FOLLOWING THE ELEPHANT-NOSED FISH.

Susanna Hertrich / Shintaro Miyazaki

REIMAGINING OUR SENSORIUM

DIAMONDPAPER

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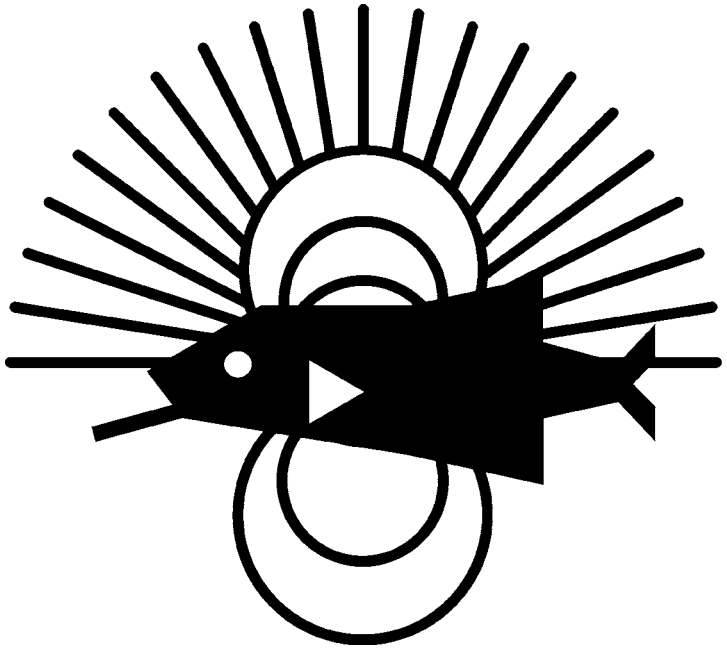


PREFACE

This book grew out of the artistic research project Sensorium of Animals that Susanna Hertrich and Shintaro Miyazaki led from 2016 to 2019 at the Critical Media Lab, Institute of Experimental Design and Media Cultures, at the Academy of Art and Design FHNW in Basel, Switzerland.

In late 2013, we met for the first time in Berlin to ponder about starting this project together, based on our shared fascination with the sensorial alterity of animals, the interrelations of media technology with ecology, and our propensity for critical yet playful artistic explorations and theoretical reflections. Both of us had been experimenting with ways to mediate aesthetic experiences between different human sensory modalities. Shintaro's previous project Detektors, a collaboration with Martin Howse, was an artistic exploration connecting the world of hearing with electromagnetic waves. In several art projects (including collaborations with the Meta Perception Group at the University of Tokyo or the Design Research Lab at the University of the Arts in

Berlin), Susanna had been investigating extensions of the human senses and the role of the physical body in relation to technology-driven environments.

We were intrigued by the immense diversity of different sensorial abilities found in the animal kingdom. This was our incentive to embark on this practice-led artistic research that takes inspiration from the sensory ecology and the fascinating world of the elephant-nosed fish, a "weakly electric" fish that makes sense of its environment through a self-generated electromagnetic field. Weakly electric fish generate an electric organ discharge (EOD) that is typically less than one volt in amplitude. These fish basically "see" their environment with their skin. While electromagnetic fields remain invisible to the human senses, they also constitute our contemporary digital information infrastructures. Therefore we began conceptualizing different artistic ways, aesthetic approaches, concrete artefacts, and film scenarios that interweave the world of animals and their non-human sensorium with the seemingly immaterial worlds of signal-based information technologies.

Looking back, however, we came to realize that back in 2013, when we started making plans, the world had been a different place. In the years since we started this project, our planet has been facing ever-intensifying challenges: global warming, exacerbated inequality, mass migration, right-wing populism, the rise of surveillance capitalism, and the tightening grip of information technology giants (such as Apple, Google, Amazon, Facebook, Microsoft) whose reach and power have been growing exponentially. Undeniably, these developments had a significant impact on our work and our design fictions: while in our early scenarios, the sensory ecology of elephant-nosed fish met information technologies in rather positive, abstract ways that were more aesthetic rather than explicitly political, as time went by and as the world changed in those few years, we recognized the desperate need for a more utopian imagination and more powerful artistic inquiries about what we desire for our futures. Therefore, we decided to emphasize fiction and the imaginary over the functional and concrete.

Part one of this book presents our utopian imagination in a twofold way: as theory-poetry (a rhapsody) and as theory-fiction (a short fictional scenario of our future). The impatient reader may skip ahead to part two where they will find an in-depth theoretical exploration of our research project and its contexts. This part also features selected documentation of our project, such as exhibition views and video stills showing the objects, graphics, and diagrams we created.

We would like to thank our advisors, Gerhard von der Emde (professor of biology and expert on elephant-nosed fish, University Bonn) and Alvaro Cassinelli (associate professor and co-director of the eXtended Reality Laboratory, School of Creative Media, City University Hong Kong) for their invaluable insights and inspiration. We also thank Akitoshi Honda, who co-developed the *Algorhythmic Driver Module* with us, Félicien Goguey, who joined us for a micro-residency, and Tomas Ribas, who helped us make our fictional prototypes and played the main protagonist in one of our scenes. Yann P. Martins, Arianna Smaron, Alessandra Puricelli, Thomas Dürst, Jan-Claas van Treek, Leonie Häsler, Felix Gerloff, Aina and Taito Lindroos, Yuko Himeno, Oskar Marosi, Martina Siegwolf, Bettina Hamel, and Denise Marty (Merian gardens) helped us with their contributions to our short films. Thanks also to Claudia Mareis, Jamie Allen, Linda Ludwig, and the entire research team at the Institute of Experimental Design and Media Cultures, Academy of Art and Design FHNW in Basel, Switzerland.

Shintaro Miyazaki / Susanna Hertrich
Summer 2020

PART I

A STORY: 2098

2098

Reflections of the flashing LED neon lights sparkling in the steaming puddles — the wet traces of the latest torrential rainfall that had caught everyone by surprise and sent them scrambling for the nearest sheltering roof like a scattering pack of mad squirrels. Mana dashes along the damp, gloomy streets in the unbearable mid-summer heat. Earlier, right when the rain had stopped, she had suddenly realized she was running late for her daily routine check on the food production unit named Edesia02. She runs fast, the sharp sound of her panting breath cutting the steady hum of the air conditioners that dot the façades of the seemingly endless apartment blocks. These were built to house an ever-growing population of 18 million inhabitants in the city formerly known as "Berlin" before it merged into the BranBerGebiet (a Germanic version of the typical contracted names for megalopolitan areas on the European continent that emerged over the course of the past century). As she is running, she notices her right wrist vibrating. The gentle buzz increases in

strength and frequency. It is the internal time-keeper in her body — impossible to ignore or switch off — reminding her that she is late. Mana knows that this gentle tactile stimulus will gradually become a painful hypodermic punishment. She curses it under her breath and speeds up her step. She enters the gates of area B107083, formerly known as "Dragoner Kiez" ("Kiez" is a regional colloquialism popular mainly in Berlin and northern Germany, meaning neighborhood), a subdivision of ECR-B1.

ECR-B1 is one of the cities that comprise the "Earth Commonist Rhizome" — a network of free cities that was first established in the late 2030s and grew to span the globe. With their focus on interconnected anti-capitalist, self-organized communities offering an environment for living and working — unlike the capitalist smart cities — while modeling how society could be reorganized by decoupling themselves from the ubiquitous networks of multinational companies (such as EDNcorp) that used to control every aspect of life, ECRs managed to attract many talented and ambitious young people from all over. Mana's parents had been among them. Shortly after they settled in ECR-B1, Mana was born.

The ECR model was not only popular but proved to be very successful in its approach, combining alternative ideas of living with a future-oriented perspective that embraced change by focusing on technoscience — especially information technologies — in combination with a holistic practice of environmentalism, different experiments in sustainable living, methods of active degrowth, and finally their very own approach to animistic spiritualism that included an appreciation for all organisms, from bacteria, slime molds, and fungi to insects, fish, birds, and mammals.

2024

Mana's ancestral roots are in India, but she had never been. As far as her parents were concerned, Helvetia was their home. Her grandparents had left India over fifty years ago, in the early 2020s, to start a new life in Helvetia in the aftermath of the "Equatorial Exodus".

Their parents — Mana's great-grandparents — had been farmers in a small village where everyone had known each other for generations. One day a group of engineers from Delhi came to the village and unpacked measuring instruments and devices of all kinds. With these they walked from one side of the village across the fields, down to the small river and back again, sweating a lot, occasionally stepping in cow dung, taking notes, photos, and measurements, gratefully accepting a refreshing glass of tea from the villagers, before getting back into their cars and driving away.

A few weeks later, white SUVs entered the village with foreigners sitting in them, as pale as their cars. The village elders called everyone together for a meeting, as an announcement was to be made. The foreigners unfurled a screen and started a projection showing skyscrapers, fountains, parks, and countless happy faces. Grand architectural plans were unfolded and, to a joint surprise, these people offered to buy the land from everyone for a decent amount and a place to live in the "NewTown" they were going to build on the village grounds.

2098

She rushes up to the metal gates, quickly scans her wrist on the IdentityTAG, and kicks open the metal door, which gives in more easily than she had expected it to so that she can just barely catch herself and avoid falling in the lobby. Mana made it just in time before the vibration would have turned painful. She grabs her coverall, wellies, and face mask and lets herself slowly sink to the floor as she exhales, relieved. When she hears the door opening again, she quickly jumps to her feet. "You are late." This is Wolfgang's way of greeting her. Wolfgang is Mana's supervisor; he is older than her. Everyone says he is a really nice guy, but Mana cannot help feeling that he secretly enjoys it when she makes mistakes — like right now. So she quickly bows to him without saying a word and walks around the row of lockers. Away from his gaze, she slips into her coveralls. Next, she grabs her communicator,

places her ring finger with the implant over the Kuebiko's sensor. Almost immediately, a beep confirms that it is now unlocked. Wolfgang wordlessly points to the side with a curt, authoritarian head nod towards the PVC strip curtain. "Freak," she thinks as she steps through the heavy plastic strips into the brightly lit hall. She pauses as her eyes adjust to the glaring artificial light, straightens her body into Tadasana, and closes her eyes. She takes three deep breaths to free her mind. Slowly she opens her eyes again. She takes a moment to make sure she is ready to go on patrol. She can still feel Wolfgang's stare as if it was burned into her back.

2048

During the Equatorial Exodus Migratory movement, millions of people moved to Europe, Siberia, Mongolia, Alaska, or Canada in a desperate attempt to flee the unbearable heat waves appearing everywhere close to Earth's equator. Meanwhile, a growing number of university graduates, a more privileged social group, most of them raised in the NewTowns that had mushroomed across the Indian subcontinent in the past two decades, received an official invitation from the other side of the world: Helvetia, a small country in Central Europe, called for a larger international workforce and targeted well-educated and low-maintenance young people willing to settle, work, and prosper (and pay into the pension system) in a country that had been severely depleted of a highly skilled workforce after the two great pandemics. They were offered citizenship, good working conditions, and — most importantly — a temperate climate. Unlike their countless rather unlucky peers, they found themselves in comfortable plane seats with free refreshments on their way to a brighter future. Among them was a small group of young people from Mana's great-grandparents' NewTown; this is how her grandparents met. Because these young people had been raised and educated in India within the NewTown framework, they were welcome in all other NewTowns, including Helvetia, the motherland of the original NewTown concept. Only now, all NewTowns in Europe were owned

and run by EDNcorp, a multinational city-owning conglomerate that had bought out almost all their competitors. At first glance, it did not seem to make much of a difference who owned the cities, but over time it became clear that EDNcorp had its own set of invasive strategies to gain most revenue from their tenants which they successfully implemented in all their towns, and respectively and literally in their citizens.

2098

The ambient sounds of the bubbling, gurgling, slurping water feel soothing and help Mana settle into the calm state of mind that she needs. Still squinting to try to filter out the bright grow lights, she walks past the long lines of hydro-tanks and vertical garden racks. Taking small steps at a measured pace, she keeps turning her head slowly from left to right and right to left like a human radar tower. For the next two hours she will keep up this seemingly easy but also somewhat silly-looking exercise — and she knows that by the time her shift is over, she will be exhausted, dark circles will have formed under her eyes, she will have a headache and a rash on her skin. Better not to think about it. In ECR, everyone is required to do their "dugnad," to contribute to the greater good and the community. This is Mana's specific task, and it's a privilege.

As she walks, she focuses her mind on the subtle vibration that wanders in pulsing waves on the skin of her cheeks and upper lip like the gentle tickling of a thousand tiny fingers. She is in a state of utmost concentration, a new level of subcutaneous awareness — she is at once totally herself and not at all. She is one with the invisible orchestra of signals, the rhythms of electromagnetic emissions.

While the last common ancestor of all vertebrates possessed an electric sense, unfortunately almost all mammals, including humans, lost it over the course of evolution. One of the few known exceptions is the Guiana dolphin with its two rows of tiny pits on its snout. Biologists long thought that this feature was vestigial, i.e. a trait rendered functionless over the course of evolution. But further

research revealed that these small pits were in fact vibrissal crypts that had once held whiskers. Biologists found out that they still had a function, namely, allowing the dolphins to sense electricity. This finding was little more than a footnote in the vast collection of biological knowledge acquired in the 21st century. But early ECR researchers picked up on it; it prompted them to review the much-talked-about research on dolphin communication undertaken by Margaret Lovatt and John C. Lilly more than a hundred years ago in the 1960s, the star of which was a male dolphin called Peter. Wanting to explore what they recognized as an interspecies spiritual connection, with not only shared bodily and sensory experiences but also language, Lovatt and Lilly's experiments involved them and their sacred dolphins being together in an electric bath modeled after the Japanese "denkiburo." In this setup, a low-level electric current running between two electrode plates under the water surface felt like an intense tickling sensation on the bodies in the bath. The experiments happened under the influence of a new hallucinogenic drug made by ECR Sevastopol, which the researchers thought would unlock the insight that salvation and success could only be reached by truly listening to the animal in us.

