NAVET

A hub to navigate to unexplored regions
between art, technology and design

Partners

KTH Royal Institute of Technology
KMH Royal College of Music
Konstfack University of Arts, Crafts
and Design
SKH Stockholm University of the Arts
Scenkonstmuseet – Swedish Museum of
Performing Arts
Tekniska – National Museum of Science
and Technology

NAVET is a center with the overarching goal
of becoming a meeting place for research
and projects in the intersection of art,
technology and design, with the purpose of
facilitating and creating opportunities for
exchange and research collaboration among
artists, designers, engineers, humanists,
natural and social scientists.

WEB   kth.se/navet
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Projects 2019-2021

Biomenstrual
Browser Chance Music
Cold Works
Cultural Rights of Public Access
Designing the Sound of the Future
Digital Bodies
Experiencing Presence in a Time of Distance
Fictitious Soundscapes
Knitting Concrete
Mixing and Matching the Luminous
Color Palette
Production Novellas
Radio Sound Studio
Transforming Practices
Transforming the Colonial Archive

Book curated by

Roberto Bresin
Ludvig Elblaus

NAVET

Projects 2019-2021

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NAVET
– A hub to navigate to unexplored regions between art, technology and design

Words by Roberto Bresin, Director of NAVET

NAVET is a centre with the overarching goal of becoming a meeting place for research and projects in the intersection of art, technology and design, with the purpose of facilitating and creating opportunities for exchange and research collaboration among artists, designers, engineers, humanists, natural and social scientists.

NAVET started as a collaboration between KTH Royal Institute of Technology, KMH Royal College of Music, SKH Stockholm University of the Arts, Konstfack, Tekniska - The National Museum of Science and Technology and Scenkonstmuseet - The Swedish Museum of Performing Arts. The centre partners joined in this effort after several years of collaborations at different levels and in different configurations with a vision:

NAVET's long-term vision is to create an internationally competitive centre for research and development in Art, Technology and Design. The partner institutions guarantee a unique competence in the field and with a practical, and critical approach the centre will stimulate research, innovation, creativity and the development of a sustainable society.

NAVET wants to put the human in the centre, which also implies to question what the human is in an age of technology. The centre provides a place for soft-networking that can accommodate and initiate new collaborative research projects and supports them by sharing of resources in terms of laboratories, equipment, courses, teaching programs.

NAVET started to be operative in June 2019 and the first action was to boost research collaboration between partner institutions from the very beginning for sharing methods and knowledge, and for experimenting with unexplored combinations of competences. We achieved this by launching calls for Small Visionary Projects (SVPs) which have been the core of NAVET's activities during the period 2019-2021. Through three calls, project proposals have been peer reviewed, and thirteen SVPs have been funded, all of which

were based on interdisciplinary creative and innovative research with participating researchers from at least two of NAVET's partners. During the same period, a two-year postdoctoral position funded by NAVET has resulted in a large number of activities, both in Sweden and internationally, including collaboration with researchers in Austria and Germany, workshops and talks in Oslo, Copenhagen, Berlin and Stockholm, concerts in Graz and Berlin, as well as streamed online concerts (Swiss and Italy).

Despite the special period characterised by the COVID-19 pandemic all the projects were completed and their results have been documented in scientific publications and presented in public exhibitions, workshops, installations or performances in different forms. Most importantly, the NAVET projects and related activities have contributed to the most fundamental result of NAVET's work, namely all the collaborations created as a direct result of the centre's many initiatives. Over 75 researchers, research managers, doctoral program managers, curators, museum educators, artists, composers, engineers and more have met, worked and created together in various constellations during NAVET's first activity period.

In this book we present a catalogue of all the projects with most of the photos taken during exhibitions of the projects in different locations. The catalogue itself has been a design project that has seen the closed-loop collaboration between researchers involved in the Small Visionary Projects, layouter Håkan Ullberg, photographer Rikard Nilsson, everything coordinated by NAVET director Roberto Bresin and NAVET Post-doc researcher Ludvig Elblaus.

This project catalogue is complemented by writings from the members of the NAVET board (Magnum Bärtås, Cecilia Roos, Henrik Frisk, Katja Tollmar Grillner), tackling the theme Art, Technology and Design from different perspectives, and by the invited essay written by artist and innovator Håkan Lidbo, who has been navigating and exploring for several years the multifaceted, challenging, and inspiring regions between art, technology and design.

NAVET is a research hub open to all institutions and their members interested in developing a cross-disciplinary research network that spans the traditional school and department boundaries. We hope that this book can inspire the reader to join us in the NAVET (ad)venture!

NAVET Board

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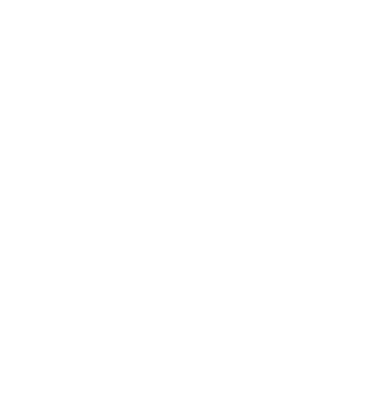
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The New Understanding

Words by Håkan Lidbo

Humanity is about to acquire a new kind of understanding of the World. And the key to this new understanding can be found in the intersection between science and art.

Humans have always made up stories to explain the World. The holy books of the different religions were the best attempts, in their respective time of origin, to describe how the World works, how we could understand ourselves and a how we should organize our societies, not different from science today. For a long time this was the only knowledge to be found and the only books that were written. But as they were made in a time when almost all of us knew almost nothing, seen with today's eyes, the knowledge in these books is pretty useless. But the stories are pretty good and have shaped the way we simplify and explain everything that is complex until this very day.

We have just opened a door to the age of abundant knowledge, but until now not so many of us have entered. In this new age, there are no simple stories, no right or wrong, good or bad, no God or Devil. Instead there is lot of data, flows, tendencies, dynamics, thresholds and probabilities. This is very different from our traditional stories; thee little pigs, seven deadly sins, the beauty and the beast. In this new age, we need a new kind of understanding that is different from the one we've had so far.

We need to bring life to a dormant human ability; the ability to see things with our brains, to visualize things that don't yet exist, to see things, not as they are, but as they potentially could be. This ability has so far been the most poorly exploited natural resource on the planet. It's called imagination.

Every aspect of our World is a point clouds with zillions of data points. Weather forecasts, economic growth, spread of virus, evolution of life, human behavior, societies, ideologies, opinions, innovations and artistic inspiration with enough data they can all be described as algorithms.

If enough people do something, we all do the same. This is the main algorithm that controls us humans. Choosing your profession, your political opinion, religious view, your taste in fashion, food and music, dyeing your hair, getting tattoos - it's all controlled by this algorithm. If we can understand it we can understand ourselves. To visualize these algorithms so they make sense, to invent new tools to tell the stories of infinite complexity - that's the most important job anyone can do. It's not being done by governments and will not be done by corporations. It will be the job of science and art.

