jorge arreola

the search for HARMONY

MIT

RMIT UNIVERSITY

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i dedicate this project to my mum and dad.

INTRODUCTION

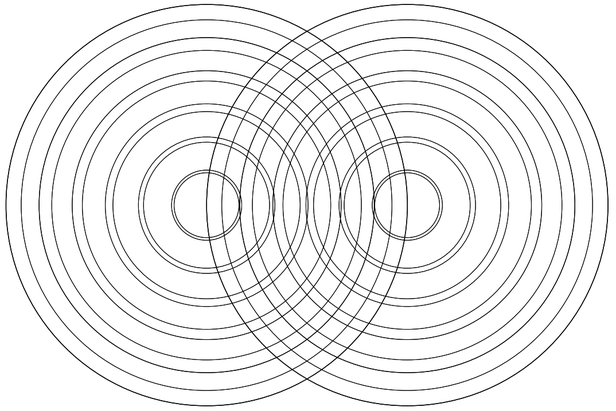
During the covid-19 lockdowns, seismologists around the world reported that the Earth was vibrating at a slower rate as a result of the sudden slowing in human activity.
While humans were in lockdown, nature thrived in harmony. Wild animals were spotted roaming our empty cities, sea animals approached and swam freely along tourist and boat-free shores, resulting in a massive unprecedented natural event - showing us how much we influence and interfere with natural systems and processes around us.

Unusual things happened, many wild animals explored the built environment; there were sightings of pumas in Santiago de Chile, sightings of jackals in Tel Aviv, bioluminescence on the coast of Acapulco in Mexico, and ecosystems that were thought to be lost showed signs of recovery in a very short period of time.

This quieting of human activity is known today as the anthropause, and it marks the first time since the dawn of the industrial era where a decrease in human productivity across terrestrial, biological, and a range of other systems have unveiled the true consequences of the impact of noise pollution.

CHAPTER I

A FREQUENCY FOR EVERYTHING



ALL ABOUT THE VIBES

All things in our universe are in constant motion, vibrating at different frequencies.
If we look at things through a microscope or a telescope; all things can be seen as vibratory systems, constituted by smaller vibratory systems - systems that, no matter how big or small they are, they all store and dissipate energy the same way: by the act of oscillating (which is a fancy word for vibration, it practically means switching between states).
When struck with a hit of energy, a system oscillates for a while until it stops running or until it receives more energy to distribute it among its parts to keep existing and functioning as intended.

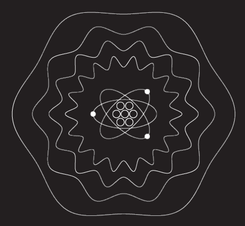
Everything - atoms, planets, and everything in between is constantly vibrating, even objects that appear stationary and solid are constantly oscillating or vibrating; since matter is ultimately vibrations of various underlying fields - at every scale, everything is vibrating, everything is in process.

RESONANCE

Since everything is vibrating, it means there must be a frequency to everything; this are known as natural frequencies. Whenever an object receives a energy at a rate that matches its natural frequency, the object will vibrate at the same rate and increase the amplitude; this is known as resonance.
Resonance is a phenomenon that only happens if the frequencies of the objects match; if they don't, dissonance among the object's properties will prevent the phenomenon from happening.

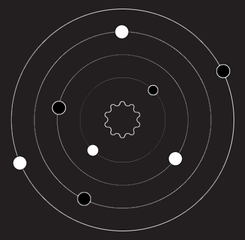
Systems that distribute their energy (resonate) effectively become *stable*, meaning that their vibrations are resonating in harmony, whereas lack of resonance introduces chaos and dysfunction among the parts - both are made up of essentially the same thing, in the end, *harmony is nothing but organized chaos*.

Resonance is what turns a bunch of parts into a system, or a bunch of atoms into an actual thing. It allows information of energy to flow so successfully that it has birthed everything we see, smell, touch, hear, and taste.



Everything is constantly
vibrating, oscilating and resonating with everything else.

THINGS IN NATURE TEND TO SYNC UP IN HARMONY



"At the heart of the universe is a steady, insistent beat: the sound of cycles in sync... These feats of synchrony occur spontaneously, almost as if nature has an eerie yearning for order."

Steven Strogatz

HARMONY (ORGANIZED CHAOS)

In natural systems, successful resonance means a balanced state - cycles keep happening and they keep influencing each other to maintain themselves and keep existing. When resonance is not effective, it creates cacophonies within the system which could overtake the original rhythm by influencing the frequency of all of its parts, breaking the balance, and causing the system to malfunction or even collapse.

When cacophonies fail to take over the system's rhythm, the natural frequency of the system influences the alien vibrations to move at the same rhythm as the others, and balance is restored, the system reaches a harmonic state within itself and its surrounding vibratory systems.
It has found its place in this infinite ocean of motion - *it has found harmony.*

Periodical resonance leads to harmony; meaning that by resonating at a pace that is manageable for its parts to keep up with the rhythm, the system balances the energy coming in and out in a sustainable way with other systems.

Everything in nature is proof of successful harmonic states working within multiple subsystems and since this change is periodical it means there is a governing law of order behind every pattern and every cycle in nature, as the mathematician *Steven Strogatz* mentions in his book "*Sync: the emerging science of spontaneous order*", there seems to be a of spontaneous order that emerges when parts of a system rely on sending and recieving signals from each other.

"For reasons we don't yet understand, the tendency to synchronize is one of the most pervasive drives in the universe, extending from atoms to animals, from people to planets."

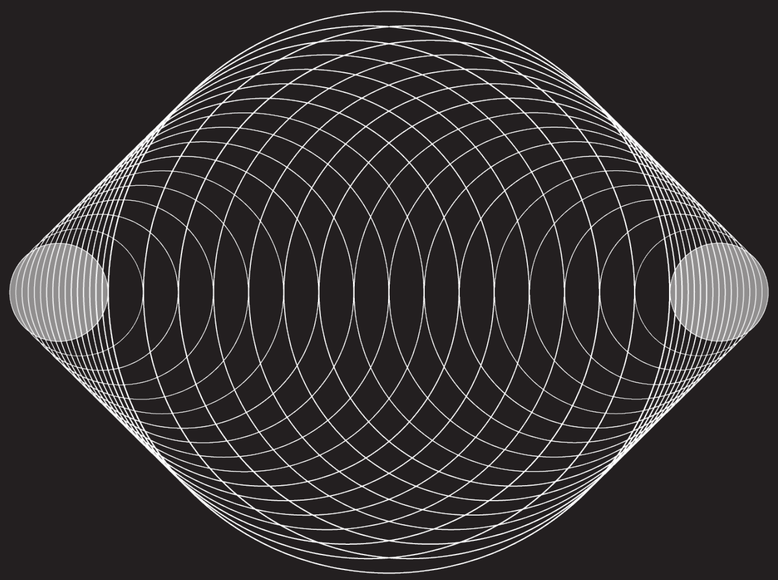


fig 1 - harmony / order

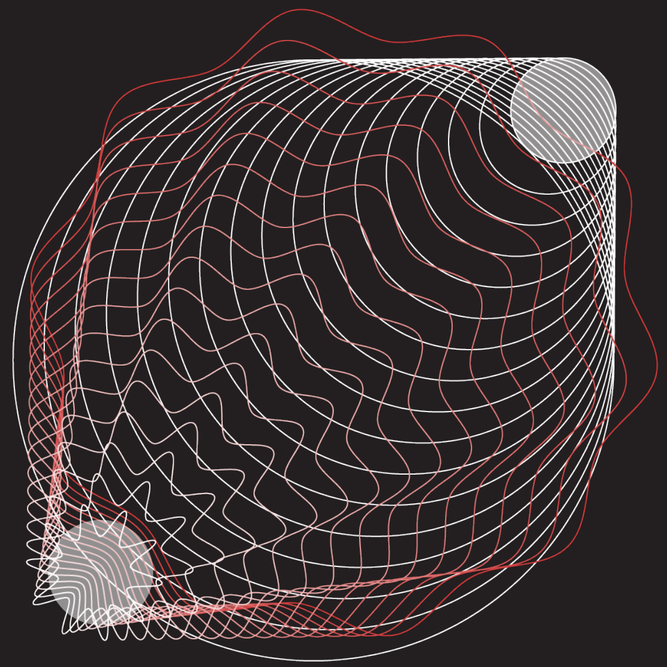
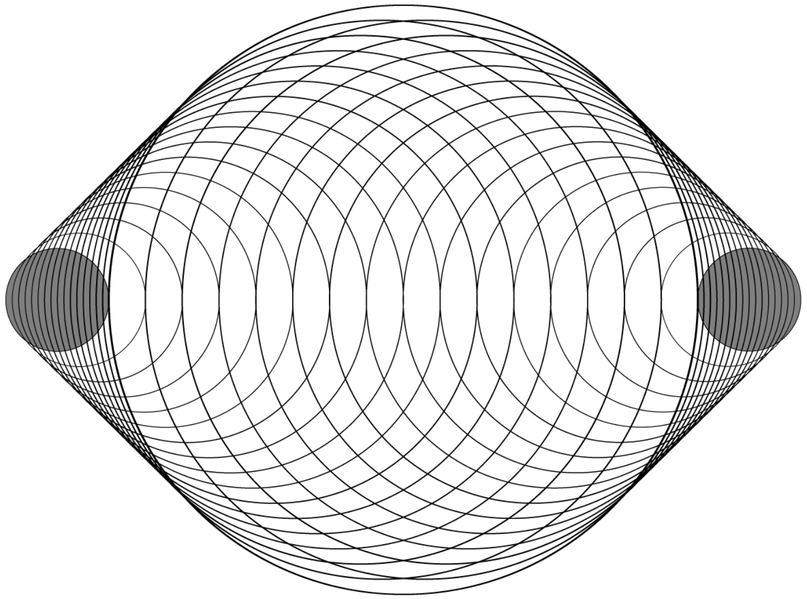


fig 2 - chaos / cacophony

CHAPTER II

SYSTEM EARTH



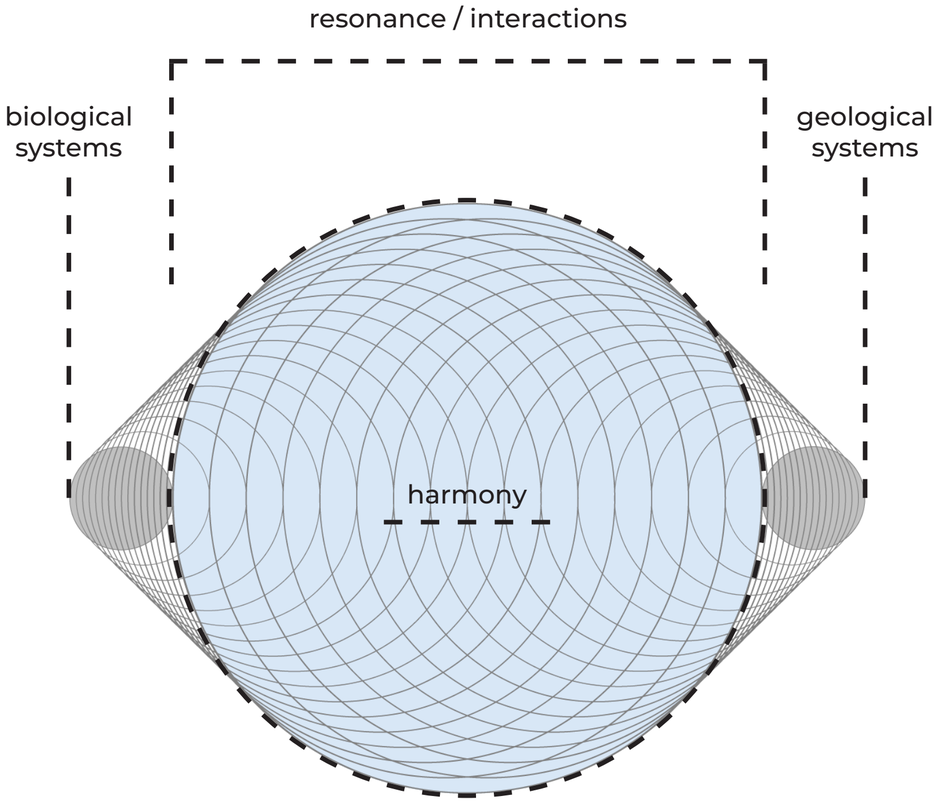
OUR LIFE-SUPPORT SYSTEM

Earth is our life-support system and it is a system of biological and geological cooperation; also known as the biogeosphere.

The biogeosphere makes up for the interactions between ‘animals’ and ‘environment’ or conditions around them; these two systems are connected in infinite ways, and those connections have been formed through thousands of years of resilience and evolution.

We are currently living during the Holocene, which has provided Earth with around 11,700 years of stability among its systems and allowed for life to evolve into what we know today.

All-natural systems rely on their capability of resonating in harmony with others around them.

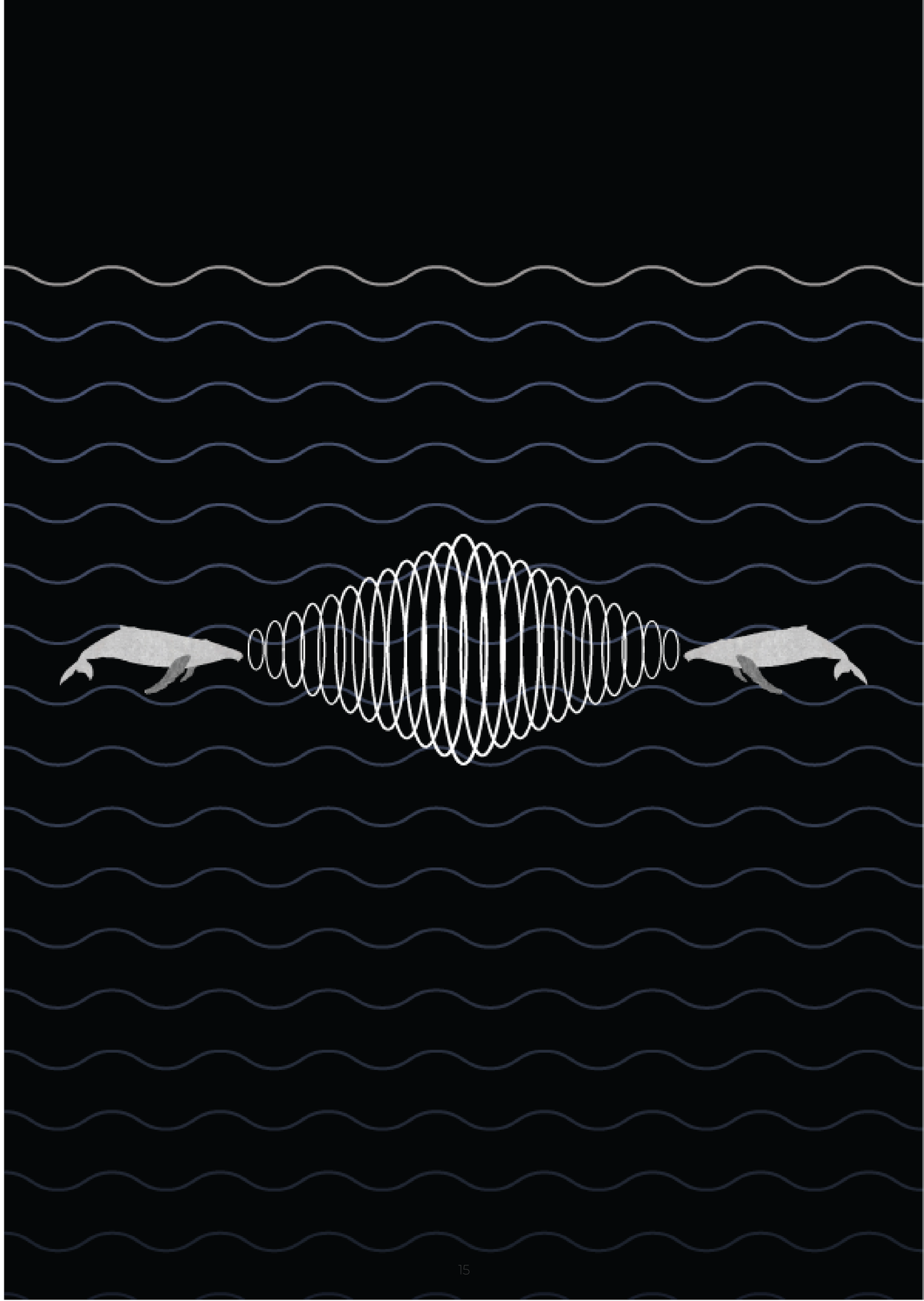


EVOLUTION THROUGH COOPERATION

Earth is a system of geological and biological forces that cooperate to achieve harmony, change, and evolution.
All these systems are somehow connected and rely on each other; Earth is our life-support system and it can be seen as an enormous circuit board generating and dissipating energy at all times.

That's why animals like whales have evolved to take advantage of the medium (water) and communicate through very low frequencies - their hearing instruments are perfect for their environment.
Sound is their primary way of communication, therefore its disruption leads to stress and unbalanced cycles.

