guide to Speculative Meteorology



nD::StudioLab

Publication#2

2024

The publication is a part of the DIY Methods conference organized by the Low-Carbon Research Methods Group, and has been made possible with the generous support of York University

Printing / Biding: name of the printhouse

Front cover: Nava MessasWaxman

Editors: Mark-David Hosale,

Aftab Mirzaei

All images and texts are copyrighted by the authors.

If you have used any of the tools and methods in this field guide, we would love to hear about your outcomes, challenges , suggestions, and any other thoughts, please share them with us at nddox@ndstudiolab.com

Digital version on issuu.com



Table of Contents

Aftab Mirzaei, <i>Introduction to the Field Guide</i>	3
Aftab Mirzaei, <i>Staging Conversations</i>	6
Kwame Kyei-Boateng, <i>The Ambient Factory</i>	7
Mark-David Hosale, <i>Intero/outero-ception</i>	9
Grace Grothaus, <i>DIY Analog Sensors</i>	11
Marcus Gordon, <i>Machinic Observation System</i>	15
Aftab Mirzaei, <i>Minutecasting Atmospheres and Microclimates</i>	19
Nava Messas Waxman & Hiromune Kubayashi, <i>Performative Gestures of Mediation</i>	25
Darian Razdar, <i>Like a Labyrinth</i>	36
nD::StudioLab bio and members	41

The n-D::StudioLab Field Guide to Speculative Meteorology

An Exercise in Speculative Method Making

Aftab Mirzaei

For millennia, understanding the weather has been a fundamental part of human culture and a mix of observation and speculation. The history of forecasting reveals a range of embodied and performative practices and speculative gestures used to understand the character and mechanics of the atmosphere. A finger to the wind, sailor's rhymes, the sound of crickets, and the thickness of caterpillars have informed how we engage with and come to know our weatherworld.

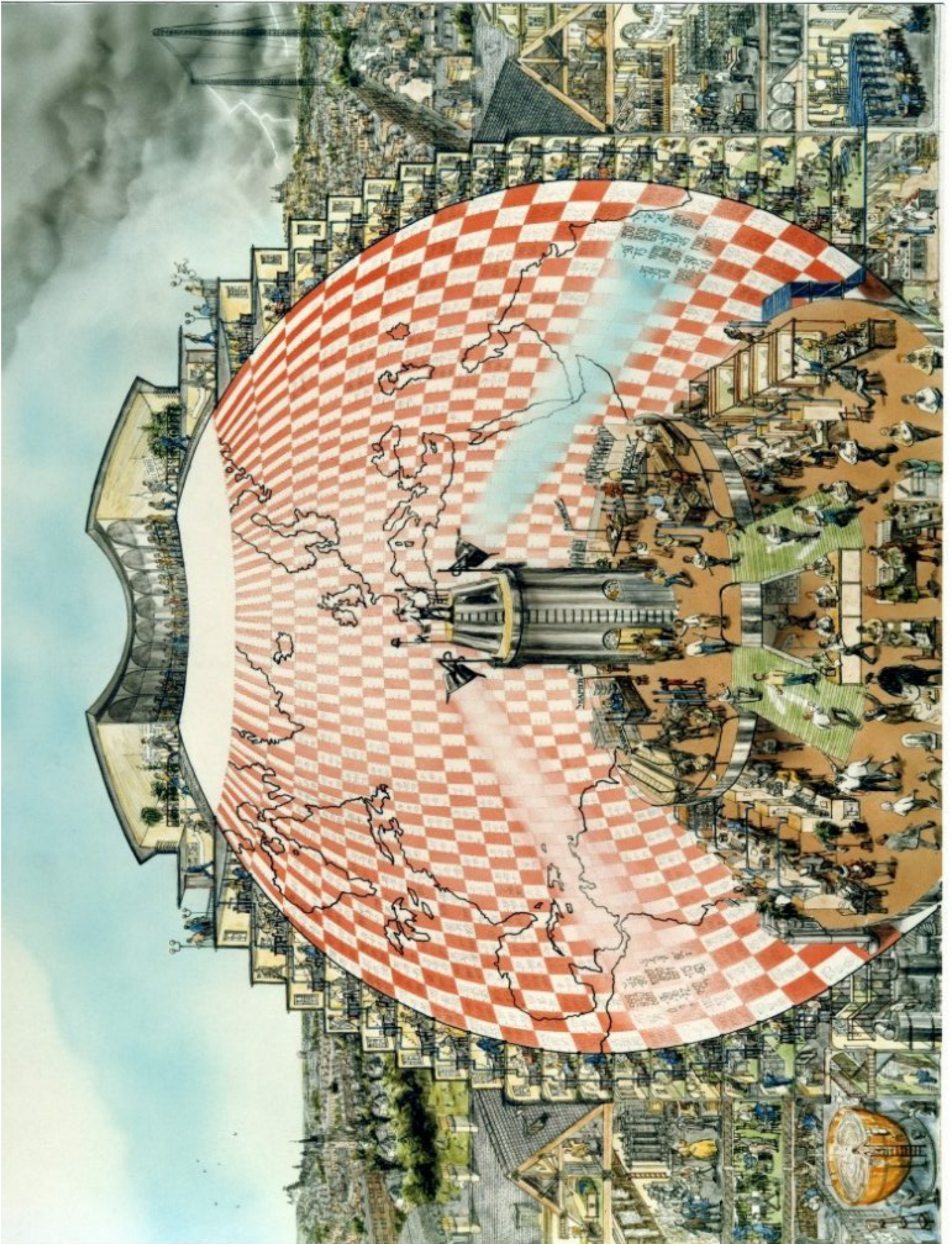
Speculation imbues even the beginnings of numerical weather prediction. In 1910, Lewis Fry Richardson made the first attempt to mathematically forecast the weather, only to fail after a protracted calculation period of three months. In response to the failure and in order to remedy the long calculation period, Richardson envisioned the "forecast factory": a spherical "hall" with its walls painted with the map of a world, housing 64,000 (human) computers who work on equations for one part of the world (See page 4).

The *n-D::StudioLab Field Guide to Speculative Meteorology* follows these traditions of speculative attunement and storytelling to explore atmospheres and microclimates around York University's Keele campus. Our efforts were also inspired by Donna Haraway's notion of SF(speculative fiction, situated feminisms, string figures, etc.) to compose a hybrid and layered account of the climate. We use

Speculative Fabulation/fictional sciences to articulate alternative configurations of knowledge-making that are situated, imaginative, and multidimensional.

The field guide serves as a worldmaking tool composed of materially distinct practices that bring forth different representations of environments, atmospheres, and climates. The toolbox is the result of several iterative collaborations between graduate research members at the n-D::StudioLab at York University, and their exploratory excursions to Stong Pond on campus. Grounded in ArtScience, Computational Arts, Interactive Architecture, Dance, and Science and Technology Studies, our proposed attunement practices seek to register climates past, present, and future around the pond and its ecosystem.

Our hope is that the case studies and vignettes collected here highlight experiential and speculative techniques for fostering intimacy, attunement and bodily resonances with the environment.



Speculative Method Making

...To make **other worlds** **visible**.

Embrace and **practice** our ability

to create **worlds** that bring

multiple/more/other

bodies.....voices..... and histories

into view.

A meteorological institute

NOT for **PREDICTION** but

PRESENT ATTUNEMENT

to futures already at play

– *Transforming imagination.*

We offer *multimodal openings*

into different ways of

thinking/feeling/making/doing.

Moving lenses. Senses. Sensors.

Out in the open. Grounded. In person. In place.

Staging Conversations Between Computers, Satellites and Antennae

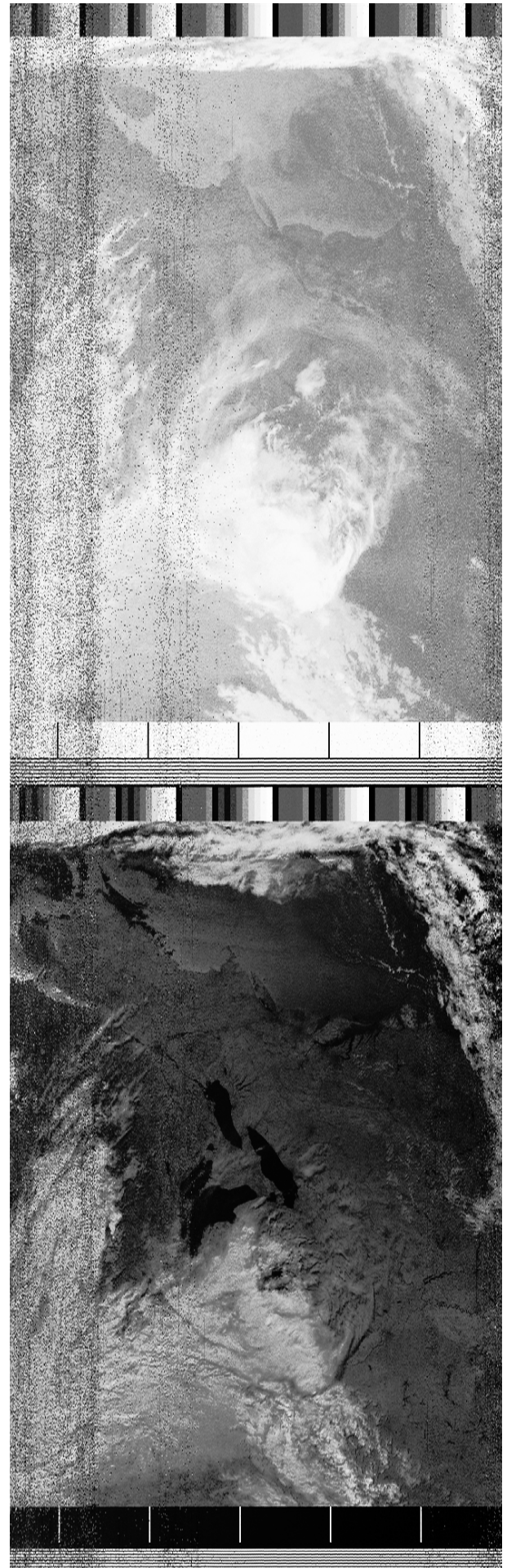
Aftab Mirzaei

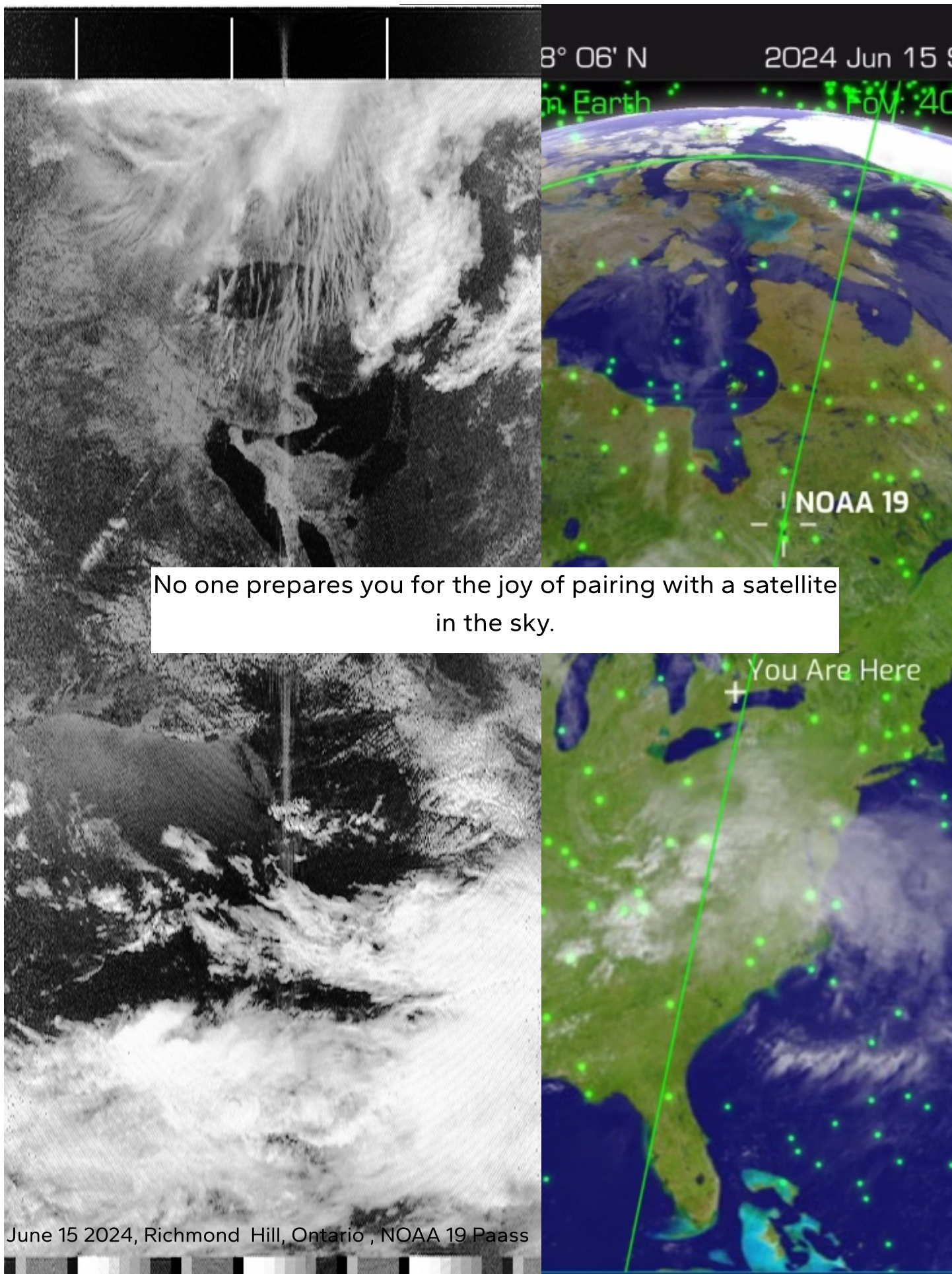
Open Weather is a transnational satellite imaging project lead by ... probing the relationship between bodies, satellites, and weather systems. The artistic experiment follows traditions of feminist citizen sensing and principles of open data and DIY technologies to facilitate embodied and grounded sensing of weather in its entirety.