Since not so many years we carry we the Internet in our pockets and we shouldn't underestimate how this has transformed us. We have acquired a new human super sense, but almost none of us know how to use it. But we are also losing a former human super power: to be with people we don't know and with whom we might disagree. We become increasingly polarized and easily offended and this is not the first time. When monotheistic religions were invented some thousand years ago, these new ideas made us equally confused. Chaos followed, both in the physical World and inside our minds. To prevent chaos way beyond today, how can we share a new understanding of an infinitely complex World to everyone? No attempt has been made so far by governments or corporations.

Even if one easily can be impressed by human ingenuity and imagination, looking back at history, it's even easier top be amazed by how little imagination we humans seem to have. Many of the every day objects we use today are designed exactly the same ways as they were designed by the very first human civilizations. The hierarchic structures in which we organize ourselves are basically the same as ancient dictatorships and armies - and it's not even possible for us to imagine another way.

The World used to have many belief systems, but today for the first time in history, almost the whole world has confessed to one belief, one religion dominating all the others; the free market and the algorithm of profit and growth. So in this abundance of information it's more difficult than ever for us to imagine anything else except what we already have.

In the Soviet Union, troubled citizens wondered why the system didn't work. The inspiring words of Comrade Lenin no longer made sense, the society didn't work and people were miserable. So looking at the other side of the iron curtain and the free market as the only other alternative, the system collapsed.

Today we have no other system to compare with (except North Korea) and no one on the planet seem to have a feasible idea what any alternative society would look like. As long as there is a profit in fossil fuel, more consumption and winning elections, we might not be able to solve the problems of today - as we all live and think in the free market. We need to re-think how we think and the forces that have the potential to guide us into this new understanding are art and science.

If we look deep inside ourselves, we might get a glimpse of who we are and of why we make the choices we make, but on the shallow depths of our consciousness, our choices are totally controlled by any inputs presented to us; by the environments we grew up in, our friends, societies and our addictions. We choose a favorite brand of cereals in the supermarket, we watch yet another episode presented by Netflix' auto-play, we choose vanilla ice cream instead of chocolate - but it's actually not us choosing. It's the human algorithm.

We have always lived in the illusion of free choice, but since not so long time we have companies with deep understanding of the human algorithm and with enough of your data to know what opinions and products you will buy. They use smart advertising and filter bubbles - and it's their business model to make us believe that we have a free choice.

Climate change and a global pandemic have proved that our freedom to choose any story to back up any belief is the biggest challenge of our time. In the free market, the customer is always right, so how can it be wrong that anyone can choose theirmost convenient truth? If there is something wrong with the system and there is no other system within the reach of our imagination, what do we do then?

In a reality where humans are increasingly easy to program, artists have a unique opportunity to explore the depth of the human algorithm and who is really controlling their own artistic choices, but to also visualize the exploration for the rest of us. When science reveals new secrets about human consciousness, it's a step towards us taking back the control. In a time where the illusion of our free will is world's number one commodity, art and science increasingly appears as one of the few remaining places of potential independence.

No one knows what skills we will need a few decades from now. On the list of future jobs most likely to be taken over by robots and automation, artists and scientists are still quite far from the top. But art and science that doesn't require new thinking and new ideas will, sooner or later also be automated. And at the same time it's our best hope to guide us in this uncertain future. We need to imagine and visualize, not only what the future will be, but who we will need to be in those possible futures.

Project: Mixing and Matching the
Luminous Color Palette.
Place: Tekniska Museet, 2021
Photo: Rikard Nilsson

Humans come from nature and that's where we used to find our inspiration, but already today the machines teach and inspire the humans more than anything else. We see how AI can generate mind blowing art by looking at vast online material and this will accelerate into new art forms that we can't even imagine today. We will soon come to a point where generated art and music is far more interesting than the ones made by humans. Many practitioners will loose their occupation, but more importantly, robotics and automation in art and music will teach us to think and create in new ways, guiding us into a new understanding of the World. One of the most important roles for AI will be augmented imagination, to help us where we fail, like a wheel chair for primates with inferior ability to think different - artistically and scientifically.

In the intersection between art and science there is a unique opportunity and responsibility. A new understanding in the post truth and post-fiction reality, visualizing complexity, probabilities and dynamics, utilizing augmented imagination when it's beyond our own capabilities, with AI as our teachers - revealing and defying the very algorithms of the system in which we exist.

We need to re-think how we think.

It's time for a new understanding.

Board commentaries

On the Relation Between Art, Technology and Design

Words by Magnus Bärtås

The relation between art, technology and design has often been antagonistic, where technology's logic of rationalization is supposed to act in conflict with art's ability to both harbor and express the irrational. The paranoia of the Cold War had driven technological development and created a world of imagination where the people in the two political blocs did not for a moment dare to give up vigilance on the enemy's maneuvers. The enemy could sneak in at night. The enemy could influence from a distance: through the air, across the border, using microwaves or with subliminal messages. It was precisely the notion of the insidious and immaterial influence that fueled the paranoia: brainwashing, hypnosis, remote control, chemical and biological influences - and all these methods and technologies threatened to invade the human soul. Ingmar Bergman's film The Serpents's Egg (Ormens ägg, 1977) portrays this fear of a secret technocratic takeover. In Berlin the lost and penniless characters Abel and Manuela are unknowingly subjected to a cruel experiment; small membranes have been introduced into their brains to monitor and influence their aggressions and their sexuality.

Together with my colleague Fredrik Ekman, I investigated in the late 1990s the actual background to Bergman's fiction. We get a hold of the book Physical Control of the Mind: Toward a Psychocivilized Society, from 1969 by Spanish neurophysiologist José M. R. Delgado. The book had been gathering dust for 30 years at the university's psychology library: it has never been cracked open. It is a disturbing book, less because of its photographs of animal experiments than because of the triumphal tone of the writing. Professor Delgado discusses how we have managed to tame and civilize our surrounding nature. Now it is time to civilize our inner being. The scientist sees himself on the verge of a new era where humans will undergo "psycho-civilization" by linking their brains directly to machines. After a series of spectacular experiments on animals in Bermuda, Delgado wrote: "If you insert electrodes directly into the brains of cats and apes, they will behave like electronic toys. A whole series of motor functions can be triggered based on which button the experimenter pushes. This applies to all body parts: front and back paws, the tail, the hind parts, the head, and the ears."

The electrodes inserted into the ape's brain were connected to an instrument that Delgado called the stimoceiver. The stimoceiver was an ideal instrument for two-way communication. Researchers could affect and at the same time register activity in the brain. From earlier prototypes where the lab animals were connected with wires, a remote control model was later developed that could send and receive signals over FM waves. The device was developed from the telemetric equipment used to send signals to and from astronauts in space. "We have already established radio contact with space; it is now time to establish contact with the human brain,"—a recurring refrain in Delgado's articles.

In 2000 we went to Madrid to meet with the 85-years old Delgado and to discuss what he called "the precise interface between brain and machine." By then we knew about the continuation of Delgado's animal experiments. In fact, anyone can walk into any well-stocked American medical library and take out Delgado's own reports and articles on the subject. There we can find his own candid, open descriptions of how he moved on from experimenting on animals to humans. In his articles Delgado proudly sums up how he has "used electrodes implanted for days or months to block thought, speech, and movement, or to trigger joy, laughter, friendliness, verbal activity, generosity, fear, hallucinations, and memory." The patients were recruited from mental institutions.