For example, large water mammals like whales communicate using low-frequency waves; since there is very little absorption sound in water, low-frequencies travel large distances at a rate 4x faster than they do through the atmosphere (the denser the medium, the more molecules the sound wave gets to interact with).



EARTH'S HEARTBEAT

HOW FAR CAN OUR INFLUENCE GO?

At any given moment, Earth is producing two thousand lightning storms, around 50 flashes of lighting per second which create electromagnetic waves that cycle around the planet between its surface and the ionosphere -an area about 100km up which contains many charged particles.
When these waves combine and increase in strength it creates a continuous beat, this is known as the Schumann Resonance.

When this wave goes around the Earth and hits itself, it creates a standing wave, which happens at what we know as 'the speed of light' 1/8 of a second or 8Hz (7.83 cycles per second to be precise) this is known as the fundamental mode of the Schumann Resonance and its stability helps predict natural events like weather patterns and natural catastrophes.

These waves are resonating at a constant harmonic state in the form of an 8Hz standing wave. The technology used to measure this has only been around since the sixties, but some temporary variations or 'spikes' have been detected since.
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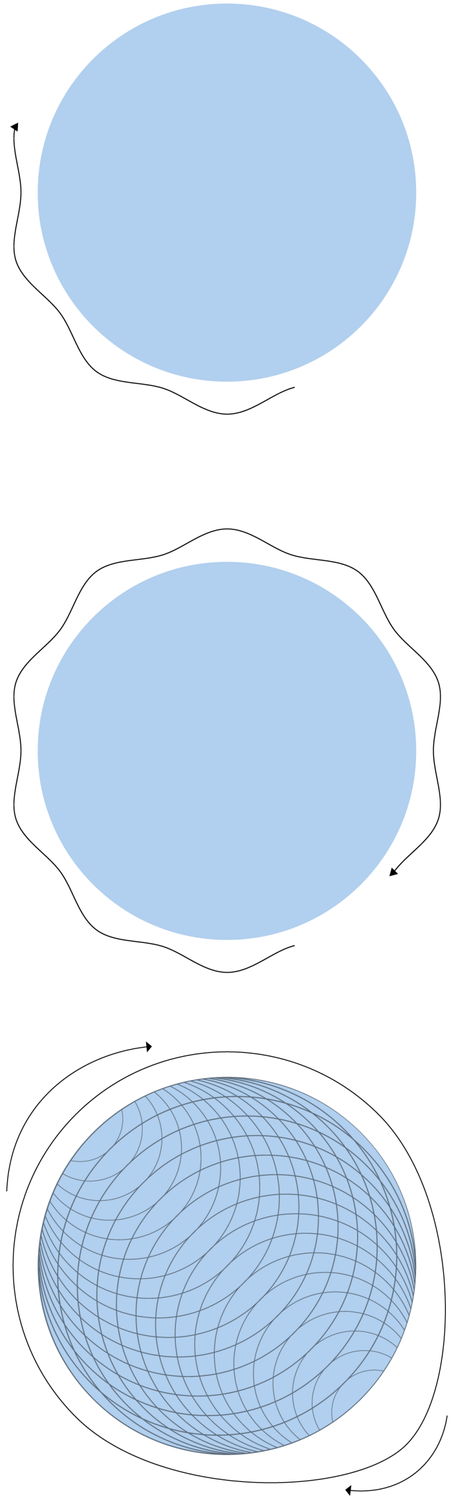
Knowing this, made me reflect deeply on how humans as a species are capable of influencing such huge things that make for the conditions that created us and everything we see - yet they are not even perceivable to us

In 'new age science', many believe that the Schumann Resonance has a direct impact on human consciousness and behaviors, and attribute the spikes/changes detected in the frequency to more stress and anxious emotional states in our societies. These theories lack scientific basis but make way to an interesting conversation of whether Earth's electromagnetic fields can affect humans.



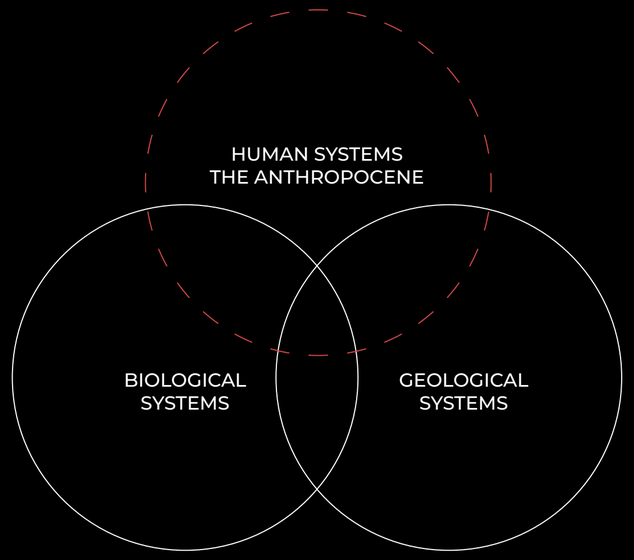
7.83 HZ

THE ANTHROPOCENE

The term ‘Anthropocene’ has been proposed by many researchers to describe our current geologic epoch, where humans have been recognized as a geological force and the great acceleration of their impact as a species is the primary cause of permanent planetary change.

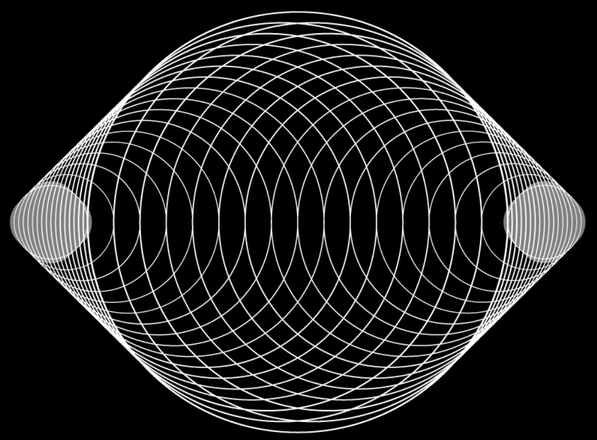
The official geological epoch we live in is the Holocene; it began approximately 11,560 years ago, and it has provided periodic, stable climate since the last ice age - so stable that it allowed for our civilizations and communities to evolve into what we are today, but scientists argue that the acceleration since the mid 20th century of rising sea levels and carbon emissions along with mass extinction of species and depletion of land have to change the earth so significantly that the Holocene must give way to the Anthropocene - the human age.

There is no arguing that we live on a human-centered planet, and it mostly seems like we are messing it up, humans today change the Earth and its systems more than all-natural processes combined, every year we extract between 60 and 100 billion tones from material from the earth, impacting, destroying and moving more sediment than all the rivers in the world combined, and all of this to satisfy our human systems- which are turning out to be badly designed with no consideration for Earth’s natural systems.

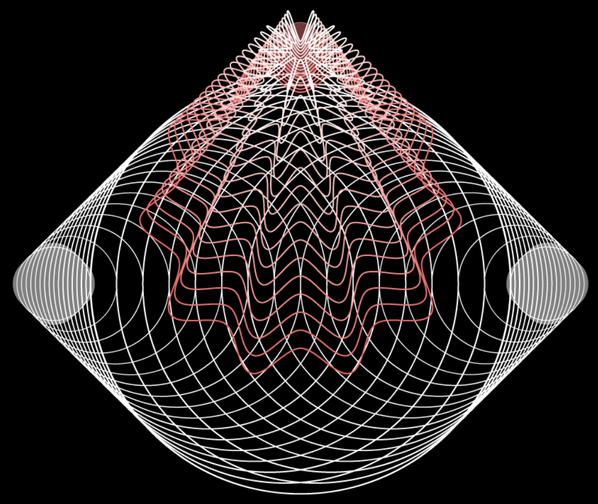


“The Anthropocene marks a new period in which our collective activities dominate the planetary machinery. Since the planet is our life support system – we are essentially the crew of a largish spaceship – interference with its functioning at this level and on this scale is highly significant. If you or I were crew on a smaller spacecraft, it would be unthinkable to interfere with the systems that provide us with air, water, fodder, and climate control. But the shift into the Anthropocene tells us that we are playing with fire, a potentially reckless mode of behavior which we are likely to come to regret unless we get a grip on the situation.”

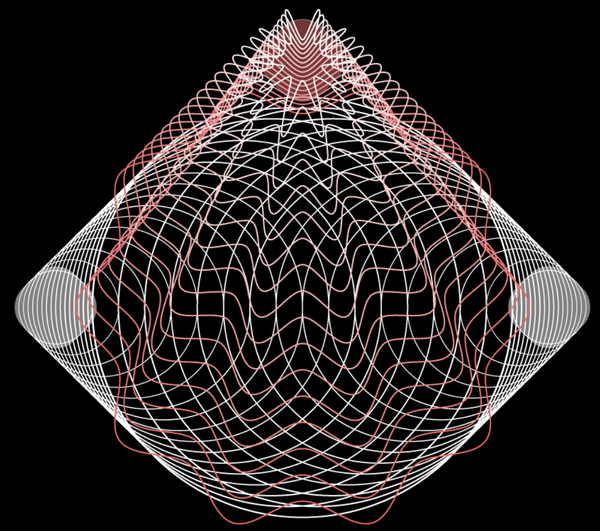
- Prof Chris Rapley
climate scientist at University College London and former director of the Science Museum in London.



THE HOLOCENE
Cooperation of systems during 11,700 years during the Holocene period provided Earth with stability among its systems and allowed for life to evolve into what we know today.



1950 - ANTHROPOCENE BEGINS
Around 70 years ago, humans began making irreversible damage to the planet to satisfy anthopogenic-systems, disregarding sustainable practices and interfering with biogeo systems around them.



CURRENT SITUATION
Human societies rely completely on the systems they have rapidly developed disregarding the other systems on the biogeosphere.

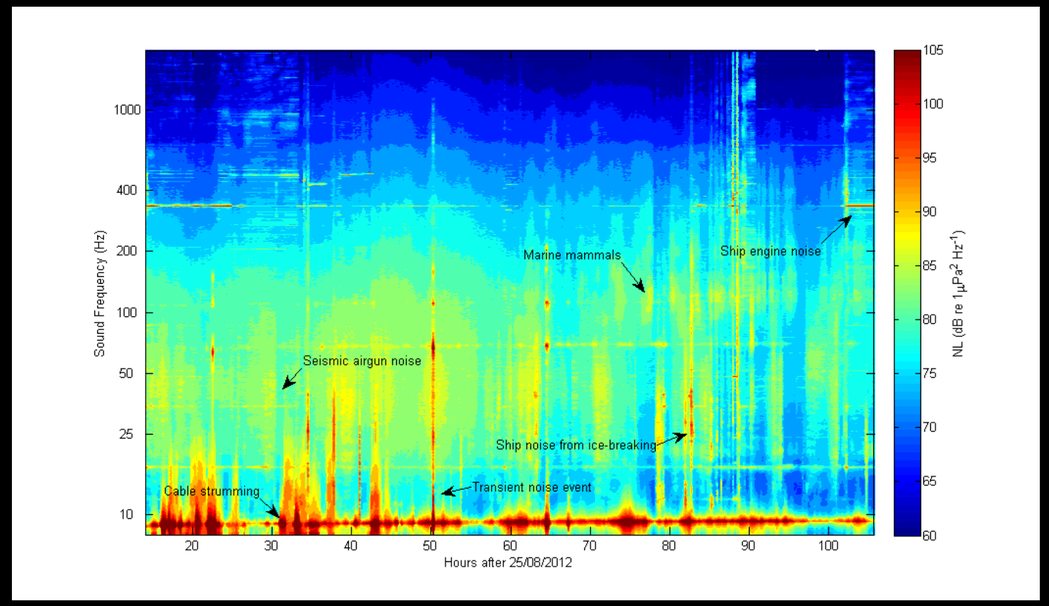
As a result of these unstoppable systems life on Earth is being threatened by climate change, climate change; ocean acidification; stratospheric ozone depletion; interference with the global phosphorus and nitrogen cycles; global freshwater use; land-system change; loss of biodiversity; chemical pollution; and aerosol loading in the atmosphere.

ANTHROPOGENIC NOISE

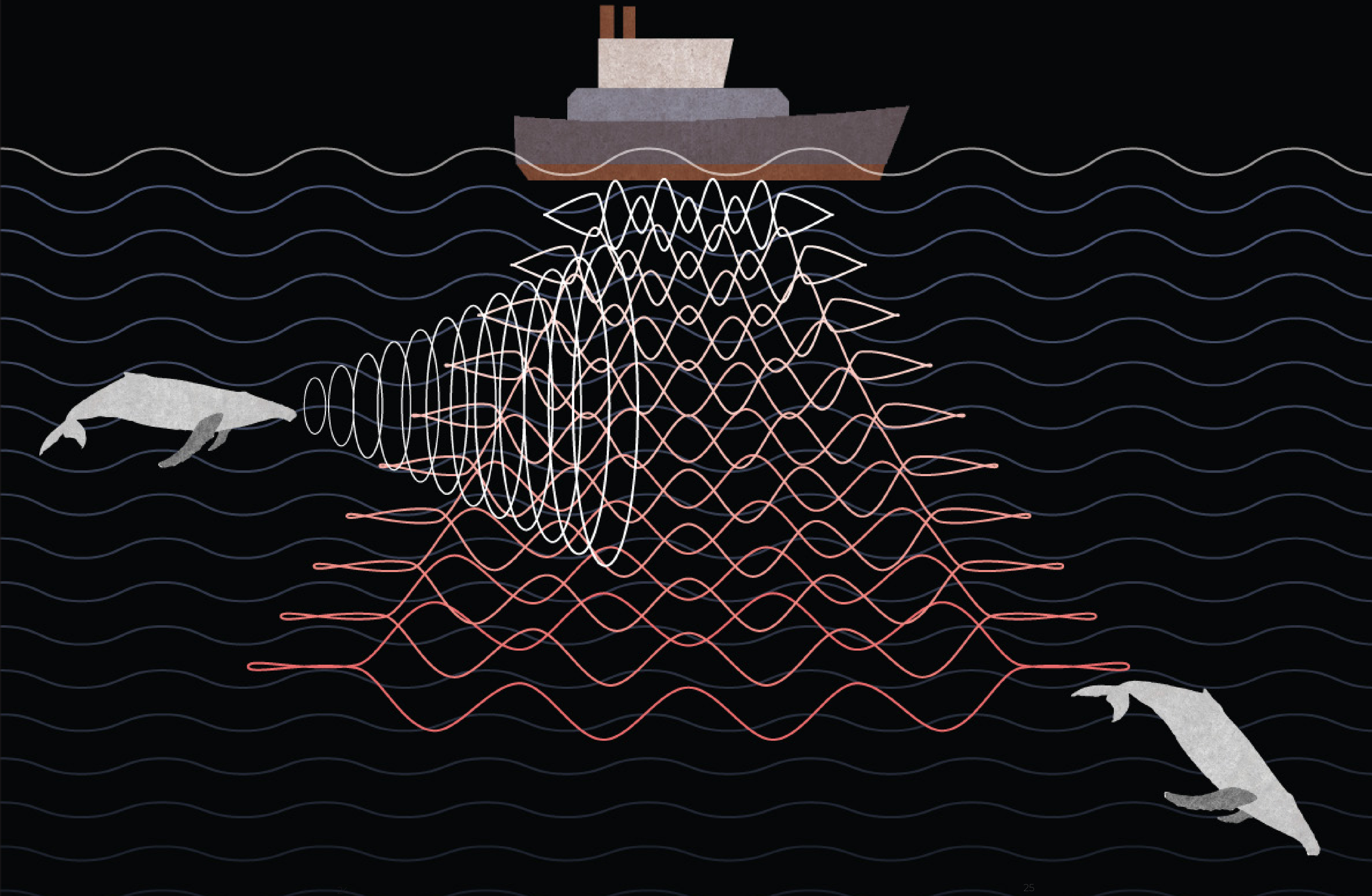
The noise we generate disturbs the rest of the ecosystem.
It can cover up natural sounds that are important for wildlife to perform very basic life functions like predator-prey interactions, or communicating in order to mate. Noise pollution is also known to scare animals away, which leads to changes in the distribution of animals and alterations in the biogeosphere.

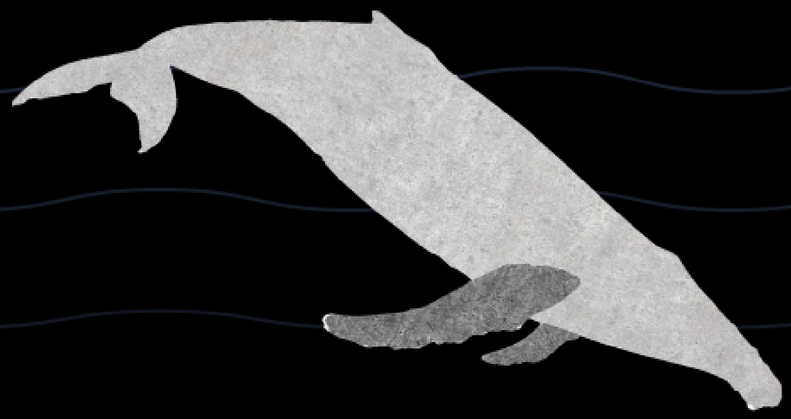
Human systems and activities like traffic, aircraft, vehicles, industrial noise, etc...) create noise (inharmonious sounds) that spreads far and wide through the ground, air, and water (the denser the medium, the more molecules the sound wave gets to interact with.); disturbing many natural systems around us, displacing them and changing their behaviors which interferes with other systems and throw our life support system out of harmony.