One group of international ECR researchers took on the idea and focused on finding ways of biotechnological metamorphosis to embed something akin to the Guiana dolphins' extraordinary sense into human bodies. The aim was nothing less than synthetically fast-forwarding human evolution to better adapt to and gain a competitive advantage over the challenges of the new corporation-driven technological environments. After thirty years of intense research (including several dead ends that everybody tried to avoid mentioning), a promising procedure was implemented in 2068 by a group in Akademgorodok, Siberia.

2079

Initially, the EDN InfoEX™ strategy (short for "informational extraction") was implemented in externalized devices and was therefore

almost too obvious. The purpose of this system was to collect as much data as possible about each citizen - as with any so-called smart device of previous generations. But here, these rather clumsy circuits lived not just in media consumption devices: they were hidden in public places as well as in walls, floors, ceilings, furniture of EDNcorp apartments, and even in everyday accessories such as handbags sold in EDNcorp stores.

In its internal communication, EDNcorp called them "EDN spyBots". These circuits observed, recorded, and stored every bit of information there was to get, and in return offered playful distractions in the form of games or quizzes, as long as they were linked to a display, such as on the refrigerator. Most citizens, like Mana's grandparents, did not really mind. They loved the free information content that came with the ubiquitous screens in their homes and enjoyed the entertainment that came with this form of service. They were delighted every time they received a cheaply made gadget as a reward for taking a quiz — even if its sole purpose was to sniff out even more information.

Mana's parents grew up in this zone of total comfort and security provided by an all-encompassing corporation, but felt increasingly uncomfortable in their world. What they first encountered as unnerving and ubiquitous but rather harmless surveillance capitalism, slowly began to turn into full-blown neuro-psychic control. Its peak was the invention of EDNcorp BoneTone™ — a bone conduction information transfer service that was included in the free dental care plan. Once implanted in the jawbone, it played advertising jingles directly into people's heads. Rumors circulated among the younger generations that the implant could even read minds, and possibly record thoughts and send them back to EDNcorp. That was certainly a step too far.

Around that time, reports about cities running under the "Earth Commonist Rhizome" status, which had managed to keep them free from EDNcorp and their few remaining competitors,

began to be circulated confidentially and whispered about behind closed doors. ECRs claimed to offer radically new ideas of spiritualism, harmoniously integrating earth, nature, and technology, materialized through a new form of living, eco-conscious, true sharing economies paired with highly advanced yet commonist technological infrastructures. These cities ran on what they called a "non-exploitative, democratic, commonistic economic system based on info-energetic infrastructures." While Mana's parents were not a hundred percent sure what all this meant, it did sound quite attractive to them, especially since they knew they had to leave their EDNcorp hometown before their first root canal was due.

2098

She can feel the countless nano-sized logarithmic power detectors that are embedded in her facial tissue, just below the dermal layer. They are chattering rapidly with a gazillion mots, embedded into a physical infrastructure that houses and caters for the fish and tomatoes, the seaweed and crustacea.

Mana's body has been augmented to register the Qi-fields fluctuations in the sub-terahertz range of a million tiny sensors, translated into a physical sensation that affects the electrosensory cells in the lower face. This new sense developed fully during her adolescence. At first, she experienced it as nothing more than an itchy sensation on her skin. "It is what you can read from it that matters," her supervisors had explained to her. Over two years of intense daily training, she came to master these readings nearly to perfection. Her new, fully-developed sense was comparable to the way one sees colors, only that her perception is not limited to just the visible range of the electromagnetic spectrum. Her range comprises all those fluctuations, signals, rhythms, chirps, flashes, rumblings, and blurrings below the terahertz range that are usually invisible to humans. She doesn't see it with her eyes, but senses it with her upper lip and the areas on both cheeks that are close to the mouth. As she passes through the aisles, the taps and vibrations signal a subtle

haptic "everything is OK, life here is prospering, we are all doing well." That reassuring vibratory pattern accompanies her while she slowly passes tank after tank, growing rack after growing rack, aisle after aisle.

2095

Mana was one of the few people in ECR-B1 who, having undergone treatment in the early embryonic stage, had actually developed cells strong enough to make her eligible for the Medjed when she turned 14. When pregnant with Mana, her mother was one of six women who had agreed to their embryo's DNA sequence being altered. The natural genetic features of these unborn children had displayed a promising likelihood to respond to genetic enhancement geared to stimulate the growth of electrosensory cells. This scientific service was only available in ECRs with advanced facilities. Mana's mother, a trained biosoft engineer and a staunch believer in technological progress, considered it a privilege to participate.

The Medjed itself was a ritual of great importance to the community. It was performed by the High Priestess Surgeon who had flown all the way from Sevastopol, as nobody in ECR-B1 had yet been trained. In the ritual space, the aspirants were lined up, on their knees. Mana was among them, wearing a bright teal gown like the others. The High Priestess Surgeon approached them, spoke her blessings, and then began injecting special nanobots into the upper lip and cheeks of each aspirant, one by one. The two young assistants at her side carried trays with cotton buds, liquid disinfectant, and sterilized needles. When Mana's turn came, the assistants first applied a topical anesthetic on her face, but when the HPS injected her face countless times with countless needles, Mana struggled to hold back tears of pain. But when the HPS finally moved on to the next aspirant, Mana felt pride swelling up in her a hot sensation traveling through her body. She was now equipped with minuscule transducers linking the invisible world of signals and waves with the tangible world of her body. Her lower face had become a detector. She was now one of "them."

2098

She has almost reached the end of the sixth aisle as she notices something is off, a new strange sensation on her face, hardly noticeable at first. A brief arrhythmia, a gap between taps that is too long, an uncoordinated movement felt on her face not as a wave but as scattered points. But the tingling sharply intensifies until it becomes almost unbearably painful. She struggles to suppress her reptile brain's reflex to scratch her face. She points the Kuebiko at the tanks closest to her and sees the digits on the small display changing so rapidly that they are illegible.

Is this a malevolent attempt from nearby dustbots trying to extract data about the food-producing unit? And if so, who is behind it? Is it EDNcorp, whose logo has become ubiquitous in her Kiez? This could be the work of new, highly powerful MFD (magnetic field drones) sent by EDNcorp. Everyone talked about this new threat. Flying over Edesia02 . . . scattering all the motes to transmit their readings . . . Her eyes well up with tears. She spins around, trying to identify what is causing this irritation, but it is impossible to tell. The signals are too strong and they seem to be coming from everywhere. Her face flushed and hot, she presses the alarm button on her device and faints.

A Rhapsody On Bringing Back The Paleo-Way & Rave It With Some Techno

1)

In the beginning,
there was a glimpse
a hunch of a trajectory.
Energized by the notion
to follow those kinds of fish,
called “elephant-nosed.”

Our perceiving and conceiving
were transformed
by their more-than-human alterity,
their receptivity
for electric fields.

This re-imagination
of our sensorium
changed the way
we envisioned our futures.

Electroreception

is an ancient sense
beyond our perception,
outside our experience,
out of our humble reach.

Yet we pondered and wondered:
what if . . . what if
we could do it ourselves?

2)

500 million years ago,
during the Cambrian boom,
receptor cells evolved
in the skins of early creatures
swimming in the oceans,
transducing electric fields
into nerve impulse yields.

Some of these fish

could not only navigate
through the muddy gray,
but also detect their prey.
Cardiac muscles
radiating electro,
affecting surrounding fields,
their positions unconcealed.

After more millions of anni
some adapted slowly
to actively discharge
electric pulses,
not only to probe,
but to differentiate
not by morphology,
but by electroethology.

For the Cornish jack,
the electric field
modulates information
about their status,

and their signal synchronization
allows for some kind of
group-based hunting.
Not yet a form
of solidarity,
but of dancing
and of bio-individuality.

3)

Warping forward
to the mid-1800s,
to more human
realms and matters.
Let us now confuse
electroreception
with telegraphy!

For telegraphy
is electro-communication

not for fish,
but for humans.
Not through water,
but through metal,
air, or vacuum.

So is telegraphy
an externalization
of an ancient
innate ability?

The embryos of a fish
and a human
are not that different.
Guiana dolphins
use their whiskers.
Some of us
even possess remainders
of these perceptual filters.

Thus we sing the parable

that electroreception
was stripped out of us
in form of telegraphy
and wireless communication.

Radio signals dance
the physical layer,
the basso continuum
of high-tech worlds.

We want to reconnect
with our self-made habitats,
our techno *Umwelt*,
where tech is chirping
unheard melodies,
glowing in unseen colors,
raving wildly.

Increasing connectivity
is internalization,
is bringing back

or at least closer
what has been
externalized,
outsourced,
outstripped,
and alienated from us.

But do not despair!
Are you ready
for counter action?!
for countering
externalization
with INTERNALIZATION??!

4)

Externalization
as such is not so bad.
Our ancestors did it
in primordial times

with their teeth,
hands and legs,
with memories,
songs, and dances.

They made spearheads
and knives, made marks
on wooden sticks,
even stones,
and painted walls,
took drugs,
domesticated wolves.
They lived like that
for at least
hundreds of thousands of years.

Then, they settled down,
sowed grains to grow.
These grains they learned
are good for externalizing
trust and value.

They got stronger
to enslave those fellows
who lived exterior,
and they thought
are inferior.
They invented machines
that helped build
their monuments,
others to calculate
for documents,
and externalize
more, more, more.

These were the years
they should have
reconsidered,
but failed to,
since they believed that
everything is abundant.
They never ceased
to desire more,

more, more, more.

In Europe around the year 1500+,
externalization is taking off.
Colonization,
nation-building,
farming, plantations,
all based on exploitation
and slavery, slavery, slavery.
Amid all this
they lost their metabolic feeling
for their land.
They became aliens
and lost their grounding.

With the dawn
of industrialization,
it was not only
physical labor,
which got externalized
for "accumulation."

Cognitive workers
got outsourced too.
Telegraph operators
skillfully listening
to morse code rhythms
and transcoding them
into Latin alphabet:
replaced.
Switchboard operators:
replaced.
Human computers:
replaced.
Our brains:
replaced.

Most recently, brain cells
have been externalized
as artificial neurons,
equipped with sensors,
advanced statistics
combined with heaps of data

finally able to outstrip
our ability to recognize
letters, speech, or faces.

Almost at the end
of this ten-thousand-year-old
transformation,
conflated with
heat-induced struggles,
we can clearly see
a dark future rising, where
there will be nothing left
to externalize,
nothing from our biology,
nothing from our cognition,
nothing from our souls.
Nothing,
really really nothing.

But don't despair!
Let us prevent together

the apocalypse
of our coming obsolescence!

5)

Becoming friends
with our tools,
and gadgets,
and infrastructures,
living with them as companion species,
joining new ecosystems
are all attempts
at making kin,
at domestication,
and, of course,
at trying for more compassion
and at taking responsibility.

We want to know
what they are doing.

We want to have them
close to us,
we want to see,
hear, or feel them,
even when things
are rotting
instead of fermenting,
or dangerous
instead of effervescent.

We are animals,
we are technology,
we all form machines together,
they with us, and we with each other.
Sprawl, sprawl, sprawl!

Sensibility is indispensable,
as is criticality.
Tech is often
a friend of warfare.
Animals sometimes attack us.

Therefore, it is crucial to know
about power and its limits.

Responsibility is agency.
It means being prepared
when things start to change,
it means knowing that things
sometimes take a wrong turn
or get better pretty soon,
it means remembering the dangers
of drawing lines
of using vectors
and manipulating gradients.

6)

Let's start at the micro level.
The everyday level
with our kin,
our friends,

and also with aggressors,
rethinking our desires,
fears, and joy,
and their effects
and causes.

But beware! Internalization
is not individuation.
It is not only about you,
but about you and me together,
about us and them.

Internalization
is an inward movement,
of holding things together,
inside the spheres on our planet,
the atmosphere,
the technosphere,
the biosphere,
the geosphere, the infosphere,
to try to keep things

from being ejected outwards.
Things that live in
our socio-bio-
technological ecosystems
made up of data,
sensor networks,
algorithmic strata,
and communication protocols.

Reaching out and caring
for the boundaries,
leaving them open
as long as it's not dangerous,
developing an altered sensorium,
like electroreception,
for feeling the techno of animals
and the bio of technology:
all this is the crux.

It is not a coincidence
that the modern discovery

of electricity is linked with
animalism.

Let's follow our totem fish,
called "elephant-nosed."
They have to process
a plethora of signals,
they have large brains
compared to their overall size.

Animalistic instincts
become vital again,
not only to survive
and fight,
but also to feel compassion.

Don't be afraid,
we won't lose ourselves,
instead, believe
in neuroplasticity!

7)

After the failing
of rationalism,
of modernism,
of capitalism,
of postmodernism,
a sort of new age is due,
not to be confused
with non-rationalism,
racism, conservatism,
religious fundamentalism,
or dogmatism.

An age cultivating
the complexities of life,
our adaptability,
the neuroplasticity
of our brains and bodies,
and caring about balance,
not to be confused with stasis.

Rationalist techno-science
fragments our body,
its conditions for health,
its physiology,
development,
evolution and more,
to micro-level knowledge
allowing the argument
that on the molecular level,
everything on earth
is quite the same.

We carry parts
of the universe in us
and as we age
we accumulate more of it.
Internalization amplifies
this latent tendency.

Rather than lamenting
a lack of wholeness

or falling into the trap
of thinking merely
about surplus values,
the belief that a system
such as a human body
with all its parts
is more than their sum.

We want to recognize
that this belief
is just wrong,
very wrong.

The whole,
which is our body,
our soul, our self, our life,
is always less than
the sum of its parts.

We are not only humans,
but are made up of

animals, organisms,
plants and microbes
or even minerals.

Let's sing it twice,
since it is so true:
We contain more parts
than us as a whole.
We contain more parts
than us as a whole.

Still, our body
is our border,
is a frame,
a shell to contain
and maintain
minimal integrity
of our humanity.

Concerning the meso,
not the molecular, but the molar,

we are dancing
in a dynamic zone
between the immanent dissolution
into the quantum level
and the complete interdependency
with our environments.

We want excessive sprawling,
an opening of proprietary,
elite, and privileged knowledge,
skills, and cultures.

We want grounded decision-making,
in which each of us
can enjoy equal rights
and opportunities.

We want a recultivation
of our ancient rituals,
touching the animalistic,
irrational, and animistic.