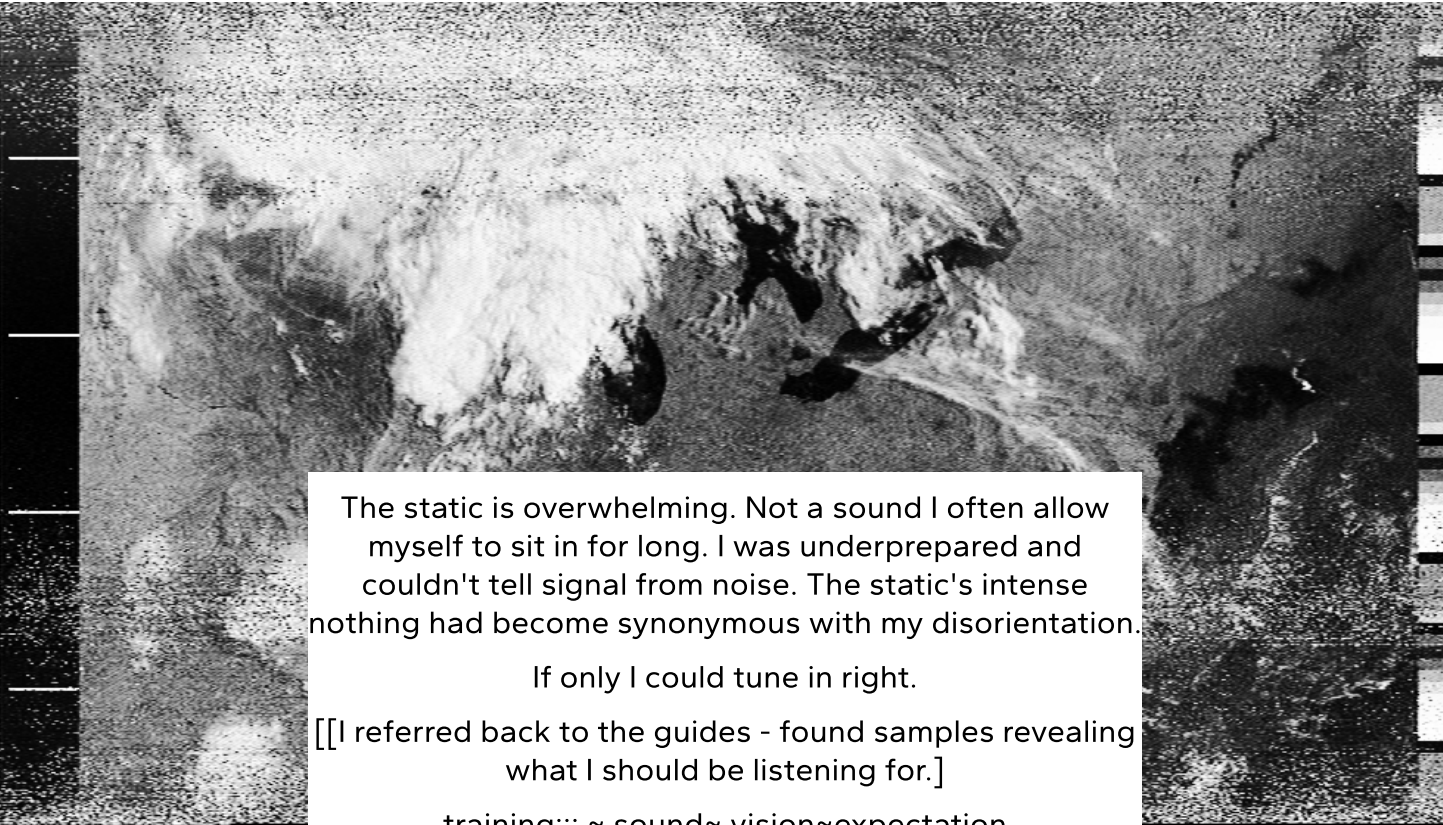
In short, an antenna is used to capture EM signals from NOAA weather satellites' passages. The signal is processed by a dongle and translated into an audio signal, which is then decoded through free software into an image.

Open Weather's methods and procedures subvert the disembodied planetary visualization by bringing bodies back into their nowcasting practice and democratizing these methods beyond communities of expert technical knowledge. The inexpensive toolbox allows practitioners to engage with US operated climate infrastructure, and participate in the imaging and imagination of images of the earth from space. Noise, interference, static and disturbances only enhance the images with situated information.

This ethos is also embodied in Engelman and Dyers' careful compiling of numerous guides that help those with no experience in DIY radio and satellite imaging. While I leave you with their detailed resources on methods and procedures, I have collected some reflections from my experiences with the process.







The static is overwhelming. Not a sound I often allow myself to sit in for long. I was underprepared and couldn't tell signal from noise. The static's intense nothing had become synonymous with my disorientation.

If only I could tune in right.

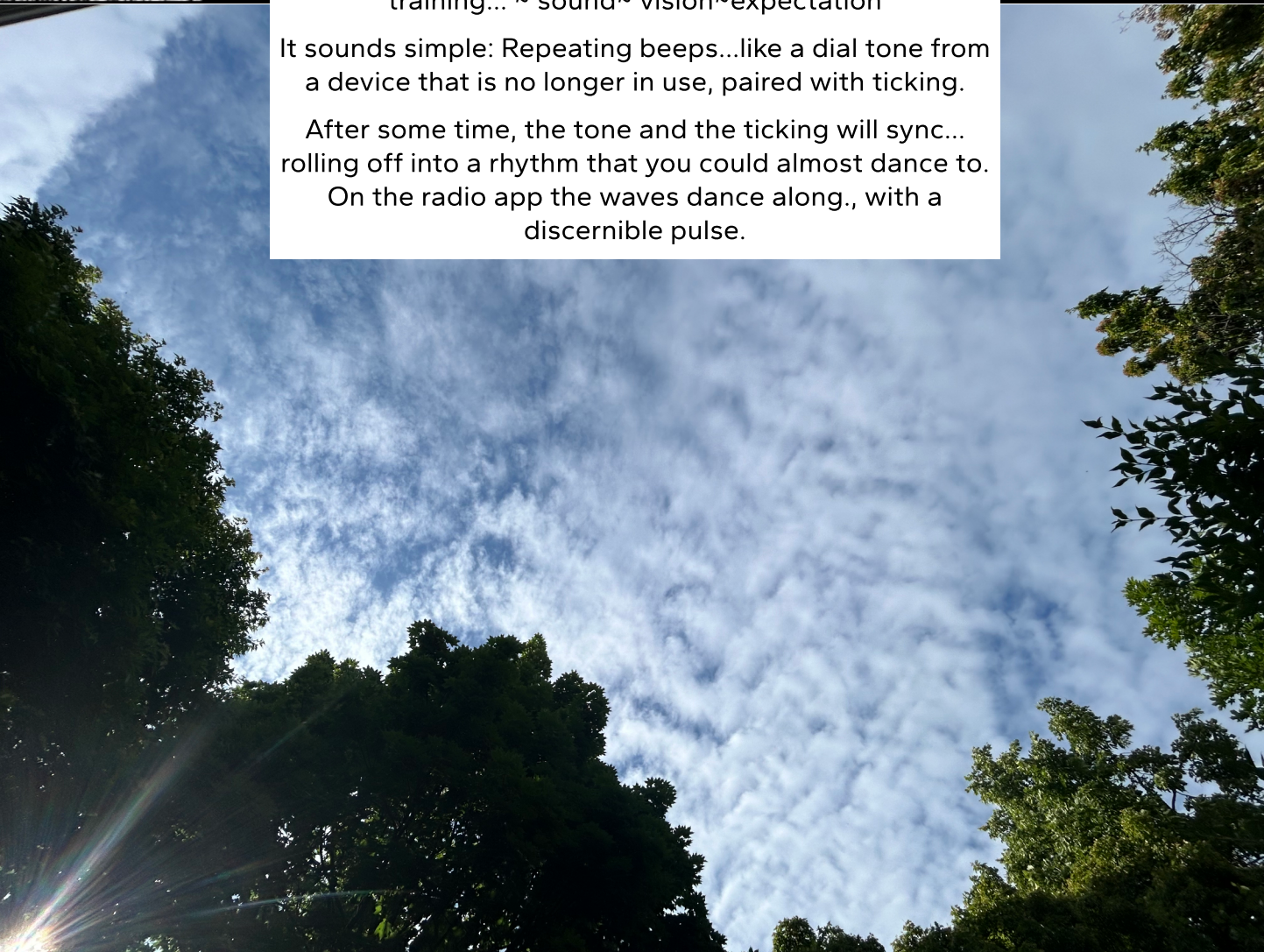
[[I referred back to the guides - found samples revealing what I should be listening for.]

training::: ~ sound~ vision~expectation

It sounds simple: Repeating beeps...like a dial tone from a device that is no longer in use, paired with ticking.

After some time, the tone and the ticking will sync... rolling off into a rhythm that you could almost dance to.

On the radio app the waves dance along., with a discernible pulse.



The Ambient Factory

Kwame Kyei-Boateng

The Ambient Factory is a 3D visualization inspired by Stephen Conlin's "Weather Forecasting Factory," a depiction of Lewis Fry Richardson's Forecast Factory, a fantasized method of weather prediction involving a large, spherical building filled with tens of thousands of human computers busily forecasting the weather.

This conception is created using Unreal Engine (UE), a real-time 3D visualization tool, and Niagara, a specialized VFX tool within UE, used to create visual effects involving particle systems. Ambient light values were collected around Stong Pond using the Arduino Science

Journal app, which allows Android and iOS devices to collect environmental data through their sensors, to create the clouds. The light and shadow data is saved as a CSV file that feeds into the Niagara System to shape digital droplets and vapor into clouds.