Water is one very dense medium, which allows sound to travel about four times faster than it does through air. At low frequencies, there is very little absorption for sound in water.
That's why animals like whales have evolved to take advantage of the medium (water) and communicate through very low frequencies - their hearing instruments are perfect for their environment. Sound is their primary way of communication, therefore its disruption leads to stress and unbalanced cycles.



source: Nansen Environmental and Remote Sensing Center





Anthropogenic noise is one of the known reasons for mass whale strandings. Loud noises cause them to go into panic dives which creates a sort of depressurization and causes their brains and hearts to hemorrage.

CHAPTER III

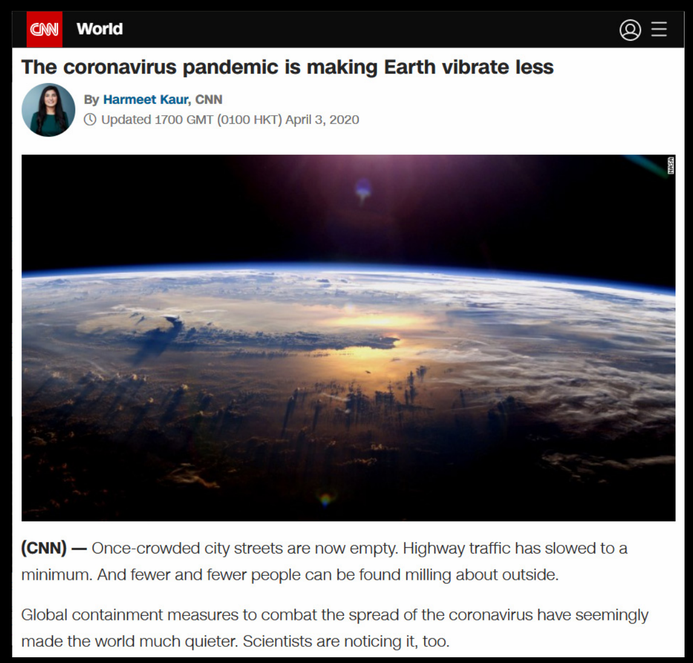
THE ANTHROPAUSE

THE TIME THE EARTH SLOWED DOWN

During the pandemic, as a third of the world's population collectively went into lockdown, media outlets from around the world reported that Earth was vibrating at a slower rate as the result of physical and social distancing measures provoking a decrease in social, industrial, and economic activity - shutting down almost the entirety of the tourism and travel industries to help stop the spread of the virus.

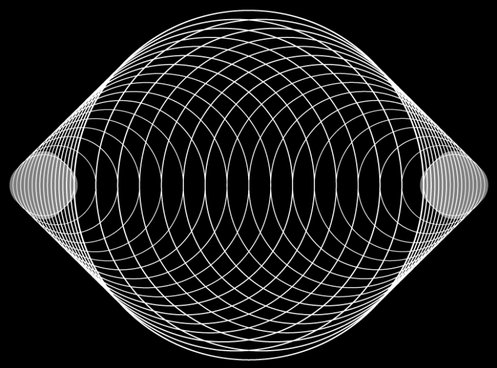
This drop in human activity gave researchers around the globe a chance to conduct significant research on the impact that humans have on other natural systems.
'The Anthropause' represents the longest global seismic noise reduction in recorded history, emphasizing how human systems and activities affect the solid Earth.

source: Fast Company, 2 April 2020

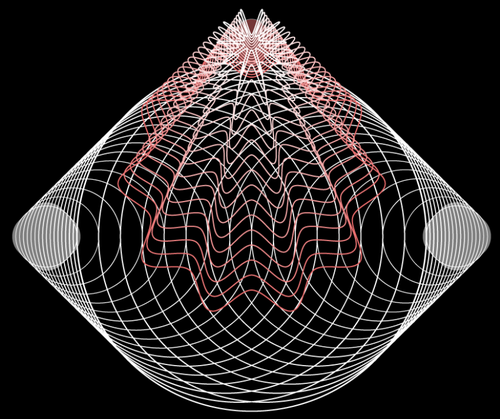


source: CNN World, 3 April 2020

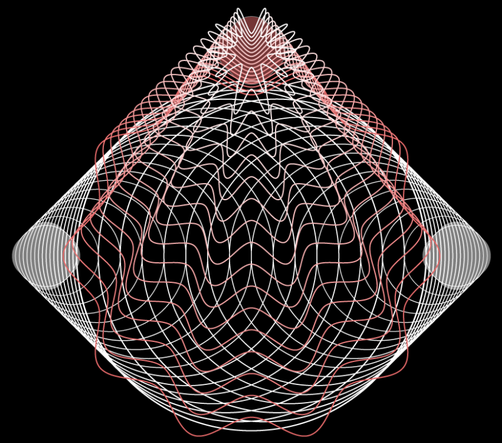
THE ANTHROPAUSE REPRESENTS THE FIRST TIME IN HISTORY WHEN ANTHROPOGENIC SYSTEMS STOPPED RUNNING SIMULTANEOUSLY, SHOWING HOW MUCH WE INTERFERE WITH OTHER SYSTEMS AND HOW QUICKLY THEY CAN RECOVER IF WE ALL WORK TOGETHER TOWARDS A COMMON GOAL.



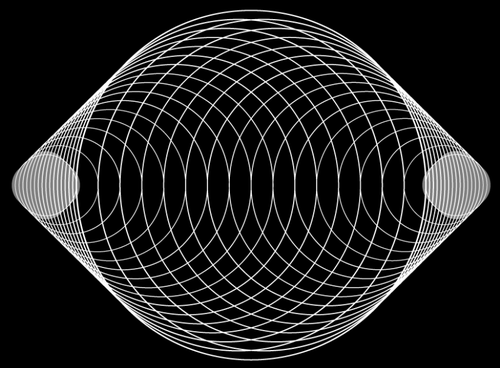
THE HOLOCENE



1950 - ANTHROPOCENE BEGINS



CURRENT SITUATION



ANTHROPAUSE

GLOBAL ANTHROPOGENIC NOISE DROP DURING COVID-19 LOCKDOWNS

Human activities create vibrations against the Earth through the ground as high-frequency seismic waves. The result of these human-linked vibrations is known as ‘anthropogenic noise’.
These vibrations or waves impact and influence other systems below and around us, usually without us noticing.

The journal Science published the results of an amazing collective study conducted by 66 scientists from different cities around the world, headed by the Royal Observatory of Belgium. The study shows seismic data from 66 cities around the world dropping to an average of 50% (see figure 2) which shows how strong the impact (or lack of it) of our collective effort was, this came as an opportunity to compare the average anthropogenic noise level in cities - 28 Hz - and the drop during the anthropause -14Hz-.

The study reveals not only when and where seismic activity dropped as the result of a successful organization during a time of crisis but also helps to identify which places failed to collaborate as successfully as others which will become of utmost importance in the designing of future systems.

This human quieting period came with many ecological upsides: lowering in emissions into the atmosphere, nature bouncing back into cities, and many natural systems showing signs of recovery over a relatively short period.

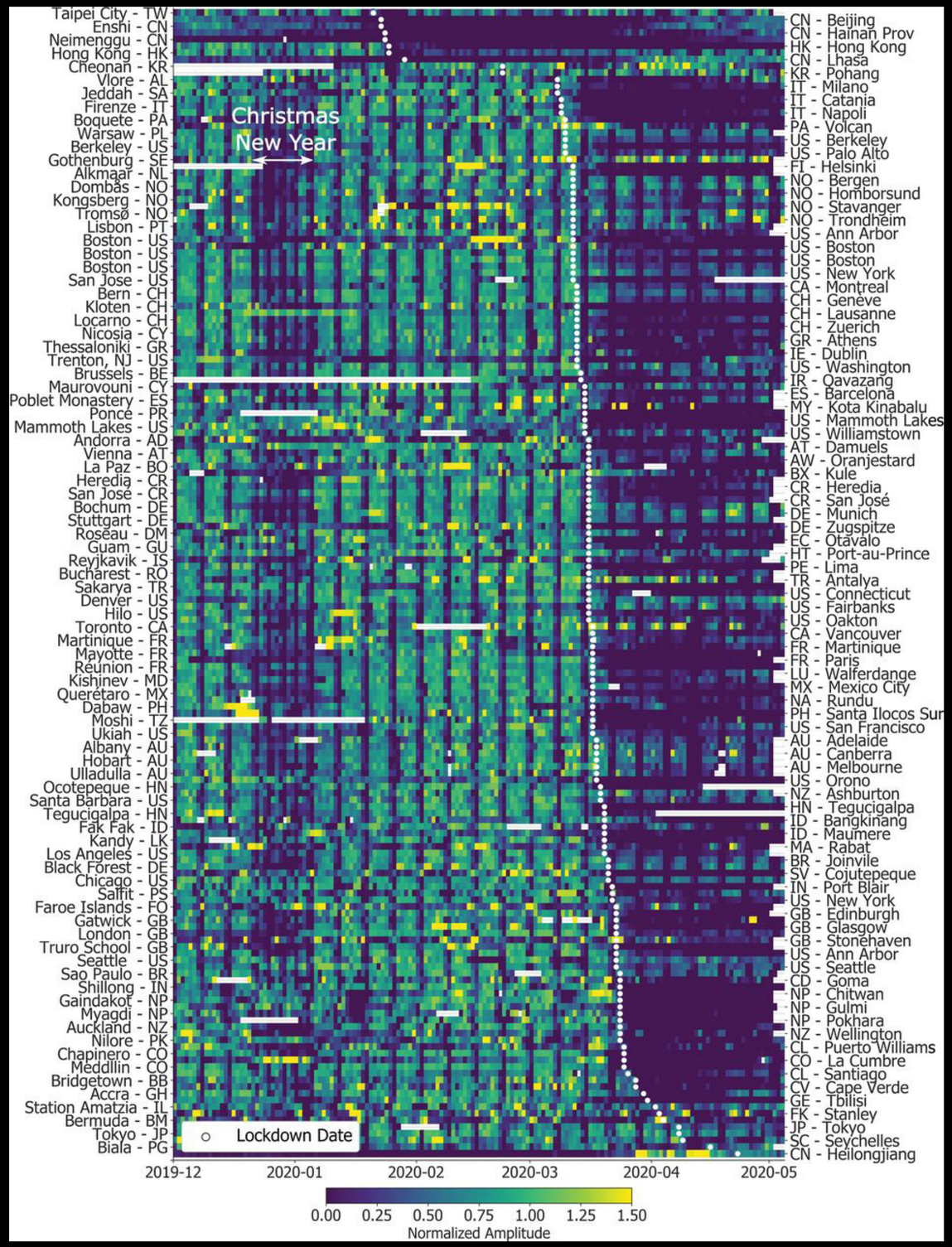


fig. 2 - global temporal changes in seismic noise during covid-19 lockdowns

Source: Journal of Nature, Ecology and Evolution

HARMONY AMONG CHAOS

While we were locked inside, nature thrived in harmony.
During the reductions of anthropogenic noise, sightings of wild animals bouncing back into the have been reported all around the world. Pictures of Boars in Spain and Italy swarmed the internet along with others of mountain lions in downtown San Francisco, Pumas in Santiago de Chile, Jackals in Tel Aviv, and many others; making us realize how our systems divide and disbalance harmony with nature.

Jackals spotted in Downtown Tel Aviv

Source:
ScienceMag

Puma in a residential area in Santiago de Chile

Source:
Straits Times

***Giant Pandas in Hong Kong Zoo finally mate after 10 years** during the covid19 lockdown when no humans were allowed in.*

Source:
ABC News

LESSONS FROM THE ANTHROPAUSE

The Anthropause presented itself not only as an invitation to slow down and reflect on our impact in the world, but also as an unprecedented research opportunity to natural scientists to study the transmission and retention of information in different animal societies without us being in their way; allowing researchers from all around the world to compare how animals behave before, during, and after the COVID-19 pandemic.

However, many of the signs of recovery from the anthropause started vanishing as soon as lockdown restrictions began to get lifted around the world, bringing back littered beaches, polluted skies, and driving nature away to where ‘we think it belongs’, failing to acknowledge that we are nature. We need to maximize the impact of the scientific insight collected during the Anthropause and bring it back into the conversation. It’s been long known that we are the problem, yet this serves as a recent and relevant example that we can reverse it and must think of ways to coexist with nature.

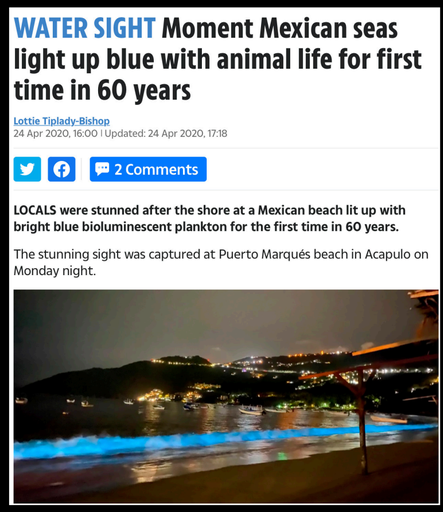


fig 1 - The Sun - 24th April 2020

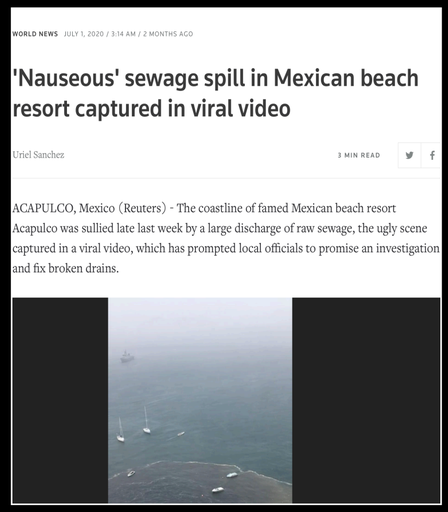


fig 2 - Reuters - 1st July 2020

fig 3 - BBC News, 2 June 2020

fig 4 - BBC News, 1 July 2020

Before the anthropause, anthropogenic noise was a known problem with a focus on marine species, as sound travels faster in water than it does through solid Earth.

But the anthropause gave evidence on how loud we actually are - giving us insight also on how sensitive animals are to vibrations in terrestrial and aquatic environments, inviting them in while we were locked inside, and scaring them away or breaking them up through the systems we choose to make part of our daily lives.

CHAPTER IV

DESIGN INTENTION

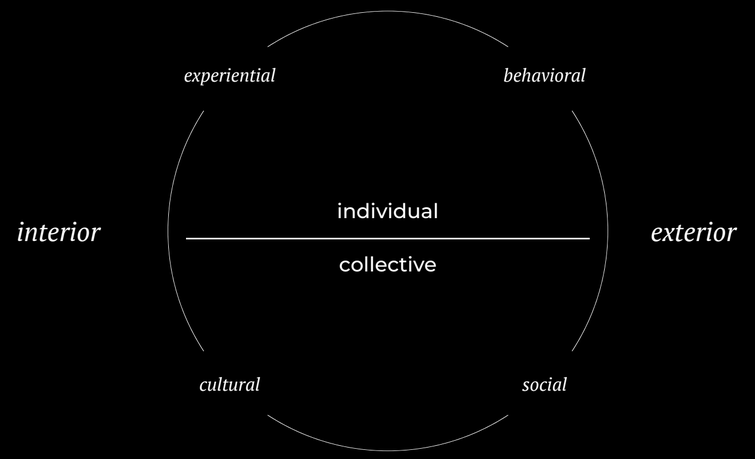
The environmental damages of anthropogenic noise pollution are real, and the evidence was there for the entire world to see, just a few months ago. Yet sound is often not a consideration in environmental conversations. I believe it should be.

That’s why through this project, I am aiming to maximize the impact of the scientific insight collected during the anthropause designing an immersive experience to educate people and reflect on how the choices made at a human scale affect other systems on a global scale.

WHY I CHOSE TO DESIGN AN IMMERSIVE EXPERIENCE

As an independent designer with the freedom to create my own project for this thesis, I came to the conclussion that attaching a meaningful message to a beautiful, immersive experience was the best way to bring my message across, creating a collective experience that will make visitors aware of the influence of others and their own have on systems around us.

I also came across a phylosophical theory that really resonated with me; the integral theory of the human experience by Ken Wilber. In his thesis, he illustrates how the individual experiences shape our collective experiences and vice versa.
On the upper left quadrant, we have the individual experiences (emotions, thoughts, perceptions) that we experience in our ‘interior world’, that influences the way we behave in the ‘outer world’ located on the upper right quadrant, defining our social environments with others who resonate with us. On the lower right quadrant, we have the social systems where these thoughts (vibrations) can be amplified to resonate to a wider audience, which leads us to the lower left quadrant, we have the ‘interior-world’ of the collective; where those thoughts (frequencies) resonate with us until becoming part of who we are as individuals, our culture.