While ancient imagination
has been linked to
magic rituals, drugs,
music, and dance,
we reimagine techno-animism
as a coming together
of magical interfaces,
wetware, cyber-implants,
and bio-circuitry
with new forms
of communal living
reviving ancient techniques
of becoming animal
to speak, feel, and play
with the spirits of acid techno.

Let's remember
what psychedelia
was conjured up for:
an attempt
at revealing the soul.

Another confusion
must be addressed:
collective ecstasis,
epiphania, excitement,
and excess
are all related
to reaching out
and holding together,
with sprawling
and Dionysian rituals.
But we shall do it
with great care
and utmost caution.

Ecstasy shall be neither violent
nor harmful.
Excitement shall be neither aggression
nor shall it exclude others.
It is also not eternal
and has its limits and its ends.

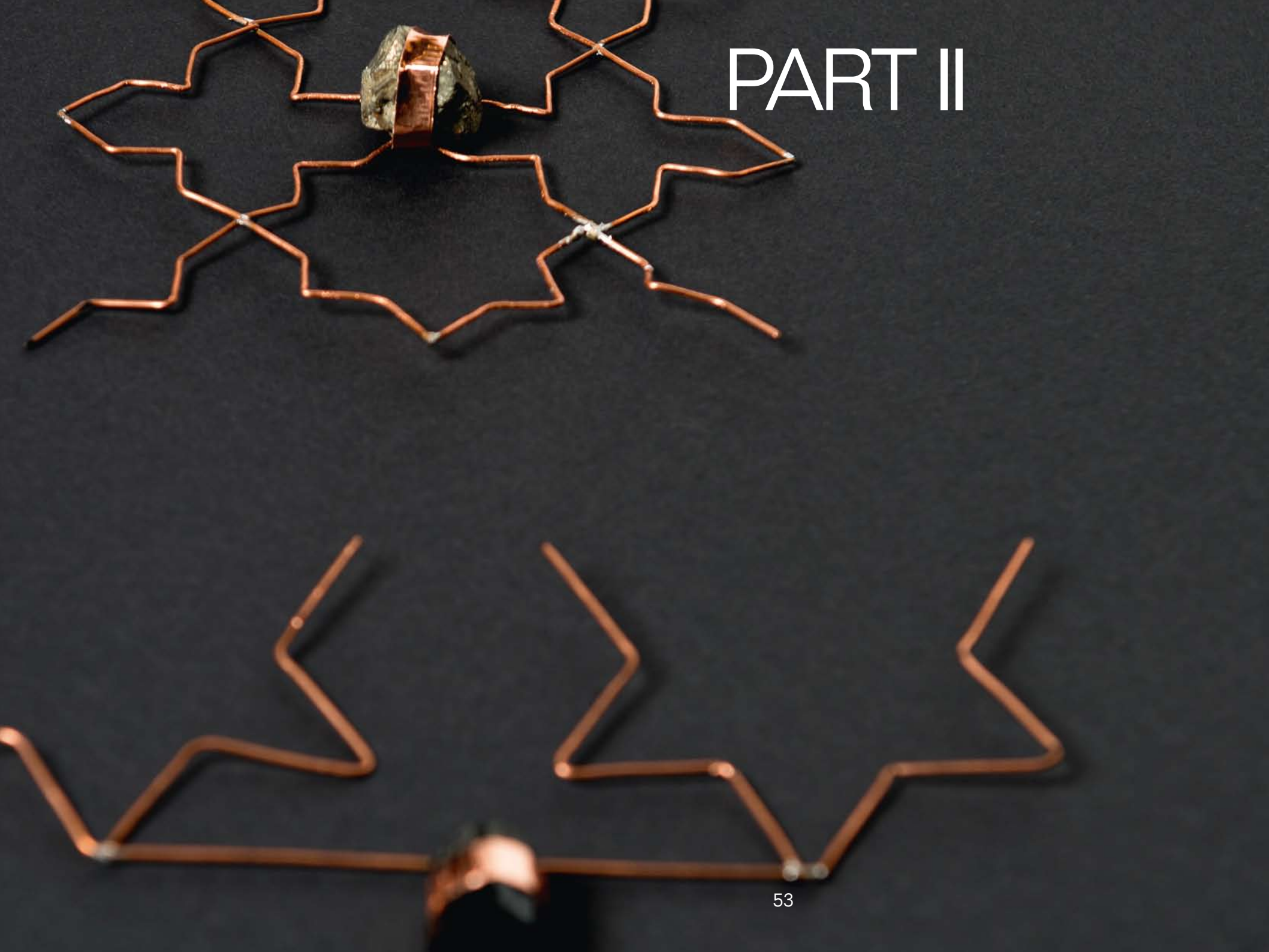
8)

These imaginations
and conjurations,
we understand, are ghosts
finally attaining peace,
after having haunted us
for thousands of years.
Ghosts of principles,
rituals, and beliefs,
lost with the dawn
of agricultural growth,
some call it the dawn of civilization,
and the slow disappearance
of advanced hunter-gatherer-societies,
which — let us remember —
lasted many
hundreds of thousands of years.

But soothing those ghosts
won't undo

all the things
that happened
to us since then.
In order to satisfy
their spirits,
we need to carefully synthesize
our ancient traits, rituals, beliefs,
and solidarity with all sorts
of appropriated technology —
for everybody,
by everybody,
with everybody.

This is our humble imagination
invoked by following the fish,
called the "elephant-nosed."



PART II

AN ESSAY

> The cyborg appears in myth precisely where the boundary between human and animal is transgressed. Far from signaling a walling off of people from other living beings, cyborgs signal disturbingly and pleasurably tight coupling.
>
> Donna Haraway, *The Cyborg Manifesto*.

In following the elephant-nosed fish, we have invoked an imaginary world [see fig. 1] that we began to explore as theory-poetry and theory-fiction in part one. Part two situates our imaginary through scholarly research. To put it simply, we theorize the kernel of our inquiry as a twofold structure, a sort of theory-toy-figure if you will, which is based on the influential *Cyborg Manifesto* written in the mid-1980s by the feminist science and technology scholar Donna Haraway.

The cyborgian capacity of the elephant-nosed fish – a popular name for those species of *Mormyridae* (freshwater elephantfish)

with striking chin appendages that enable them to feel and generate electromagnetic fields — is the most prominent part of our theory-toy-figure. We used our imagination to combine their unusual sensory abilities with those of humans. Would it be possible to engineer and cultivate such an ancient, biological, but cyborgian, almost electronic trait as an augmentation of the human sensory apparatus? How would society evolve if the sensory abilities of humans were altered in this way? Or conversely, what kind of society would develop the necessity for such sensory abilities?

The other side of our theory-toy-figure operates at a more concrete level: we developed another prototype that couples our human haptic and auditory senses with the worlds of electromagnetic signals by experimenting with rudimentary technological setups that helped us to transduce high-frequency radio signals into sound or vibration. This served a twofold purpose: On the one hand, it gave our theory-fiction and theory-poetry an aesthetic and sensorial foundation. On the other hand, the technicity and materiality of the radio antennas, sensors, actuators, and computing hardware offered entry points for historical contextualization and inquiries into their media archaeology and genealogies.

This double-sided cyborgian coupling structure caused some epistemological, ethico-aesthetic, and ethico-political disturbances of the interfaces and borders between animals/humans and humans/machines. We focused on these disturbances primarily from a sensorial perspective, but then also touched upon social-political and historical aspects. Coupling implies close engagement with the object of study, far from any aspirations to any sort of "objectivity" based on an allegedly rational "distance" (Hayles 1999, 85; Schwerzmann 2020). This critical approach highlights the contingent ways the individual parts of the coupling (the animal, the human, the machine) are defined and blurs the previously sharp lines between different categories. When and how does a human become an animal? Where is the line that separates machine, animal, and human — how is it defined?

Our work followed three activity threads: prototyping/media experimentation, historical and theoretical contextualization, and fictional world-designing [see fig. 2]. This approach unfolded an enriched spectrum of propositions in both design and theory, as well as narrations, speculations, and imaginaries, which in the end connect back to our current socio-technological situation. Most of our daily interactions online and the sociality they create are used to generate valuable data collections that drive the machinery of techno-capitalism. All this is increasingly dependent on infrastructures of wirelessness that provide broadband connectivity via the electromagnetic spectrum. We attempted to reimagine the technological constellations that are, at present, ubiquitous in our lives by focusing on alternative sensoria. We advanced the hypothesis that deepening our insights about the often protected designs of the wireless infrastructures we live among in smart cities, homes, and cars, might open up new entry points – and might offer possibilities to intervene and redesign, opening up space for more self-determination in how we want to use and live with these highly invasive information technologies. Finally, we extrapolated our insights, designs, and fabulations by making things more complicated as a form of resistance towards research that capitalizes on the reduction of complexity leading to optimized and profitable forms of design. Our pushback against these tendencies towards techno solutionism is inspired by the Harawayian concept of situated knowledge, which develops from the partiality of knowledge, not its universality, opening up the way to insights stemming from bodies that are complex, contradictory, structuring, and structured, not from above but from within (Haraway 1991b, 195).

The following subchapters will explore the three aforementioned research activities and present our research project, its contexts, and their discourses in more detail.

A) HISTORICAL CONTEXTUALIZATION

Historical contextualization not only reflects the contingency of current practices (Mareis 2016) but provides alternative conceptual, discursive, and socio-political perspectives, affording opportunities to further elaborate these.

MORMYRIDAE

The possibility that peculiar fish like the *Mormyridae* [see fig. 3], often called elephant-nosed fish, or the *Gymnarchus niloticus*, their closest relatives, may be capable of electroreception and electrolocation probably began to be discussed amongst zoologists in the late nineteenth century, but was scientifically documented in the 1950s by the Ukrainian-German-British zoologist Hans Werner Lissmann. His research used electrophysiological measurement techniques involving electrodes, amplifiers, headphones, and oscilloscopes to record the emissions of weakly electric fish. While Lissmann was amongst the first who measured signals from weakly electric fish, he was not the first to note and describe electric signals emitted by fish. Aleksandr Ivanovič Babuchin (1876/77) or Gustav Fritsch (1891), a neurologist focusing on the electrophysiology of the brain, had both already conducted similar research in the late nineteenth century. In 1958, Lissmann collected signal characteristics from different species of these weakly electric fish (for example *Gymnarchus niloticus*, *Mormyrops*, and other species of the family of *Mormyridae*) in the northern territories of Ghana. He suggested that "by means of their electric pulses, [they] can locate objects if their electrical conductivity differs from that of water" (Lissmann 1958, 188). Similar to military radar systems, weakly electric fish can actively sound out electric field differences in their surroundings by emitting electric pulses and sensing their back-reflections not in air space, but in water [see fig. 4]. Most recently, Gerhard von der Emde and his team in Bonn, Germany, built on these findings, focusing on *Mormyridae*. In the late 1990s already,

von der Emde confirmed that it is mostly the interplay between "the spatial pattern of voltage change" sensed by the electroreceptors on their skin and nearby objects that help these fish to navigate in dark waters. Objects change the electric field and thus change the patterns and currents flowing through their electroreceptors.

"The results of our experiments suggest that electric fish can measure three-dimensional depth by analyzing the electric image of objects projected onto a single, stationary two-dimensional array of electroreceptors (von der Emde et al. 1998, 893)."

Von der Emde's research field is often called sensory ecology, since forms of sense-making are highly dependent on their environments (Dusenbery 1992). It is not merely an accident that Lissmann, the zoologist mentioned earlier, in the 1930s had been a PhD student of Jakob von Uexküll in Hamburg, whose concept of *Umwelt* (translated as surrounding-world, phenomenal world, self-world, environment) was highly influential for the environmental sciences. "Umwelt" is also a key concept in at least two other related fields: cybernetics, as developed by Norbert Wiener, and ecological psychology, as developed by James J. Gibson, who is known for his concept of affordance.

Looking at the research equipment used in sensory ecology and specifically for research on weakly electric fish, we can recognize its peculiar entanglement with the history of electronic measurement technology. Lissmann, who relocated from Hamburg to the University of Cambridge, a central node of neurological research, is considered the first to have conducted measurements in the field (in northern Ghana in 1951) and later, in a laboratory, to have measured the signals and patterns emitted by *Gymnarchus niloticus* (which are not elephant-nosed, but belong to the same electroreceptive family of fish), *Mormyridae*, and weakly electric fish in general. He used a portable magnetic tape recorder for field recording, a battery-driven three-stage amplifier, and either headphones or a G.E.C. Miniscope (6 V. d.c. using a vibrator) to listen to and view the recordings (Lissmann 1958, 158).

Lissmann was probably the first scientist to describe the signal characteristics of *Mormyridae* in the field. He also investigated the role of the large cerebellum of those fish, which he suggested developed for the specific purpose of analyzing the signals (Lissmann 1958, 181). In his analysis, he abstracted and simplified the body of a *Mormyridae* down to an antenna electrode, which is, in principle, a piece of metal. To model their dynamic body resistance (which today would be done using software-based simulations), he used modeling methods called electric analog(ue)s, simple circuits consisting of electric resistors and capacitors. Then they used an electrolytic tank analog system, which is an analog, not a digital computer, to model its signal behavior and dynamics (Lissmann and Machin 1958). Such practices were not unusual in zoology, but they piqued our interest because this tight coupling of this type of electronics-based and -oriented modeling speaks to the cyborgian character of *Mormyridae*.

BECOMING CYBORG

Cybernetics, a neologism coined by Norbert Wiener in the 1940s, is inspired by the Ancient Greek verb *kubernáō* — meaning to steer, to navigate, to govern. The term refers to a then-new field of science that connected technological systems such as servomechanisms developed for military fire-control systems with human and animal sense-making via the now-ubiquitous concept of feedback (Wiener 1948; Galison 1994; Mindell 2002). Elephant-nosed fish, therefore, are not only objects of cybernetic research, but subjects of cybernetics. They have been conceptualized as cyborgs, if you will. *Mormyridae*, like many other animals, have been theorized and modeled as electronic circuits, antennas, mechanical structures, and, later, as feedback circuits capable of orienting themselves in their natural environments. A feedback circuit is both an abstract concept (i.e. non-material), but also one tied to matter. It simply describes the changing flow of material properties such as voltage, weight, but also monetary value leading back into its own source and thereby causing either its amplification or its reduction. Feedback

systems are also building blocks in ecosystem ecology, system dynamics, or communication systems. They have been present in Californian counterculture, art, psychedelic culture, and design research since the 1960s (Turner 2006; ter Meulen, Tavy, and Jacobs 2009; Blauvelt 2015; Kallipoliti 2015; Bernes 2017; Mareis 2015). Fields such as sensory substitution (Mills 2010, 2011) proved fertile terrain for the encounter between cybernetics and assistive technology. Sensory substitution, later renamed sensory augmentation, is a field of research and engineering that aims to build devices and systems that translate signals from one modality of the human sensorium (such as seeing, hearing, or feeling) to another.