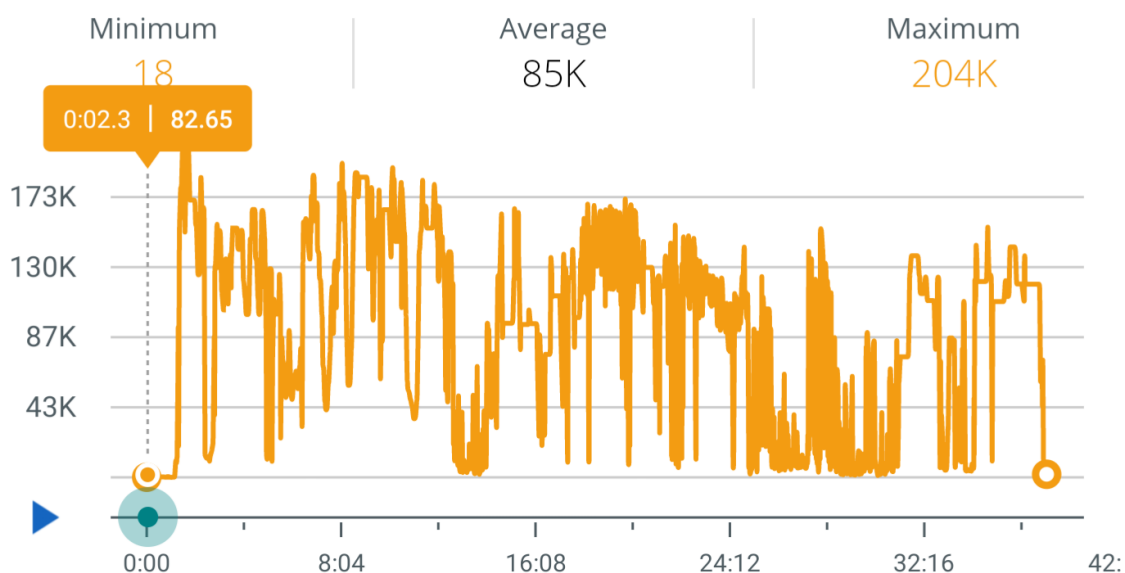
Stong Pond Ambient Light Data

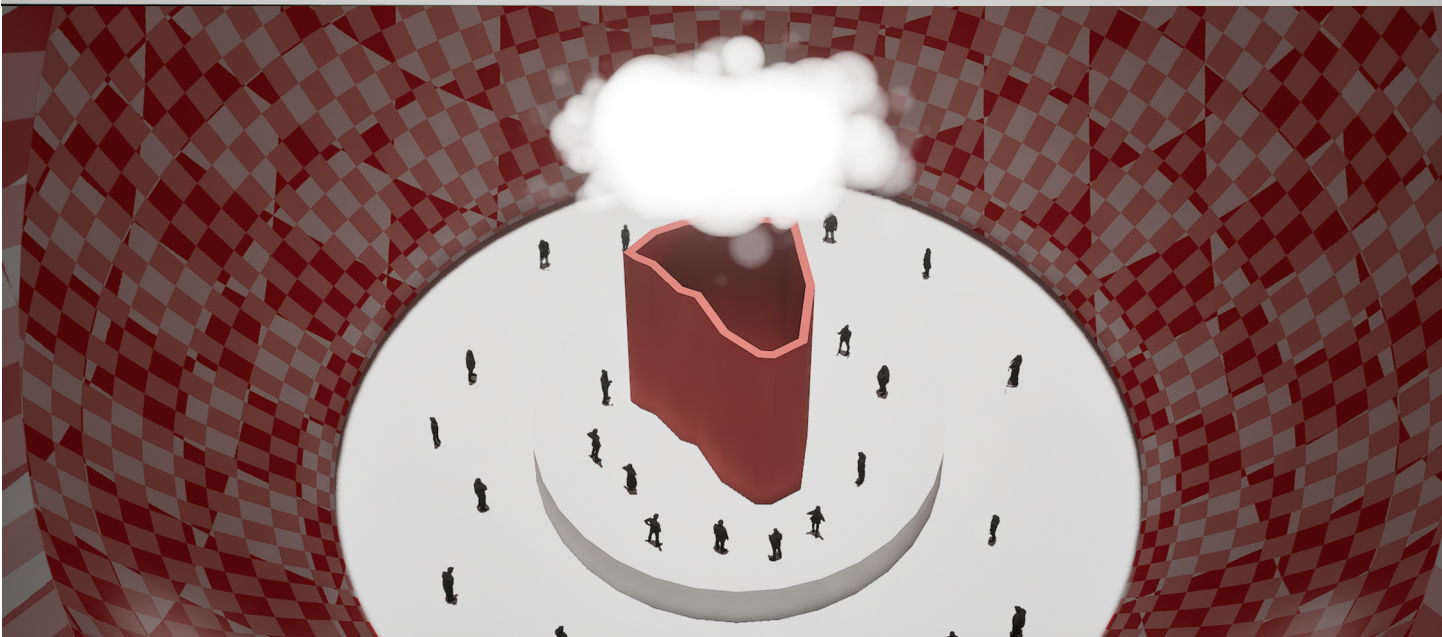
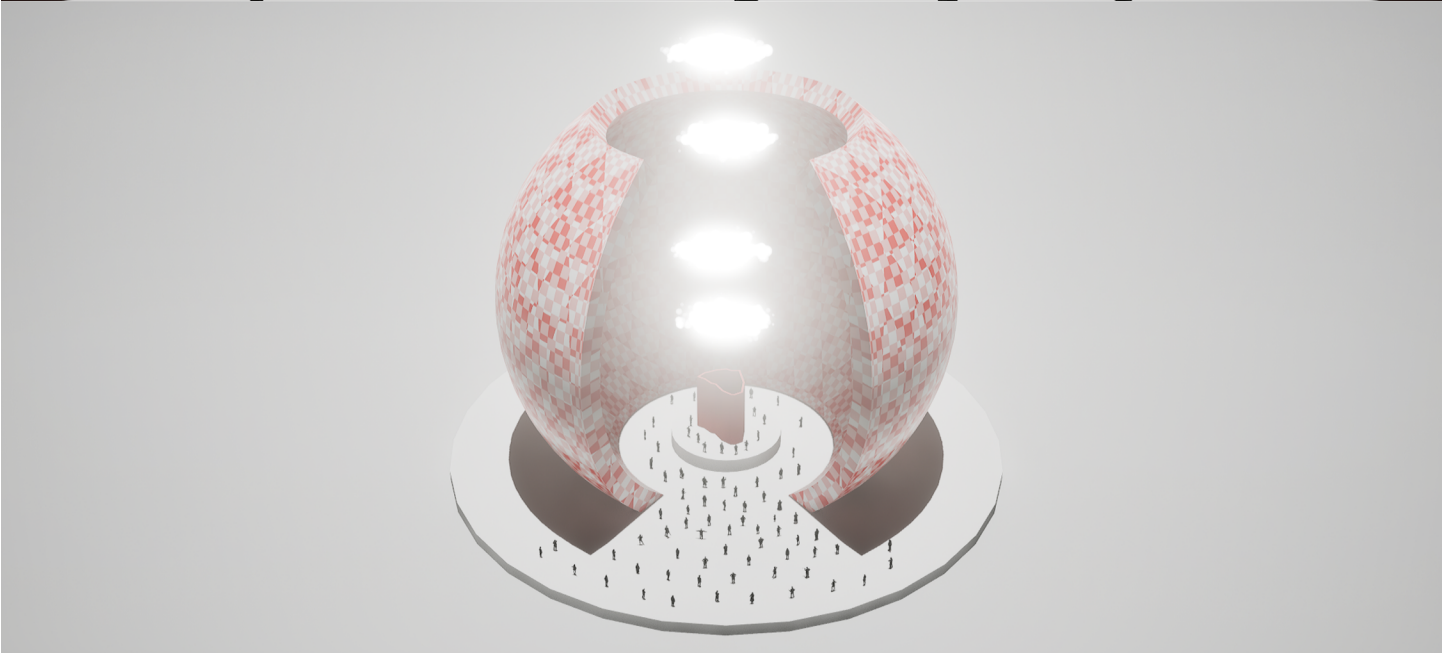
Jun. 12, 11:36 a.m.



37min 24s

Ambient light (lux)





Intero/outero -ception

Methods for the layered capture of environment and affect during

Mark-David Hosale

Thursday, June 20th, 11:45
Five hours and five minutes before Summer Solstice 2024.

The pond is located in the South-West corner of the York University Keele Campus, just South of one of the newest buildings on campus, The Bergeron Centre. It is a location where people often come to get away from the bustle of campus life, lovers go to be alone, and people go to get high. Geese are abundant, there are reeds, a broken dock, a stream with a dam, and trees around the edge. There is no trail to navigate the shore, tall brush is present which is lush in summer and dry in winter. Because of the brush, the coast of the pond is inaccessible at most points. Therefore we walk around the pond as close to the shore as we can.

We begin the journey at a mysterious structure, a high modern bus stop, that is not directly connected to any road with broken benches on its interior, littered with cigarette butts, cannabis containers, junk food wrappers, leaves and dust. Forking trails from structure lead to the pond's edge in one direction, a canopy of trees in another, and back to campus in another direction. The water is home to odd pieces of junk, garbage and algae. A broken desk sits half submerged in the water next to a tire, beer cans are littered here and there. All of which is juxtaposed by a choir rehearsing on the banks, disturbed by our presence, they came to enjoy the beautiful weather and scenery alone.

The goal of this preliminary experiment is to track the experience of circumnavigating an urban pond while tracking several layers of data streams simultaneously. This includes photo and video documentation, satellite tracking, poetry, and location sensing. My focus was on weaving sensor data that exposes activity from within my body (Electrocardiogram [ECG]) with a time accurate

field recording of the environment outside my body, annotated with comments, conversations, and reflections. I analyse the body signals to assess my affective state (valence and arousal, as in (Russell 1980), I am using my long and short-term memory recall (triggered by the sounds of the field recording) to identify the locations I encountered on this journey for self-assessment¹.

Tools used

The process involved two stages. Stage one involved the recording of a journey around the Strong Pond using a field recorder that was simultaneously capturing a stereo field recording of the environment and the continuous electrocardiogram of a subject (see Fig.1). Stage two involved the integration and analysis of the data using custom software tools (see Fig.4).



Figure 1. Mark-David Hosale equipped with a Tascam DR-40, on a boom arm, and The Source by bioMECI, worn around the waist, collecting a simultaneous stereo field recording and his own biophysiology. Wen Luo and Mark-David Hosale are shown (from left to right). Image courtesy of Marcus Gordon (a.k.a. magfoto) ©2024 Marcus Gordon

¹In parallel Wen Luo captured images and recorded time and events that synchronized with these images, as reported in a separate article in this document.

Tascam DR-40, 4-Channel Field Recorder

The Tascam DR-40 (<https://tascam.com/us/product/dr-40>) is a field recorder that captures up to four tracks, using two built-in, high-quality condenser microphones to record on channels 1 + 2, and two line inputs to record on channels 3 + 4. It is possible to record on all four channels simultaneously, with the internal microphones on channels 1 + 2, and the signal from The Source (described below) on channel 3.

The internal microphones are adjustable from XY to AB position, allowing for precise tailoring of the recording for different acoustic situations. For this recording they were placed in the XY position to allow for the inclusion of a windsock (which looks like a fuzzy grey hat on the device, see Figure 1).

The Source by bioMECI

The Source (<http://www.biomeci.com>) is a wearable device that captures and interprets data from people, plants, and fungi, integrating seamlessly with creative software like Max/MSP, SuperCollider, Ableton Live, TouchDesigner, Processing, and Pure Data. It



Figure 2. Pictured above are the basic components of the The Source kit. From left to right, top to bottom there are the electrode leads, audio cable, two straps (large and small), the battery pack (with USB-C charging cable, shown below it), The Source (with USB mini connection cable, shown below it), and electrodes. Image: ©2024 bioMECI

translates biological signals into dynamic digital art in real-time.

The Source was used to collect an Electrocardiogram (ECG) from Mark-David Hosale during the journey around the pond. This is accomplished by applying Electrodes (sticky, disposable pads with a metal piece) to the skin in a strategic place where an electrode lead can clip to and collect signals from the human body.

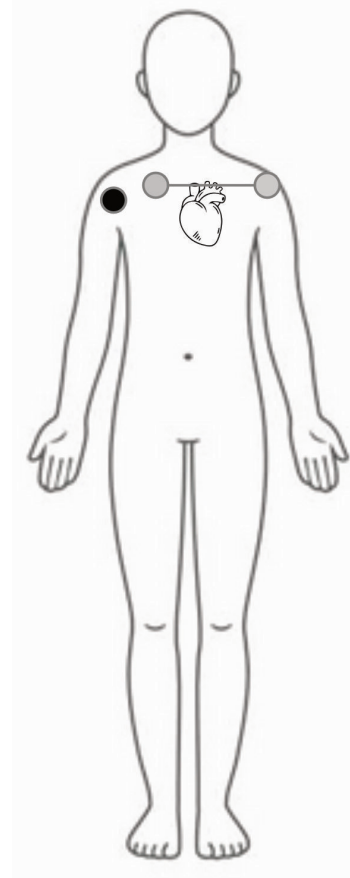


Figure 3. Diagram of the position of a lead 1 electrode placement for ECG. Image: ©2024 bioMECI

In Figure 3 the dots represent the placement of the electrodes. The black dot represents the black lead (reference) and the grey dots represent the grey leads (two poles of a differential signal that is amplified and filtered by the source). The heart can be recorded from multiple directions, depending on what kinds of details you want to capture from the heart. For the purposes for generic heart signal capture a lead 1 works well and is easiest to put on with clothes on.

Figure Patch in Cycling74's Max8 that includes a custom made object from bioMECI for analysis of the ECG signal. The ECG signal and stereo field recording are combined on the lower left.

The Source outputs an audio signal that the Tascam DR-40 is capable of recording, despite the signal from The Source being sub-audio. The DR-40 outputs two stereo files corresponding to channels 1 + 2, and 3 + 4 respectively.

Integration And Analysis Of The Data Using Max8

The separate, synchronized, audio recordings collected by the Tascam DR-40 were re-integrated using Max8, an application-level tool for artists that facilitates the arbitrary integration of audio and visual media with interactive interfaces in real-time using a visual coding logic and integrations with several programming tools and platforms (see Figure 4). In Max8 it is simple to create a tool that triggers the playback and allows for sample level seek on two sound files simultaneously (left side of Figure 4). Once this integration was accomplished the field recording (channels 1 + 2) was outputted directly to the computer's audio outputs, and the biophysical signal recorded on channel 3 was sent to the *biomeci.ecg~* object for analysis.

biomeci.ecg~is a Max8 object developed by bioMECIfor analyzing ECG signals from The Source. The object takes a raw/unfiltered ECG from The Source and provides several signals that correspond to raw ECG (bi-polar signal of

the heart), cooked signal (uni-polar signal that emphasizes the R-wave of the ECG), heart rate in beats-per-minute, R-to-R delta time in milliseconds, an ECG derived respiration signal, and respiration rate. From this complement of signals further analysis can be executed that will provide an estimation of valence (positive and negative affect) and arousal (level of excitement) as described in Russell 1980.

Results

The primary objective of this preliminary experiment was to integrate sensor data reflecting both internal bodily states and external environmental interactions, providing a comprehensive analysis of the subject's affective state during the journey. During the recording stage, the Tascam DR-40 simultaneously captured environmental sounds and ECG data from the subject (Mark-David Hosale). In the integration stage, the synchronized recordings were processed using Max8 software, allowing for real-time interaction and analysis of the audio and biophysiological data. Custom tools developed by bioMECI facilitated the detailed analysis of the ECG signals, providing insights into the subject's affective states based on the Russell model of valence and arousal.

The integration of these tools facilitates a nuanced understanding of the interplay

between internal physiological responses and external environmental stimuli during the circumnavigation of the pond. External events and self-reporting (narrations during the field recording) can be accurately synchronized with the biophysiology of a subject. This can be further enhanced by contributing to the array of simultaneous recordings, such as weather, photo journalism, satellite, etc. that are described in this journal to provide a subjective and objective multi-dimensional lens that extends from the beating of an individual's heart to the near orbit view of the Earth provided by a satellite image.

References

- Max8, Cycling '74, <https://cycling74.com/products/max>. Last Accessed July 11, 2024.
- Russell, James A. "A circumplex model of affect." *Journal of personality and social psychology* 39, no. 6 (1980): 1161.
- The Source by bioMECI, <https://biomeci.com/>. Last Accessed July 11, 2024.
- Tascam DR-40, <https://tascam.com/us/product/dr-40/>. Last Accessed July 11, 2024.
- .

DIY Analog Sensors

Guide to creating low-cost environmental sensors

Grace Grothaus

In electronics you aren't limited to the components you can purchase from manufacturers. The possibilities open wide when you realize you can also make your own. In this simple guide we will **fabricate sensors that can detect environmental data using materials that cost only a few dollars** and many of which you may already have at home.

In this step-by-step guide, **we will fabricate sensors that can detect animal footsteps, raindrops, soil moisture, and wind** and then learn to read their values using Arduino.

The data from these sensors can be used as input for actuators in physical computing projects or they can be triggers for screen-based animation or music - the options are wide and varied. Using the principles learned from this tutorial you can also go on to invent your own sensors or even turn sculptural artwork into a sensor as part of a larger work or installation. In a world in which human-induced changes in our environment are ever more pressing, these methods provide ample opportunity to make art that is not only about the environmental but is a real-time expression of it.