This gave me insight on the power of public installations for starting conversations and maintaining them until they become part of our collective knowledge. how I wanted people to behave inside the installation and how my message could be amplified for both individual and collective experiences.

DESIGN CHALLENGE
VISUALISING THE ANTHROPAUSE

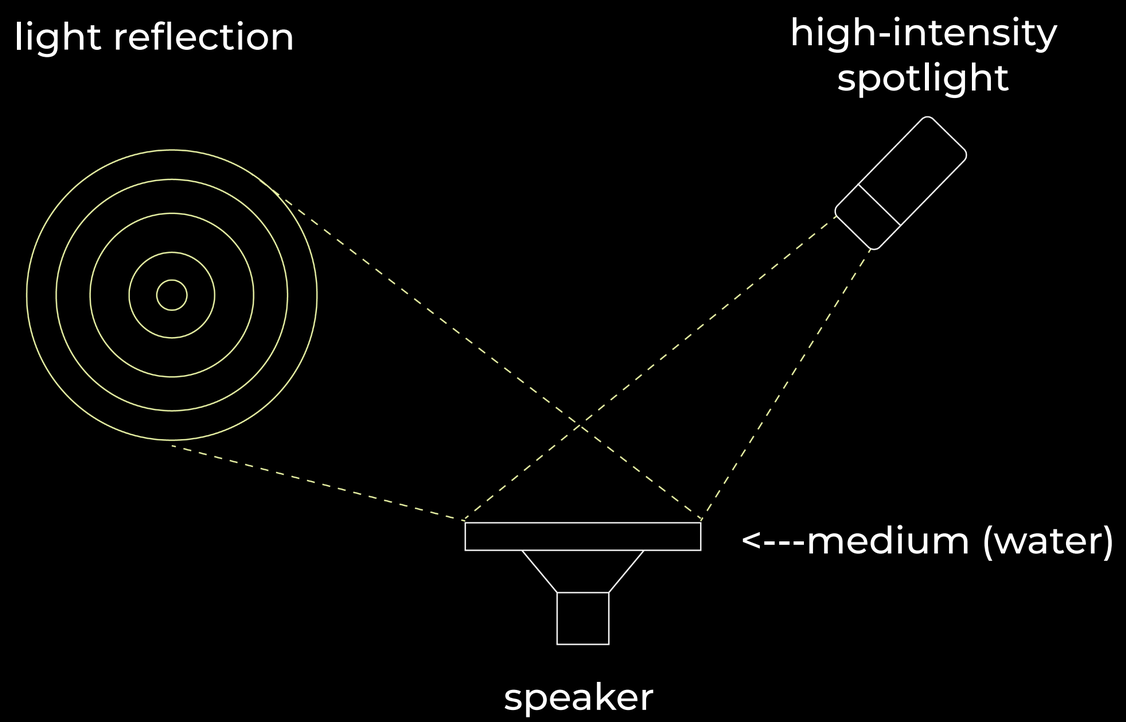
My main challenge was finding a way to visualize this issue, as humans can only perceive vibration or sound in a range from 20-20,00Hz. Which makes it impossible for us to listen to these frequencies. 8Hz / 14Hz / 28Hz

However, through prototyping and applying understanding of the physical characteristics of sounds and movement, I found an effective way to visualize these frequencies. Using a speaker to vibrate a plate with water and shining a spotlight onto the plate; reflects periodical ripples of light in front of it.

Through experimentation and recorded observations it was noticeable that a faster frequency, the waves would speed up and clump together, whereas lower frequencies resulted in smoother, harmonic visuals. We are literally watching the soundwaves harmonizing through the medium
The movement of the water is only perceivable on the light reflections; if we were to look at the plate, it would look completely at rest.It is only through the light reflections that all this movement can be perceived - turning it into a potential audio-visual way to compare different states within the system; drawing comparisons within harmony and chaos.

Human Hearing Range:	20 - 20,000Hz
Key Frequencies:	8, 14, 28Hz

YOUTUBE
VIDEO PLAYLIST



7.83Hz

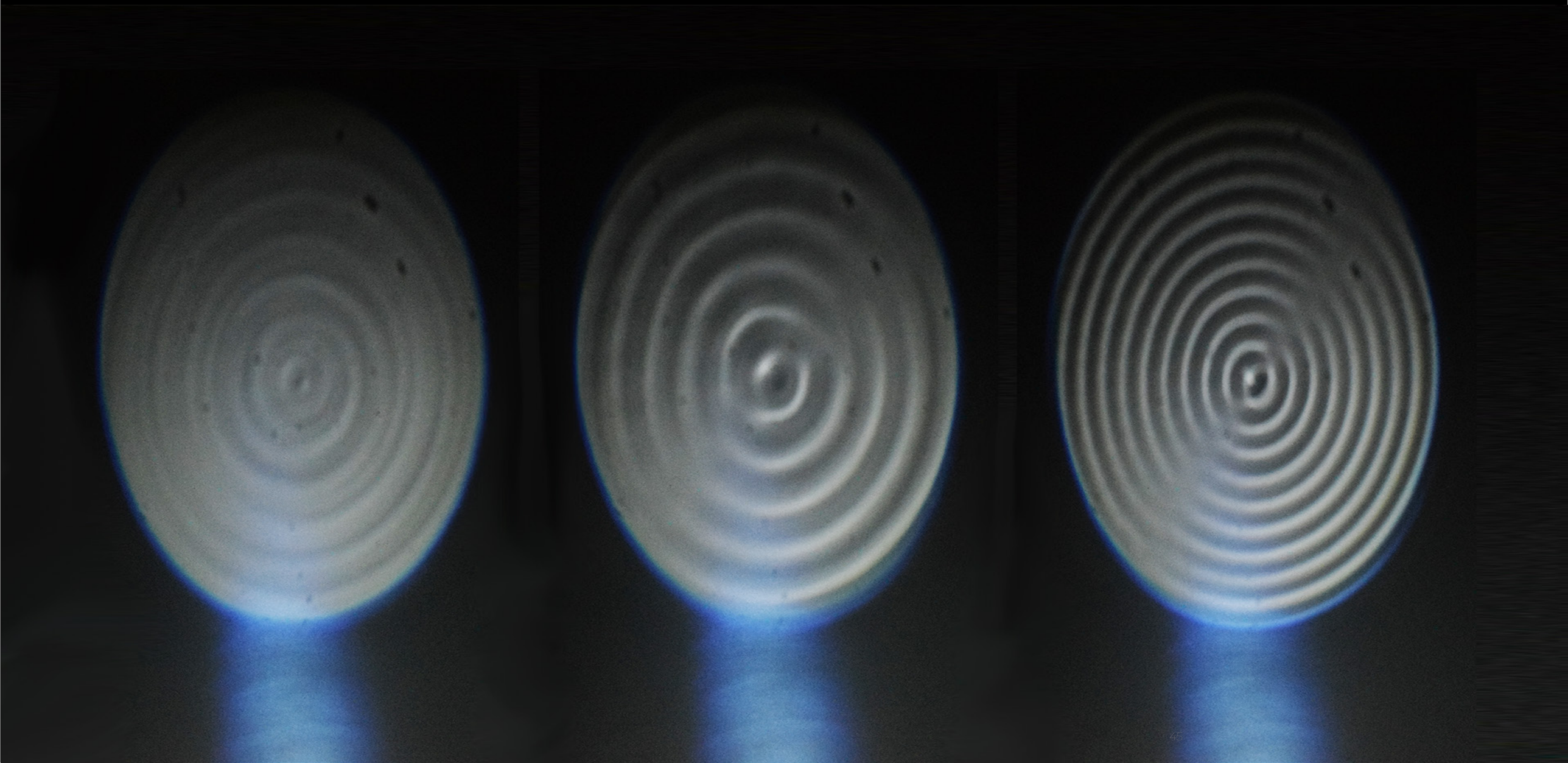
Schumann Resonance
(fundamental mode)

14Hz

Anthropogenic Noise Levels
During Lockdown

28Hz

Average Anthropogenic
Noise Levels



the search for
HARMONY

ABSTRACT

During the covid-19 lockdowns, seismologists around the world reported that the Earth was vibrating at a slower rate as a result of the sudden slowing in human activity.

This quieting of human activity is known today as the anthropause, and it marks the first time since the dawn of the industrial era when our systems and activities stopped and unveiled the true consequences of the impact of noise pollution.

By making people aware of their influence on the natural systems supporting their existence, the search for harmony hopes to provide people with the agency to change their individual and collective relationships with each other and the environment. Resonating together in harmony towards a more equitable future.

the search for **HARMONY**

MEL BOURNE DESIGN WEEK
26 MARCH –
5 APRIL 2021

CREATIVE VICTORIA

NATIONAL GALLERY OF VICTORIA NGV

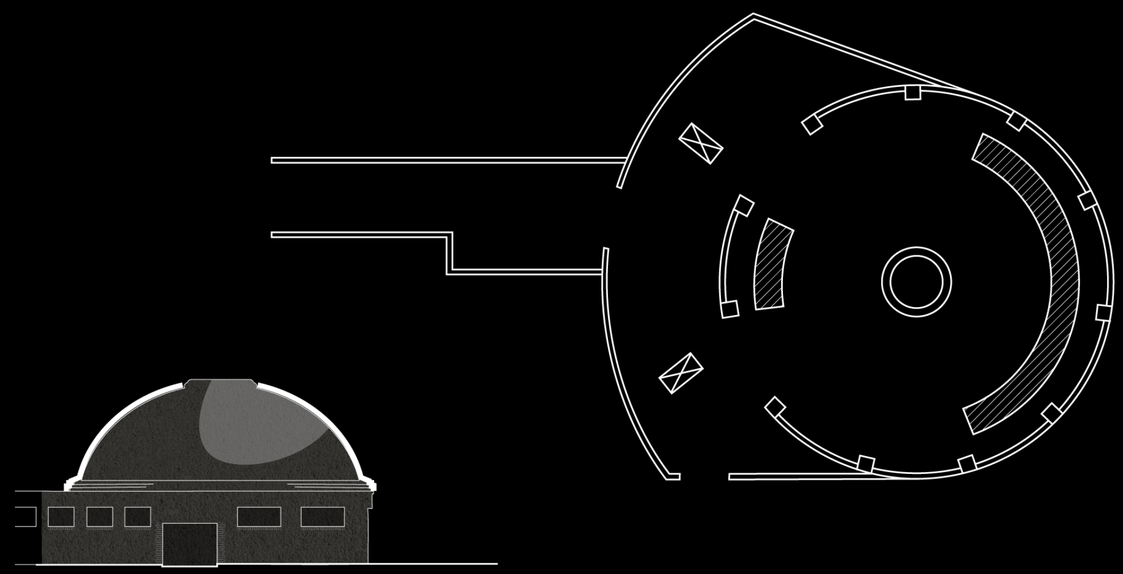
RMIT UNIVERSITY

MD IT

MELBOURNE DESIGN WEEK 2021

During the development of this project, my project was accepted to be showcased as part of the satelite program of Melbourne Design Week which will take place on the week of March 26th.

Stay tuned for updates on this section.

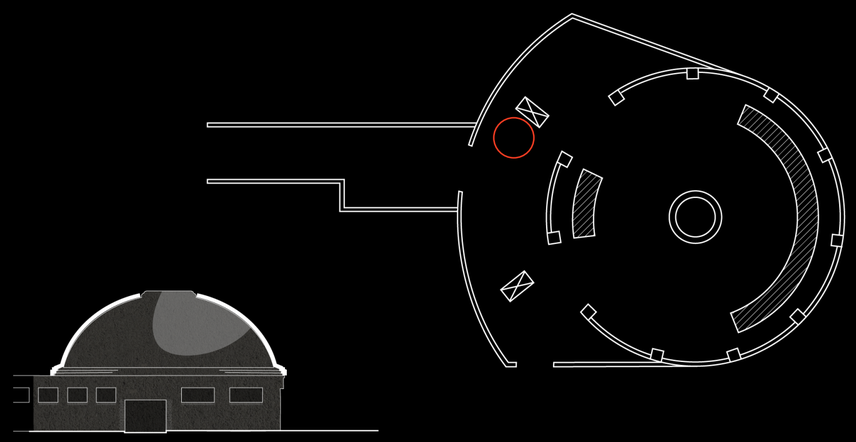


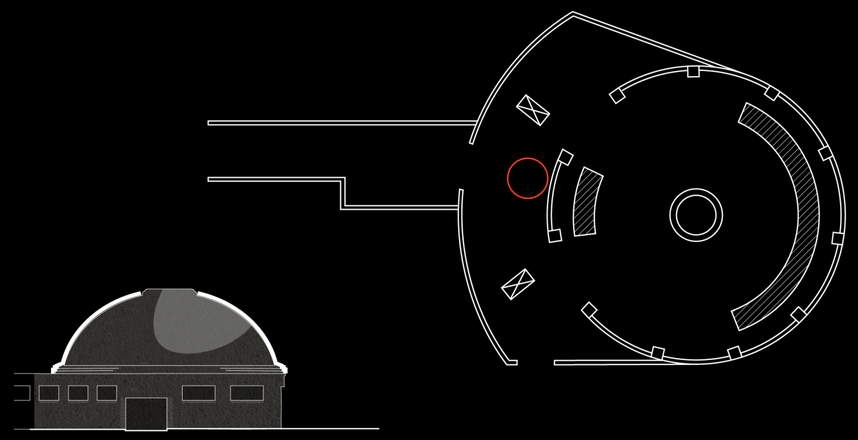
NORLA DOME

For the purpose of demonstrating this experience, I am using the Norla Dome as a potential venue to host the immersive audiovisual experience.
vI chose this venue to take advantage of its acoustic and spatial properties - its hard surfaces make for a very reverberant space and its dome is perfect for hosting the experience. However, this experience could be easily adapted to different spaces.

I. KEY FREQUENCIES

When entering the space, visitors will encounter and learn about the three key frequencies of the experience. Each frequency will be playing individually reflecting the movement in the water. Accompanying each frequency will be a panel explaining what that frequency represents.

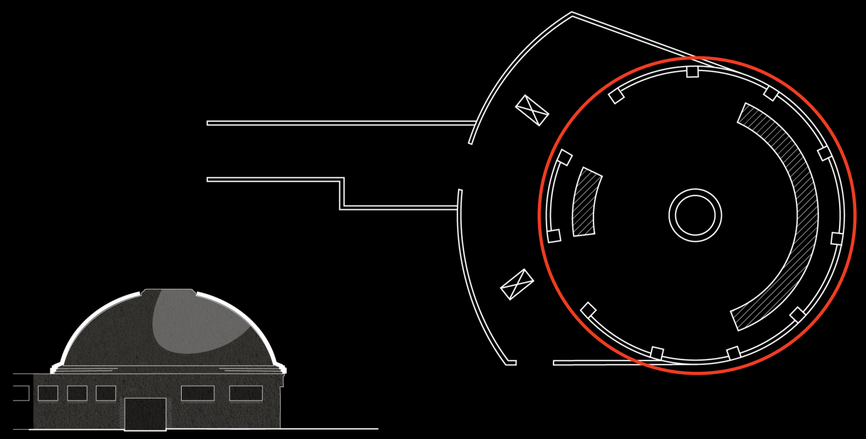




II. ENTERING THE ANTHROPAUSE

Secondly, visitors will interact with the second part of the experience; entering the anthropause. To this artifact, I have added an arduino and an ultrasonic sensor to detect distance. Using Max msp, the program will run in the following way:

- Whenever no human presence is detected in front of the sensor, the speaker will vibrate at the rate of the Schumann resonance -7.83Hz
- When a visitor approaches the sensor, detecting human presence, the plate will accelerate to the rate detected during the anthropause while we were in lockdown - 14Hz.
- However, as the visitor approaches the sensor, this artifact will speed up in frequency, ranging from the rate of the anthropause (14Hz) to the usual anthropogenic noise (28Hz)
- If the visitor gets curious enough, he might even touch the water that looks at rest to the naked eye, and might even be surprised by the momentary chaos in front of him.