In the early 1970s, Frank Geldard and Carl Sherrick, who at the time were working at the Cutaneous Communication Laboratory at Princeton University (Geldard and Sherrick 1972), described a tactile illusion they called the "cutaneous rabbit illusion": A quick sequence of taps delivered first near the human wrist and then near the elbow creates the sensation of sequential taps hopping up the arm from the wrist towards the elbow — like a rabbit — despite the absence of any physical stimulus between these two locations [see fig. 5]. Hence, with the appropriate spacing and timing, it is possible to create the impression of a higher actuator density (Jones and Sarter 2008, 97). Directly related to such effects is the slightly earlier context around Paul Bach-y-Rita's famous tactile television hardware (Bach-Y-Rita et al. 1969), which stimulated the skin surface not only with a one-dimensional line but over a two-dimensional area, sometimes also called matrix.

In the most general terms, cybernetics accelerated the rationalization, capitalization, and exploitation of everything on our planet by turning everything into a system of interdependent feedback loops, circuits, or machinery. It continues to do so nowadays under different guises and keywords, such as big data, machine learning, and artificial intelligence. With the spread of personal computers, digital communication, and network protocols such as the IEEE 802.11 in the 1980s, the miniaturization of

semiconductor technology, the dissemination of sensor networks and wireless information technology, and protocols such as WiFi, Bluetooth, or mobile phone protocols, we have reached the most recent age of smart environments, intelligent media-techno-ecologies, which unnoticeably expand a new stage of global profit-making. These high-tech, info-centric, and data-driven environments are built on wireless, insensible electromagnetic infrastructures.

MEDIATIONS

The last strand of our historical contextualization explores the cultural history of the interferences of electromagnetics, animism, esoterics, and other fields of knowledge that are pseudo-scientific or non-scientific. Techno-spiritualism arose in the context of technical media networks with the dawn of telegraphy and the first explorations of radio — at a time when radio was not yet a distinct technology, but a side effect of telephony (Kahn 2013, 1). With the dissemination of vacuum tube amplification and high-frequency radio during the 1920s and 1930s, esoteric, techno-spiritual, and pseudo-scientific narratives and theories exploded exponentially (Borck 2001). Later prominent figures of these contexts inspired by electromagnetic media technology are Wilhelm Reich (Orgone Theory), David Tansley (Radionics), Konstantīns Raudive (Electronic Voice Phenomenon), and many more.

We found alternative entry points for our fictional world-designing in the cross-comparison of the aforementioned discourses with the long and rich cultural history of cosmologies of East Asian cultures, such as animism and shamanism. Practices of working with energies are central to Taoism and Zen Buddhism, for example. Reactualized as so-called techno-animism (Jensen and Blok 2013), these contexts build a broad spectrum of bizarre narratives, imaginative concepts, alternative metaphors, and terminology based on an interweaving of the world of animals, electromagnetic media technology, and human-based understanding [see fig. 6].

B) MEDIA EXPERIMENTATION

First, we reconstructed some of the above-mentioned historical contexts and their experiments in the field of sensory substitution between the tactile and other senses (such as hearing and vision). Our extended team member Akitoshi Honda's previous work *Bipolar* (2012) [see fig. 7] has been inspired by Bach-y-Rita's sensory matrix, which consisted of a 20×20 vibrator stimulator matrix "mounted in the back of a dental chair for projecting mechanical television images on the skin of the back of blind subjects (Bach-Y-Rita et al. 1969, 963)." Honda made a scaled-down version with an 8×8 vibrator matrix, which we also used to rudimentarily recreate "the cutaneous rabbit illusion" within an experimental setting [see fig. 8]. Moreover, we have been prototyping various devices that have helped us to sense our high-tech electromagnetic environments (especially WiFi and Bluetooth signals) via a wearable tactile interface.

Tinkering and hands-on experimenting with easily available low-cost modules, parts, and devices have grounded our fictional world-designing as well as its historical contextualization. We tied the fictional and speculative aspects of our research to concrete issues of functionality so that our research operated within trajectories of plausibility rather than being merely a work of fiction or theory. Our present system is based on a previous project called *Detektors* (2010) conducted in collaboration with artist-researcher Martin Howse [see fig. 9]. While *Detektors* allowed us to listen to the electromagnetic signals surrounding us (Miyazaki 2013), the *Algorhythmic Driver Module* (2017) we built in collaboration with the artist and programmer Akitoshi Honda invokes feelings of electromagnetic signaling. Instead of hearing electromagnetic waves, the new system helped us to feel them [see fig. 10]. The *Algorhythmic Driver Module* consists of a Raspberry-Pi-Computer (+ low-budget sound card), which conducts an FFT-based spectrum analysis and triggers (according to programmed patterns) the motor driver units connected to a small and portable 4×4 matrix of button-shaped

vibration motors. Driver units and Raspberry-Pis are mounted on a custom-made printed circuit board. Up to 64 vibration motors can be controlled with this setup. We increased the sensibility and bandwidth of the receiver device from 100Mhz–3Ghz to 1Mhz–10Ghz. Logarithmic radio frequency detectors — small integrated chips — made by Analog Devices transform these radio waves into sound [see fig. 11]. These micro-circuits operate similarly to decibel meters for sound waves; they measure the power of electromagnetic waves and relate that to changes in voltage. As these voltages fluctuate very quickly, they become audible when amplified and connected to a loudspeaker. The specific acoustic characteristics, dynamics, and signatures of the detected electromagnetic waves are translated, coded, and mapped to selected vibratory activation patterns. We experimented with different antenna designs [see fig. 12], and tested a variety of different vibratory activation patterns and ways to attach the small vibrator buttons to our upper and lower limbs or torso, but did not continue developing our prototypes, since we had never aimed for a fully functional setup.

C) FICTIONAL WORLD-DESIGNING

Inspired by approaches such as critical or speculative design (Dunne 2008; Dunne and Raby 2014), fictional world-designing is a way to create various playful scenarios of an alternative or future life, where we could feel our invisible electromagnetic infrastructure, its signals and processes as sensible pulses, rhythms, and tickling. Here, the sensorial ecology of the elephant-nosed fish operates as a vehicle that helps us to intertwine the non-human sensorium of the world of animals, including its alterities, with its dynamical relationships with non-human worlds full of signal-based and seemingly immaterial aspects of designed invisible environments. To what degree would that be needed or even become empowering? How and for what situations? What would happen to our conventional senses?

FIRST APPROACHES

We started with paper-based techniques such as diagrammatization or quadrant mapping [see fig. 13] and wrote text-based narratives and film exposés; we thought about found objects, such as a Japanese lucky charm for success with information technology [see fig. 14]; we designed liminal objects [see fig. 15] (Star and Griesemer 1989; Pierre Johnson et al. 2017), such as antennas or crystals, based on which we developed different artifact-based stagings and scenarios [see fig. 16]. In order to work within a constrained spatial framework, we built a simple small studio with three plywood walls, each ca. 2×2 meters, painted blue [see fig. 17]. Since that hue of blue evokes an aquarium, the studio invites associations with water and fish. We dubbed it "the Aquarium." It holds not only the objects of our imagined worlds, but also the visual, textual, and haptic materials from our historical contextualization. They act as triggers and orientation nodes for our story-creation and for the object we developed in our media experimentation [see fig. 18].

Hence, the Aquarium is not only a mode of displaying, but is itself a generative environment that helped us to connect with our research objects and the objects we designed in unexpected ways. It is also a simple and effective method for materializing practice-based research beyond the discursive medium of written text and printed publication. We showed different variations of our Aquarium in several exhibitions [see fig. 19], presenting selections of the described artifacts, sometimes the micro-studio itself or a representation of it, in two short films, and in a related fictional timeline [see fig. 20–21].

SCENARIO

We first began developing more straightforward scenarios in which we would biologically transform into hybrid beings inspired by elephant-nosed fish, or in which our bodies would be augmented by wearables, and in which we were confronted with the quite

obvious issue of invisibility: how can we show the technological operativity of electromagnetic waves when they are invisible to our eyes? This insight made us realize that we would need to focus on artifacts and non-direct ways in which human citizens in a future world will handle, operate, and work with electromagnetic signals. The rituals and customs dealing with invisible matters as practiced in different cultures in Europe, Asia, and North America that we learned about informed our imagination. We constantly extended and refined scenario fragments considering historical contexts, socio-political aspects, and technological plausibility until we arrived at the utopian scenario we proposed in part I of this book: a group of human citizens performs techno-shamanistic transformations rituals of becoming a super-(techno)-animal in order to protect themselves from the information retrieval machinery of transnational data-mining conglomerates. These fictitious techno-anarchist groups are part of alternative closed-loop neighborhoods that are ideally economically and socio-technologically independent from these conglomerates. Our focus on socio-political issues became rather crucial for our fictional worlds since they not only provide narrative vectors but indicate alternative ways of living in an increasingly automated, highly complicated, and technology-driven world. Our fictions are intended to provoke reflections about our current infrastructures that are intentionally designed to remain invisible.

Clearly, techno-shamanistic imaginaries played an important role in our scenario, which is not so strongly expressed in the story and the rhapsody of part I itself, but it was an invitation to dream and ponder about our future where we reencounter and remember our animalistic traits specifically to adapt to our ever-changing sensory ecosystem increasingly flooded with electromagnetic waves, signals, and networks. This also opened up our horizon, and hopefully also our readers', to alternative, sensorial, or sense-oriented imaginings of our future: reimagining our sensorium.

Our aim with this project was to link the world of electromagnetic waves and the vast informational infrastructures they provide with the manifold facets of the fictional worlds they afford, based on our historical contextualization. This approach might offer broader insights into our core concern: social empowerment in the age of complex entanglements of technology and ecology. To describe it metaphorically: we avoided creating a smooth, monolithic, and glossy body of insights and, instead, we aimed to make this body more porous, manifold with many holes and docking sites for linkages.

The three activity threads we pursued while following the elephant-nosed fish were our approach to show that things are more complicated and complex than they seem to be. Materialization is surely a straightforward way to tackle issues of design, which becomes increasingly ungraspable, invisible, and unperceivable. The simplicity and inaccessibility of designed environments such as our wireless information spheres is an illusion and prevents the possibility of self-exploration, production, and determination. Increasing complexity by an oscillation between materialization and theorization is furthermore a form of ethico-aesthetic (Guattari 1995, 8) and design-based resistance towards overly profit-oriented forms of research mostly capitalizing the reduction of complexity, leading to more calculable and thus economically valuable forms of design. Feeling the pulsations and vast activity of data exchange, data collection, and surveillance provide not only ways to become sensible and raise awareness about hidden, still crucial information on infrastructures of urban life, but, moreover, offer generative and playful frameworks for further experimental research in design. And this especially concerns our contemporary condition, where "life" and "living" are increasingly enabled, controlled, and dependent on invisible, electromagnetic, quasi 'magical' infrastructures.

By following the elephant-nosed fish, we soon found out that even the concept of this fish is a sort of porous subject: there are many species of elephant-nosed fish. The sensorium of those fish is fascinating since it has been cyborgian long before cyborgs existed and even before humans existed. Still, it was us imagining becoming like one of those fish that also made us more porous both to becoming machine and becoming animal. This opened up our horizon towards evolutionary biology and species formation while simultaneously shedding light on the limitations of humanist concepts such as tool-making or even language that might have existed long before the emergence of *Homo sapiens*. Since we have always already been coupled with our tools, then there is no human "nature" as such. Looking at our past affords a better look at our future. Focusing on our sensorium and that of the elephant-nosed fish led us to new forms of social imagination. The ideas, thoughts, and stories in the first part proposed only a few among a million possibilities. We hope that they will grow like a rhizome and become the foundation for a more just and desirable future.