Delgado, who is often portrayed as a Dr Mengele of mind control on Internet's conspiracy sites, turned out to be a proper old gentleman with sharp, intelligent eyes. He served meringues and strawberry tarts after a large meal and bombarded us with a steady stream of anecdotes, scientific comments, and provocative rhetorical questions that were only interrupted by occasional tender comments directed to his wife. He admitted that his research gave a realistic edge to the common paranoid idea of being controlled by foreign voices, voices that surveil you and direct you.

Delgado's mind control technology represents a technology that forms "an enormous metaphysical force that pushes us to an unknown destination", as the philosopher Yuik Hui comments on the fearful and antagonistic relations between art and technology. But Hui speaks from the Asian context where technology is still an object of desire and there is a strong fascination with the modern. "In order to regain the future we must nurture our relationship to the unknown", Hui says. But in doing so we may focus on rediscovering forgotten techniques as well as rethink the way we use existing technology. He also points out that we will have to move beyond the established premise that new technologies transform artistic practices. Hui discusses another possibility: transforming technology through art.

I strongly believe that NAVET, as fertile collaborative environment and as an interface between four schools, is harboring these possibilities; critically reflecting on the history of technology, nurturing the relationship to the unknown, rediscovering old techniques as well as rethinking existing.

Board commentaries

The Structurality of Artistic Research

Words by Henrik Frisk

References:

Latour, Bruno (1998). "ESSAYS ON SCIENCE AND SOCIETY: From the World of Science to the World of Research?" In: Science 280.5361, pp. 208-209.

Nowotny, H., P.B. Scott, and M.T. Gibbons (2013). Re-Thinking Science: Knowledge and the Public in an Age of Uncertainty. Polity Press.

In the Swedish Higher Education Ordinance there are two distinct and equal disciplinary foundations: scientific or artistic. This is a cornerstone in both education and research in Sweden. It is a great advantage in many respects and has been a driving force behind the strong development of artistic research in Sweden. It gives artistically merited teachers a solid foundation upon which to build and develop their competences on par with scientifically merited teachers. However, and this should not come as a surprise, it also creates a structural and epistemological dividing line between arts and science which sometimes appears as an unfortunate obstacle in interdisciplinary projects.

But why is this separation a problem? The idea that science is the sole valid producer of knowledge is obviously debatable and as a consequence the strict dividing line between the arts and the sciences is unfortunate. In an artistic practice or research project that in one way or another uses scientific methods or modes of thinking, or even attempts to critically confront these, the separation may become an issue. In music, even related subjects such as musicology and music psychology are structurally separated from artistic higher education in music.

It is not always self-evident how this gap should be approached or understood in explicitly interdisciplinary projects and it may be difficult to achieve a solid ground for the research. Due to the organizational distance between the artistic and scientific modes of thinking there is a risk that whatever interdisciplinary work is produced is absorbed by the gap, and that any useful knowledge that was produced in the project remains hidden to either of the two disciplines. By the sheer difference in the size between art and science, the risk of loss is commonly greater from the point of view of the arts, but the consequences may be equally problematic.

The role that science has played in the development of modernity and the creation of wealth (in the West) is undeniable. "Science and modernity have become inseparable" (Nowotny, Scott, and Gibbons, 2013) as put by the authors of the book Re-Thinking Science: Knowledge and the Public in an Age of Uncertainty, while they go on to point to how this is continuously being challenged. Bruno Latour makes a similar claim in his 1998 Essays on Science and Society pointing to the breathtaking scientific development characterized by a movement from the "culture of 'science' to the culture of 'research'" (Latour, 1998). That art has had an equally undeniable influence on the development of society for much longer than what science has had is clear–after all, art is much older than science. Nevertheless, art has had obvious difficulties in competing with the attention given to science during the post-war era of capitalist-driven development.

Latour continues stating that:

Science is certainty; research is uncertainty. Science is supposed to be cold, straight, and detached; research is warm, involving, and risky. Science puts an end to the vagaries of human disputes; research creates controversies. Science produces objectivity by escaping as much as possible from the shackles of ideology, passions, and emotions; research feeds on all of those to render objects of inquiry familiar. (Latour, 1998)

In this quote, it is possible to replace 'research' with 'art' and come up with a partly relevant and preliminary characterization of some of the contemporary art fields. Characteristics such as uncertainty, involving, risky, controversial combined with an activity that feeds on passion and emotion in various constellations could be seen as a reasonable way to depict art practices of the 21st century. Hence, it is science, not research that differs from art.

At any rate, the way Latour represents research is not at odds with artistic research, at least not in my view: the issue here is again structural, not practical. I wish to claim that regarding research as the common activity between art and science is a fruitful way in which interdisciplinarity may be addressed. What appears to sometimes be a steep difference between artistic research and research, as two distinct disciplines, can be overcome by regarding the act of research as the common denominator between science and art. That one is scientific and the other artistic is perhaps less important (and the difference may even be less between these two kinds of research compared to two disparate scientific subjects).

In addition, arts and science have a shared interlocutor society that contextualizes and participates in the validation of the research. Because, just as "science and society cannot be separated, they depend on the same foundation" (Latour, 1998), neither can art and society. In other words, if research is the common aspect of arts and sciences, their respective relation to society is another. In this view, the prefix artistic is merely a contextualization of the activity, an indication that practice, method, and theory may differ from scientific research practices. Regardless of the type of activity, the validity of the results is measured by its usefulness for other research, for the field of practice, or society. The freedom that the discipline of artistic research provides will remain untouched. This view merely allows us to disregard the obstacles of the structurality of research disciplines and instead focus on the search for knowledge, which in all cases should be the driving force.

Board commentaries

# Pushing the Boundaries Within the Art Field

Words by Cecilia Roos

One of the goals in SKH's strategic plan is to develop experimental, innovative and collaborative artistic research environments where art forms are strengthened. The foundation of all the research that SKH conducts is artistic practice and the field encourages methodological diversity. As within all research fields, the artistic researcher interacts with other spheres of knowledge to develop new relationships – and new ways of working – with materials, technologies and audiences. Here NAVET has played an important role for SKH the past three years. So far SKH has been involved in four SVP projects that included SKH teachers from acting, documentary film, mime performance, film sound, visual media and doctoral students in film and media.

I met with Mirko Lempert, assistant professor in visual media at SKH, for a discussion around possibilities and challenges within research collaborations in the intersection of art, technology and design which is the field where his research is situated. Mirko was very clear with that in the collaborations the researchers from the field of technology really needed foundations that art could provide. Are we then back with a situation of instrumentalization of the arts? Mirko responded immediately that artistic researchers act in the same way, namely instrumentalizing technology and that we today are past that discussion of who is capitalizing on who. Researchers of today meet because they share a common field of interest which means that all involved contribute and gain equally. The questions are much more about how to identify and articulate the common dilemma or area and then experiment, again and again, in the process of a shared overlapping practice of transgression and translation. The challenge Mirko met has to do with the different research paradigms. In art there is a maybe, in science there is either or when it comes to results and insights. These two perspectives need to meet and create an interesting and constructive friction, an enabling exchange.