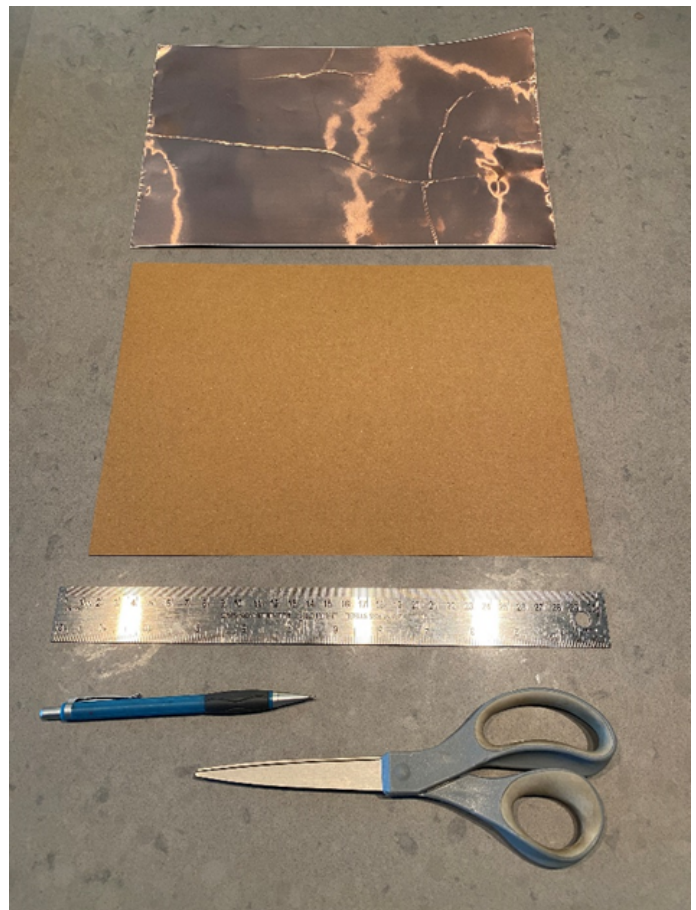
PART 1: SENSOR FABRICATION MATERIALS

The materials needed for the four sensors described in this guide are:

- card stock or thin cardboard
- printer paper (or other type of thin paper)
- copper adhesive sheet (or substitute aluminum foil and adhesive)
- pencil
- scissors
- a ruler
- tape
- a kitchen sponge

As well as some soldering basics and an electronics component:

- soldering iron
- solder
- wire stripper
- multimeter
- a few jumper wires
- and a basic photocell such as this: [Mini Photocell - SEN-09088 - SparkFun Electronic](#)



Raindrop Sensor

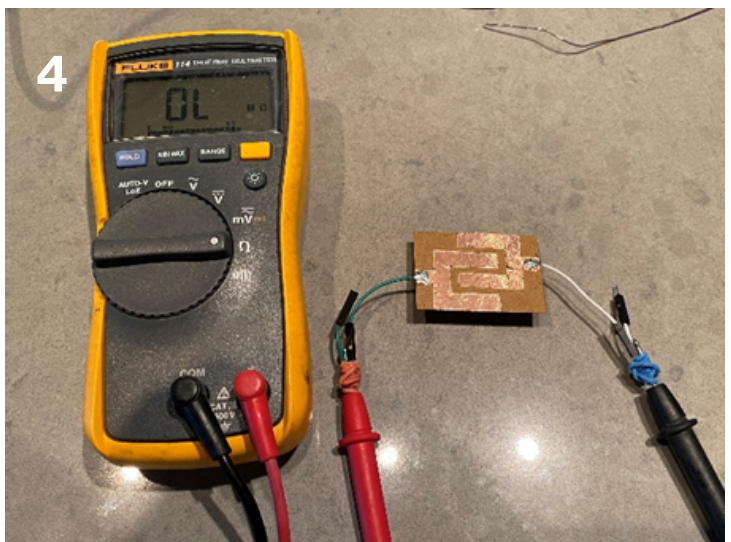
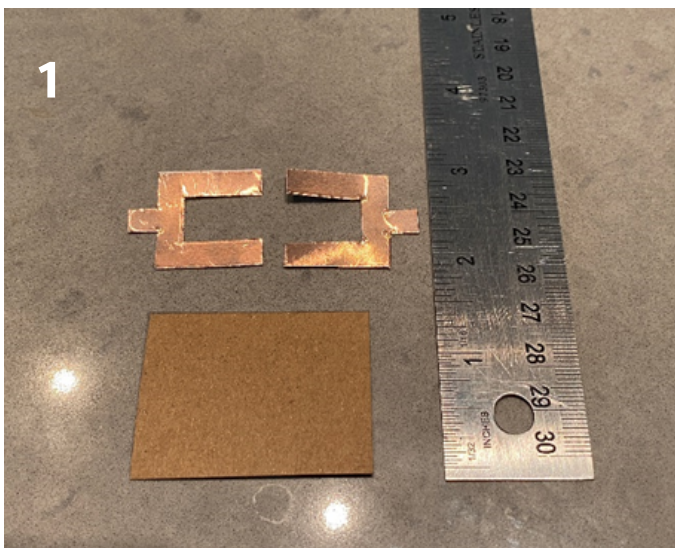
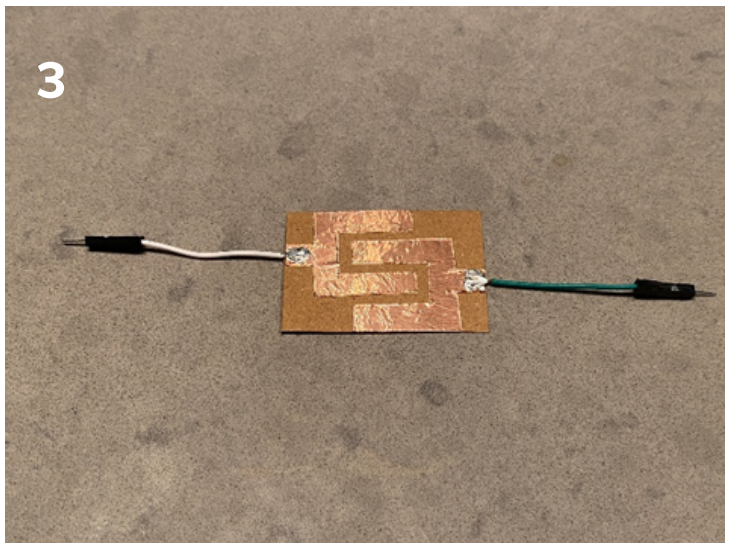
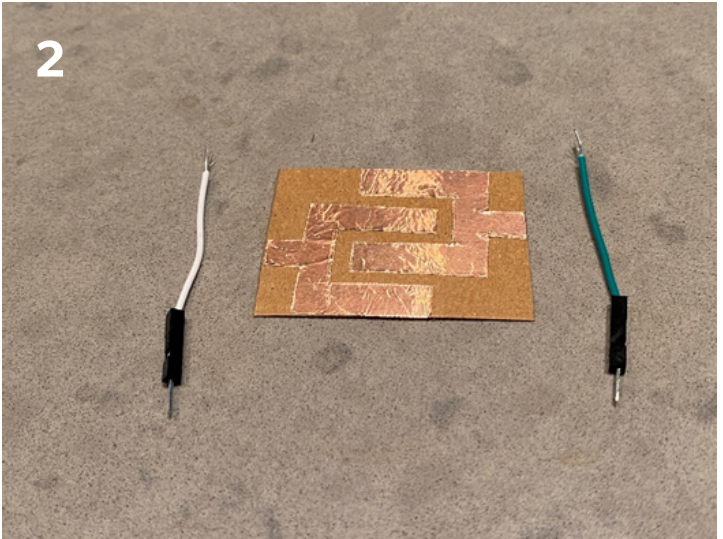
1. Cut card stock into a small rectangle. The dimensions I used are 1 1/2" x 2". Cut two pieces of adhesive backed copper (or aluminum foil) into two "U" shapes as shown here. This shape can take many forms. The main idea here is that there are two pieces of foil interlaced with a narrow gap of card stock separating them. The width I used is 1/4".

2. Adhere the foil on the card stock, as shown. Next, we will need a couple of wires to lead out from these sensor pads. Cut two jumper wires in half and strip a short length of the protective plastic off of each of the cut ends, as shown here..

3. Solder two different coloured jumper wires to each of the two metal pads, as shown.

4. Let's measure the resistance of our newly created sensor. Plug the two wires into separate rows on a bread board and plug the leads of a multimeter into the same rows, or measure directly from the jumper wires.

When the multimeter is on and placed on the setting to measure resistance (as indicated by the Ohm symbol), we will see infinite resistance. However, when water is sprinkled onto the sensor surface, in simulation of rain current is able to pass through and will show up on the multimeter. When placed on the ground outside this sensor will be able to detect raindrops.



Footstep Sensor

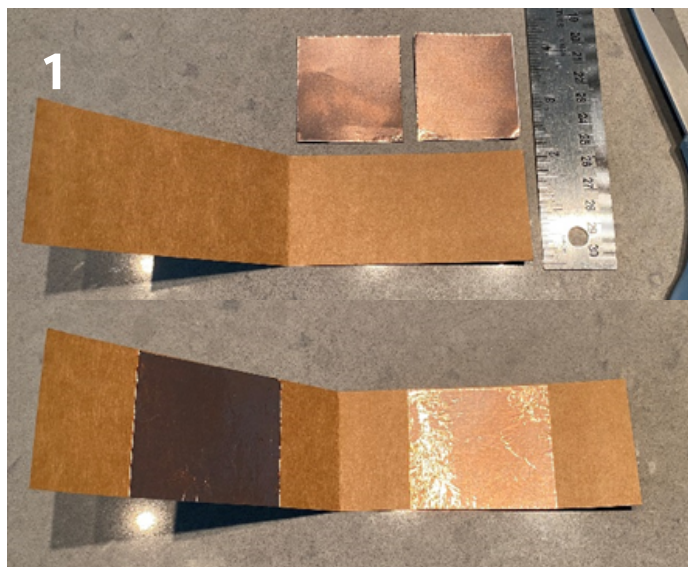
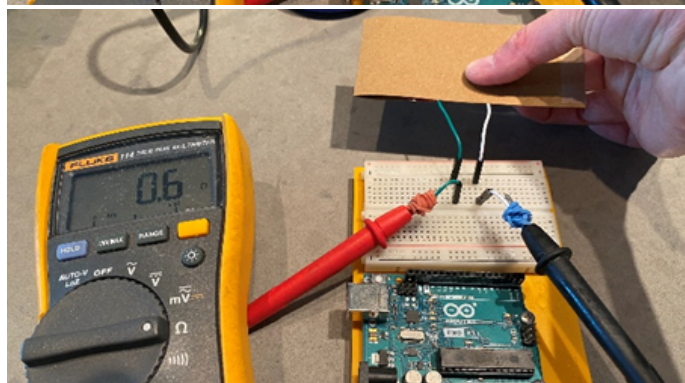
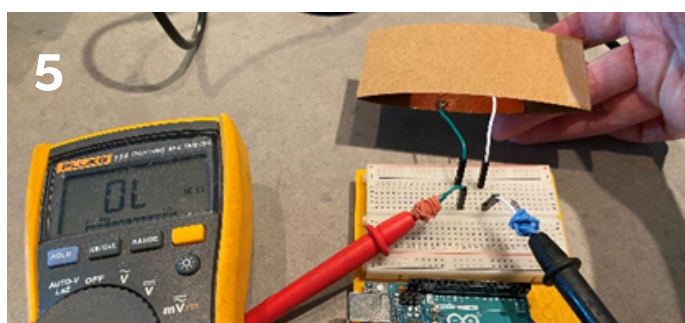
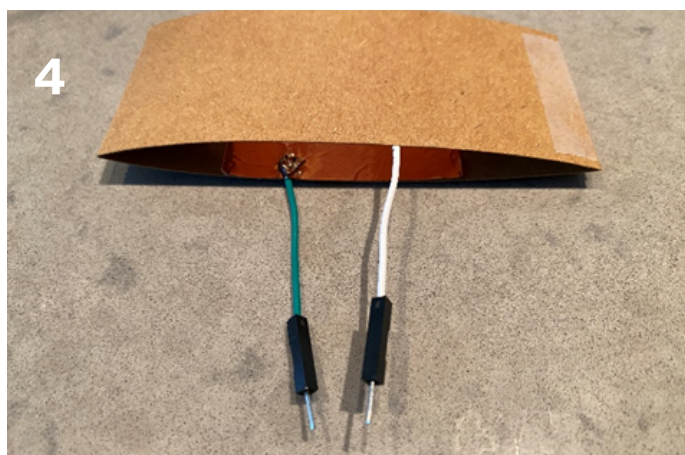
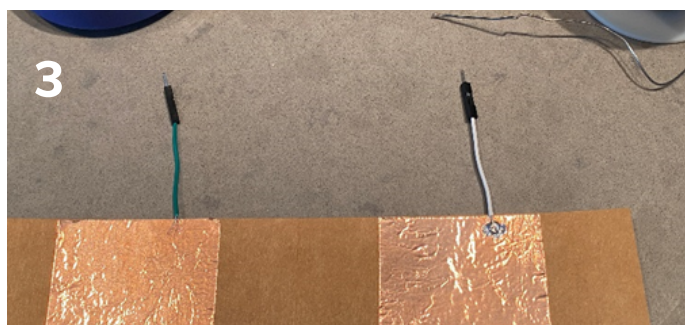
1. Cut a section of cardstock into a long, narrow rectangle. The dimensions I used are 2" tall by 8" wide. Fold it in half, lengthwise. Cut two pieces of adhesive backed copper (or aluminum foil) into squares roughly half the width of one of the folded halves of paper. The dimensions shown here are 2" x 2". Adhere the copper or aluminium foil in the middle of each of the folded paper halves, facing each other.

2. Cut two jumper wires in half and strip a short length of the protective plastic off each of the cut ends. These will lead out from these sensor pads.

3. Solder two different coloured jumper wires to each of the two metal pads.

4. Fold the paper stock in half and secure the two sides together with a piece of tape.

5. Let's measure the resistance of our newly created sensor. Plug the two wires into separate rows on a bread board and plug the leads of a multimeter into the same rows, or measure directly from the jumper wires. When the multimeter is on and placed on the setting to measure resistance (as indicated by the Ohm symbol), we will see infinite resistance. However, when the two sides are pressed together (above image on right), current is able to pass through and will show up on the multimeter. When placed on the ground outside this sensor will be able to detect the footsteps of animals passing by.