Figs. 1–21

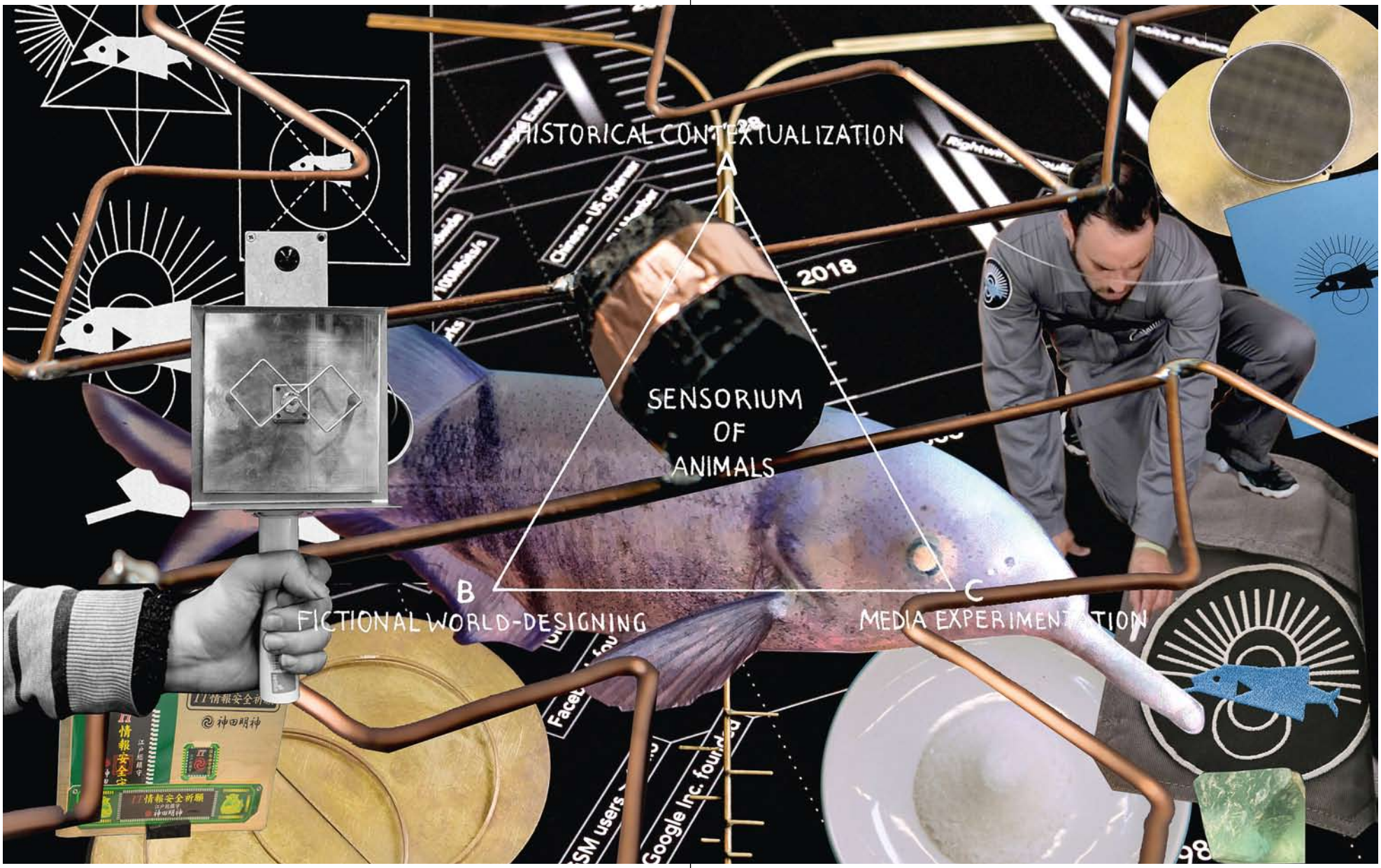


Fig. 1

A vizualisation of the imaginary world invoked in our pursuit of the elephant-nosed fish. Contains: CC BY 2.0, 2017, XLAB Göttingen, Germany.

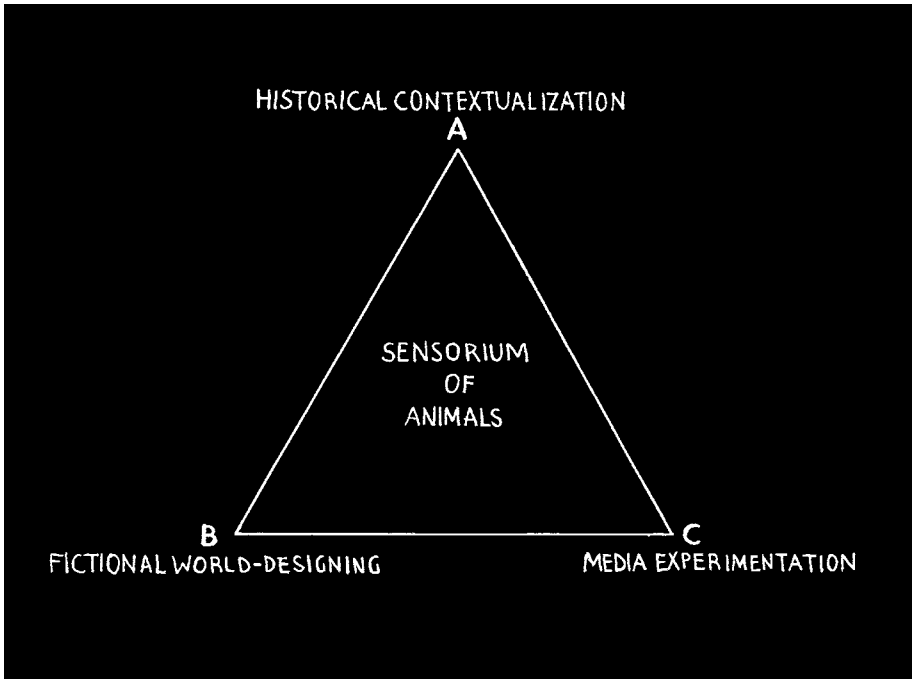


Fig. 2

We were working along three tracks: prototyping / media experimentation, historical and theoretical contextualization, and fictional world-designing.

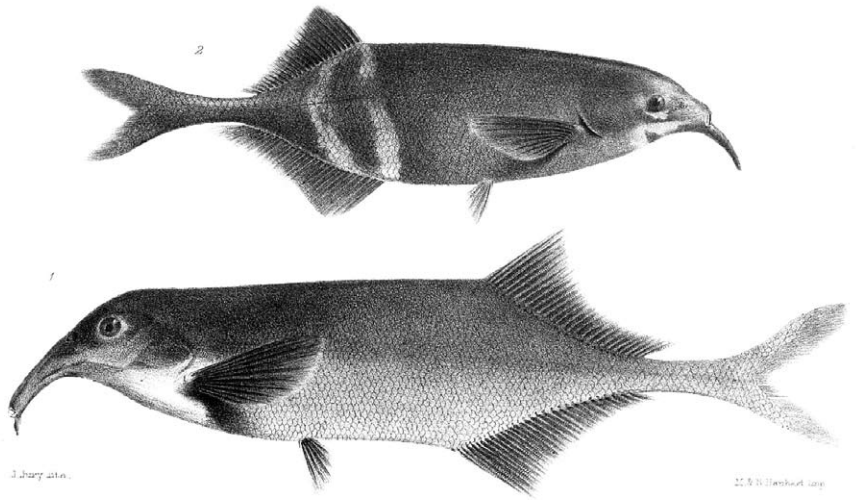


Fig. 3

Peter's elephant-nose fish (*Gnathonemus petersii*). Jury, J. Proceedings of the Zoological Society of London (vol. 1864, plate II).

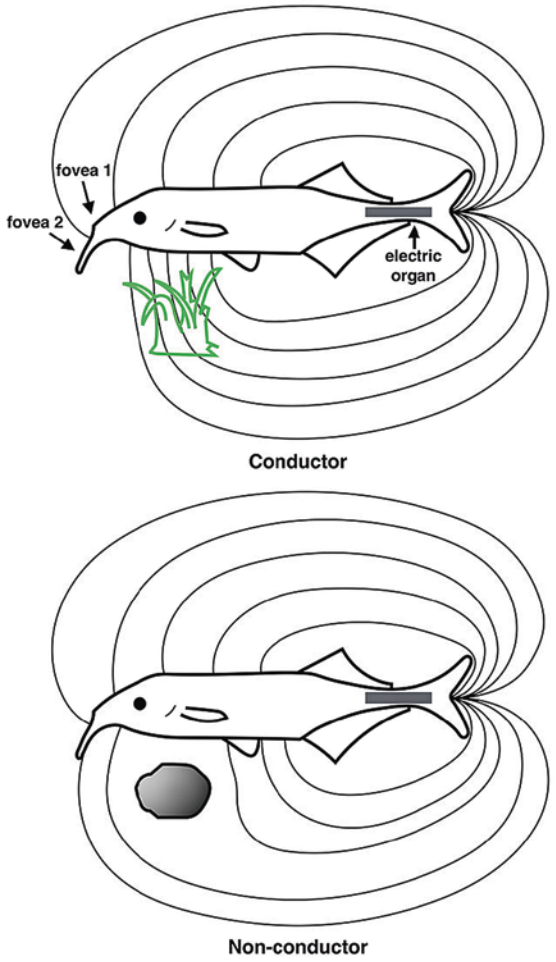


Fig. 4

Similar to radar systems in the military, weakly electric fish "see" their surroundings in cloudy waters by sending out electric waves and interpreting signals that are reflected back toward them. These electric fields emanate from the electric organ in the tail region (gray rectangle) and are sensed by the electroreceptive areas on the skin. This figure shows the field distortions created by two different types of objects: on top, a plant that conducts electricity better than water (indicated in green) and a non-conducting stone (indicated in gray). Based on: Heiligenberg, Walter (1977) *Principles of Electrolocation and Jamming Avoidance in Electric Fish: A Neuroethological Approach*. Berlin: Springer Verlag. CC BY 4.0, 2014, Michael S. Lewicki, Bruno A. Olshausen, Annemarie Surlykke and Cynthia F. Moss.

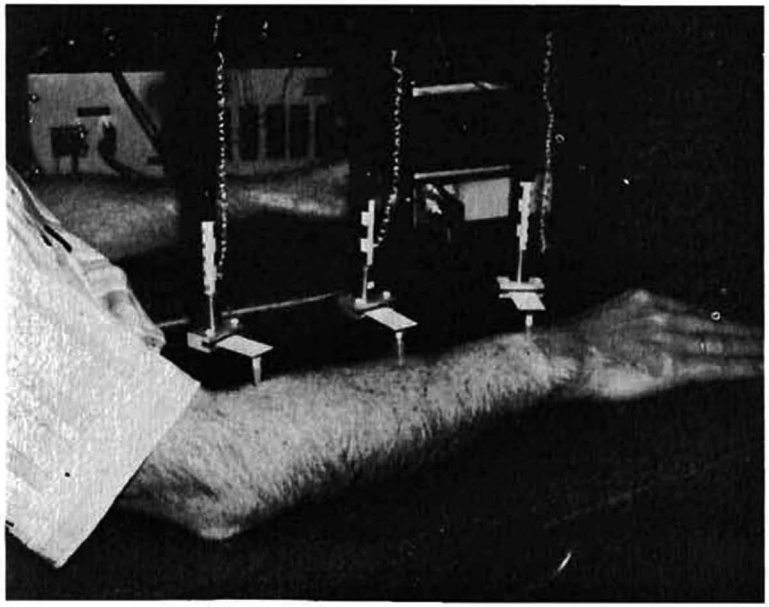


FIGURE 1. The three contactors, driven by Bimorph benders, in place on the dorsal forearm. Static pressure is controlled by the tubular spring dynamometers which, in turn, are suspended from the ceiling to minimize "crosstalk" among the vibrators.

Fig. 5

The picture above shows the experimental setup that was used to create the "cutaneous rabbit illusion" at the Cutaneous Communication Laboratory at Princeton University in the early 1970s. Geldard, Frank A. 1975. *Sensory Saltation. Metastability in the Perceptual World.* Hillsdale, NJ: Lawrence Erlbaum Associates, p. 29.

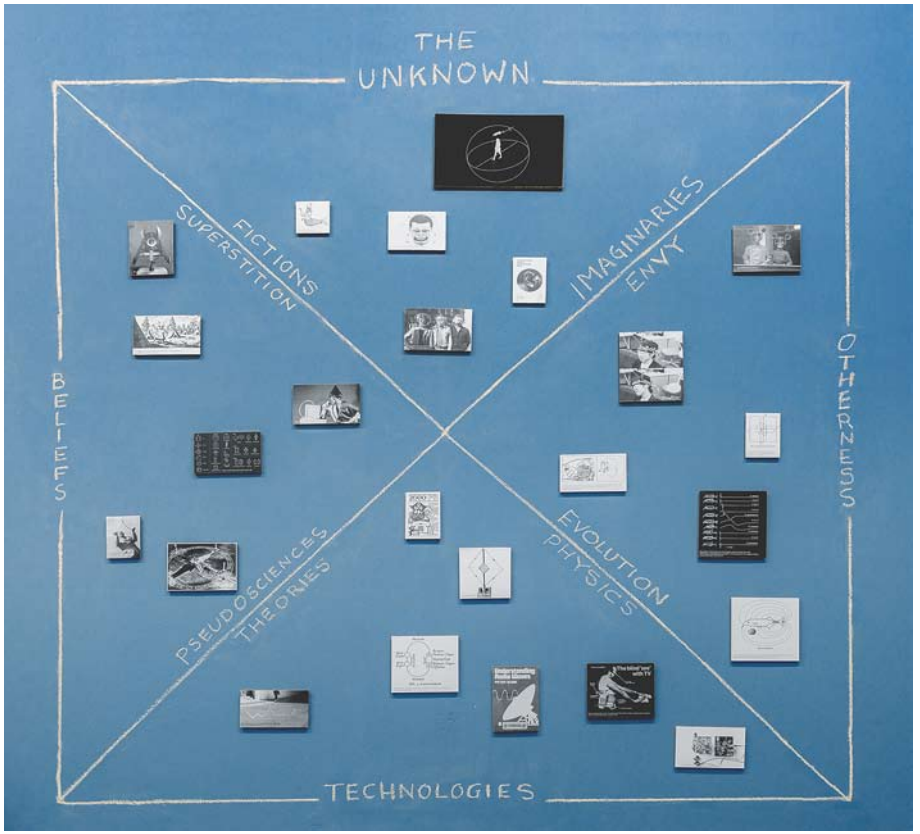


Fig. 6

Analytical diagram on the wall of the aquarium: an overview of our inquiry.