SKH:s researchers and students are pushing the boundaries within the art field to meet up with challenges of our present time. NAVET offers a necessary framework for new encounters and thereby new trajectories of thought and knowledge can emerge.
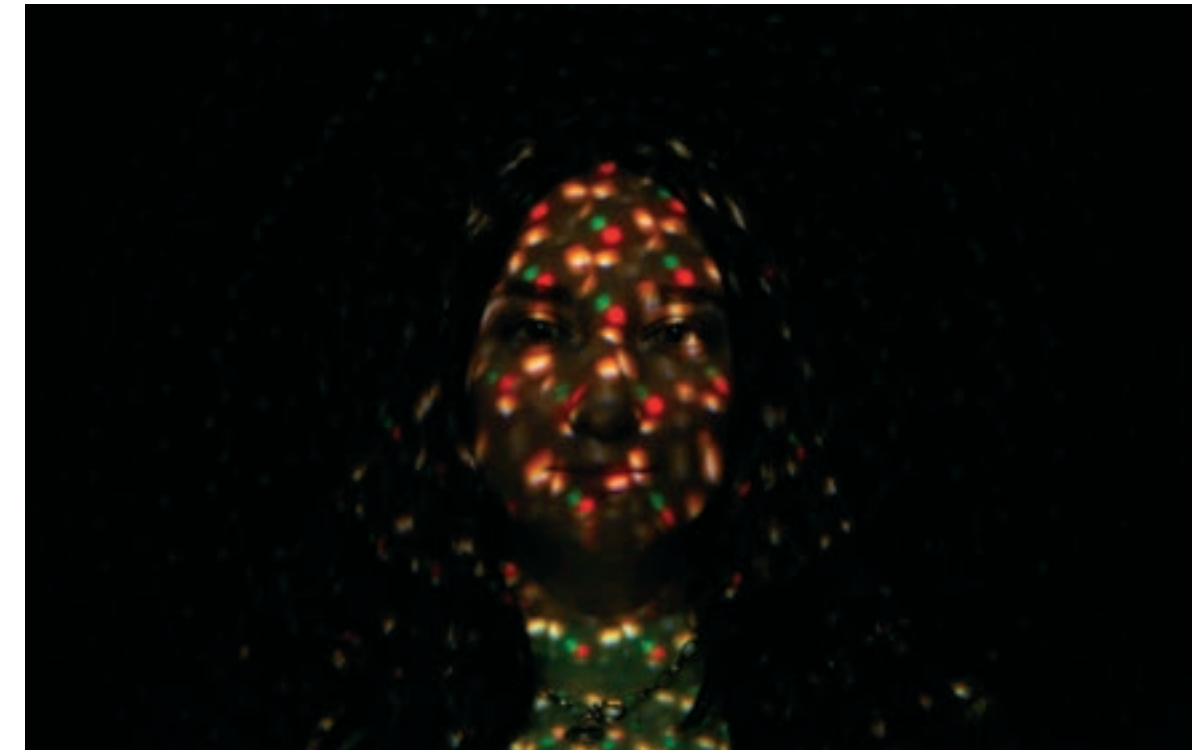
Project: Transforming Practices
Place: Tekniska Museet, 2021
Photo: Rikard Nilsson

Experiencing Presence in a Time of Distance

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In this text, I will briefly summarize the intentions, adaptations, and results of the two-year postdoctoral research project I did for NAVET from October 2019 to October 2021. I will outline the initial research questions, present some of the work done, and point to some future work I plan to explore. The scope of this text only allows for an overview, I refer the reader to the websites and papers referenced for details and recordings of the pieces used as examples, as well as the other work done during the same time period, left out for the sake of brevity.

Exploring Shared Listening

The initial research topics of the postdoctoral research project were concerned with exploring socially shared physical phenomena connected to sound, in particular room-scale acoustic feedback music. That is, electro acoustic music made by intentionally feeding back speakers and microphones in a physical space, thus creating a musical material that is shaped by that particular room, meaning that it would behave and sound differently if performed anywhere else. Furthermore, the audience and performers physically present in the room will influence and complicate the production of the music, entangling actors and concepts that are usually kept separate, e.g. performer-audience and instrument-venue. The earliest formulations of the research direction looked like this:

–   Room-scale acoustic feedback with audience and performers in the room presents a particular acoustic, technical and aesthetic situation. How does that manifest in the experience of performing, listening, or participating in some other way?

–   What are the technical characteristics of such musical material? How can it be created, manipulated, and composed with?

–   If acoustic feedback can be tuned to make passive listening impossible by achieving equilibria that can be disturbed by the acoustic influence on the scale of a human body, what are the implications for the relationship between the composer and the listener, when the listener always also performs by being physically present?

–   What then are the aesthetic and ethical concerns involved in composing for sound installations and site specific music?

–   How can acoustic measurements help guide the composition process, and what tools and skills are needed to provide useful aids for composers when dealing with these sometimes very unpredictable dynamical systems?

Absence Makes the Art Grow Fonder

As the pandemic struck, a few months into the postdoc, many of the practical plans needed to change. As much of the work planned was about co-located experience, making use of all aspects of social listening as well as physical consequences of bodies and sound interacting, many proposed activities had to be canceled. One public performance was done in March of 2020 *(Rundgång)*, and one was done in August of 2021 *(St. Elisabeth Song Cycle)*, bookending a period of travel restrictions and lockdowns. In between, a hybrid piece *nullibidem* was constructed that in many ways points the way forward, picking up several themes that will feature in my future work. All three utilize the concept of modeling in different ways, and I propose that modeling is an artistic practice with very interesting implications for musical composition.

Modeling as Artistic Practice

Modeling is a wide and multifaceted topic in itself, but for the purposes of this text we can describe it as *the act of investigating the qualities of one system by looking at a second system, that has some, but not all, of the characteristics of the first system*. I argue that in the three examples that follow below, modeling, in different ways, allows for a smearing of time and place enabling site-specific compositional work to be done in more ways than might be obvious in the first instance.

The models that figure in this text are digital simulations of room acoustics, using a signal processing technique called *convolution*, that are made using the swept sine method where a space is measured using one or more loudspeakers and one or more microphones. The model allows you to send an audio signal into it, and receive it back out from it, adding many of the characteristics the signal would have had if played on the measured speaker and recorded on the measured microphone, thus replicating the physical measurement setup digitally. If the recording microphone is a binaural microphone, i.e. a microphone that emulates the two ears of the human head, it can provide a listener's perspective. This way, one can simulate playing a sound, on a set of loudspeaker, in a particular room, listening to the results at the position where the binaural microphone was positioned at the time of the measurement.

utrumque

All of the work described in this text has been carried out together with my colleague Gerhard Eckel, professor at IEM in Graz and affiliated professor at KTH. Together, under the name *utrumque*, we are exploring musical implications of dynamical systems and acoustic feedback, in performance and in fixed media pieces.