Soil Moisture Sensor

For this next simple sensor, we will need a sponge and two jumper wires.

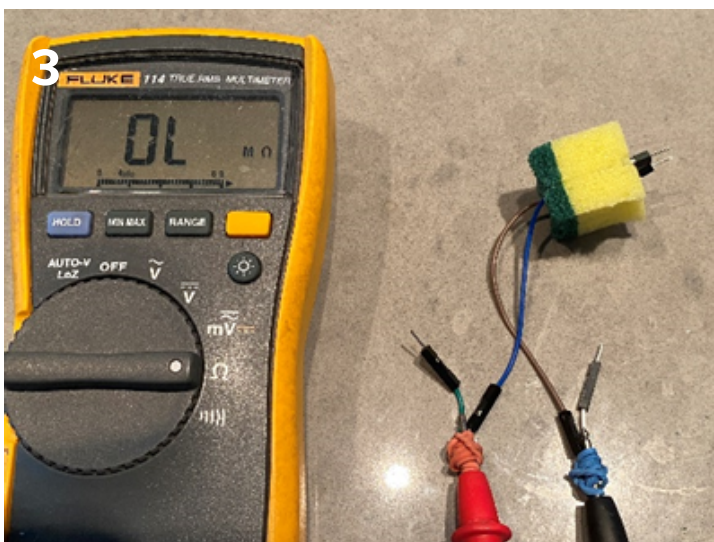
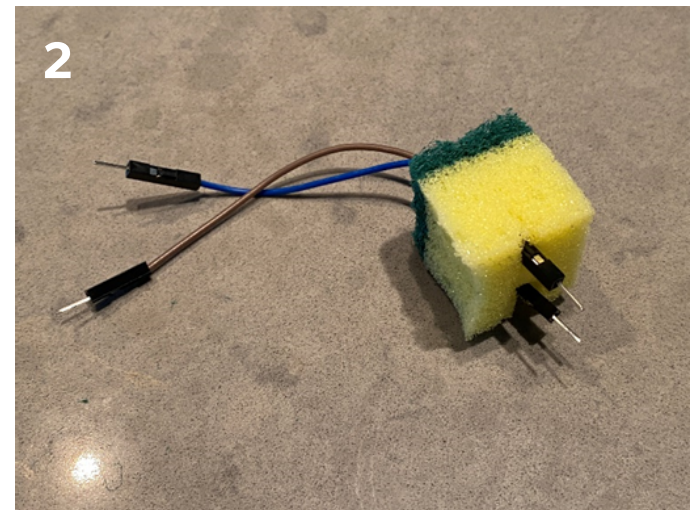
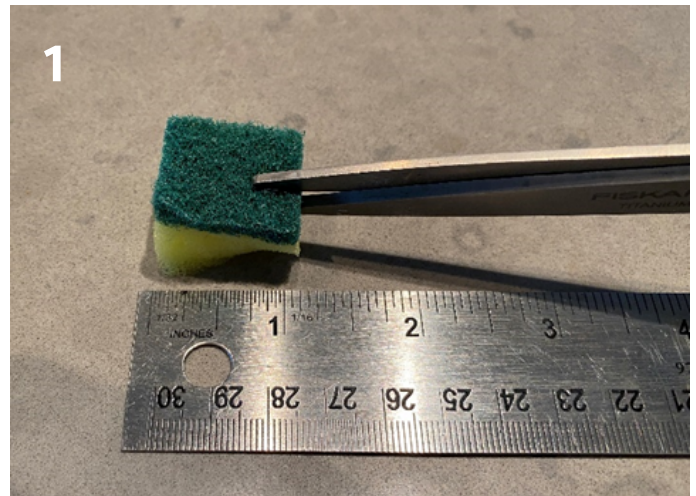
1. Cut a small section of the sponge into a square. The dimensions used here are 1" x 1". Cut into the sponge approximately 1/4" on two sides of the square that are facing each other.

2. Insert the two jumper wires into the cuts in the sponge.

3. Let's simulated how this sensor will work in the soil. Plug the two wires into separate rows on a bread board and plug the leads of a multimeter into the same rows, or measure directly from the jumper wires.

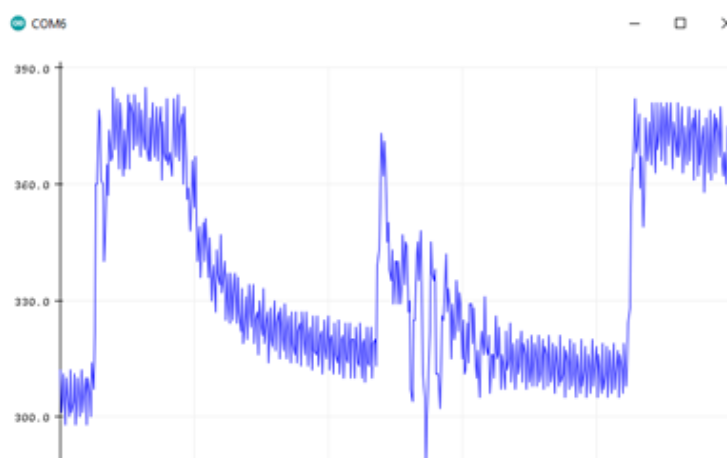
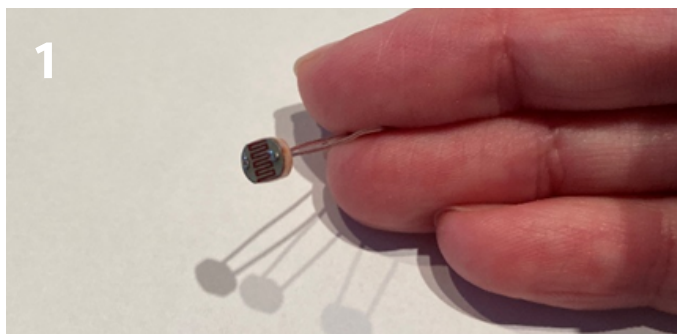
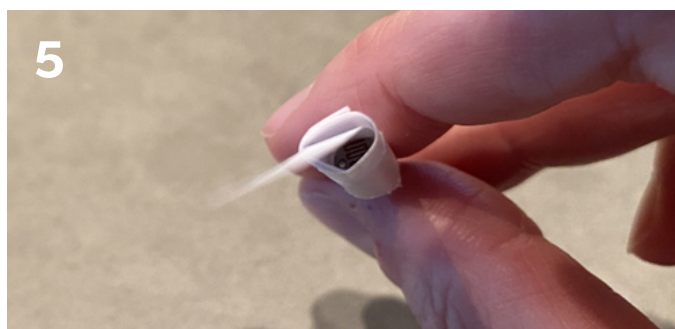
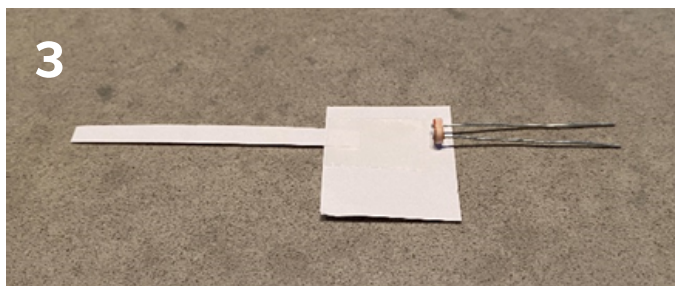
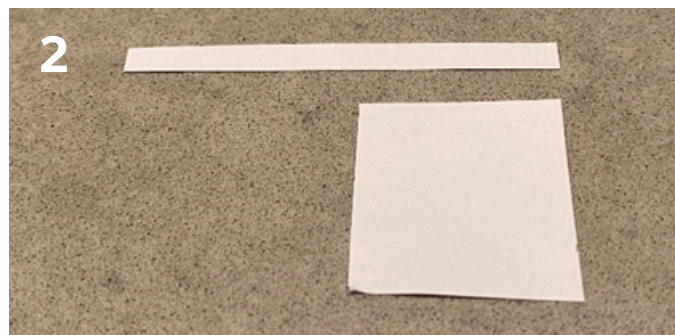
When the multimeter is on and placed on the setting to measure resistance (as indicated by the Ohm symbol), we will see infinite resistance.

However, when we touch both of the jumper wires at the same time, we will see a resistance value on the multimeter. This simulates the conductance that wet soil will provide.



Wind Sensor

1. For the wind sensor we will start with a photocell, a simple light sensor that costs around \$0.25-\$1, and some paper.
2. Cut two pieces of paper, one into a rectangle and the other a long narrow rectangle with a height equal to the photocell's width. The dimensions used here are a 1" x 1" square and a 1/8" x 2" rectangle.
3. Lay both the paper rectangle and the photocell on the same end of the square as above. Tape the two pieces of paper together.
4. Roll the paper square tightly around the photocell and tape it in place, as shown here.
5. Now blow on the rectangle of paper along the top end and you will see how wind will vary the amount of light coming into the photocell. This will result in varied values of resistance as shown below on this Arduino graph. In the following section, we will step through the process of reading the values of these four sensors in Arduino and explore some of the ways this data can be logged and/or used in real-time.



```

sketch_may17a_simple_Diy_enviro_sensors_tutorial | Arduino...
File Edit Sketch Tools Help

sketch_may17a_simple_Diy_enviro_sensors_tutorial
1 int analogPin = 0; // The analog pin your sensor is connected to
2 int val = 0; // variable to store the value read
3
4 void setup() {
5   Serial.begin(9600); // setup serial communication
6   pinMode(analogPin, INPUT_PULLUP);
7 }
8
9 void loop() {
10  val = analogRead(analogPin); // read the input pin
11  Serial.println(val); // Write value to serial console
12 }

```

PART 2: Reading Sensor Data

If you are new to Arduino and need assistance getting their IDE setup, please visit [Arduino Docs](#) | [Arduino Documentation](#) and follow their “Get Started” guide.

Open Arduino and create a new sketch using the following simple program which enables the analog data from your newly created sensors to be read, and later used in data visualizations/sonifications.

```
int analogPin = 0; // The analog pin your
sensor is connected to

int val = 0; // variable to store the value read

void setup() {
  Serial.begin(9600); // setup serial
  communication
  pinMode(analogPin, INPUT_PULLUP);
}

void loop() {
  val = analogRead(analogPin); // read the input
  pin
  Serial.println(val); // Write value to serial
  console
}
```

At the top of our sketch we create two variables, one named ‘analogPin’ which should be equal to the pin number on the Arduino that you connect to (Ex. A0 or A1), and another variable names ‘val’ that we can store the incoming data on:

```
int analogPin = 0; // The analog pin your
sensor is connected to

int val = 0; // variable to store the value read
```

In setup we will let the software know which baud rate we will communicate on. When viewing the incoming data in serial plotter or serial monitor, make sure this baud rate matches. 9600 is the most common to use but you can also read at 11520 bits per second or another rate if desired. Also, using ‘pinMode’ we will declare which pin we are connecting a sensor to and that it is an input rather than an output. Using ‘INPUT_PULLUP’ rather than simply ‘INPUT’ will also initialize an internal resistor in the Arduino board which will protect it from receiving too much current at once.

```
void setup() {
  Serial.begin(9600); // setup serial
  communication
  pinMode(analogPin, INPUT_PULLUP);
}
```

Lastly, in loop we will set our variable ‘val’ equal to the values coming in from the sensor by using ‘analogRead’ and ask that value to be printed to serial at the speed of the baud rate we chose in setup.

Because the ‘void loop’ function loops continuously, the changing values from our analog sensor(s) will continuously change as well, which we can use in software such as TouchDesigner, Max MSP, PureData, Processing, and many others to create real-time changing sounds and visuals for our very own environmental data visualizations and sonification. Visualizing and/or sonifying data is not only interesting and useful in art but has also been used by scientists to help with data analysis.

Now try out one of the sensors you just made outdoors and have a look at its incoming data using either Serial Plotter or Serial Monitor!

PART 3: Setting up the Sensors

For this guide, I cited all four of the sensors at Stong Pond, on the campus of York University

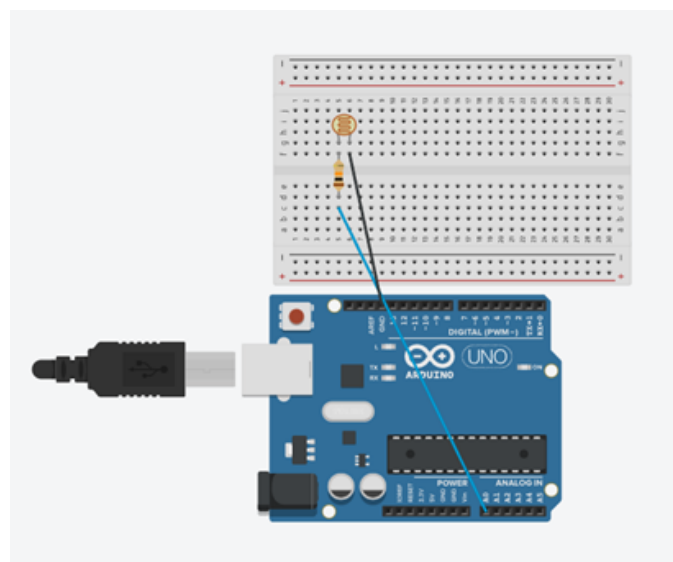
Now we are ready to set these up outside to receive streaming data for use in artwork. That could be an environmentally responsive sculpture in a remote gallery, a real-time animation or sound work, a game that incorporates the environmental data, or anything else you envision. In a world in which human-induced changes in our environment are ever more pressing, these methods provide ample opportunity to make art that is not only about the environmental but is a real-time expression of it.

Here a diagram that shows how all four of these DIY sensors we have made should be connected to the Arduino microcontroller via analog pin A0. Any of the analog pins will work, but be sure to make changes in the code if doing so. It's a simple set-up and includes only a 10k Ohm resistor to protect the arduino. We have also initiated the internal "pull-up" resistor in our code above, but this offers helpful additional protection..



.MOISTURE SENSOR

Below is the moisture sensor. The more moisture the sponge absorbs, the lower the resistance and the higher the millivolt readings that can be observed in Arduino and used as variables in artworks.