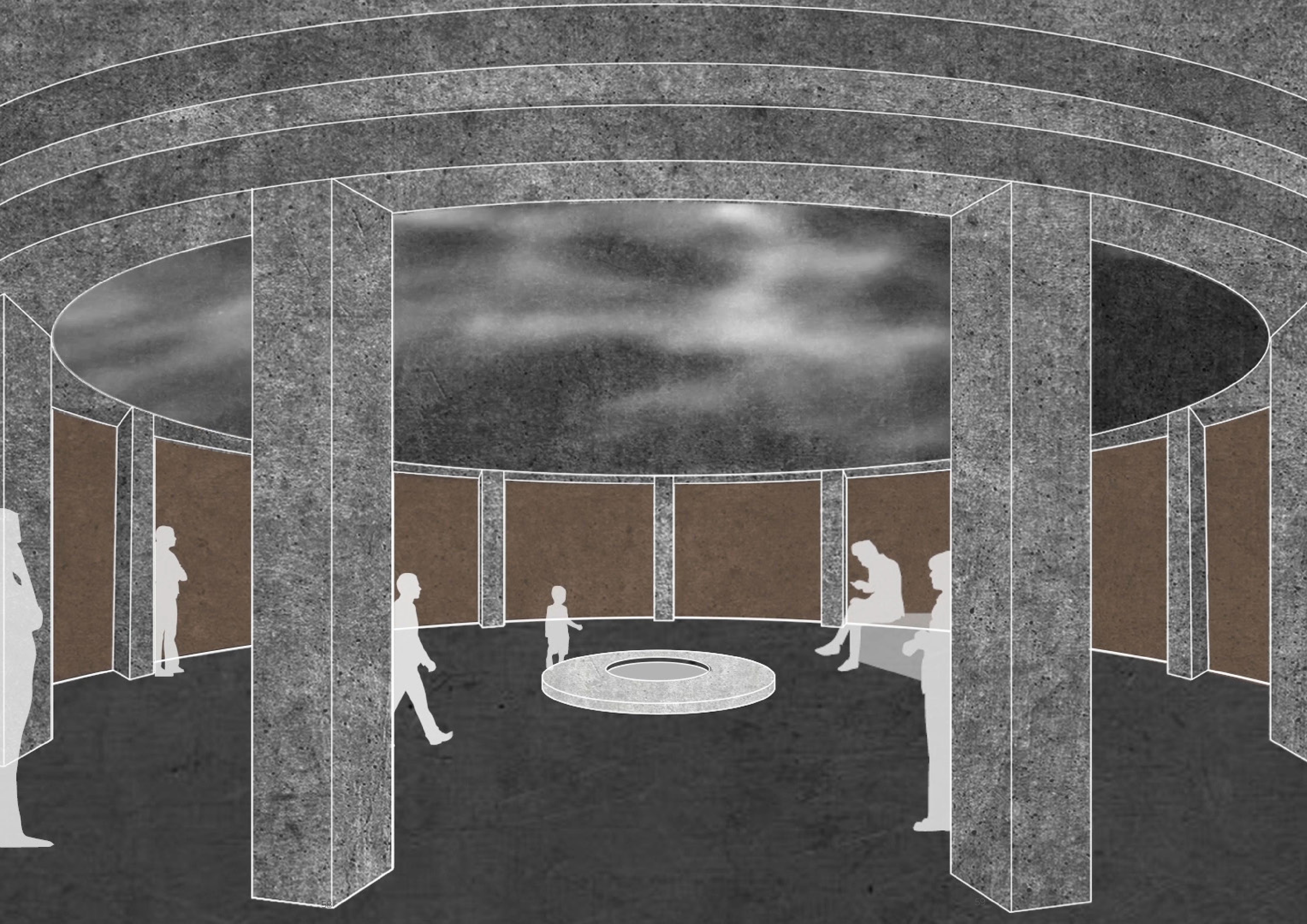


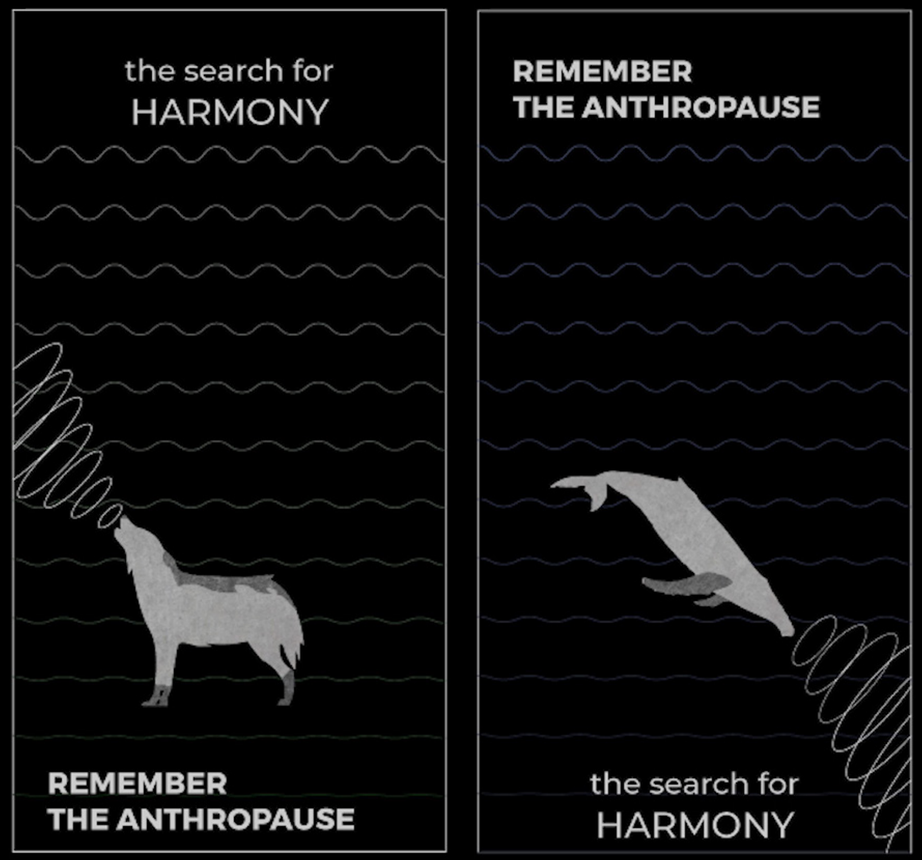
III. THE SEARCH FOR HARMONY

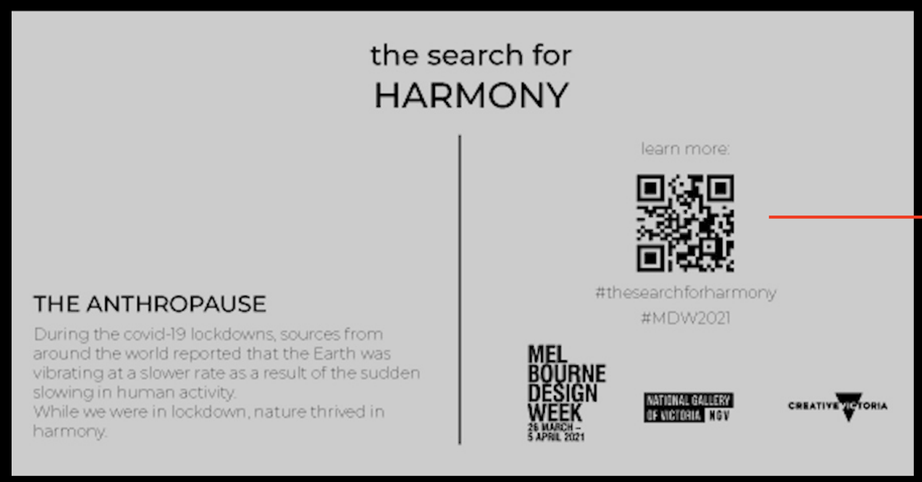
Using the same principle, the visitor will enter the main experience in the dome; in which the intention is to make people notice how they are influencing the rhythm of the system.

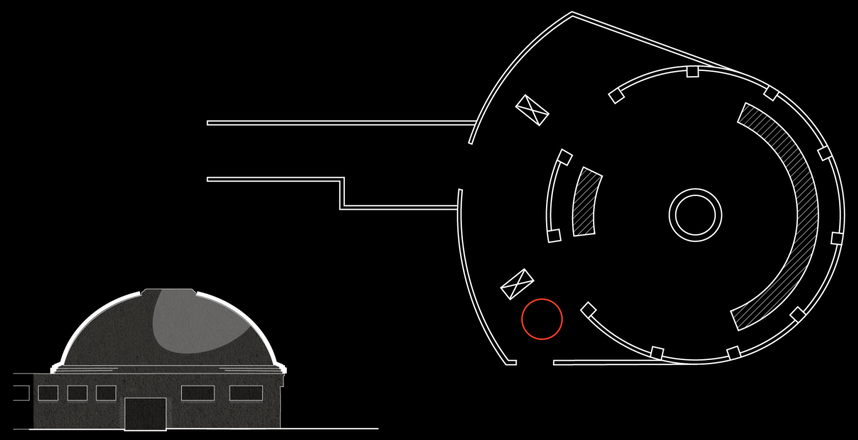
- When being outside looking in, visitors can notice the smooth ripples being projected on the dome at the rate of the Schumann Resonance - 7.83Hz.
- When entering the dome area, and approaching the plate, the program will accelerate from 14Hz to 28Hz according to the distance captured by the sensor.
- At the periphery, there will be designated sitting areas where people can sit without accelerating the system - allowing them to rest, and reflect on anthropogenic interference within systems generating opportunities for conversation and reflection.


the search for
HARMONY









IV. POSTCARDS FROM THE ANTHROPAUSE

While making their way towards the exit, visitors will be offered a souvenir postcard to take home and remember the experience. On the back of each postcard, they will find QR code to visit a microsite where they can revisit the experience and it will provide with more information on the anthropause and on how to live sustainably and in harmony with natural systems.

INFO
PHOTOS
VIDEOS
TESTIMONIES
ARTICLES
CALL TO ACTION.

CHAPTER VI

MAJOR PROJECT PRESENTATION

This project was presentedin front of a pannel as part of my major project to conclude my masters degree in design, innovation, and technology at RMIT.

To watch the presentation scan the QR code below:

FEEDBACK

Ewan McEoin

Good area of focus “sounds like a new age theory but actually a scientific fact”.

Consider scaling it up into an exhibition for different examples of anthropogenic noise, create an artifact which function is to draw attention to differences or changes.

Focus on the artifact.

Anthropause articles could be a part of the exhibition.

“Don’t focus too much on how to change people’s behaviors. Focus in the area of noise and really make clear that less noise brings good to the world and visualise different problems using the artifact.”

“MDW is an amazing oportunity to tell a story. It’s exciting that this is a new topic, so if you can do it really well quickly; you could be the first person to do it.”

Emma Luke

Good work on the images and prototypes done for this presentation; they will allow for the project to move forward smoothly when thinking about scalability.

The dome is a beautiful and holistic way to bring it all together.

Think of ways of adding more of the research into the experience.

Ross McLeod

Very poetic and beautiful. Think of ways to deliver the message; it’ll have to be done delicately.

Consider adding soundscapes to at some point help deliver the message in a sensorial manner.

CHAPTER VII

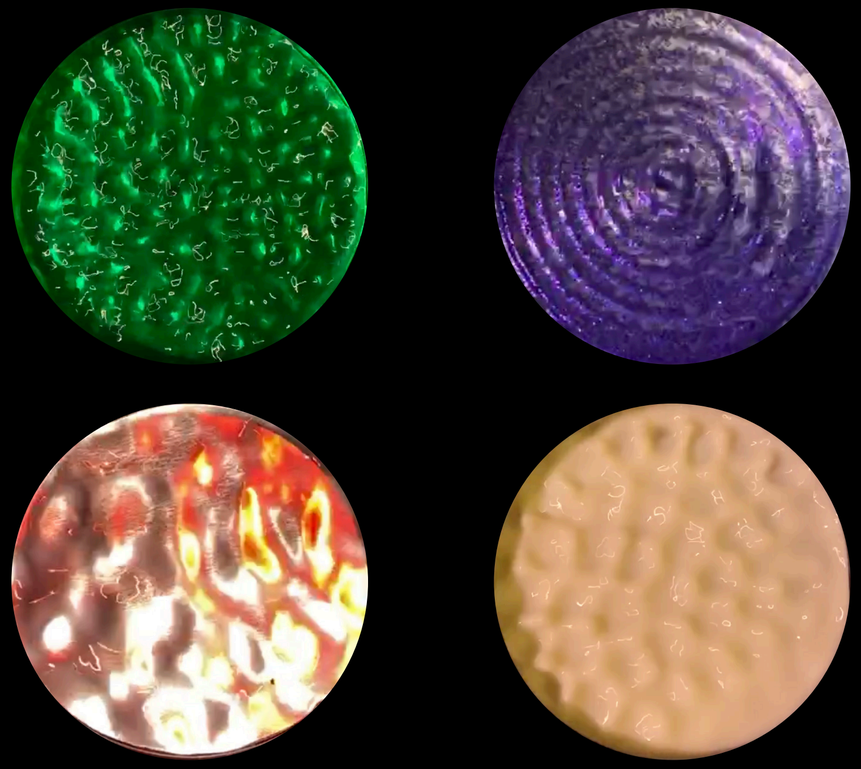
DESIGN JOURNEY
+
EXPLORATORY WORK

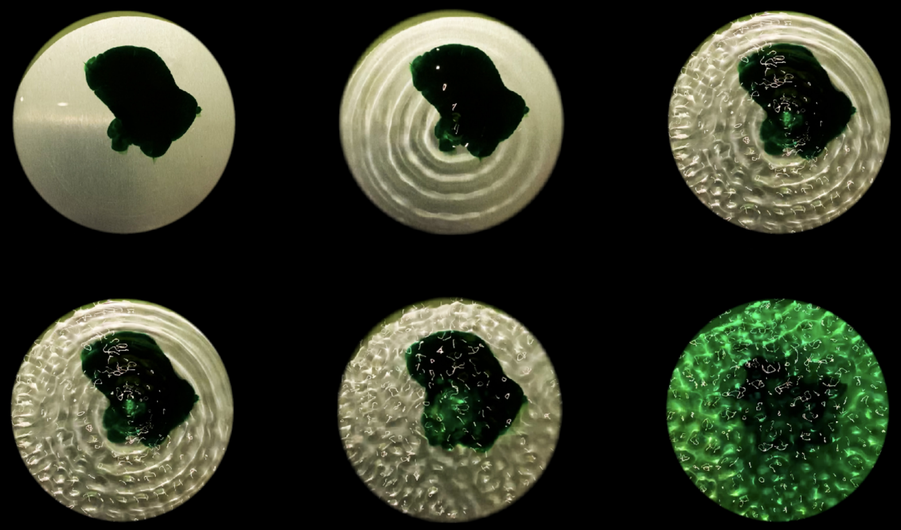
PROTOTYPING
DIY CYMASCOPE

For this project, it was important to visualize comparissons of different vibratory systems representing them through cymatics; using a speaker to vibrate water at specific frequencies.

This one I did on my past semester in MDIT on a class ‘make things interactive’ and it is what got me hooked on cymatics.

It has an Arduino Uno inside and I can reupload any code to it without having to take it apart.
However it is easy to open in case any new stuff should be plugged into the arduino.





Using a small plate to vibrate the water, the soundwaves can be visualised through the medium in the forms of different patterns. This is only achievable using small plates, which were not ideal for the collective experience I was aiming for.

However, this drove me to use bigger plates and amplify the movement in the water using light reflections.