Rundgång

Rundgång is a piece commissioned for the INA GRM Acousmonium that premiered at the Elevate Festival in 2020 in Graz, Austria *(soundcloud.com/utrumque/rundgang)*. It is a live performance with a duration of about 20 minutes featuring three performers, two by the Acousmonium mixer, and one on stage. The piece consists of three layers that share the same input, a microphone on stage, and each layer processes that microphone signal and plays the result back on one speaker of the Acousmonium. The sounds emitted by the Acousmonium are picked up by the microphone and the resulting feedback loop is the only source of sound in the piece.

The Acousmonium is a loudspeaker orchestra comprising a large heterogeneous set of vintage speakers. Which speakers are included and how they are setup on stage depends on the venue and material that is to be performed. Traditionally, a stereo source is diffused on different groups of loudspeakers at different parts of the piece, to highlight different sonorous qualities at different points. However, as the process of composing the piece took several months, and the Acousmonium was only set up a few days before the premiere, a strategy was needed to include aspects of the site into the music long before the construction of the site itself. This was accomplished by utilizing a model constructed of a subset of a large number of loudspeaker measurements made in the premiere venue, switching out and refining the model as the plans for setting up the Acousmonium got more and more clear. In addition to this, tests in other venues using binaural microphones were used to supplement the digital models and get a sense of how the material unfolded in space, something that is hard to do in the static perspective of the digital models.

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Photo: Clara Wildberger

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Photo: Clara Wildberger

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Photos: Gerhard Eckel

It is an example of how modeling can be used to compose for particular situations and setups, to anticipate some but in this case perhaps not all aspects, in order to extend the access to a site in time, even before the site is actually constructed. The compositional process that led up to *Rundgång*, and a discussion on modeling can be found in the 2020 paper *Acoustic Modeling as a Strategy for Composing Site-Specific Music*, in the proceedings of the Audio Mostly Conference 2020.

nullibidem

nullibidem is a fixed media piece that evolved from a live performance at the 2020 edition of the Audio Mostly Conference. It is the subject of its own published text, that can be found on utrumque.com, where it is described as "A site-specific performance that never happened in a place that doesn't exist", referring to is hybrid nature where recordings from many different performances, in more than one space, are assembled to provide a perspective that is in one sense impossible, but at the same time quite persuasive.

The performance at Audio Mostly featured one on-site performer and one networked performer. Gerhard Eckel was physically present and I was connected via the Internet, listening in and performing remotely from Stockholm. This worked well, but the recording of the premiere was not satisfactory. In attempting to re-record the piece, an opportunity emerged to reimagine the piece completely. Instead of a straight on-to-one copy of the performance, we began iterating each section, stretching it out, recording each take with slight variations. In parallel, the post production work started, that in turn informed the work in the recording sessions. The process dragged out as we found more and more details that interested us the slower we went, and as the re-recorded version of the piece started to stretch beyond the hour mark, compared to the twenty minutes of the original, we realized that we effectively were composing a new piece, with a new identity. In the end, *nullibidem* got a duration of over two and a half hours, containing layered juxtapositions of often several takes of transposed and filtered recordings.

In the compositional process, modeling was used in many different ways to realize *nullibidem*. As the site of the preceding piece was a public space with limited exclusive access, using acoustic measurements of that space to create digital models was a necessity

for the work to be done at all, allowing the investigation of the acoustic characteristic of the room to be done without physical access. Later, when doing the re-recordings, artificial reverberation in the style of the space could be added to dry recordings, and processed sounds that originated from the site could be clad in its timbre again after being transformed.

A longer aesthetic position statement on *nullibidem* can be found in the booklet that accompanies the final fixed media version of the piece. Both can be downloaded from the *utrumque* website.

St. Elisabeth Song Cycle

The *St. Elisabeth Song Cycle* was commissioned by the *Labor Sonor Festival* in Berlin for their 2021 edition. It was a four hour performance in two spaces at one, the Villa Elisabeth and the St. Elisabeth Church.

In each space there was an identical ensemble, consisting of an augmented double bass, fitted with a transducer and a contact microphone allowing us to inject sound into the bridge from one side, sending energy into the whole instrument in a similar way to if it was bowed, while listening to the other side of the bridge. There was also a snare drum, outfitted with a loudspeaker element suspended inside the drum. The snare also had a contact mic attached, allowing both signal input and output. Finally, each room also had an air mic, a PA Top speaker and a PA Subwoofer speaker.

Taken together, this double ensemble setup provided a myriad of inputs and outputs and our compositional strategy was to set up a large set of digital signal processing layers that would fade in and out during the piece. The only other parameter we varied during the duration was scanning between the different inputs and panning between different outputs. Even so, the resulting timbral qualities were difficult to predict, as many overlapping layers could spin on top of each other, creating very long and complex paths of feedback across instruments in both rooms.

Composing for such complexity required ways to experience the results, at least in part, and this in turn required models. First, the instruments were measured, later, when some material for the instruments was composed, the two rooms were measured using the instruments and loudspeakers. From this, a large model of the two rooms containing the two ensembles was created and the final months of composition were spent in that simulated site.