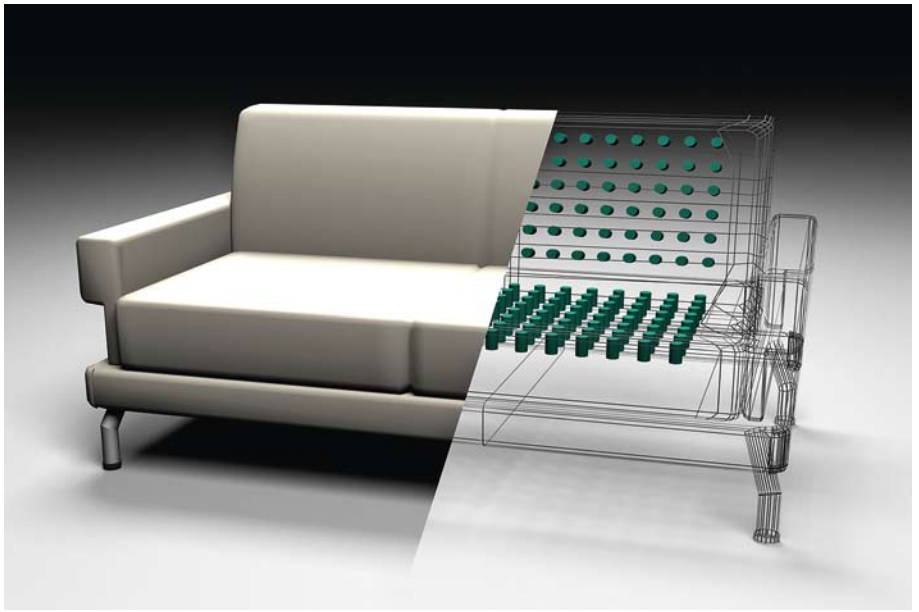


Fig. 7

Bipolar (2012) by Akitoshi Honda is a sofa with a built-in vibrator matrix. The matrix responds to real-time data about radiation levels in the local environment measured by the module shown on the left. These levels are translated into haptic vibrations in the sofa's structure. The intensity of the vibrations is proportional to the measured local radioactivity. This project creates an awareness of radiation in a domestic environment that people usually experience as safe. Image credit: Akitoshi Honda

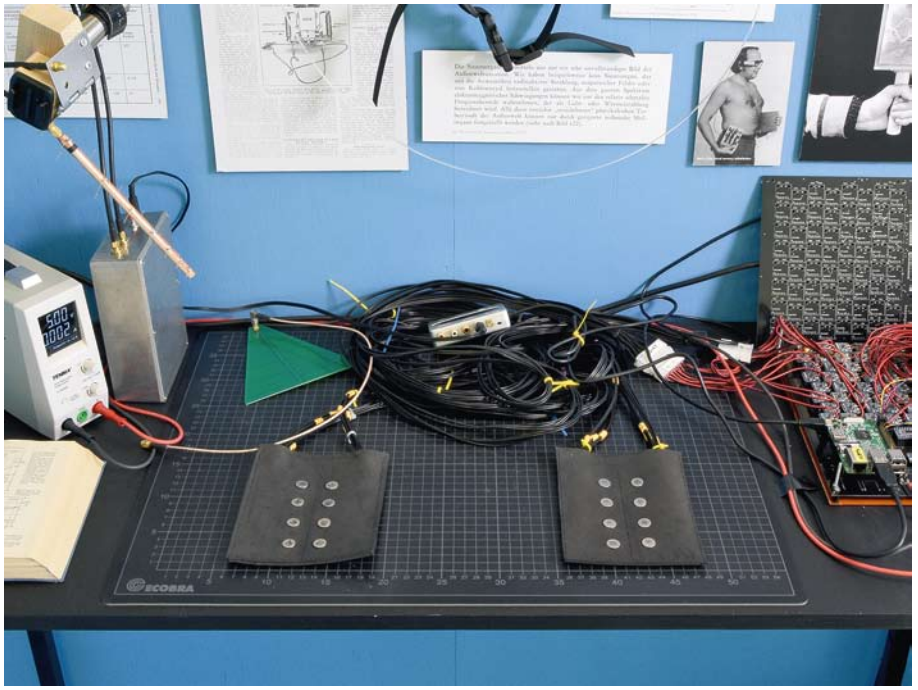


Fig. 8

Experimental setting inside the research aquarium: A 8x8 vibrator matrix, built for us by Akitoshi Honda, as a rudimentarily re-creation of the "cutaneous rabbit illusion."

Fig. 9

Detektors, co-developed by artist-researcher Martin Howse and Shintaro Miyazaki in 2010. These devices can record hidden electromagnetic signals emitted by common electronic devices and gadgets such as mobile phones, laptops, cameras etc. But the "detektors" can also capture high-frequency bands (modulation of WiFi, Bluetooth, GSM, UMTS and GPS networks) as well as any other transmission system in the range between 100 Mhz and 5 Ghz. They translate these emissions directly into sounds audible to the human ear.

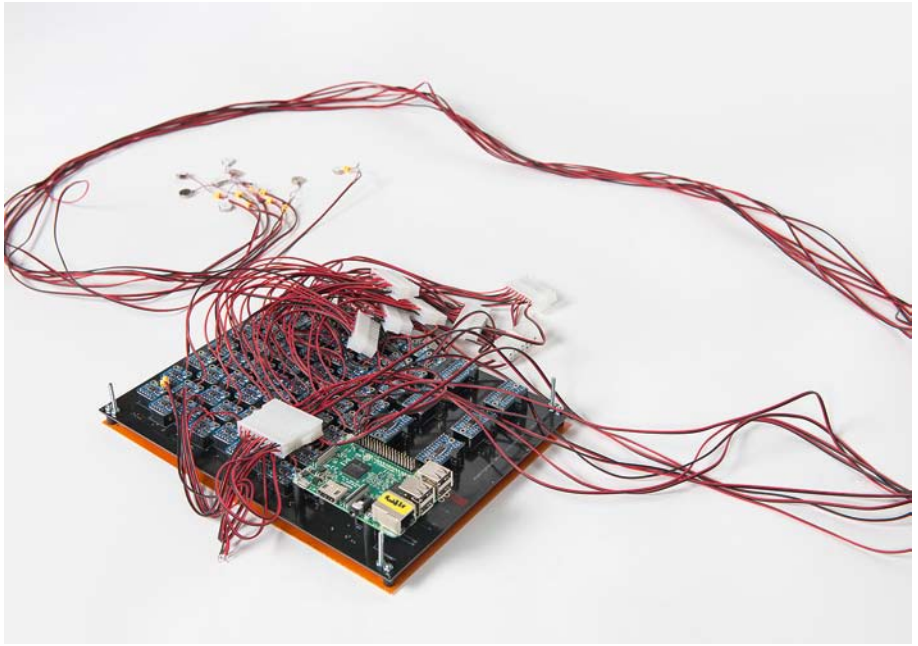


Fig. 10

The Algorhythmic Driver Module consists of a Raspberry Pi-Computer that can control up to 64 vibration motors. The sensibility and bandwidth of the receiver device ranges from 1Mhz to 10Ghz.

Fig. 11

This experimental setup is based on off-the-shelf evaluation boards for “logarithmic radio frequency detectors” — small integrated chips — produced by Analog Devices.

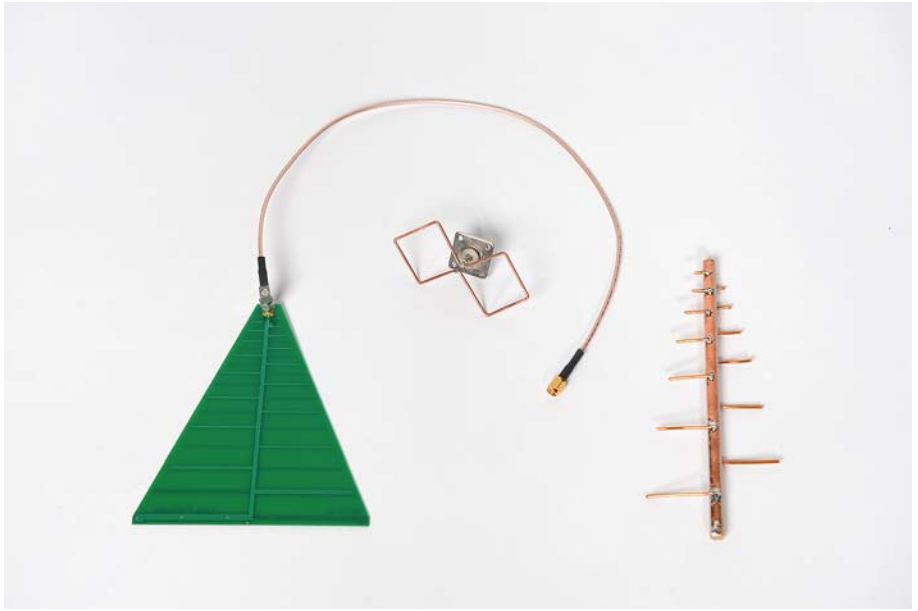


Fig. 12

We experimented with different antenna designs — some came off-the-shelf, some we made ourselves.

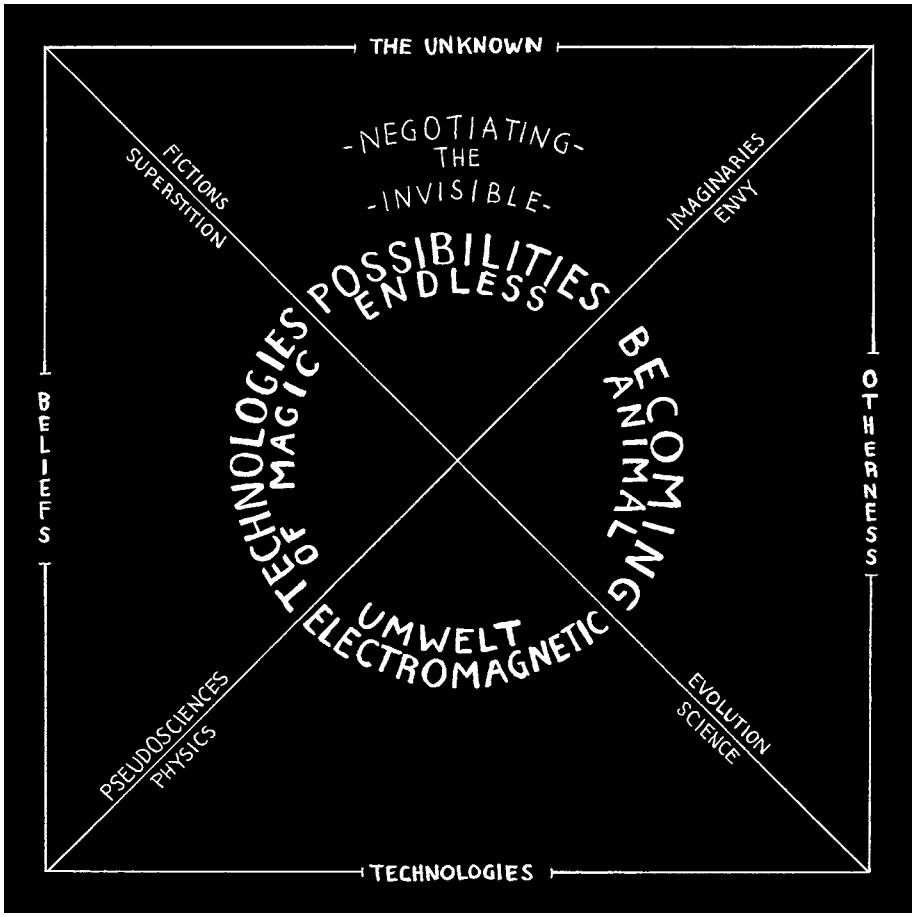


Fig. 13

We outlined the areas of our inquiry using quadrant mapping as a method. A version of this diagram was applied with chalk on the wall of our "micro-studio."

Fig. 14

We collected peculiar objects that directly refer to our inquiry, such as a Japanese lucky charm *Omamori* which promises protection and success with information technologies. This specific *Omamori* is sold at one of Japan's most sacred shrines in the vicinity of the electronics district Akihabara in Tokyo.

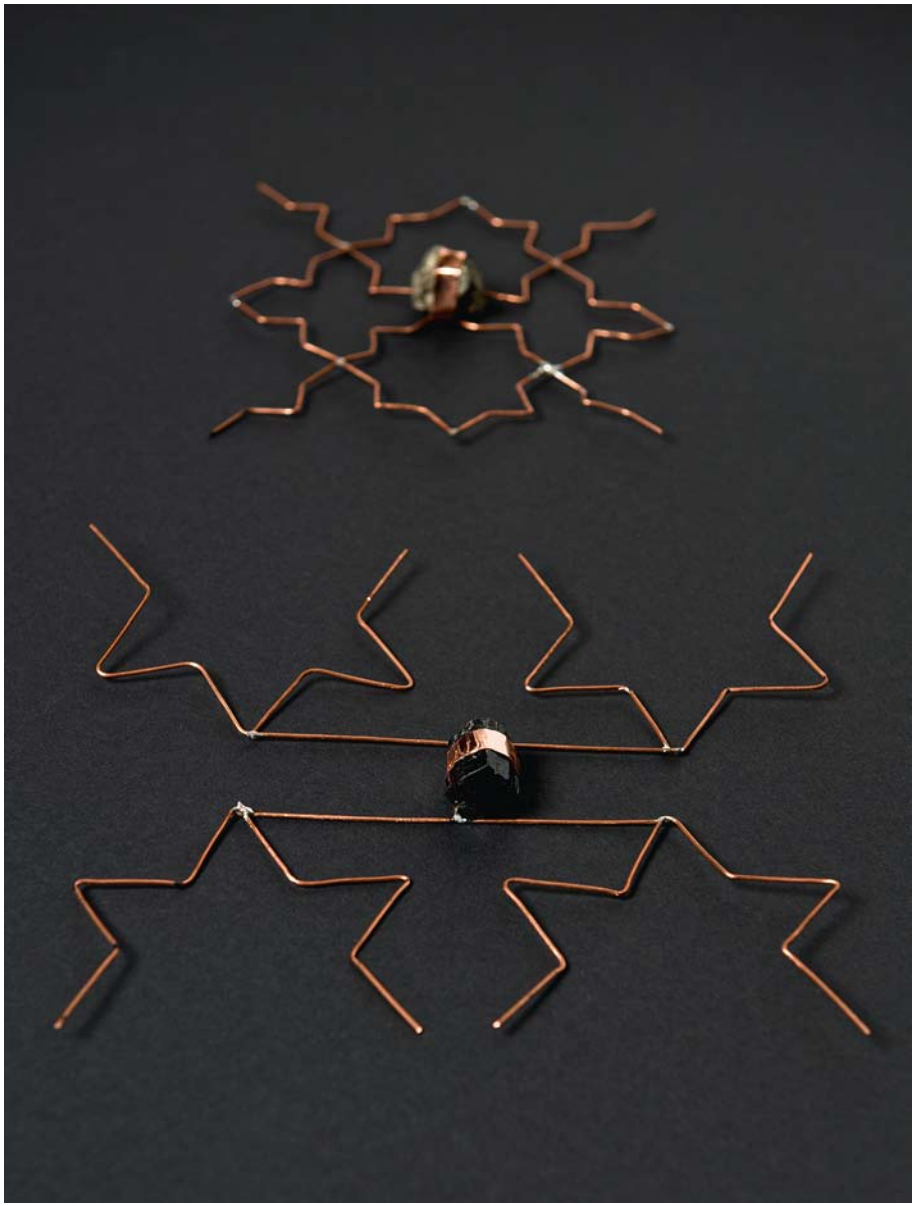


Fig. 15

Antenna Fetishes: a series of fictional prototypes that act as "boundary objects".