PROTOTYPING

Medium

Processing

Arduino

Output

Mono Amp

Narrow beam PinSpot

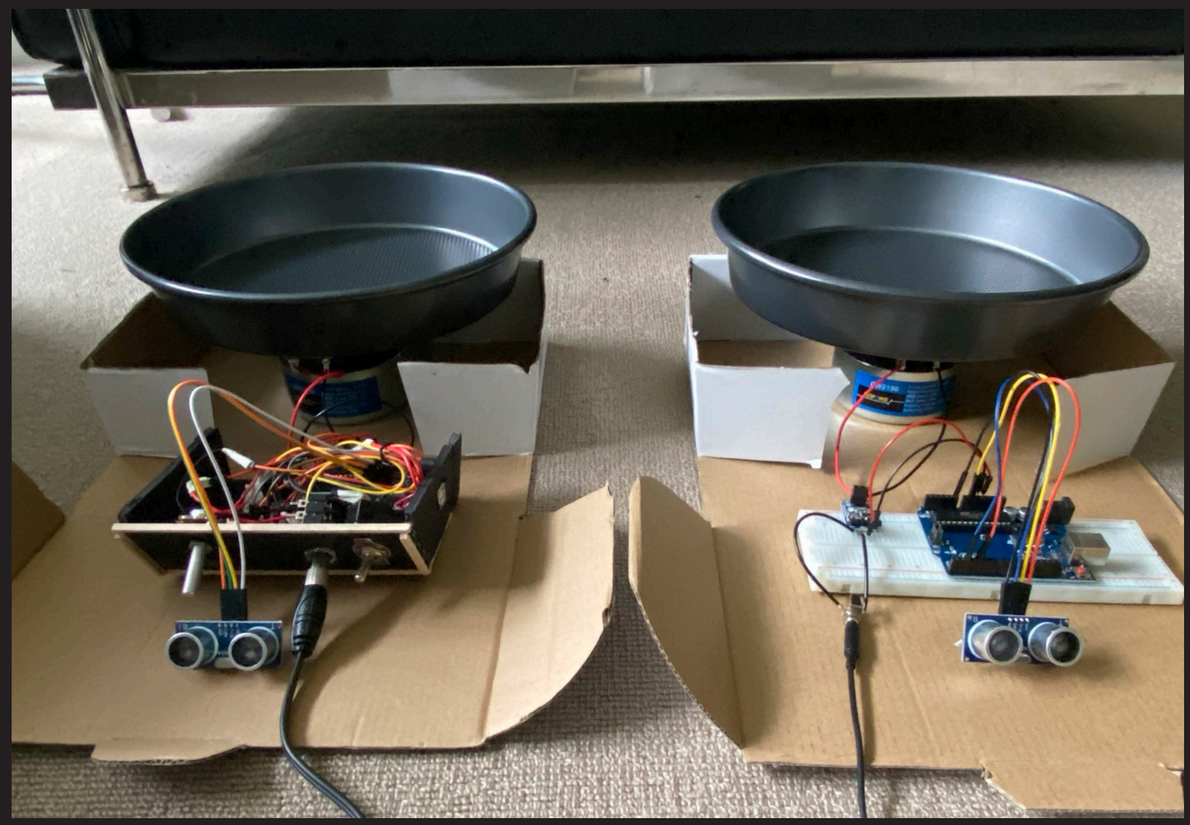
Input

Ultrasonic Sensor

Max MSP

4” Speaker

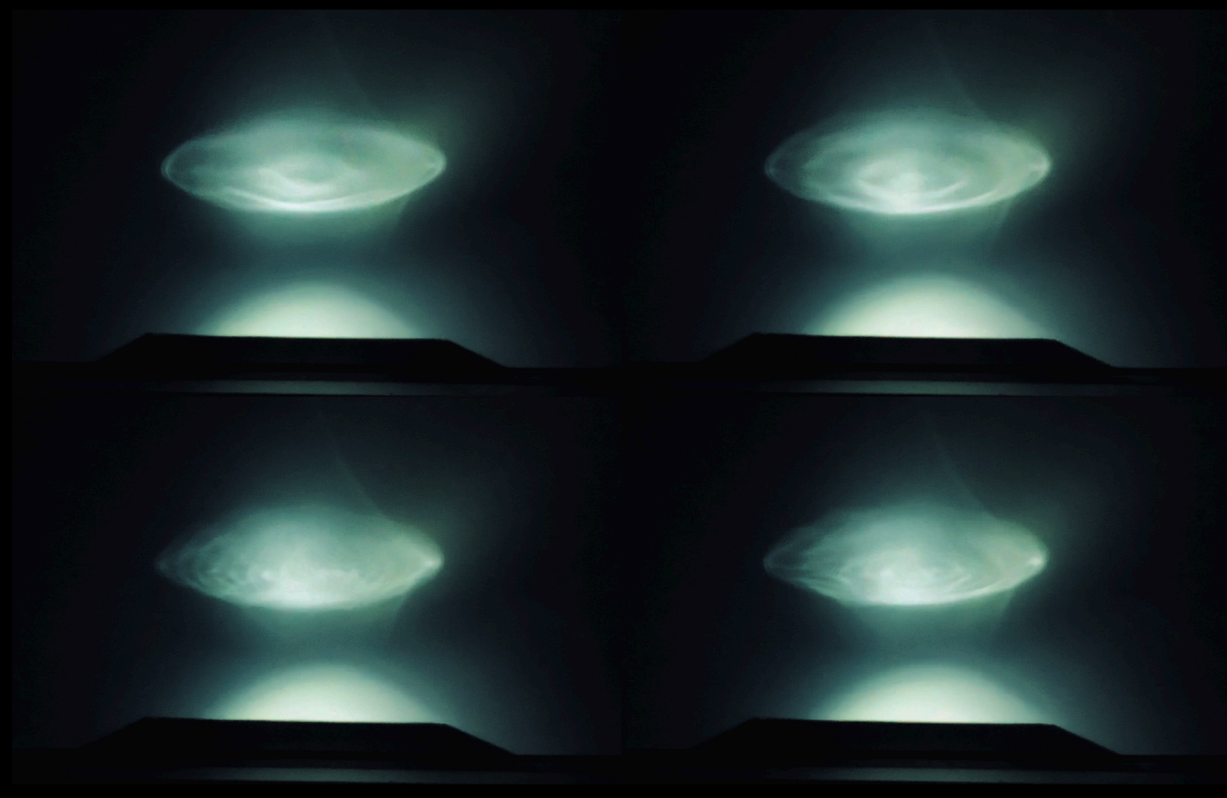
Water



EARLY LIGHT EXPERIMENTS
Finding the right setup

I documented different experiments using various types of lights to reflect the water ripples off the vibrating dish.
You can see the iterations in a series of videos demonstrating how the sweep of frequencies from 14 to 28 HZ looks like. Link to the youtube playlist is below.

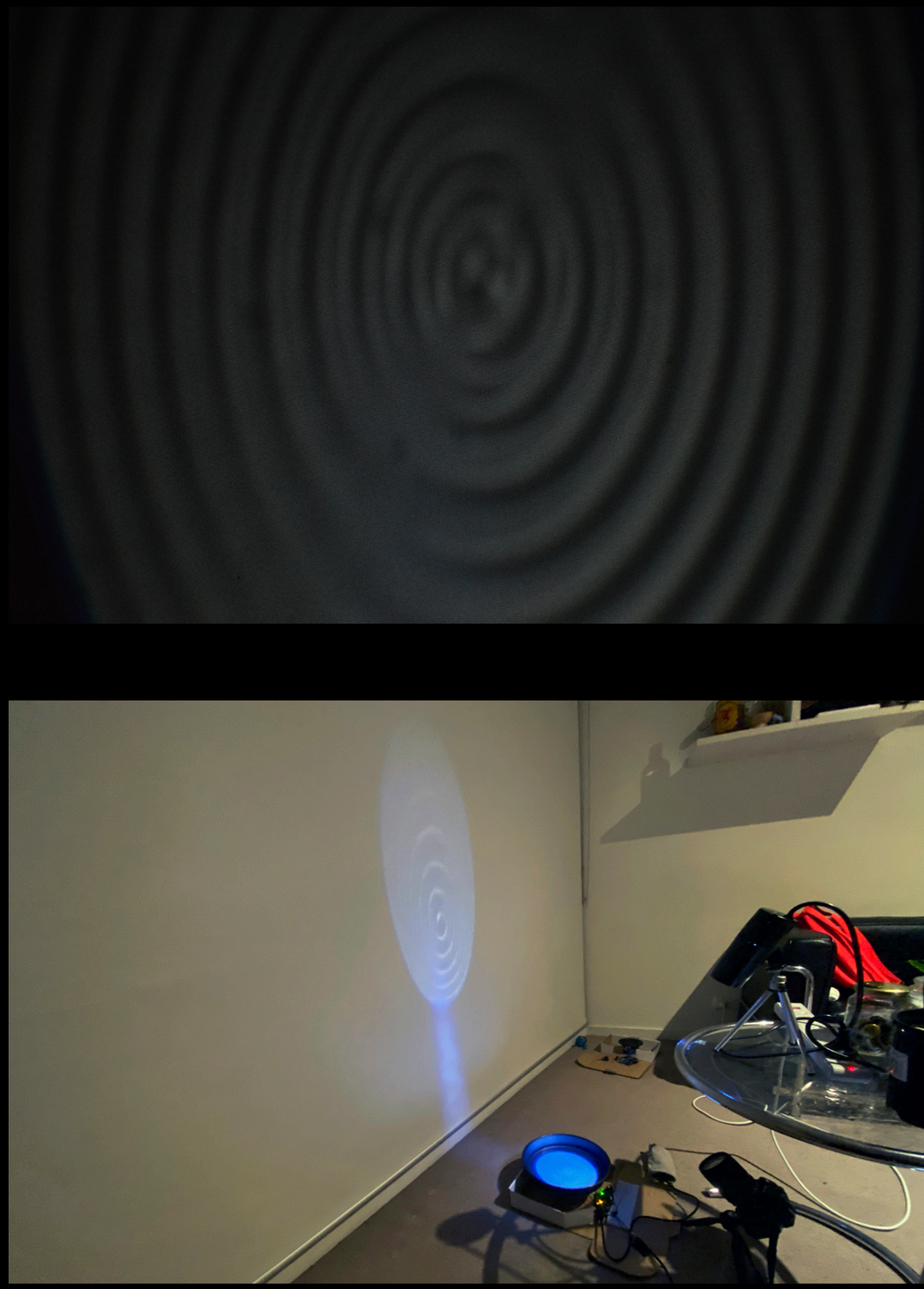
The range of frequencies is not audible to human ear, nor is it visible when looking at the water - it is only when reflecting the water onto a surface using lights when these vibrations become perceivable to us. When the speaker vibrates at a higher rate, the water ripples distort and go all blurry, as if it's reflection was losing focus.

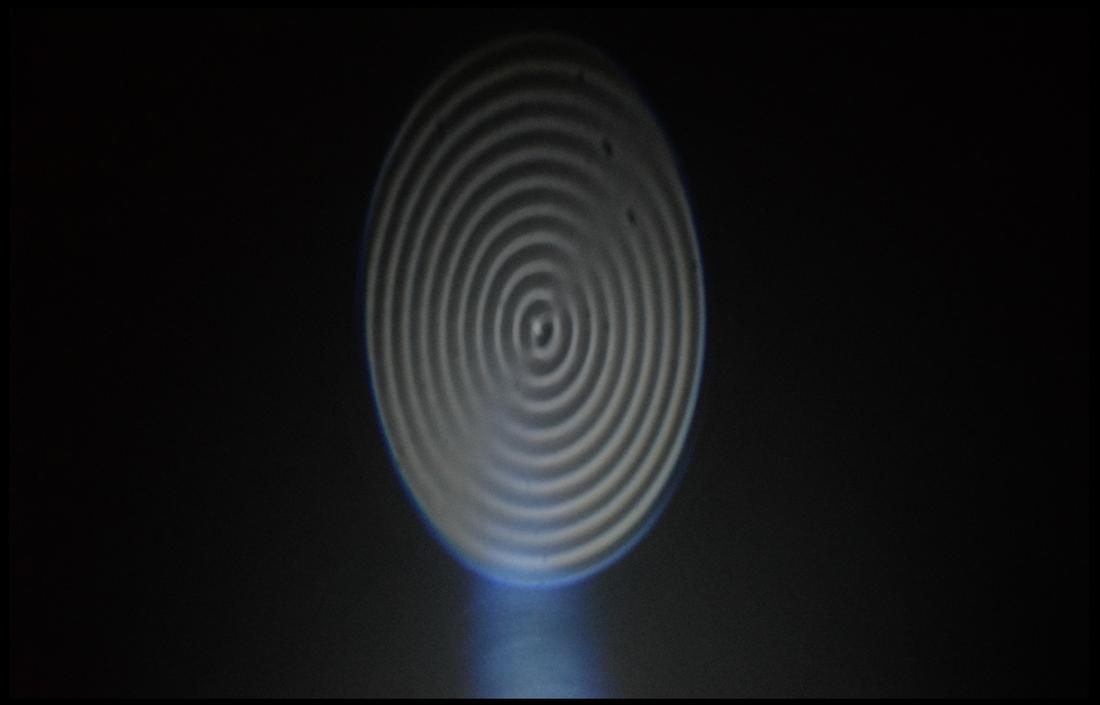


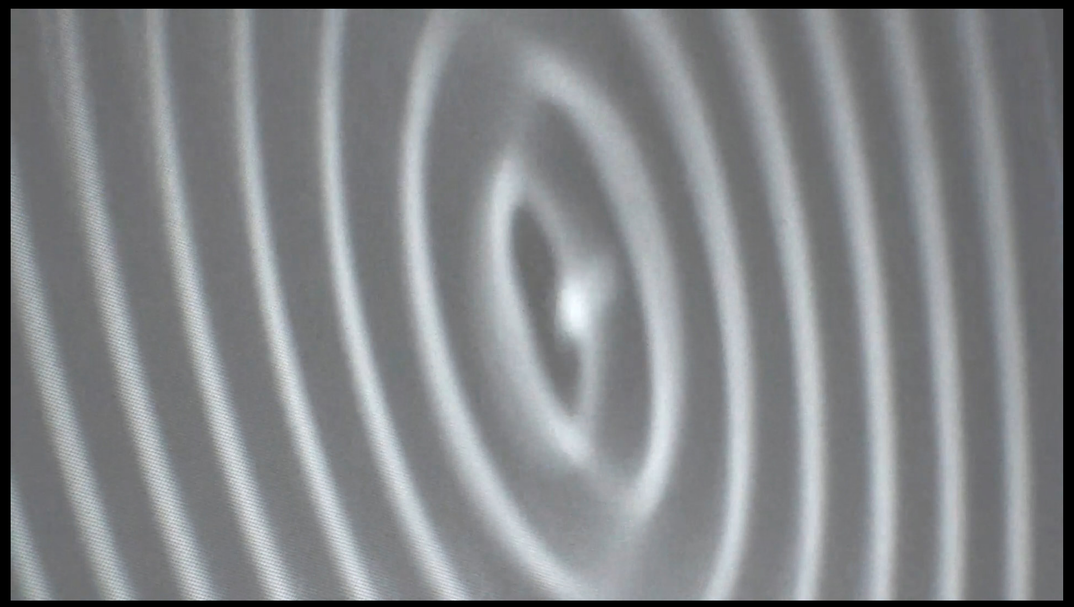
Sequence 1.
Vibrating a small aluminium plate using my phone's torch as a light source.
The aluminium plate is highly reflective, therefore we get a white bright reflection.

Sequence 2.
Using an LED flashlight and a cake pan as a dish.
A wider beam angle from the light source translates into less focus area on the ripples.
This made clear I needed an extra bright spotlight with a very narrow beam.

LIGHT REFLECTIONS
FINAL SETUP







CHAPTER VIII

APPENDIX

PRECEDENTS

Elizabeth Ogilvie | Bodies of Water

Her work in her exhibition ‘bodies of water’ magnify the natural properties and movements of water through carefully placed lights and water projections over large screens that immerse the visitor in an environment of continuous change. She uses water as a medium for her art and to send a message of environmental concern.The source of the movement varies between a musician playing different instruments to the artist creating the movement herself behind the screen, her use of technology goes as far as creating a cloud inside a room (visit link below).

source: *elizabethogilvie.com*
folio link: *http://www.elizabethogilvie.com/proj_uploads/bow.pdf*

We are Matik | SONOS CyFi Lab

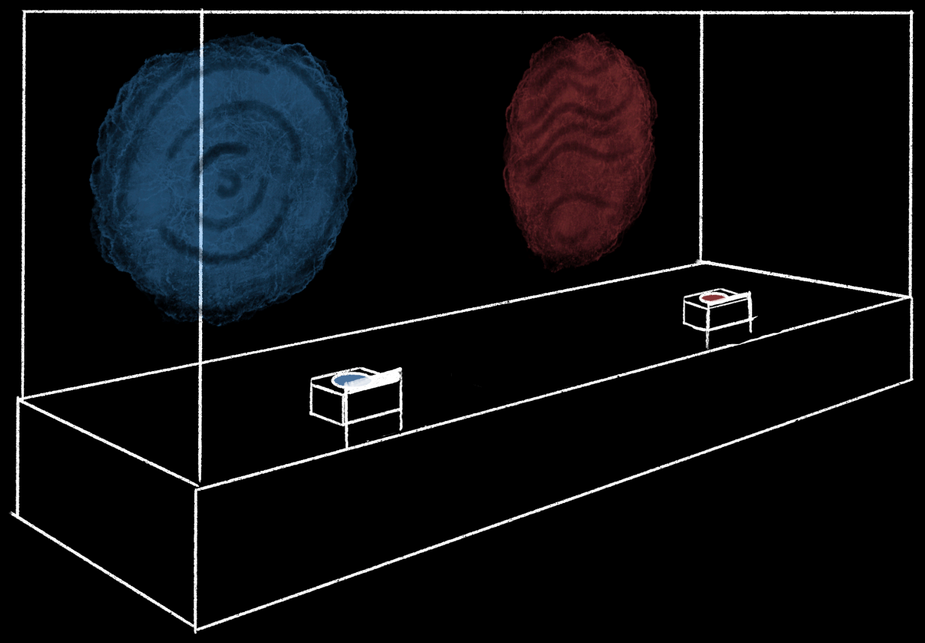
Studio ‘we are matik’ created this immersive experience for Sonos - a speaker brand; to showcase the power of their low frequency range.
It consists of multiple stations with acrilic boxes containing different cymatic experiments using the low end bass of the sonos speakers. The systen as far as I understand, is patched to a VJ booth were music can be performed while the stations react to it and the video walls project patterns of white light.