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Photos: Gerhard Eckel

© St. Elisabeth Song Cycle,
2020.
Photo: Ludvig Elblaus
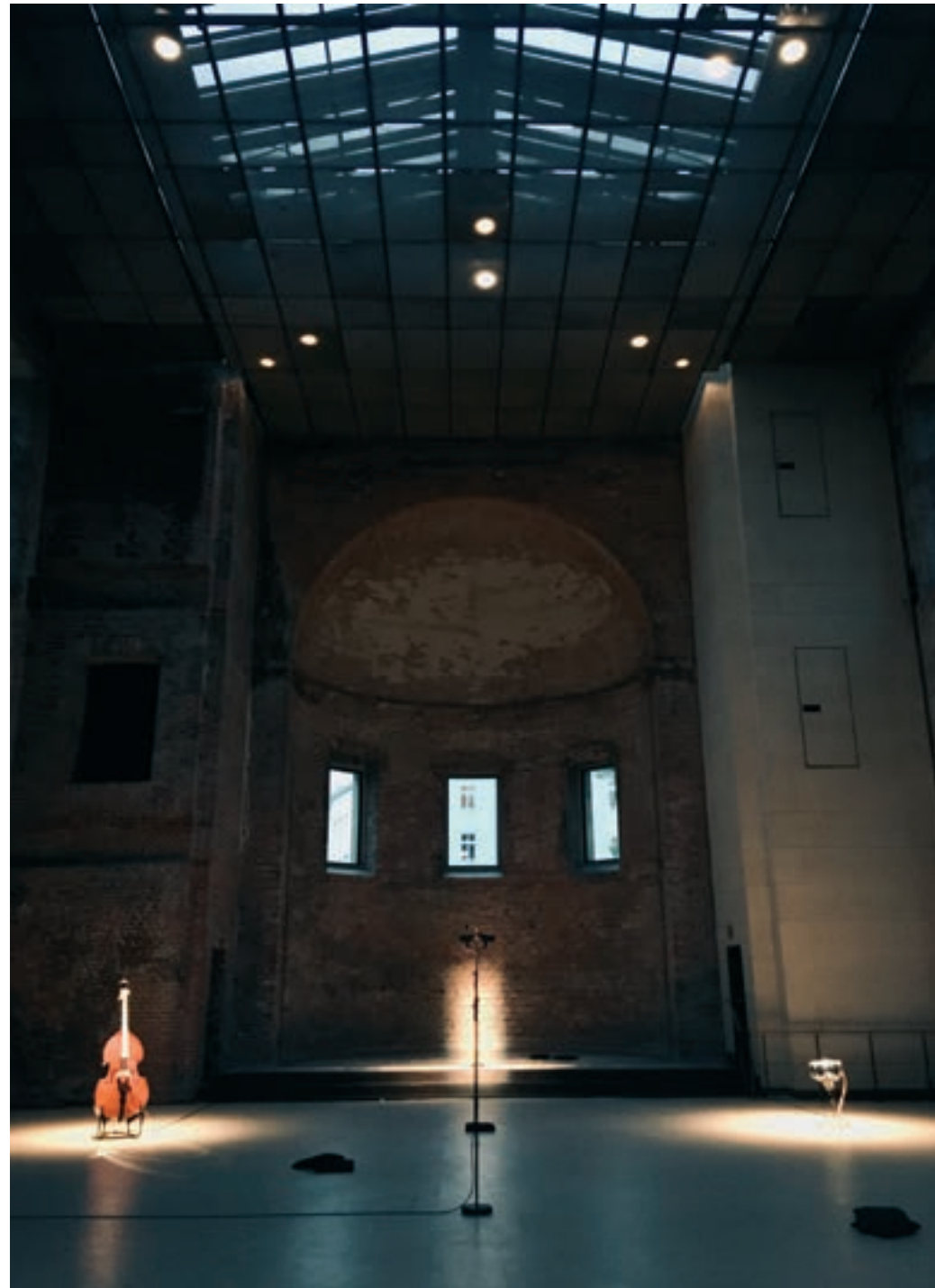
Conclusions and Future Work

It is important to state that the modeling practice I am describing in this text is not just an engineering effort, but it relies in equal measure on artistic imagination and aesthetic judgment. A careful listening perspective is needed and models can be understood as partial perspectives that can lend some insight but never replace the physical on-site experience. Indeed, a very critical listening practice is needed to avoid overfitting to the models, or becoming too enamored with some particular aspect that might not translate to the physical system that is simulated.

In the future, I hope to extend the modeling work in the direction that *nullibidem* took. While there is much potential in exploring modeling as a tool to widen access to resources like venues and other infrastructure, as well as producing remote presence, exploring ways of having a plurality of relationships to site in the same process, or the same piece, like in *nullibidem* is something that fascinates me.

Finally, the remote performances that I have been involved with, both in the *nullibidem* recording sessions but also in other projects, e.g. The *0×03 ensemble* and the *ETX Project* that developed out of that, is something that I am convinced will be a deep well for future explorations of remote presence in musical contexts. Regardless of future pandemic effects, we need to limit travel, and give opportunities for musicking globally through refined networked experiences, making artistic efforts to relate to the networked performance space, rather than relying on engineering solutions while sticking with old patterns of composition and performance.

Biomenstrual: Designing Multispecies Menstrual Care

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Publications:

Project website: biomenstrual.com

Campo Woytuk, N., & Juul Søndergaard, M. L. (2021). Biomenstrual: Designing Multispecies Menstrual Care. US-AB, Stockholm. files.persona.co/108249/Biomenstrual-spellbook.pdf

Campo Woytuk, N., Juul Søndergaard, M. L., & Avila, M. (2021, September 13). Designing Multispecies Menstrual Care [Presentation]. DRS Festival of Emergence. http://drsfestivalofemergence.org

Juul Søndergaard, M. L., & Campo Woytuk, N. (2023). Feminist Posthumanist Design of Menstrual Care for More-than-Human Bodies. In Proc. of the ACM CHI'23 Conference on Human Factors in Computing Systems.

Biomenstrual explores sustainable menstrual health through designing for non-anthropocentric, ecofeminist practices of human menstrual care. We shift from discourses of menstrual management and hygiene, to community and more-than-human health care practices where caring for menstrual health is also an environmentally nurturing practice. We explore how menstrual products are made, used, and discarded, with a focus on the material waste generated both by the body (menstrual blood, mucus, and tissue) and by the products (a wide range of organic and non-organic materials such as cotton and plastics).

Through our research and practice inspired by speculative and more-than-human design, we have explored how we can design menstrual care practices that re-use and compost menstrual care products and bodily materials, turning these from a discourse of waste into a nutritious fertilizer in composting processes. Through this change of practice, we also attend to and open up possibilities for cohabitation and collaboration with other-than-human species, such as bacteria and microbes, plants and insects.

Through the practices we speculate on concepts of fertility in women-soil relations, on waste and resources, and on cultural taboos. Drawing on the figure of the witch and witchcraft, we shift to community and more-than-human health care practices where menstruating people might harvest or grow their own materials to craft menstrual care products at home.

By extending the design of menstrual care technologies and practices to the ecologies that surround us, we reveal how caring for one's own menstrual health can also be an environmentally nourishing practice, as well as how caring for the environment extends to caring for ourselves.

The project results encompass a set of objects, prototypes, sketches and collages, as well as the dissemination of the project, including presentations, an exhibition and a self-published booklet we have crafted in the form of a "spell book".

We designed and documented a set of recipes and samples of biobased and biodegradable materials, assembled into menstrual pads. These consist of superabsorbent and antiseptic materials such as sphagnum moss, wheat gluten, algae-based (agar) bioplastics, and pH sensitive red cabbage extract. These menstrual pads speculate on the possible shape, color, and overall aesthetic qualities of biodegradable pads, opening up for conversations surrounding the qualities of cleanliness and whiteness traditionally associated with sanitary products. In addition, we designed several tools and harvesting, cooking and fabrication processes that accompany the crafting of these menstrual pads. This includes a machine learning moss classifier for identifying the required species of moss in the wild, along with 3D printed kitchen tools and a spell book for guidance when assembling the pads.

Another contribution of the work is a set of design proposals for collecting, observing, diluting and filtering menstrual blood, considering the queer use of this bodily fluid as something precious and nurturing, which can be used as a fertilizer for soil and plants. We crafted two collages that represent scenarios of the possible encounters with other species through these practices. One collage depicts a tardigrade, a microscopic organism that grows in sphagnum moss, living on a menstrual pad in a person's underwear. The second collage envisions the composting process of these pads, where fungus, yeasts and earthworms are busy at work breaking down these materials, including menstrual blood.

To document and guide the project, we have created a spell book titled "Biomenstrual: a spell book for more-than-human menstrual care" which includes stories about menstrual care, species we have collaborated with in this project, recipes for cooking biomenstrual pads, and speculative multispecies scenarios. This spell book prompts others to think with us about these practices.