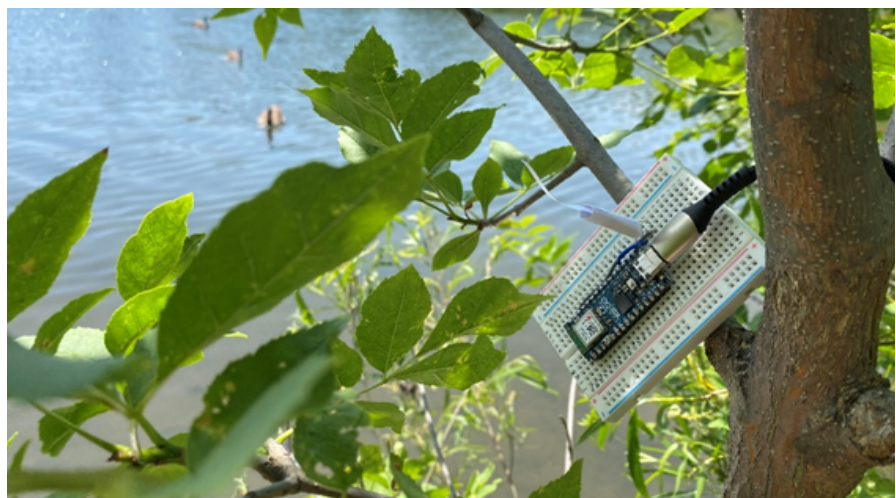
Footstep Sensor

For the footstep sensor, I cited it under a leaf along a narrow path through the grass. When animals (or people) step onto it, the sensor will log it. Please note, that waterproof housing is necessary for leaving electronics outside for a long time, which is not shown below. For long term remote sensing, I recommend water & dustproof electrical junction boxes (IP66 rating) and airtight cable glands, such as this one below:



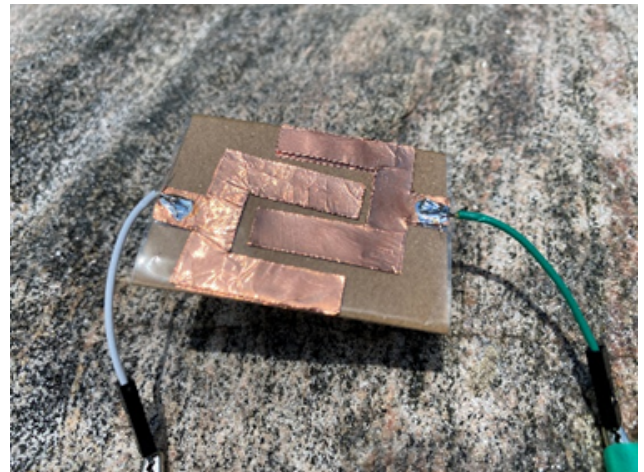
Wind Sensor

As the wind blows the wind sensor, as shown in the video below, the amount of light reaching the photoresistor changes and the variable millivolt reading can be read through an analog pin of the Arduino.



Raindrop Sensor

The raindrop sensor is shown below with just a breadboard and power bank, but again, if logging for any length of time, use an IP rated container for everything but the raindrop sensor itself.



Suggested next steps:

1. Log your environmental data for later use or condensing into a time elapse. My recommendation is Arduino's cloud agent because of it's ease of use, extensive tutorials and supportive community, but there are many options online or later you can learn to create your own.<https://app.arduino.cc/>
2. Stream the data from Arduino to TouchDesigner for environmentally generative real-time graphics, video manipulation and more. A good place to start is the following tutorial, and there are others online as well.
[https://derivative.ca/community-post/tutorial/how-use-touchdesigner-arduino](https://derivative.ca/community-post/tutorial/how-use-touchdesigner-arduino-together/65273)
3. [-together/65273](https://derivative.ca/community-post/tutorial/how-use-touchdesigner-arduino-together/65273)
4. Stream the data from Arduino into Max MSP, a great software choice for not only audio and data sonification but animations and video playback as well.
<https://maker.pro/arduino/tutorial/how-to-send-and-receive-data-between-an-arduino-and-maxmsp>

There are many other options as well including Processing, PureData, Unreal Engine and Godot Engine - the choice is yours!

Machinic Observation System for Weather and Atmosphere

In Conversation with Chat GPT

Marcus Gordon



Can you describe the weather in this photo and describe the atmosphere?

Certainly! The photo depicts a scene of calm and somewhat overcast weather. The sky is covered with a layer of gray clouds, suggesting the possibility of rain or that it has recently rained. The overall lighting is muted, giving the scene a subdued and tranquil atmosphere. The air likely feels cool and damp due to the cloud cover and potential recent precipitation. The atmosphere in the photo is peaceful and somewhat reflective. The gray tones and absence of strong sunlight create a serene and contemplative mood. There is a sense of

stillness in the scene, as if the world is quietly waiting for something, or perhaps simply resting. This kind of weather often evokes a cozy, introspective feeling, inviting people to stay indoors with a warm drink or take a quiet walk to enjoy the calm surroundings.

How would you translate this into poetry?

Gray clouds blanket the sky,
Whispers of rain lingering nearby,
A muted light, soft and shy,
Holds the world in a tranquil sigh.

The air is cool, the ground is damp,
Nature's quiet, a peaceful camp,
Stillness settles like a gentle lamp,
In this calm, thoughts revamp.

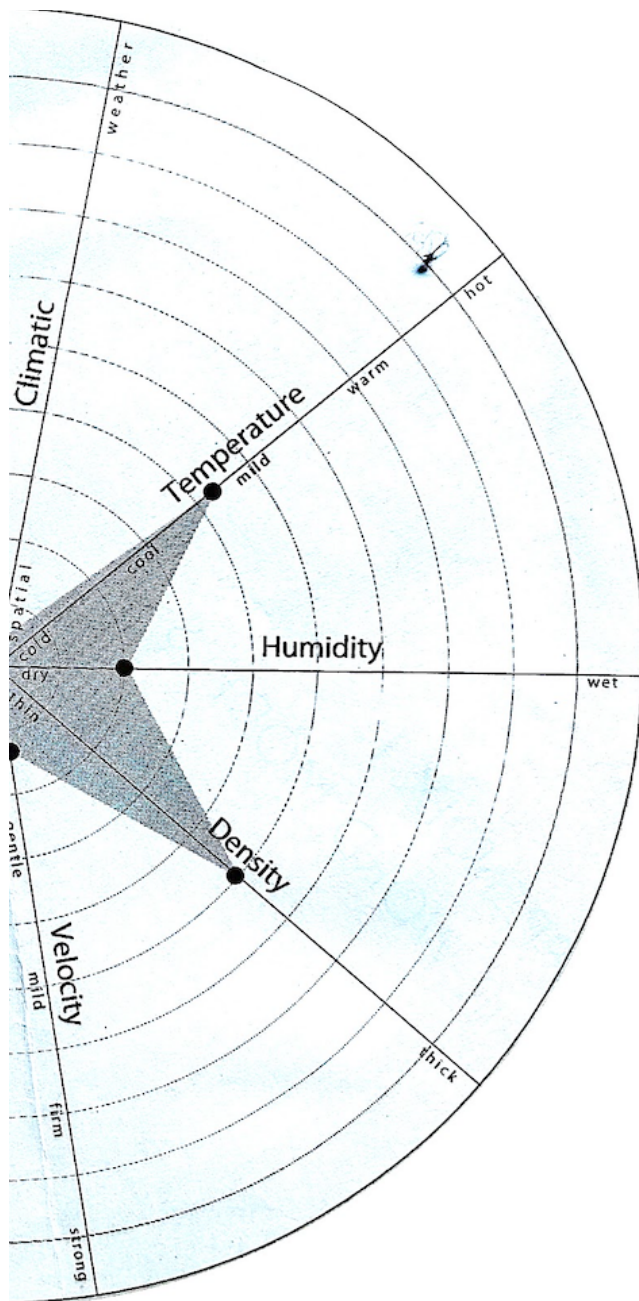
The day rests in a subdued hue,
Inviting moments old and new,
In quiet reflection, skies askew,
A contemplative mood ensues.

Here, in the gray and soft repose,
The world in gentle pause does close,
Wrapped in serenity, it shows,
The beauty in stillness that grows.

Minutecasting Atmospheres and Microclimates

An Exercise of Remote Sensing and Aesthetic Perception

Aftab Mirzaei



Nowcasting refers to localized forecasts focused on thunderstorms, rainfall, and other short-term weather events in meteorology. These forecasts are derived from radar and satellite observations of local atmospheric conditions, which are processed by meteorologists using computer models. These models leverage accumulated expert knowledge, enabling meteorologists to produce quick and consistent forecasts across large areas.

Historically, however, knowing the mechanics of the sky and the characteristics of the weather was about intimate observations of the environment and sensitivity to patterns across different scales. Knowing the weather and environment was grounded, experiential, embodied, and often more than human.

Our Minutecasting training module was created with the guidance of Tomie Hahn, an artist, ethnomusicologist, and expert in embodied cultural knowledge, senses, and transmission. This exercise aims to attune practitioners to the thickness of microclimates and the affective atmospheres that surround them. The training is rooted in aesthetic perception and practice as a capacity to perceive and be *concerned*—a capacity to make oneself sensitive to atmospheres that contain and shape everyday life, politics, and possibilities. **In the following pages, we share a few examples from our Winter 2023-2024 training, followed by a guide to conduct your own program.**

Minutecasting

For Trainers

1. Schedule a number of alerts to send to participants. The pings prompt participants to attune to their atmosphere through a specific sense/modality. Share the following instructions with the participants:
2. Upon receiving the prompt, close your eyes and take 30-60 seconds to focus on the surrounding atmosphere.
3. You can choose to do this through one or more modalities (i.e. vision, sound, smell; you can follow the light, listen to the wind, sense the air, temperature, humidity, movement)
4. Take a few minutes to express your experience in a few words, whether handwritten or typed. You can also draw, photograph, or use any other medium and send it to me. At minimum, a few words are required.
5. Tag your entry with relevant geographic information so that your Minutecast can be paired with meteorological data.

Practical considerations

- Ideally, 4-5 recordings should be made.
- Submissions can be made through email, WhatsApp, or whatever else works for ease and comfort.
- Participants may not be able to respond or send their response exactly when you receive the ping. We ask that you record something as soon as you can and send it when possible

November 29, 2023, 6:20 PM IST, in Santiniketan, India (specifically in the Ballavpur area)

AC

I am in my childhood home, upstairs, there is a fluorescent light buzzing. Spotify is playing "Noor" by the Gobi Desert Collective. The air is still, but cool and dry. My feet are on blankets and my back is on pillows. There is a faint smell of flowers - I am not sure if that's real or from the detergent. Textures are all around very soft, but my body feels tense and lost. I am tired and want to be alone and rest for a long time. It's dark outside and the fluorescent light in my room and the darkness outside tells me that it's later in the year on the eve of winter, when it will only get drier and cooler.



23/11/23 10:57pm - bedroom, Maldon

19C and cooling after a high of 29C. no wind.

AW

In this room there are three small lamps lighting the rough mud brick walls different shades of muted yellow. One is low wattage Ikea, one is a traditional oily ex-kitchen lamp (Johns') and three is a shapely BenQ computer E-screen lamp with colour temp adjustment, tilt adjust, set to be nearly as warm as the others. I am wondering if "playing yellow" is stressing it out. I imagine it now must idle at a speed that makes it emit an inaudible but stressful ultrasonic frequency that only bats can hear. And I know It is doing this for my benefit. Soon I will turn it off by tapping the touch sensitive ring at the top of it, and it will pass on a mild electrocution to which I have become accustomed.

sound: public broadcaster approved classical music plays quietly from the adjoining bedroom off an iPhone (bothersome). literal crickets outside. corrugate roof metal cooling with occasional creaking.

Performative Gesture of Mediation

Engaging with Haunting Representations of Environmental Phenomena

Nava Messas Waxman & Hiromune Kubayashi

We live in a post-epoch time where human activity now dominates the climate and environment, its influence present in every ecological interaction and every aspect of our surroundings. This era is marked by profound changes and challenges, altering the very fabric of the natural world in ways that are both visible and hidden.

Even this picturesque and pastoral pond feels like a deceptive envelope that has buried beneath it stories and names, events and natural processes that occurred here before everything was coated in feigned



[Link to video, 2:35 minutes, sound.](#)

Strong Pond is a human-made body of water, specifically designed for retention of stormwater and flood protection in the York University campus area.

This pond elicits for me a mixed feeling, shivers of memory clashing with greenery, visual quietness, and grey noises. Despite being a location that students appear to value, its state of disrepair implies neglect. Issues such as contaminated water, trash, and dirt are apparent, detracting from its aesthetic and ecological value.

The Pond also serves as a vital water source for local wildlife, providing a habitat for various species. However, it's disheartening to observe geese and ducks swimming in murky water, a stark reminder of the environmental impact we have on even the most tranquil places.

In reflecting upon the pond, one can't help but consider the broader implications of human influence on nature. The pond, with its dual role as a functional infrastructure and a wildlife habitat, symbolizes the complex relationship between human needs and environmental stewardship. It stands as a testament to both our capability to engineer solutions and our responsibility to maintain and protect the natural world we alter.

In her work "Ghostly Matters," sociologist Avery Gordon uses haunting as a research method to examine a present marked by a past insisting on a seething presence. For Gordon, haunting challenges traditional scientific methods by recognizing the disquieting presence of what appears to be absent. This concept, known as hauntology, offers a method for artistic research to explore the fleeting but powerful specters that linger amidst environmental crises. Through repeated visits and collaborative encounters at the pond, I've sensed an unsettling, uncanny presence haunting its surroundings. Returning to the Strong pond environment at York University campus invoked awareness of our embodiment interwoven with environmental and invisible entities.