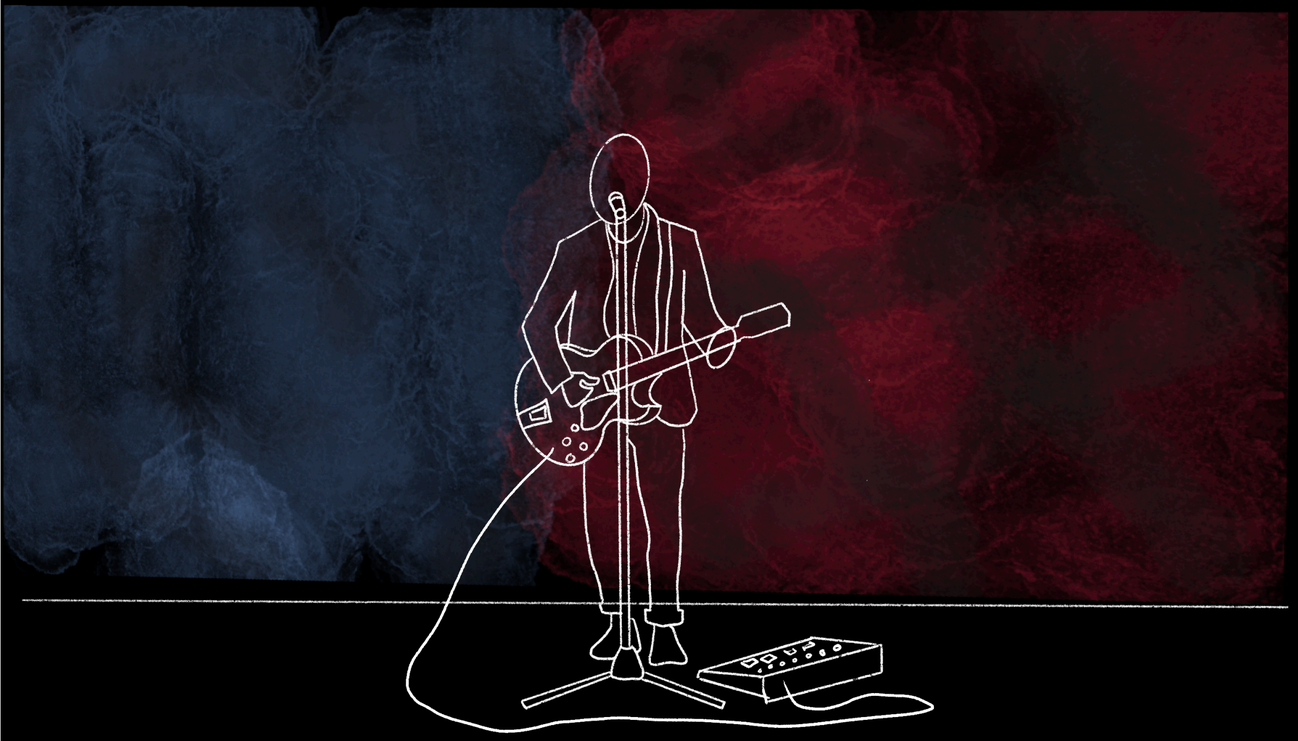
source: *wearematik.com*

Finnboggi Petursson

Finnboggi Petursson is an artist that works with lights and vibrating water usually making use of big spaces with big bodies of water in them.
I find his work extremely inspiring and his execution is amazing; personally (sadly) I have never been to any of his installations but the images and videos are immersive enough to understand how powerful manipulation of simple elements such as water and light can be.