Fig. 16

Our fictional prototypes allowed us to create different artefact-based stagings and scenarios, for example as props in the short film *2038*.

Fig. 17

We built a simple micro-studio that we called “research aquarium.” We used this space to present the artifacts from our research, staged as an imaginary unnamed scientist’s laboratory, complete with a desk, chair, and shelves. We also used this space as a work environment during our process.

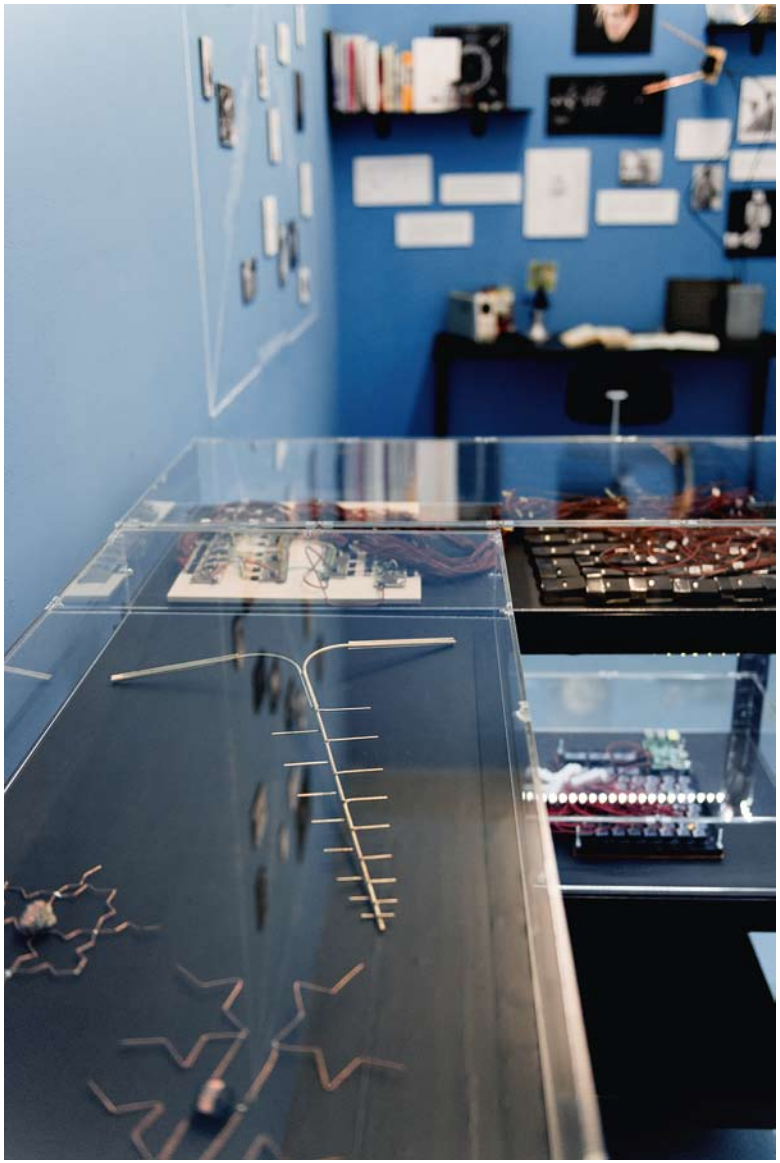


Fig. 18

Installation views of *Sensorium of Animals* during Art Week at Balzer Projects Gallery, Basel (2018).

Fig. 19

Installation views of *Sensorium of Animals* during Art Week at Balzer Projects Gallery, Basel (2018).


THE UNKNOWN
IMAGINARIES
ENVY
EVOLUTION
PHYSICS
TECHNOLOGIES
BODY ELECTRIC

Fig. 19

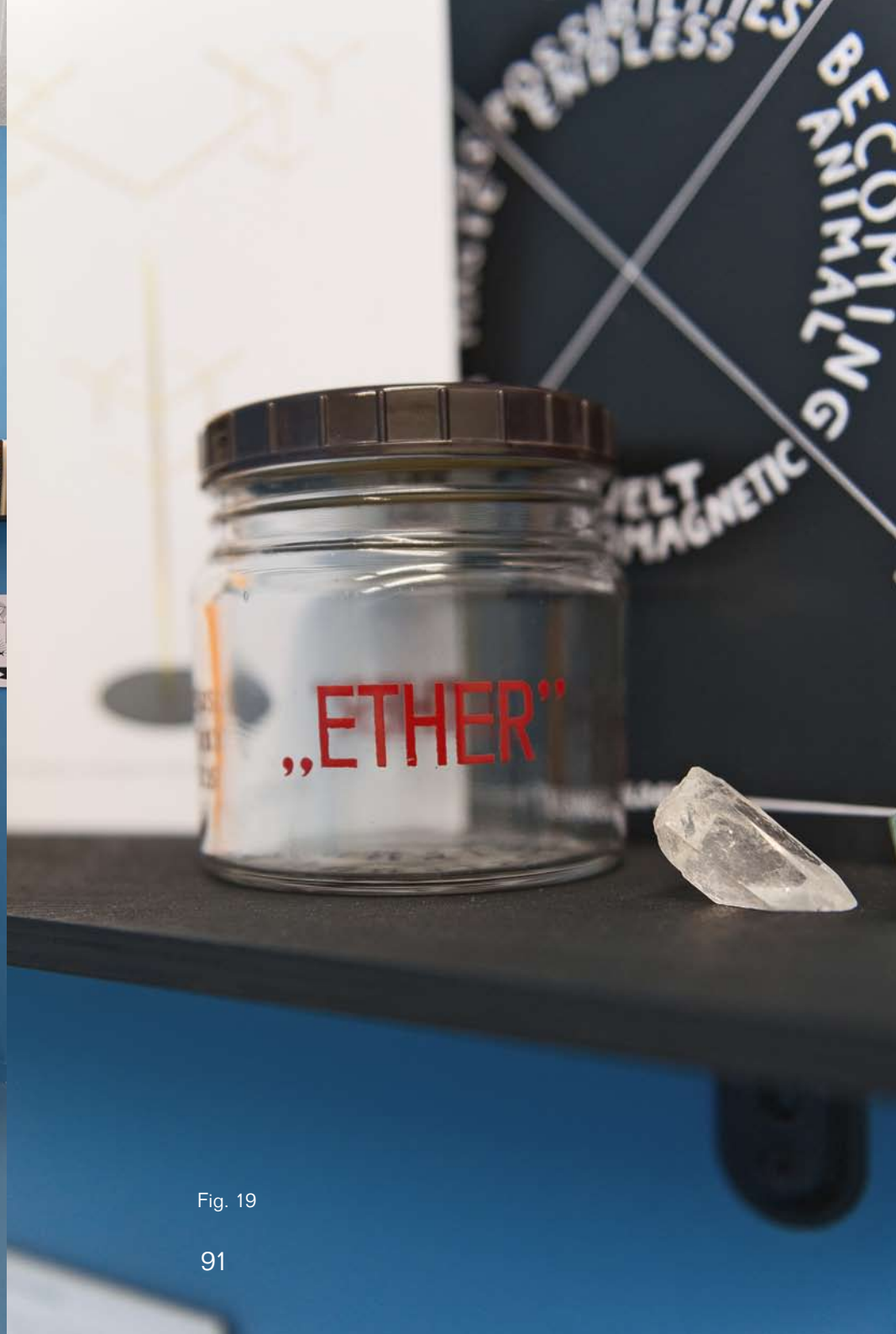

„ETHER"
BECOMING ANIMAL

Fig. 19

Fig. 19


THE
BODY
ELECTRIC
ELECTROMAGNETISM AND THE FOUNDATION OF LIFE
ROBERT O. BECKER, M.D., AND GARY SELDEN
The Human Senses
Sensory substitution and the human–machine interface

Fig. 19

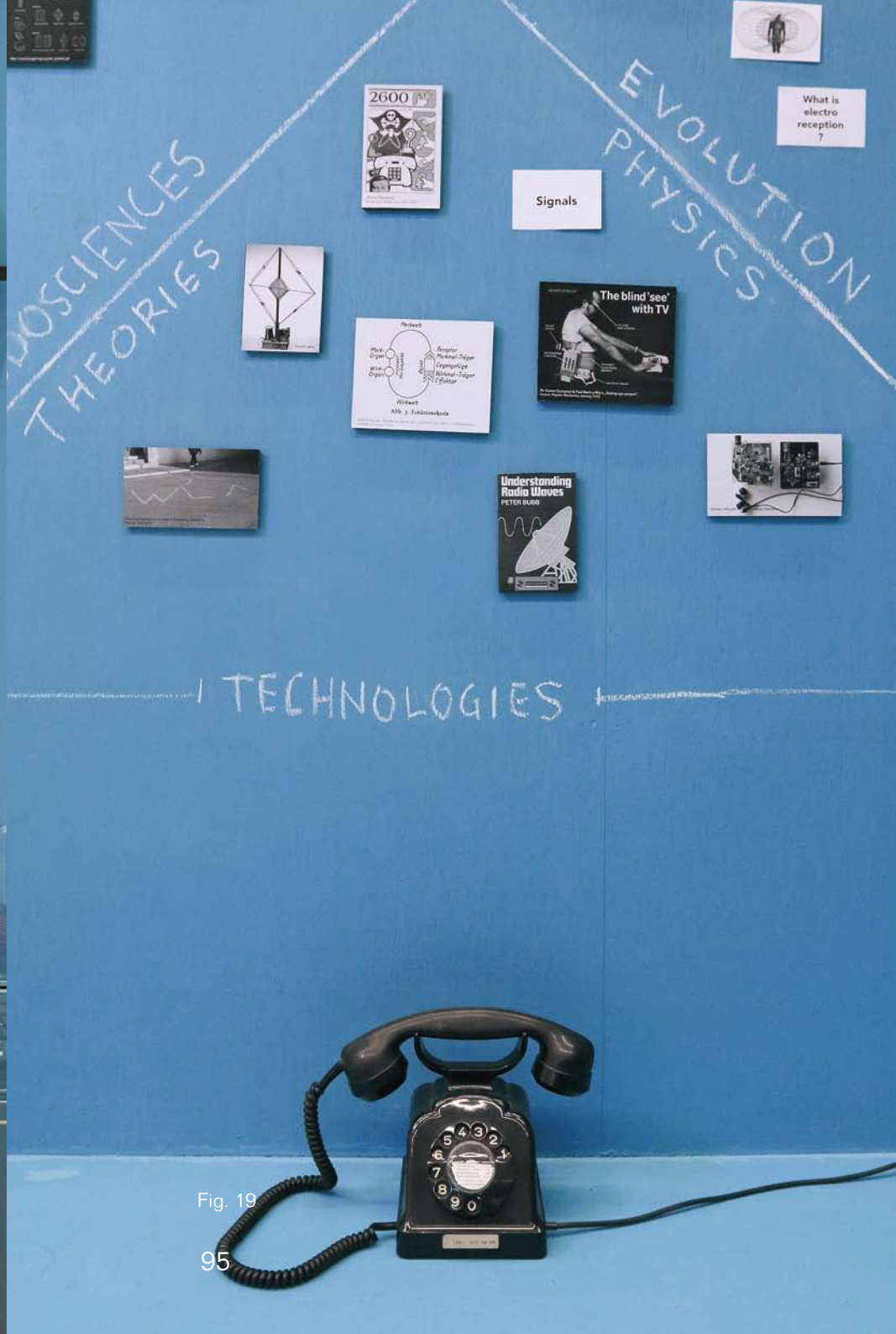

EVOLUTION
PHYSICS
NEUROSCIENCES
THEORIES
TECHNOLOGIES
2600
Signals
What is electro reception ?
The blind 'see' with TV
Understanding Radio Waves
PETER BUBB