My body is learning to sense the place,
the pond on the other side of the world.
Arriving after crossing through the Atlas
Mountains in Morocco a few months ago,
I stand facing a field of stones at the
foot of the mountains, and everything seems
ostensibly pastoral. A deep tremor in the heart,
and a silent. An attentive
stance to realize that I did not arrive here
by chance. The field of stones I'm walking
on is an ancient Jewish cemetery where my ancestors are buried, including
great-grandmother, and
an aunt who died at the age of three, whose burial
site is unknown. As I walk, I observe and
identify a marked engraving on a
tombstone, and here is another stone that
has rolled down the field slope, inscribed in Hebrew. Not far from here, a stream that crosses between
the Atlas Mountains and the ancient cemetery passes. Over
seventy years, the stream has
shifted its course towards the burial field,
and with the force of
the water and the flooding, the stream
has washed away the tombstones, blurring this
sacred place. The stone tombstones, made of rocks,
are no longer in their place; they have detached
from the burial site and mixed into the field. What
remains to remember? Beyond marking the land?
I do not need to find a specific grave to feel the people
and the place. Nature has its own laws, but it's
a less painful erasure than human
intervention becoming more violent. Thus,
I think sometimes it is
better to let the stream
flow.

Performative Gesture of Mediation

Engaging with Haunting Representations

What does it mean to approach the performative gesture of mediation as artistic research? How can modes of mediation be utilized to engage with the representation of environmental phenomena, and what aesthetic forms might it generate?

Inspired by Avery Gordon's use of haunting as an artistic research method, we explore "Ghostly Matters": an environmental present marked by a past insisting on a seething presence. For Gordon, haunting challenges traditional scientific methods by recognizing the disquieting presence of what appears to be absent. This concept, known as hauntology, offers a method for artistic research to explore specters lingering amidst environmental crises.

Through repeated visits and collaborative encounters at Stong Pond, we've sensed an unsettling, uncanny presence haunting its surroundings. Returning to the Pond invoked awareness of our embodied presence interwoven with environmental and invisible entities. These engagements with the immediate surroundings embrace chance encounters in real-time, embodied listening, sensing, and speculative reflection. Each embodied act of mediation thus becomes a gesture that generates representations of environmental phenomena.

Engaging with haunting representations of environmental data through performative actions, props, site-specific interventions, embodied listening, and experimental recording. The documentation materials are then reconstructed to create a transmedia installation comprising performance videos, projected images, objects, and an augmented reality interactive soundscape.

We document our on-site process using experimental audio-visual recordings. This data

transcends traditional scientific methods of mapping and measuring environmental conditions. Instead, it employs performative modes that engage with speculative and poetic representations of environmental and atmospheric phenomena.

We reconstruct these recordings through experimental choreographies of mediation, utilizing video editing, Adobe Augmented Reality Environment, MaxMSP, and TouchDesigner. The resulting transmedia installation features performative videos, moving image projections, encaustic objects, and a dynamic sound composition that users can interact with both within the installation space and in their own environments.



Fieldnotes

Each of us engaged freely in various activities around The Pond to gather hauntological data using audio equipment, photography, video, and intuitive spiritual senses. The data collected was experiential. Here are fieldnotes and data obtained by Hiro from our spontaneous actions around the pond, in his words.

1.White Balloon (Light) and Shadow

First, I hung a white balloon from a tree like a wind chime, tying a piece of rubber he found on the ground to the balloon and suspending it from a branch. Nava covered a monument with a blue cloth beneath the balloon. At the time, I wasn't sure what he was trying to demonstrate. The sunlight filtering through the leaves seemed to connect with the white balloon's glow. The combination of the white balloon, blue cloth, sunlight, and greenery created a subtle piece of art. Looking at the ground, he noticed the balloon's shadow. The contrast between the white balloon and its dark shadow seemed to invite ghosts.

2.Accidental Natural Music

I played a frying pan using an air pump. The rhythm echoed through the forest, reminiscent of the wooden fish sound at Japanese temples, though it was the metallic sound of striking the pan. Despite being in Canada, I felt like I was in Totoro's Forest in his hometown of Tokorozawa, Japan. The natural setting combined with familiar temple sounds transported me back home. Birds sang in the background, creating a new form of music with the frying pan's sound.

3.Messages from the Trees

I made various marks on a white wax-coated board prepared by Nava. He rubbed the board against a tree surface, then collected about ten different branches from the forest to make vertical, horizontal, and diagonal marks on the

board. Sometimes, I pressed the branches against the board like a stamp. I rubbed a pine cone on the board. The trees, having endured rain, wind, and snow, conveyed their messages through the board.



The commonality in these three activities is the absence of specific motives. His actions were based on intuitive spiritual sensations. He felt while exploring the natural surroundings of the Pond. Just as people's moods change with the weather, his actions were guided by his feelings at that moment. Different weather conditions would have likely led to different data.

環境データの収集方法には、科学的な手法や機材を使う方法があるが、今回の検証ではヨーク大学nd研究室の研究員であるナバ・ワクスマンとの共同プロジェクトで、憑在論 (Hauntology) を検証するために、それぞれが自由に大学内の池周辺でさまざまな行動を行った。憑在的データを収集するために、音声機材、写真、ビデオ、そして自分たちの身体で感じ取った霊感的な感覚を使用した。データは経験的なものだ。この論文では、自分が池周辺で行った即興的な行動から得た四つのデータについて述べる。

一つ目。

私は白い風船を風鈴のように木に吊るし、地面に落ちていたゴムを風船に結び、それを木から垂れ下がっている枝に吊るした。風船の下には、ワクスマンが記念碑の上に青い布を覆っていた。その時、私は何を実証しようとしていたのが自分でも分からなかった。葉っぱの隙間から輝く太陽の光が、白い風船の輝きと結びついていたのかもしれない。白い風船、青い布、そしてそれを包み込む太陽の光と緑が、巧妙なアートを生み出していた。地面に目を向けると、風船の影ができていた。白い風船と黒い影、このコントラストが幽霊を誘き寄せているようだった。

二つ目。

私はフライパンを風船の空気入れて叩いて音を奏でた。日本のお寺で聞く木魚のようなリズムが森中に鳴り響いたが、音自体は金属を叩く音であった。この時、私はカナダにいるにも関わらず、地元所沢のトトロの森にいるような錯覚に陥った。自然の空間とお寺でよく聞くような音が、私の心を故郷に連れて行った。この空間では鳥も歌っており、フライパンの音と鳥の歌声が新しい音楽を作り出していた。

三つ目。

私はワクスマンが用意した蠟を塗った白い画板にさまざまな傷をつけた。まず、画板を木の表面に擦り付けた。その後、森の中からさまざまな枝を10本ほど見つけてきて、画板に縦、横、斜めの傷をつけた。時には、ハンコを押すように枝を画板に擦り付けることもあった。枝だけでなく、松ぼっくりも画板に擦り付けた。木は屋外の環境で、雨風や雪に耐えてきた。そんな環境で育った木からのメッセージが、画板にどのように現れるのか、ワクスマンの試行結果を待ちたいと思う。

Through experimental mark-making, we mediated the environmental sound through inscriptions onto an encaustic panel using rock and wooden sticks as tools. We inscribed environmental sounds onto the surfaces, translating and mediating the wind, birdsongs, water ripples, and white noise.

Wondering and wandering through walking as a method of collecting data through audiovisual recording, becoming intermediary bodies carrying movement and sound as data, inscribed on our marking surface and digital recording devices. There are things that stayed with us, collected data that could not be translated into any scientific, visual, or linguistic forms, and became an archived, inwards inscription of data.

Choreographies of Mediation

The second part of the process involves various choreographic strategies of reconstructing the audio-visual documentation recording, using various digital new-media applications, such as video editing, Adobe Augmented Reality Environment, and MaxMSP.

I utilized granular synthesis in Max MSP to create intricate textures and compositions from the sound recordings. The reconstructed sound materials were then mediated to the AR environment. In addition to this, I transformed the physical encaustic objects into virtual assets. These virtual assets were then integrated into the augmented reality (AR) environment. Alongside these virtual representations of the encaustic objects, I also included other 3D objects that conceptually represent the pond environment.

Other artistic forms include the encaustic objects and performative videos that could potentially be used in multimedia installation that include the physical encaustic objects, moving image projection, and the AR interactive soundscape that intertwines with the physical space of the installation. Through these choreographies of mediation, we propose performative approaches to create transmedial artwork that engages with haunting representations of the environment.



Step-by-Step Guide

Step 1: Site Selection and Initial Engagement:

Choose a site with personal or ecological significance, like an urban park or neglected water body. Visit at different times and weather conditions. Observe human interaction with nature, noting neglect or coexistence. Record your observations.

Step 2: Performative Engagement and Data Collection:

Engage with the site through performative actions such as walking, marking, or other gestural interactions that resonate with the environment. Use these actions to explore the sensory and emotional impacts of the space. Choose Mark-making tools, such as pencil, ink and chalk. Sharp noises can be shown with hard lines, while softer sounds with curvy marks. Experimenting with materials alters sound interpretation. As you listen or recall the sounds, start drawing on your chosen surface. Let the rhythm, pitch, and volume guide your movements. **Documenting the Experience:** Use audio-visual devices to record these engagements. Focus on capturing the nuances of interaction between your actions and the environment. This could include sounds of the interactions, the visual record of changes you make or observe, and your movements within the space.

Step 3: Reflective Journaling and Conceptual Development:

After each visit, record your reflections on the experience, focusing on what felt significant, surprising, or revealing. This reflective practice is crucial for developing deeper insights into the environmental and personal interactions occurring at the site. Begin to map out how these reflections and recorded data might inform a larger artistic inquiry. Consider how themes of haunting, memory, and environmental interaction can be represented through your chosen media.

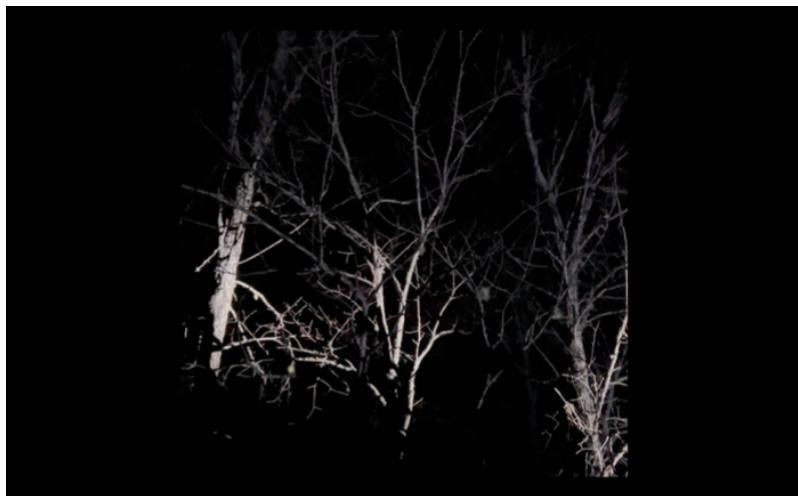
Step 4: Experimental Recording and Mediation:

Utilize the recordings and other collected materials to create experimental compositions. This might involve editing audio to highlight certain sounds, creating video montages, or developing photographic series that emphasize specific aspects of the site.

Step 5: Installation and Interactive Elements:

This part can be experimental and based on chosen space\place to present that work**. ** Plan an installation that integrates the mediated recordings with physical elements from or inspired by the site. This could include objects found at the site, or other materials that symbolize the environmental and cultural narratives you have explored.

Interactive Components: Consider using Augmented Reality environments to design and reconstruct the audiovisual materials into an interactive experience. The spatial audio engine built into Adobe Aero will allow you to effectively design multi-sensory experiences, where sounds are triggered based on actions taken by the user. Audio in Aero works via a simple import feature that allows you to bring .WAV and .MP3 files into the app. This makes it easy to design an accurate soundscape for any AR experience, tied to the layout of the digital objects in a room. The level and frequency of these sounds can also be altered based on a viewer's actions and directional changes.



Like A Labyrinth

Getting Lost, Tracing The Edge
Darian Razdar

Holes and Edges

Holes are everywhere. Perhaps ever since Einstein's theory of general relativity, holes have circulated between scientific and artistic discourses. From Hawking's black holes to Pope.L's Hole Theory¹, from Karen Barad's quantum field theory of the void² to glory holes proliferating pandemic safer sex practices, or even from the holes perforating the epidermal layer to the "i'm just a hole, sir" meme circulating bottom twitter. . . at this point, we're well aware of the ubiquity and omnipotence of the hole. The void is no longer where ideas go to die, for they have shown us that they are where ideas go to mingle, move, dissolve, and transform.

But what about edges?

Every hole has its edge, and every edge its hole.

Little theorized, the edge is what defines a hole. Without the event horizon, black holes would not exist. Without the flesh of the lips, labia or anus, there would be no landmarks for entrances or exits in our body.³

My interest in edges began with Anne Carson's reading of ancient Greek poetry in *Eros the Bittersweet*. For Carson, Eros creates holes and makes those already holey even more apparent. "A hole is being gnawed in my vitals" quotes Carson of Sappho as she senses the

void between herself and her beloved.⁴ "Who is the real subject of most love poems?" Carson asks, "Not the beloved. It is that hole."⁵

If the hole is the generative negative space of lack, then the edge is one's sensual experience of that lack. When we're in the throes of desire, it's impossible to ignore the edges that separate the subject from its object. "Eros is an issue of boundaries . . . suddenly, at the moment when I would dissolve that boundary, I realize I never can."⁶ In a stroke of pure genius, based in her deep reading of erotic ancient Greek text, Carson relates the acts of writing and loving as both mediated by the desire to breach the edge — to say the unsayable, to want the wantable, to know the unknowable, "to reach beyond perceptible edges—toward something else, something not yet grasped."⁷

In this vein, it is impossible to breach erotic edges.⁸ If it were, all desire would collapse, for it's the edge that defines desire and not the inverse.