We have disseminated the project through the DRS Festival of Emergence and in an exhibition at Galleri Frihamnstorget in Stockholm in addition to several presentations to colleagues and researchers. In the DRS Moment we presented the project and opened a conversation about the possibilities and implications of this work, and invited the DRS community to try out the practices themselves. The exhibition at Galleri Frihamnstorget was open between 21-28 October 2021 and included the workshop "Microcosmic Gazing" on observing biomaterials under the microscope, including human and nonhuman bodies, fluids and ecologies.

Project: Biomenstrual: Designing
Multispecies Menstrual Care
Place: Galleri Frihamnstorget, 2021
Photo: Rikard Nilsson

Project: Biomenstrual: Designing
Multispecies Menstrual Care
Place: Galleri Frihamnstorget, 2021
Photo: Rikard Nilsson

Project: Biomenstrual: Designing
Multispecies Menstrual Care
Place: Galleri Frihamnstorget, 2021
Photo: Rikard Nilsson

Project: Biomenstrual: Designing
Multispecies Menstrual Care
Place: Galleri Frihamnstorget, 2021
Photo: Rikard Nilsson

Browser Chance Music (BCM)

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Browser Chance Music (BCM) lets the audience experience the high-frequency, invisible software activity that occurs in our mobile devices when we browse the web. Billions of citizens browse the web every day, everywhere. This activity is powered by billions of software operations that take care of connecting devices to the web and transporting the information from one side of the world to another. Yet, this amazing underlying software activity is invisible, highly intangible, and unknown to most users.

Browser Chance Music allows for an interactive and spatialized experience of a sonification of this software activity. The rich data flow and software execution, usually disembodied and invisible in regular interaction with software applications is now brought forward through sound and image. A challenge faced in this project relates to the significant temporal gap between the two activities. The visible and sensible act of browsing is performed at the speed of the general clicking of buttons or swiping screens, while software that runs in the browser which lets us access the world wide web, operates at a radically different speed, with up to thousands of operations per second.

A space for a radically different relationship between user and software is opened by the sonification and visualisation provided by the system. Activating it with ones own smartphone gives a sonic and visual presence to the evanescent and imperceptible internet activity that emanates from the sites visited. A simple Wikipedia page generates a relatively soft response to the user, whereas the activities from a complex social media site creates a sonic explosion of complex and intermingled events. But even a seemingly idle smartphone generates events that may be heard. Defamiliarizing the smartphone and revealing a possible aes-thetics of its operations opens the doors to a new relationship to the underlying activities of smartphones and internet technology.

The main results of the project may best be summarized by the public installations that took place in 2020 and 2021, representing different incarnations of BCM, tailored to various locations and audiences.

A first instance of BCM was exhibited at the festival Visualia 2020 on September 11 (https://nava.community/visualia/). For this installation, BCM was made for one single participant and the sonic output in this instance was confined to a stereo set of speakers. Software events were also visualized on a screen (see screenshots and documentation at https://rethread.art/projects/bcm.html). This event provided lots of important feedback from users, about the interaction between personal devices and the installation, as well as about the sound and visual representations of network traces.

A second version was set up at Tekniska Museet in Stockholm under the name Pellow described as such: Pellow is a browser art installation that through sonification and visualisation lets you explore the web anew. This version was intended to have a pedagogical perspective, teaching young people what happens when browsing the web. The installation was set up in October 2020 and lasted for 5 days, until Tekniska Museet had to be shut down due to Covid. During its relatively short time it still had a fair amount of visitors. Thanks to a visualization that showed where in the world the internet traffic for each call emanated from, one of the outtakes of this version is how extreme the centralization of servers is in the world, and surprising this is for visitors.

Finally, in October 15 in 2021 Browser Chance Music was set up at KMH in the Klangkupolen of Lilla Salen. For this version the sonification was spatialized in the 29 speaker sound dome in the hall. Up to four simultaneous users could play the installation at the same time, with their own device and apps. This created a virtual polyphony of users for the first time. Also this time the sonification was combined with a visualization of the events. The balance between the activity of the visualization and the sonification is clearly quite sensitive. The visualization may take over and become the dominant mode of communication. The installation was well visited during the four hours it was open.

The project has seen a few offshoots along the way and there are many aspects in which the project may be developed or expanded. The relation between the visualization and the sonification is one such thing. In the last iteration, software events were simultaneously present in both sound and image, where a larger degree of interdependence could perhaps be developed with the aim to engage the user more fully in both media. The sonification could also have deployed a more developed sonification of the different parts of the sound allowing for an even more immersed sonic experience.

The main result of the project, however, is that aestheticising software events is not only possible but informative on both a pedagogical and aesthetic level.

Project: Browser Chance Music
Place: Tekniska museet, 2021
Snapshot from video installation
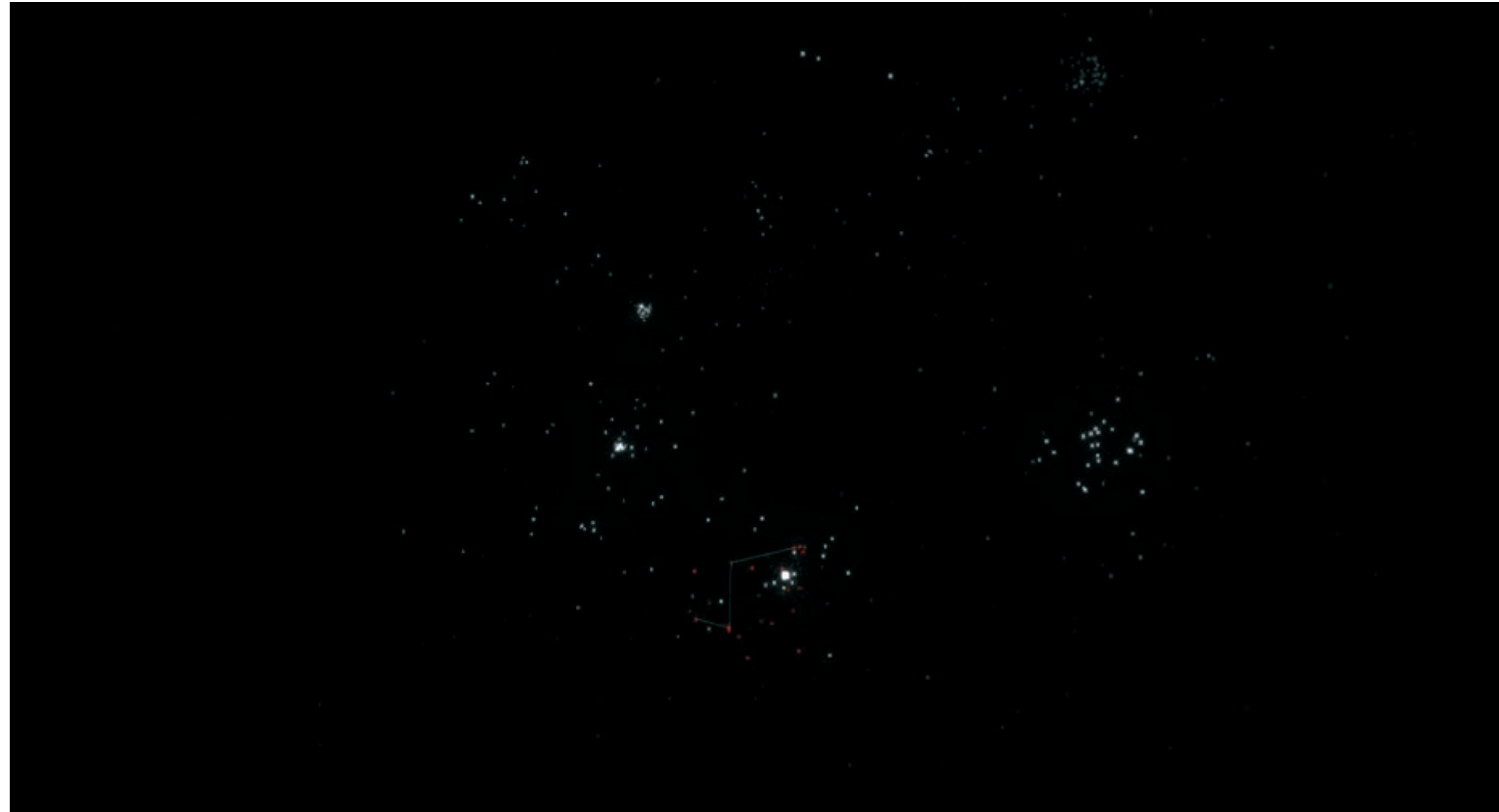
Project: Browser Chance Music
Place: Tekniska museet, 2021
Snapshot from video installation:
Starry Sky