Fig. 19

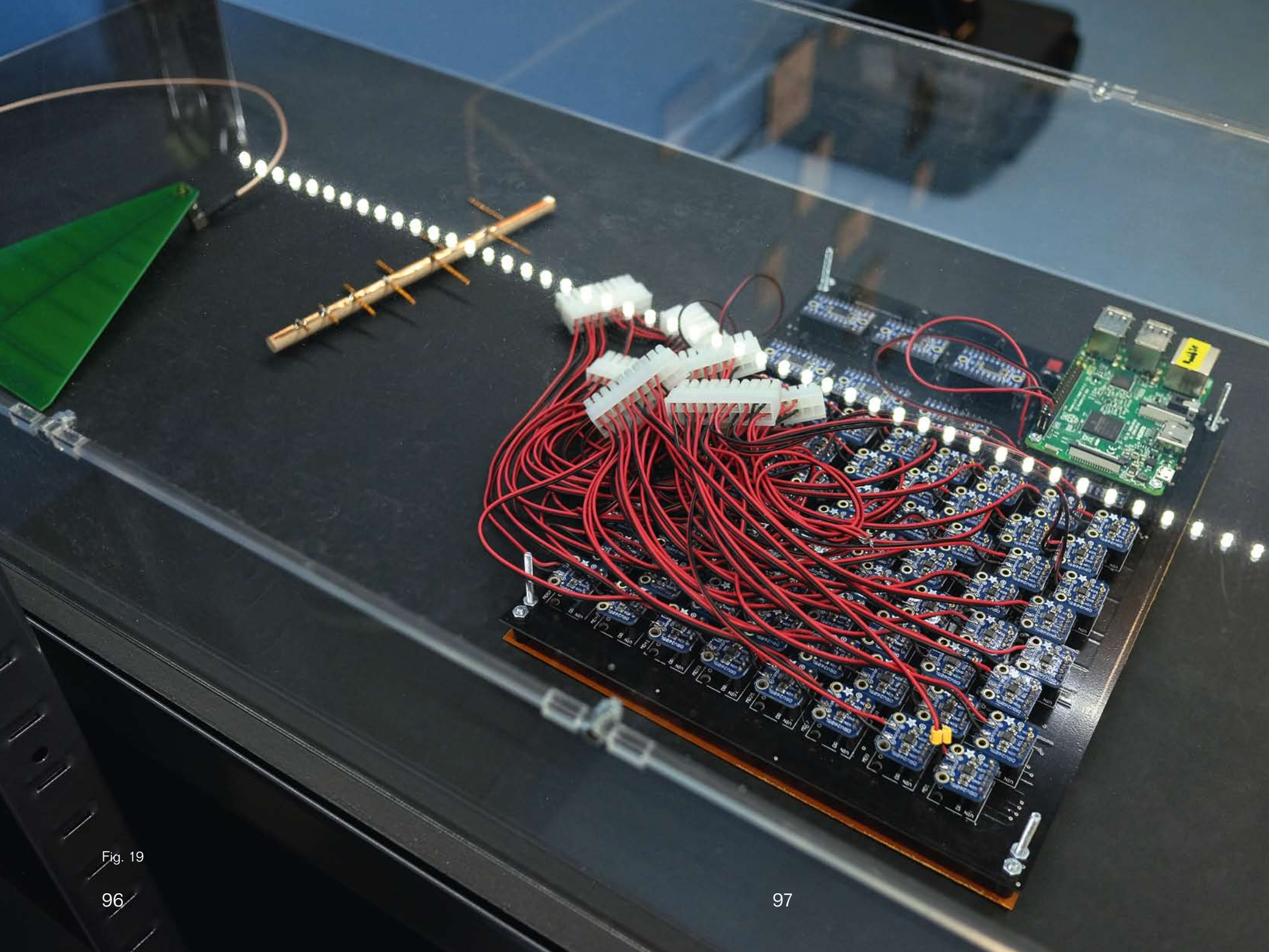


Fig. 19

Fig. 19

Fig. 19

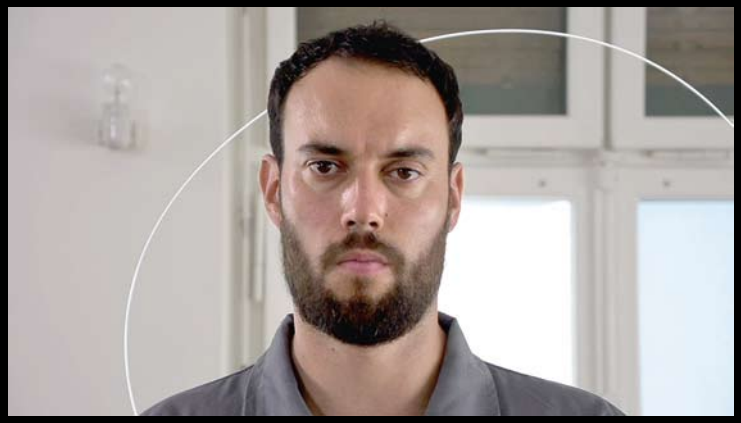
Fig. 20

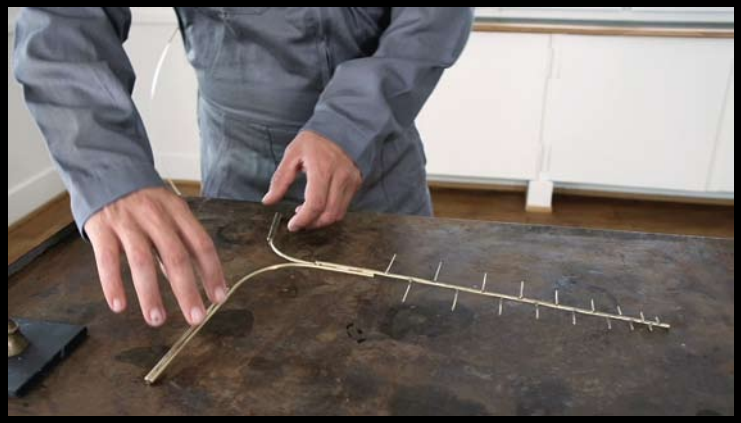
Installation views of *Sensorium of Animals* and the "research aquarium" in the foyer of the Academy of Art and Design FHNW, Basel (2018).

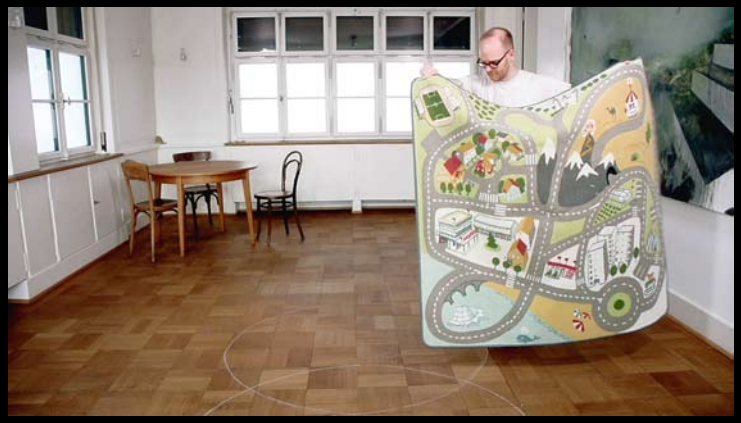
Fig. 21

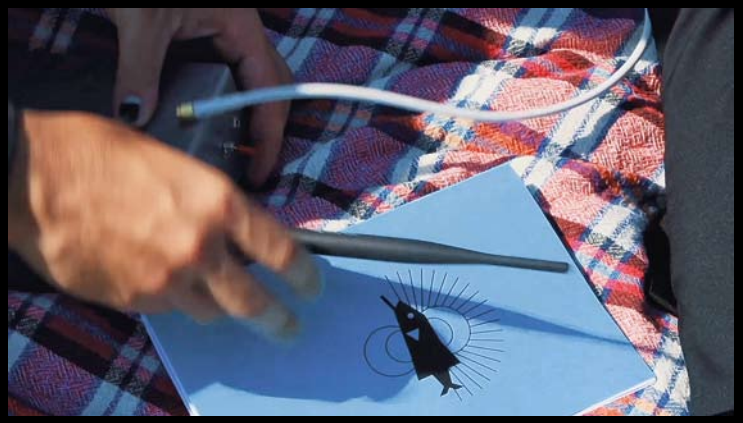
Installation views of *Sensorium of Animals* and the "research aquarium" in the foyer of the Academy of Art and Design FHNW, Basel (2018).

Short film: *2038*









Short film: *2008*

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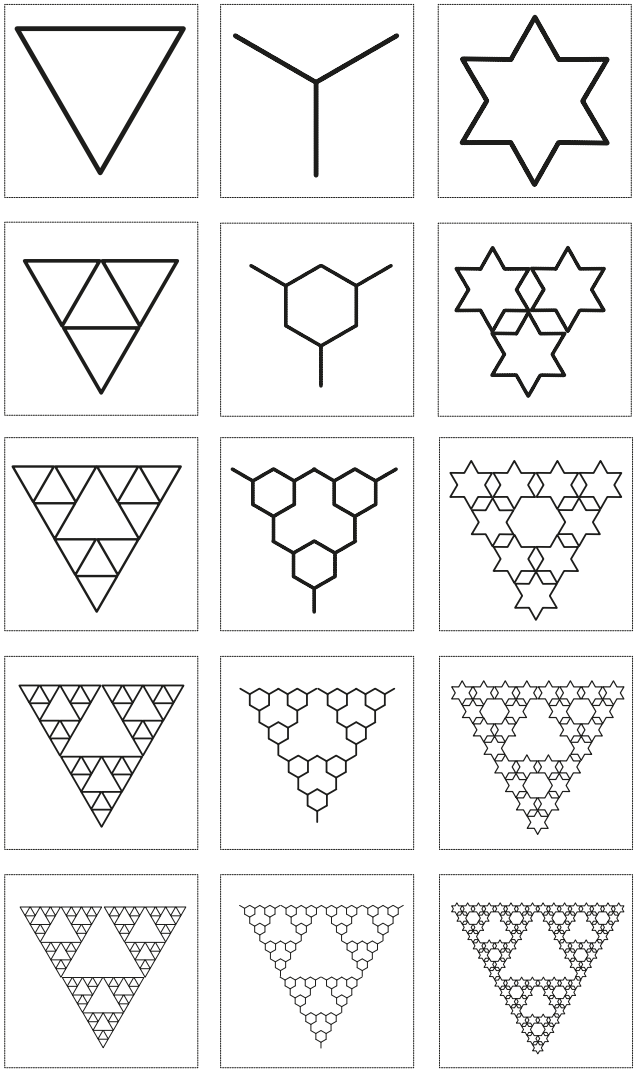

COMPANION

SENSORIUM OF ANIMALS IN PUBLIC EXHIBITIONS

Sensory Orders
Center for Contemporary Art Łaźnia, Gdansk, Poland
06 November 2020–14 February 2021
Curated by Chris Salter and Erik Adigard

Experiment Zukunft
Kunsthalle Rostock, Germany
24 March–05 May 2019
Curated by Susanne Jaschko

Sensorium of Animals
Academy of Art and Design FHNW, Basel, Switzerland
06–20 December 2018

The End is Where We Start From. On Tsunamis, Nuclear Explosions and Other Fairy Tales.
Balzer Projects gallery, Basel, Switzerland
06 June–21 July 2018
Curated by Dr. Isabel Balzer

On the Dependency of our World View on the Duration of our Moment.
Solo exhibition by Susanna Hertrich
Mannheimer Kunstverein, Germany
30 October 2018–13 January 2019
Curated by Hortense Pisano and Dr. Martin Stather

Dialoge 05: Human Upgrade
Duo exhibition by Susanna Hertrich and Hannes Wiedemann
Gallery at Schader-Stiftung, Darnstadt, Germany
14 October 2016–05 March 2017
Curated by Dr. Klaus D. Pohl

TEI 17 – 11th International Conference on Tangible, Embedded and Embodied Interactions
Arts Track exhibition
KEIO University Media Design, Yokohama, Japan
20 February–23 March 2017

MENTIONS IN PUBLICATIONS

Kirsten M. Langkilde, ed. 2017. Futures Values Archives, Basel: Merian Verlag.

Kirsten M. Langkilde, ed. 2017. Poetry of the Real, Basel: Merian Verlag.

PUBLISHED IN

Witzgall, S. and Kesting, M., eds. 2022. Politik der Emotionen / Macht der Affekte, Zürich: Diaphanes.

Chris Salter, ed. 2020. Sensory Orders, The Art and Science Meeting 2020, Center for Contemporary Art Łaźnia, Gdansk.

Erlhoff M. and Jonas W., eds. 2018. NERD – New Experimental Research in Design. Positions and Perspectives, Basel: Birkhäuser.

Hertrich S. and Miyazaki S. 2018. Sensorium of Animals, booklet for the exhibition at Balzer Projects gallery.

PUBLIC PRESENTATIONS

Follow the Elephant-Nosed Fish, invited talk
Kunstschule Liechtenstein
01 September 2020

Die Zukunft der Künste, lectures series "Real Utopias", invited talk
Deutsches Hygiene-Museum, Dresden, Germany
14 May 2019

Stories Leading to the Future, invited talk and discussion with Hiroyuki Hattori
TOKAS Tokyo Arts and Space residency, Japan
10 March 2019

Forum Paradigm_Shift #2, invited talk
Mapping Festival
HEAD, Geneva, Switzerland
09 May 2018

Empathy and Justice, invited talk
cx centre for interdisciplinary studies
Akademie der Bildenden Künste München, Germany
9 January 2018

Altering Perceptions, invited talk
Questioning Aesthetics Symposium: Art Research & Aesthetics
La Virreina Centre de la Imatge, Barcelona, Spain
20–21 June 2017

Synthesizing Historical Contextualization. Fictional World-Designing, and Media Experimentation. An Ongoing Case Study, invited talk
NERD New Experimental Research in Design, symposium
Braunschweig University of Art, Germany
16 June 2017

Sensorium of Animals, invited talk
Poetry of the Real Symposium
Academy of Art and Design, FHNW, Basel, Switzerland
15 June 2016

The Principle of Oscillation – The Immersed End Consumer, invited talk
Schule der Distanz No. 1
Berliner Festspiele, Berlin, Germany
19 November 2016

SHORT FILMS "2008" AND "2038"

Actors: Tomas Ribas, Jan-Claas van Treek, Yann P. Martins, Arianna Smaron, Alessandra Puricelli, Thomas Dürst, Leonie Häsler, Felix Gerloff, Aina and Taito Lindroos, Yuko Himeno, Oskar Marosi

Direction, production and post-production: Susanna Hertrich and Shintaro Miyazaki

BIOGRAPHIES

Susanna Hertrich is an interdisciplinary artist and designer. Her artistic research has taken her to laboratories in Tokyo, Berlin, and most recently Basel. Her artwork has been exhibited and published internationally. She has received grants from Atelier Mondial for an artist residency at TOKAS in Tokyo (2019), for an artist residency at Villa Kamogawa in Kyoto (2015), was invited by the Goethe Institute and Tsinghua Media Art Laboratory in Beijing (2012), and more. In addition to her artistic work, she leads the new master studio Experimental Design in collaboration with the Critical Media Lab / Institute of Experimental Design and Media Cultures at the Academy of Art and Design FHNW in Basel.

www.susannahertrich.com

Shintaro Miyazaki is Junior Professor for Digital Media and Computation at the Department for Musicology and Media Studies at Humboldt-Universität zu Berlin. He studied media studies, philosophy, and musicology in Basel and Berlin in the early 2000s and defended his PhD on the media archaeology of digital technologies focusing on algorithms and their rhythms at the Humboldt-Universität zu Berlin in 2012. It is in this context that he coined the term algorhythmics. After an extended excursion in experimental design and artistic research (2013–2020), he is presently interested in how to generate moments of (non-modernistic) criticality that emancipate us from our self-imposed ignorance of the algorithmic infrastructures we are captured by.

COLOPHON

Editing and proofreading:
Nine Eglantine Yamamoto-Masson

Book design:
DiG Studio

Illustrations:
Susanna Hertrich

Published by
DIAMONDPAPER

DOI:
https://doi.org/10.26254/med/6301

KINDLY SUPPORTED BY:

This is an open access publication funded by the Swiss National Science Foundation (project nr. 159849) and supported by Institute of Experimental Design and Media Cultures at FHNW Academy of Art and Design, Basel, Switzerland

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