Labyrinths

It's only fitting that the idea of the edge, which first appeared to me via Carson's translation of ancient Greek literature, re-appeared in the form of the Minoan myth of the Labyrinth. The book *Four Times Through the Labyrinth* caught my eye at the Spector Books table at the 2024 New York Art Book Fair. Following four scholars from the original myth of Theseus and the Minotaur and proceeding in different, though often intersecting directions, the book covers the labyrinth-form from urban design to game theory and migration to militarism.⁹

Immediately after NYABF I traveled to Wakefield, Québec for a week-long residency hosted by UKAI Projects at Ferme Lanthorn. Entitled “Intelligent Terrain,” a small group of artists and creative technologists gathered on this regenerative farm to experiment with ideas of ecological and artificial intelligence through material and land-based practices. Arriving with the idea of exploring edges, and with *Four Times Through the Labyrinth* in hand, I was reminded by my peers that *labyrinths are all edge*. That is, the edge functions as the labyrinth’s defining feature, without which — much like desire — it would not exist.

Tasked with creating a piece to present to the lower Gatineau River community on the residency’s final day, I determined to explore edges through the idiom of the labyrinth. I wanted to create a film-poem. I came prepared to use my method of choice, poetry, to move through this space, while eager to challenge myself to work with moving image and sound — two methods of my lesser acquaintance.

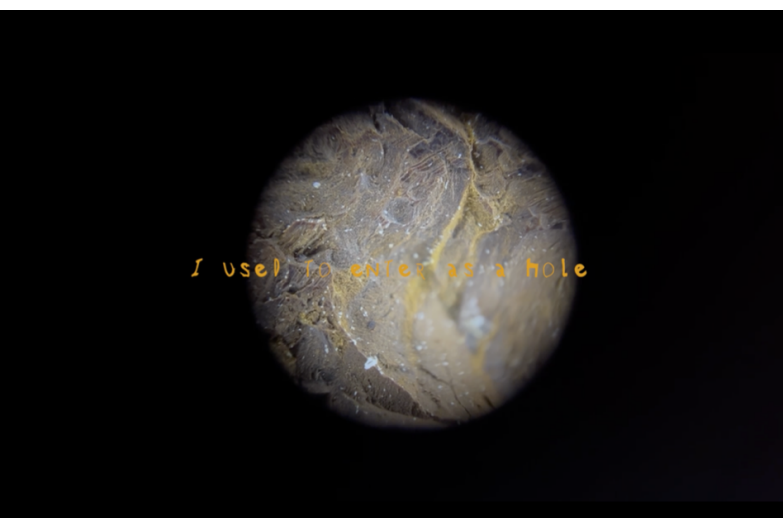
Could I integrate poetry and audiovisual to my liking? How would I be able to trace the edges of the labyrinth with these technologies? Where would I find the edges at Ferme Lanthorn? How would I respond to the question of intelligence to which we were gathered to respond?

Disorientation

I got lost.

In *Four Times Through the Labyrinth*, writer and publisher Anne König asks, “Does one’s sense of direction improve, the more one knows? Or is it even harder to find the way when one knows how easy it is to get lost?”¹⁰ In *Queer Phenomenology*, Sara Ahmed offers a sort of response: “‘getting lost’ still takes us somewhere.”¹¹ Ahmed continues: “risking departure from the straight and narrow makes new futures possible” and that such departures “might involve going astray, getting lost, or even becoming queer.”¹²

Ferme Lanthorn is situated on the edge between rural countryside on the east and mountainous old growth forests to the west. Through it snakes a tributary of the Gatineau River, which flows into the Ottawa and then mixes with the St. Lawrence before reaching the Atlantic Ocean. On a morning walk surveying the land on which I might record in my film-poem, I fell into this tributary while attempting to cross over it on a mossy felled tree. I earned a few bloody scratches and a broken camera in those still-thawing waters on





their way to sea. It was the fall that made me realize that I needed to fall even further, to get even more lost in this landscape in order to make the thing I came here to make.

Equipped with a GoPro, 360 camera, and Sony Handycam lended to me by fellow residents, and my iPhone 11 paired with detachable 45x microscope lens, I set out for a rural and wild *dérive*. I followed trails, traced fence-edges and tree-edges into forests, finding myself at times genuinely lost under the canopy of budding maple and birch while wading through underbrush of vernal saplings, trillium, and fiddlehead fern.

First filming on GoPro, I made use of the camera's nimble nature and easy-to-grasp tripod. The camera became a removable appendage — holding it as I walked and placing it down for stable shots of the forest, fields, and streams. This got me thinking about the tools I use and their entanglement with my body. Were they as lost as I?

Remembering Edouardo Williams's use of 360 video in *Human Surge 3*, I clipped a "gooseneck" desktop phone holder with a "flexible lazy arm" to the top of a bike helmet and switched out the phone clamp for the 360 camera.¹³ Walking around with this contraption on my head was cumbersome — the clip didn't fit well on the helmet and would sink over the course of my walk — and it hurt. In the film you see me manually adjusting the lazy arm so as to be a little less lazy.

I lost myself in scale just as I did in the field. Using a handy detachable 45x iphone camera lens, I gained access to a microscopic world — new topographies full of holes and edges. Training my microscope toward moss, lichen, tree bark, fungi, paper, silk, and felted wool opened a new layer of disorientation from which I could look back out at the world.

"In order to become oriented, you might suppose that we experience disorientation."¹⁴



Body

The only way I could make sense of my disorientation was through the body. We often talk about certain practices as *embodied* — as routing themselves through the body as if every other human practice isn't already. When I talk about the body, I mean the thing that is always already there, that is never not invisible. And yet, as we discussed during this residency, we often forget that our fleshy bodies are what make us *us*.

When we buy into anxiety about Artificial Intelligence replacing humans, we forget that the hallmark of biological intelligence — the ability to learn and make meaning out of information — is that information is transfigured by a body's electrochemical signals. Unease in my microbiome, cool breeze against my sweaty brow, feeling of joy when I read the right page at the right time — such bodily sensations condition my intelligence. In this light, human intelligence can be extrapolated to animal intelligence, plant intelligence, soil intelligence, and even water or mineral intelligence, but not quite artificial intelligence.

This approach to embodied intelligence speaks alongside Ada Smailbegovic's *Poetics of Liveliness* when she asks: "How can language index or somehow register in its syntactic and rhythmic unfolding the temporal flux of materiality that makes and unmakes the rich variability of animal, plant, and mineral worlds?"¹⁵ In other words, how might acts of human creativity address the many worlds in which they are inscribed?

Like A Labyrinth

¹ William Pope.L, "Hole Theory—Parts: Four and Five" in *William Pope L.: The Friendliest Black Artist in America*, ed. Mark H.C. Bessire (Cambridge, MA: MIT Press, 2002), 76-110.

² Karen Michelle Barad, *Meeting the Universe Halfway : Quantum Physics and the Entanglement of Matter and Meaning* (Durham: Duke University Press, 2007).

³ "Lacan talks about the significance of edges — how sex is not so much the urge to get inside, or to have something within one(self), so much as the desire to oscillate across the threshold established between inside and outside. Thus, the parts that are the landmarks to our entrances are desirable — lips, anus, labia, slit at the tip of the penis, eyelid, and ear — but not the liver, not the lungs." Anthony Howell, *The Analysis of Performance Art : A Guide to Its Theory and Practice* (London ; Routledge, 2000), 1.

⁴ Anne Carson, *Eros the Bittersweet : An Essay* (Princeton, NJ: Princeton University Press, 2023), 34

⁵ Carson, 32.

⁶ Carson, 30

⁷ Carson, 109.

⁸ Of course there are other ways to interpret the edge — through the form of borders, boundaries, shores, and skin — that might lead to different conclusions about the nature of edges. For instance, the porous edge of the epidermis mediates contact between the internal body and the atmosphere, and every wall that separates necessitates a door for certain peoples' movement. Such edges are never not already breached.

⁹ *Four Times Through the Labyrinth*, ed. Olaf Nicolai and Jan Wenzel, trans. Sadie Plant (Leipzig & Zürich: Spector Books and Rollo Press, 2012).

¹⁰ Annette König, "Orientation / Disorientation: Tati Halle-Neustadt, Debord, etc." in *Four Times Through the Labyrinth*, ed. Olaf Nicolai and Jan Wenzel, trans. Sadie Plant (Leipzig & Zürich: Spector Books & Rollo Press, 2012), 165.

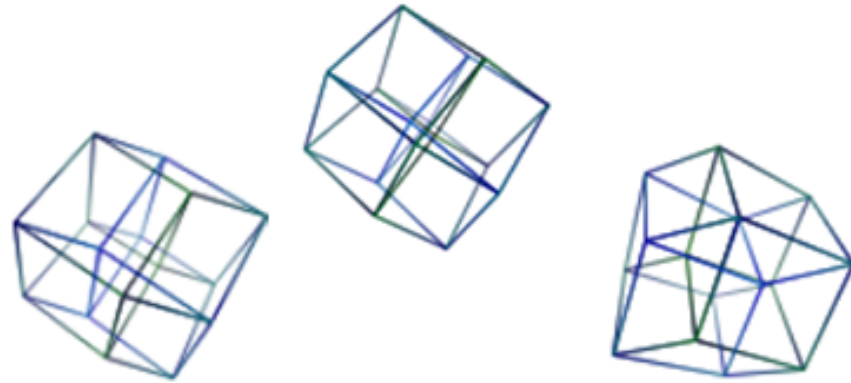
¹¹ Sara Ahmed, *Queer Phenomenology Orientations, Objects, Others* (Durham: Duke University Press, 2008), 7.

¹² Ahmed, 21.

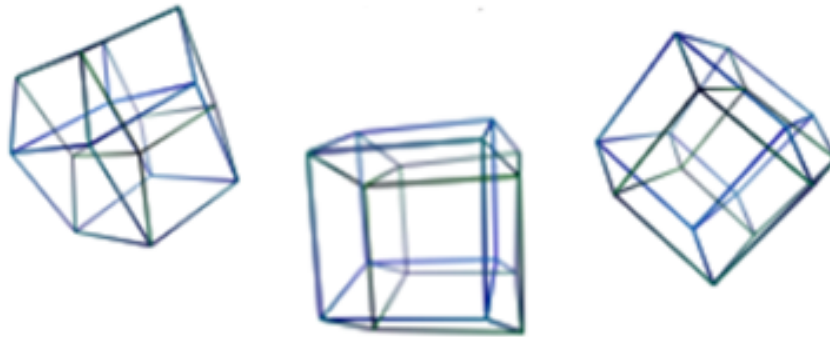
¹³ Quoted are technical terms for the kind of bendable, flexible standing phone holder common on desktops in 2024.

¹⁴ Ahmed, 5.

¹⁵ Ada Smalbegovic, *Poetics of Liveliness : Molecules, Fibers, Tissues, Clouds* (New York: Columbia University Press, 2021), 15.



n-D :: StudioLab



The *n-D::StudioLab* is an adaptable space for research-creation based theoretical discourse, methodological development, and the production of works in the areas of ArtScience, Computational Art, and Interactive Architecture. In addition, there is an emphasis on methodological development in the integration of software development, digital fabrication, electronics hardware development, and sound and vision research with the goal of creating eversive works that blur the divide between the virtual and the real. Since its inception in October 2011 the *n-D::StudioLab* has been involved in the research and development of several works that have been shown internationally in such places as Toronto's Nuit Blanche, the Deutches Museum, the Dutch Electronic Arts Festival (DEAF), the Re-New Festival in Copenhagen, the Sydney Biennale, Currents New Media, ISEA International, and the Venice Biennale.

The “*n*” in *n-D* refers to vast potential and the infinite, whereas the “*D*” in *n-D* refers to:

- *n*-Disciplinary – trans-disciplinary, blurring boundaries, cross breeding and evolving fields
- *n*-Dimensional – expanding, complex and continuous
- *n*-Domain – trans-sensory, trans-experiential, transmodal

nD::StudioLab members

Filiz Eryilmaz, Digital Media, (HBA 2018, MA 2023)

Hrysovalanti Maheras, Digital Media MA (2020), Ph.D. (since 2020) www.hfmaheras.com

Francesc Morales, (Since 2017)

Marcus Gordon, Ph.D., Digital Media, (2024), www.magfoto.xyz

Jacob Cram, MA, Digital Media (2020) jacobcram.xyz

Aftab Mirzaei, Ph.D., Science and Technology Studies (since 2020)

Ilze Briede [Kavi], Ph.D., Digital Media (since 2020), www.ka-vi.com

Kwame Kyei-Boateng, MA Digital Media (2023)

Grace Grothaus, Ph.D., Digital Media (since 2021), www.gracegrothaus.com

Eyal Assaf, Ph.D., Digital Media (since 2022)

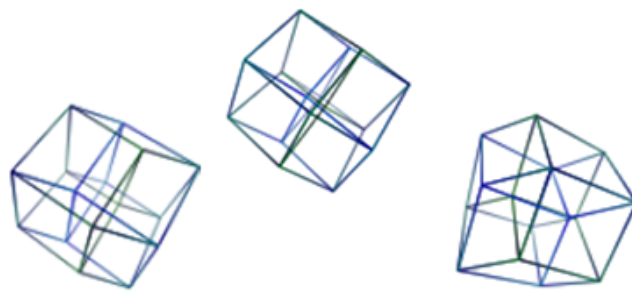
Nava Messas-Waxman, Ph.D., Visual Arts (since 2022), www.navawaxman.com

Boluwaji [Boma] Adeyanju, MA Digital Media (since 2023)

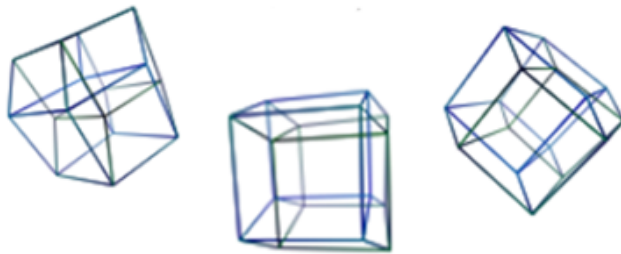
Hiromune Kubayashi, HBA, Digital Media (since 2023)

Wen Luo, MA Digital Media (since 2023)

Xuan Han MA Digital Media (since 2023)



n -D :: StudioLab



<https://www.ndstudiolab.com/>