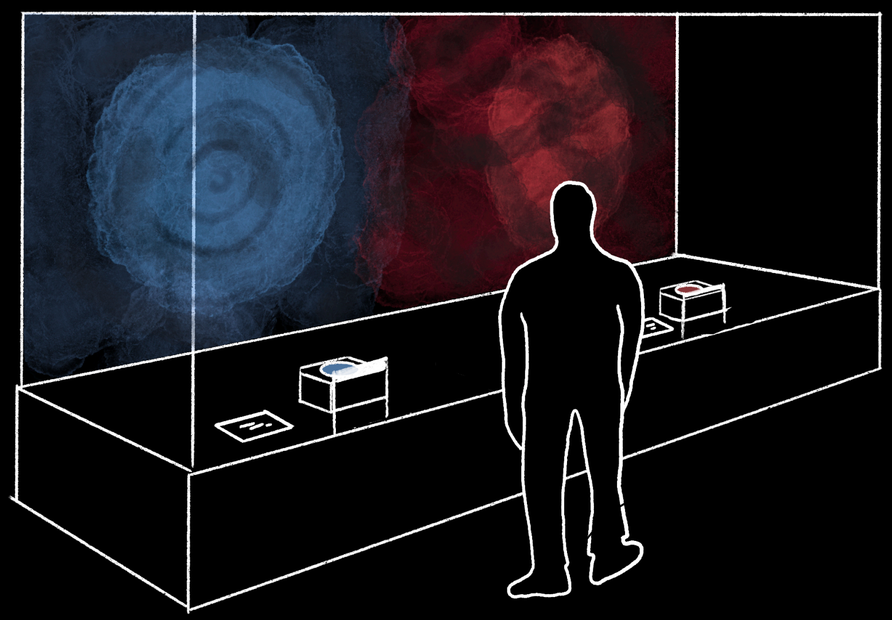
source: *finnbogi.com*

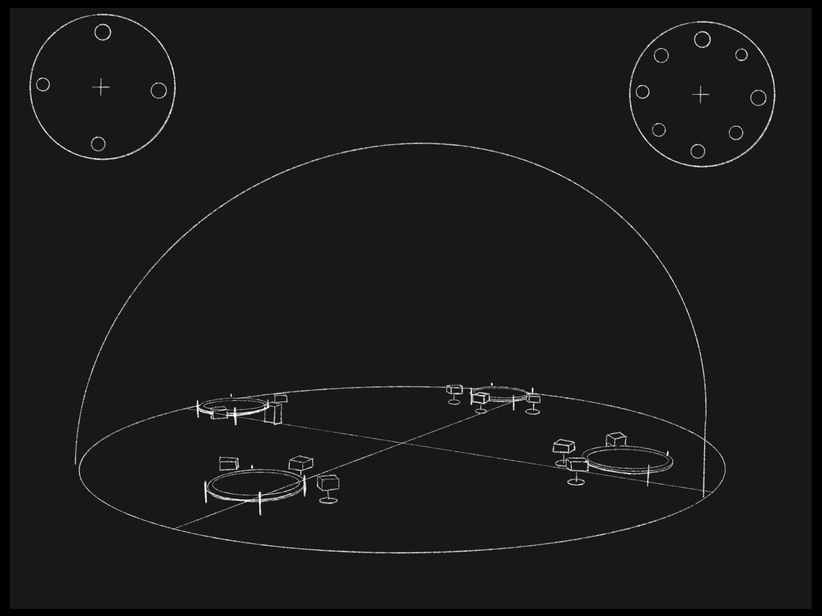


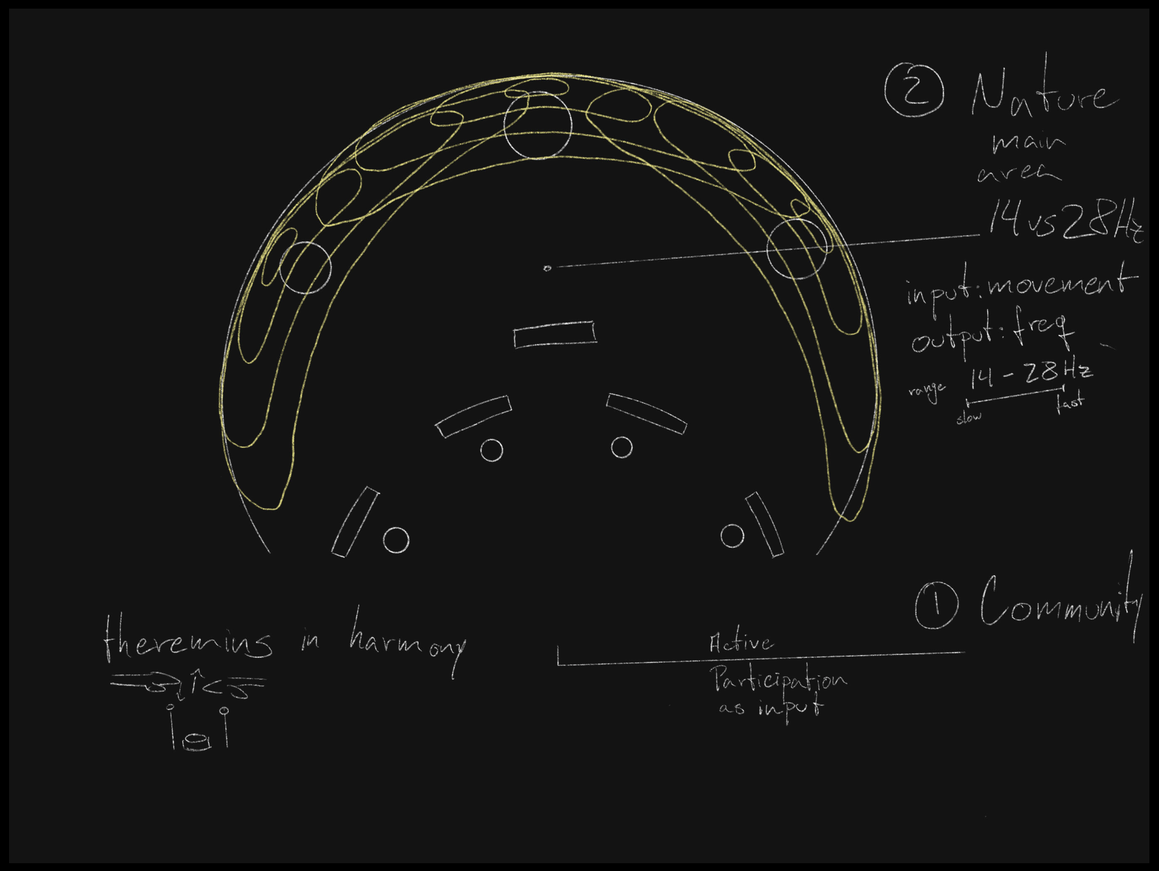


Music Performance
streamed in Social Media

Storefront
of a closed business

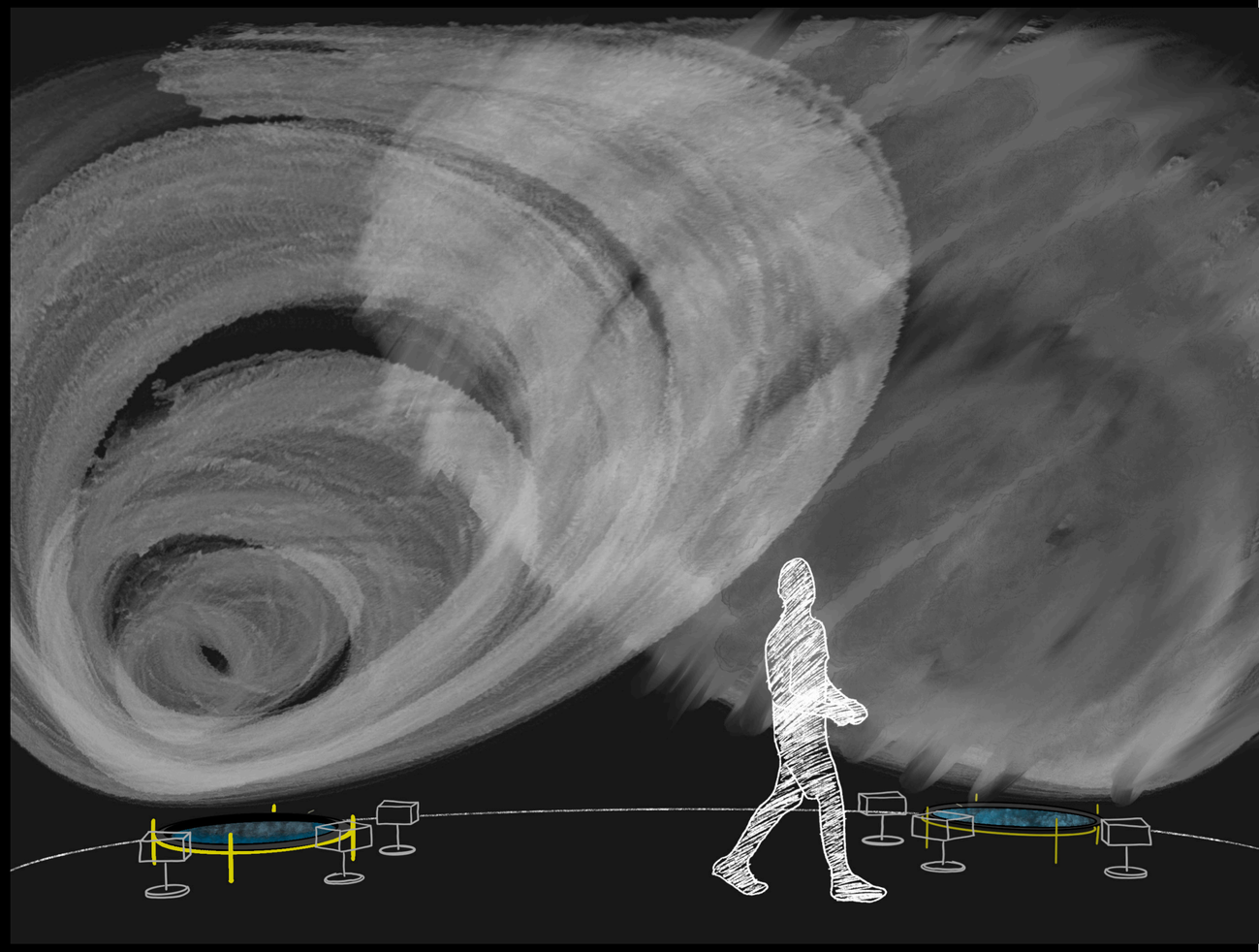


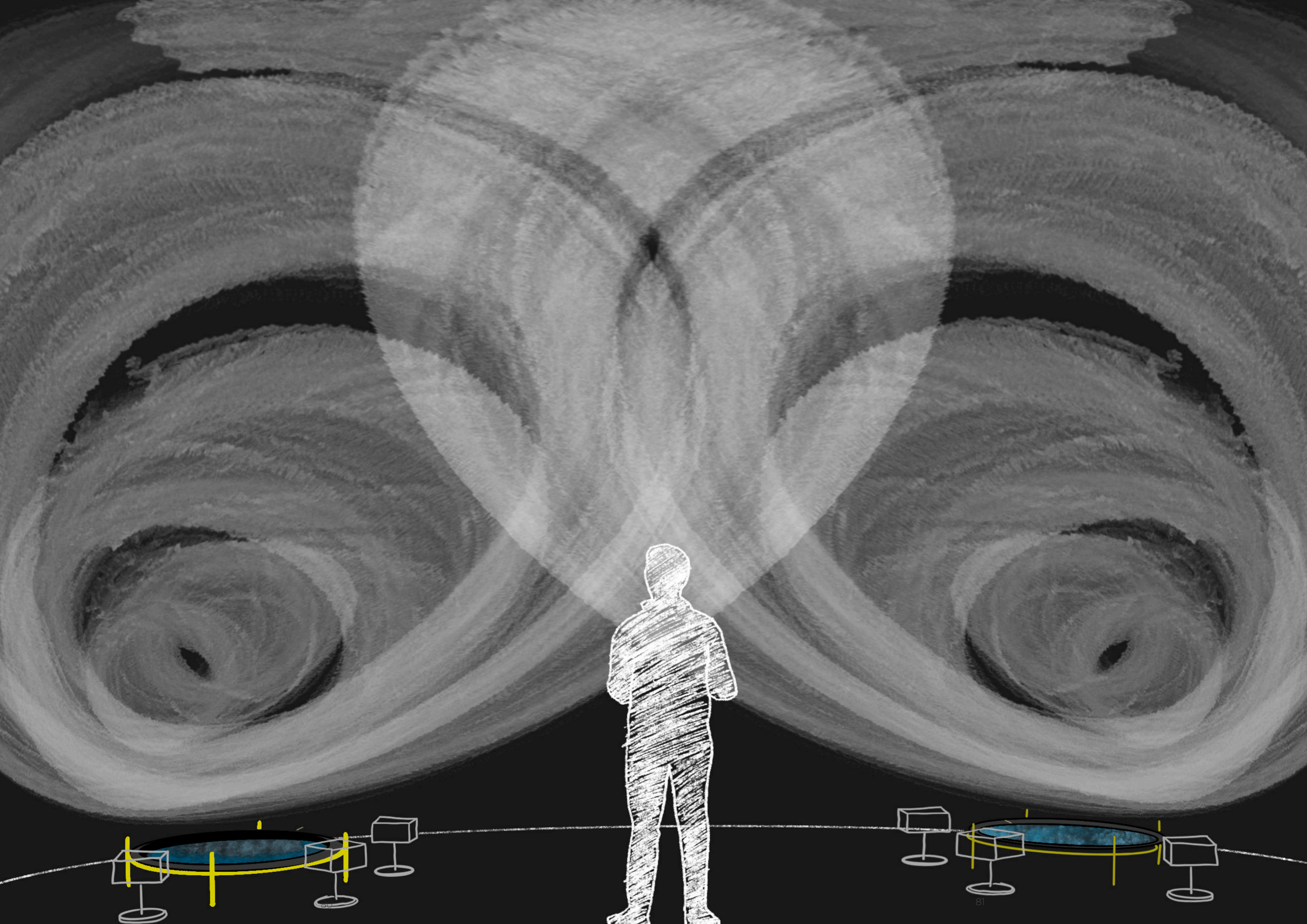


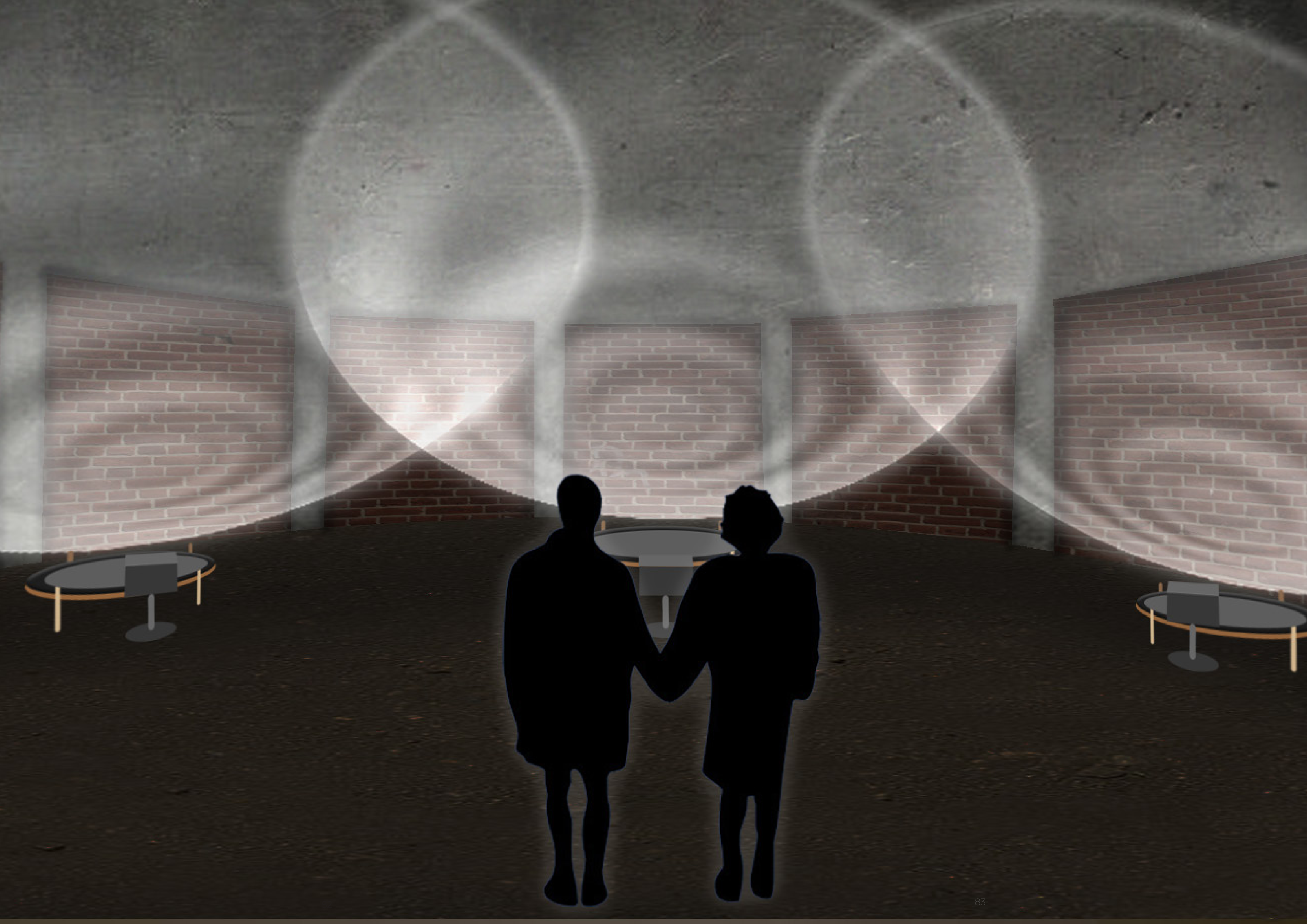


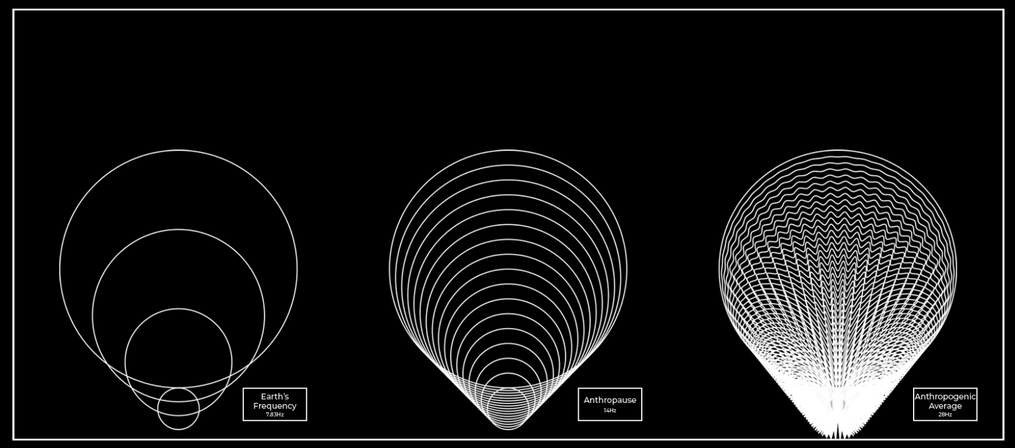
steady
14Hz

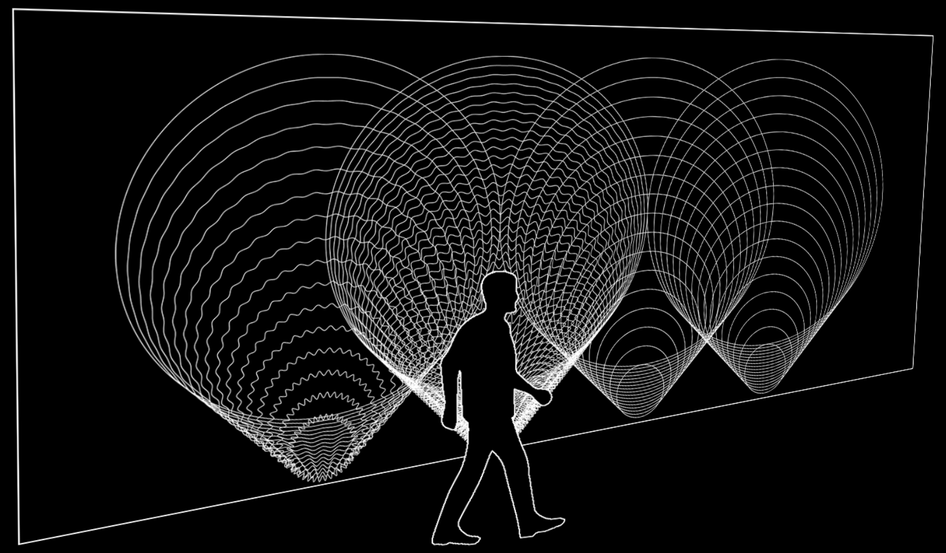
movement
28Hz

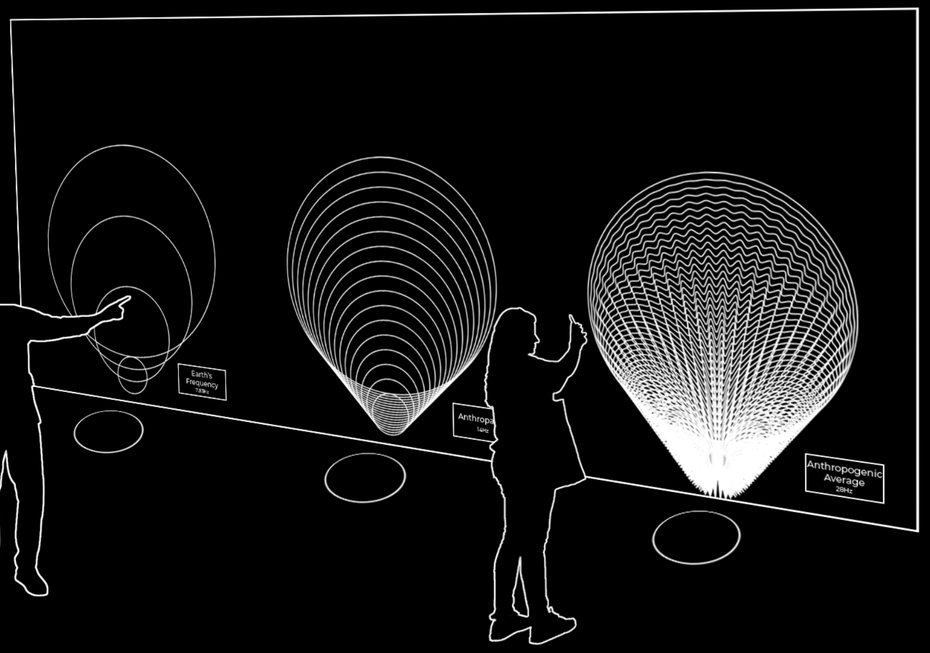







Earth's Frequency
7.83Hz
Anthropause
14Hz
Anthropogenic Average
28Hz

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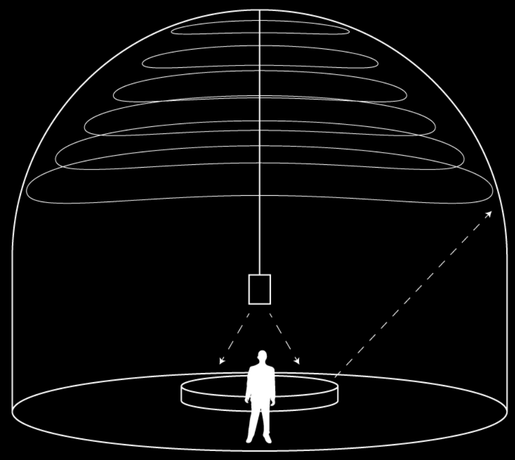

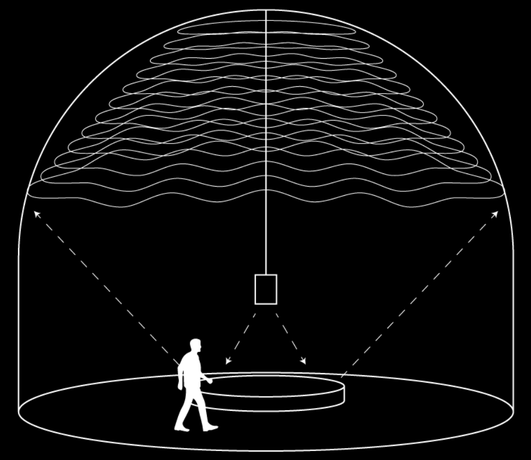

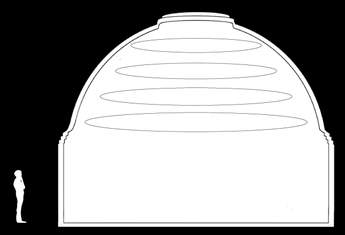

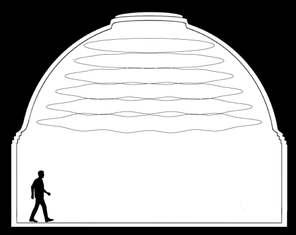

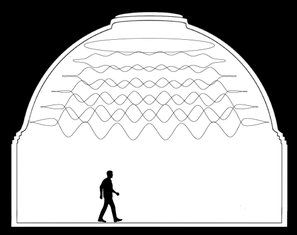

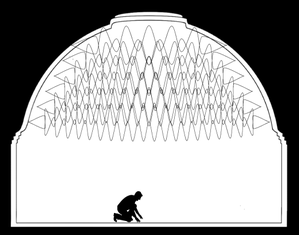

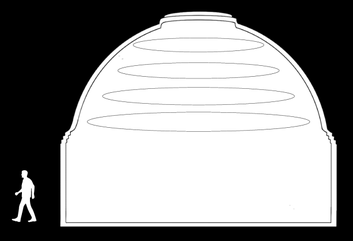

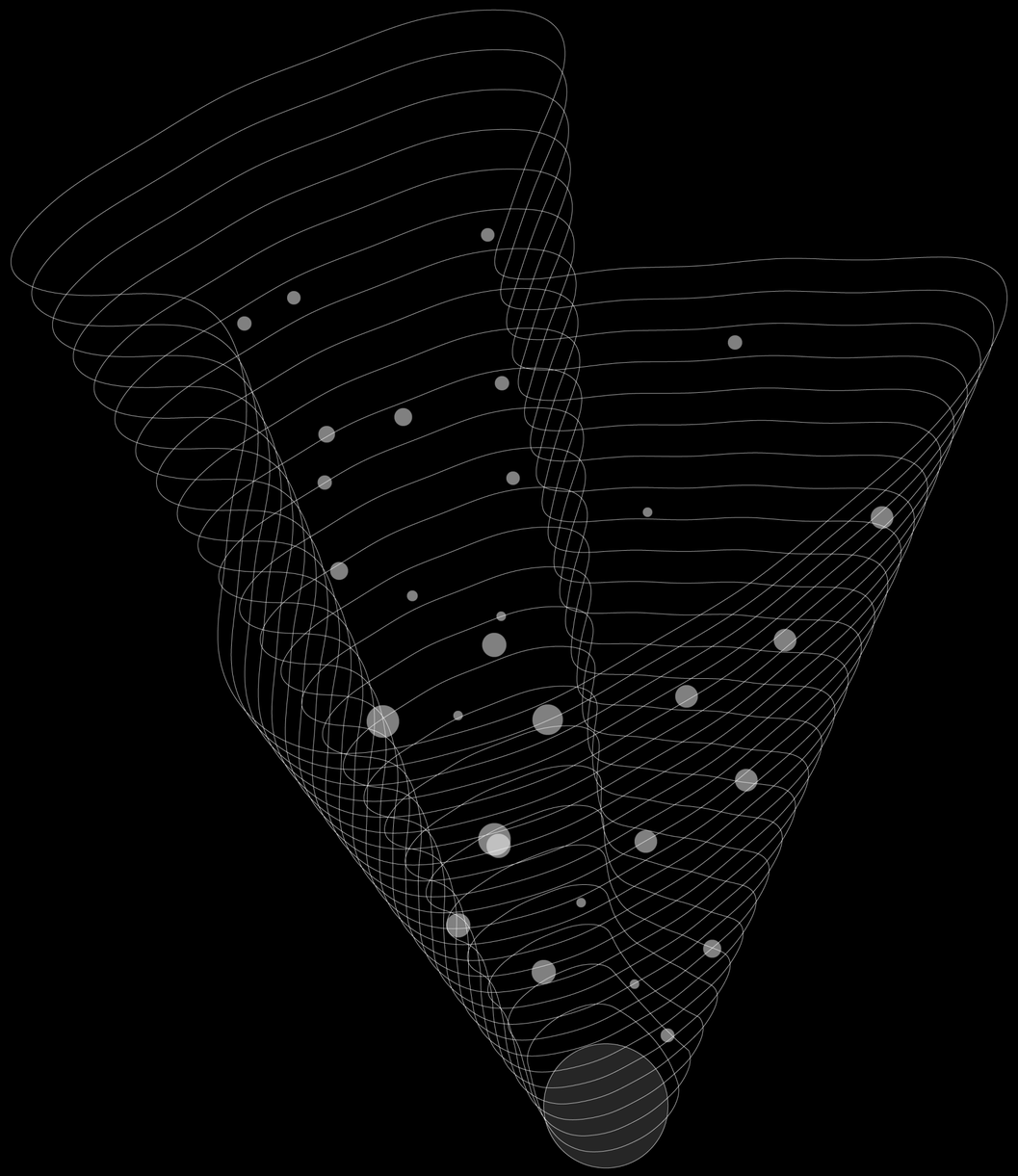

ANNOTATED BIBLIOGRAPHY

Cymatics | Hans Jenny
My journey started watching the videos of Hans Jenny which led me then to get and read his books on observations on different cymatics experiments. Even though cymatics is considered new age, I found the experiments and the words by Hans Jenny mesmerizing and beautiful.

Jenny, H 2001, 'Cymatics: A Study of Wave Phenomena and Vibration' MACROmedia, San Francisco, USA

Sync: The science of spontaneous self-organization | Steven Strogatz
In this book, mathematician Steven Strogatz questions the natural sync of different processes in nature. This provided me with a broad understanding of synchronization among natural processes and made me approach the topic with more wonder without losing a scientific mindset.

Strogatz, S 2003, ' Sync: The emerging science of spontaneous order' Penguin Books, London, UK

COVID-19 lockdown allows researchers to quantify the effects of human activity on wildlife | Journal of Nature, Science, and Evolution
This is a must-read for anyone interested in the anthropause as a topic. It's the paper that introduced the term "Anthropause" and it touches on future challenges in the post-anthropause world.

Rutz, C., Loretto, M., Bates, A.E. et al. 22 June 2020 'COVID-19 lockdown allows researchers to quantify the effects of human activity on wildlife.' Journal of Nature, Ecology, and Evolution, 1156–1159.
https://doi.org/10.1038/s41559-020-1237-z

Global quieting of high-frequency seismic noise due to COVID-19 pandemic lockdown measures| Journal of Science
This paper contains the results of the study made in 66 cities across the world. It also explains very well the general idea of anthropogenic noise and how it affects systems around us.

Lecocq, T 11 Sep 2020 'Global quieting of high-frequency seismic noise due to COVID-19 pandemic lockdown measures' Science Magazine Vol. 369, Issue 6509, pp. 1338-1343
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