Cold Works

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Publications:

Sitnikov, V. (2020). Ice Formwork:
The Rationale and Potential of Ice-Based
Moulding Systems for the Production of
Complex-Geometry Precast Concrete.
[Doctoral dissertation, KTH Royal
Institute of Technology]. The KTH
Publication Database DiVA.
https://kth.diva-portal.org/smash/
record.jsf?dswid=-6401

Sitnikov, V., & Rogers, P. (2021).
Preliminary Assessment of Environmental
Performance of Ice Formwork Production
Method for Irregular Architectural
Elements of Concrete. International
Journal of Space Structures, 36(1): 78-87.

Sitnikov, V. (2020). All That Is Porous:
Practicing Cross-Disciplinary Design Thinking.
In B. Sheil, M. Ramsgaard
Thomsen, M. Tamke, & S. Hanna (Eds.),
Design Transactions: Rethinking
Information Modelling for a New Material
Age (pp. 122-128). UCL Press.

The aim of the project is to conduct a collaborative experimental study in the design and production of artistic objects of concrete in the circumpolar region of Sweden. The project relies on an active exchange of expertise between the collaborators: artistic practices of Toril Johannessen, architectural practice of Tatjana Gorbachewskaja, and knowledge in advanced fabrication of precast concrete elements of Vasily Sitnikov (KTH). All collaborators have professional interest in the arctic region, in its cultural, ecological and environmental qualities.

At the core of the project lays the technique of making precast concrete objects using ice as the molding material. This method has been studied by Vasily Sitnikov at KTH within the frames of doctoral studies. The preceding work has revealed a vast potential of this material process configuration in many perspectives, focusing mainly on its ecological and form-giving virtues. Through an active collaboration between the main investigators, the anticipated project will try to give way to the hidden potential of the natural formal expression of circumpolar ecology by capturing the ephemeral formations of ice using the durable material.

The first month will be dedicated to a three-way discussion, design tests and planning of the experiments. During the second month the project will focus on the on-site experimental production. Since the production process is directly dependent on the natural cold, the location of the experiment will take place in the subarctic climatic zone, where the average temperature in November fluctuates around -10C. This phase will investigate the practical feasibility of concrete casting in unstable climate conditions. The field experiments will be video documented to share the flow of this original process that is made possible through the natural resource of cold.

Through a series of online meetings in the commencement of this project, we have arrived to a design inspired by the vegetation of the north, and the ice glazing that forms on it during ice storms. The effect of accumulative ice formations on tree branches was tested in the cold laboratory at the university during the off-line workshop. The additive offsetting and merging of the branches structure discovered during this work resulted in a very intensive formal expression of the concrete cast, an indirect expression of the fragility of the cold, and its fossilized traces. Now, the discovered technique needed to be taken out of the stable laboratory environment and into the fluctuating natural conditions.

A suitable location for the production stage have been found in the Jokkmokk municipality, in a small place of Vajmat located just a few kilometers away from the Arctic Circle. Deployment of the production that is mainly powered by the natural forces of cold in this remote and quite place has had a strong scenographic effect. Considering that towards the end of fall darkness largely dominates over these lands, the rays of electric lights shining on our production site made a very direct feeling of a staged action. For this reason, a lot of effort went into filming of the production process, taking place under the raging flashes of auroras.

Despite of an extremely low density of population in this area, which is 100 times less than the average global value, there is a constant and active presence of the Anthropocene: the European route E45 that runs two hundred meters downhill from our house and leads all the way down to Sicily, powerline clearings chopped through the forests and over the hills, and dozens of satellites splitting the skies above us on our long-time exposure shots. Last but not least is the decent network coverage which would keep delivering emails even if you are stranded in woods. Our project has profoundly depended on all these infrastructural edifices: the transportation of materials, the power tools and equipment, and, most importantly, the constantly updating meteorological forecast that computes on the basis of data collected from the orbiting spacecrafts. When the concrete is poured in an ice mold, the temperature should be steady for at least two days to give concrete time to set and harden to the demolding strength. In this sense, our working hours were mainly governed by the movement of the cyclonic fronts, revealing a type of technology-to-nature relationship such as sailing or flying an aerostat, a relationship in which nature allies with the technology.

Place: Vajmat, Jokkmokk kommun
Date: December 2021
Photographer: Vasily Sitnikov
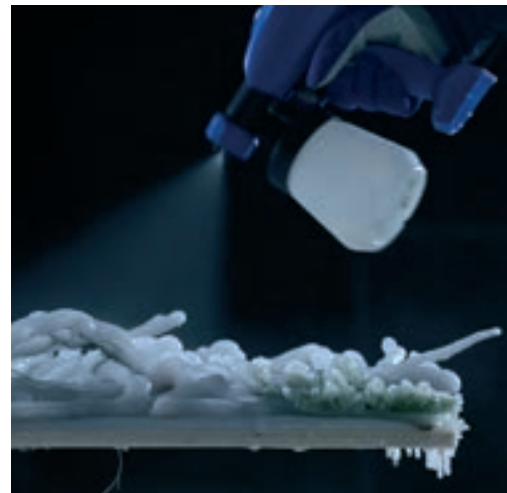
Place: Vajmat, Jokkmokk kommun
Date: December 2021
Photographer: Vasily Sitnikov

Place: Vajmat, Jokkmokk kommun
Date: December 2021
Photographer: Vasily Sitnikov

Place: Vajmat, Jokkmokk kommun
Date: December 2021
Photographer: Vasily Sitnikov

Cultural Right of Public Access

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This is a pilot in concert with the PhD research project "Sloyd-exploring how to manifold historiographies" which is concerned with creative practices, such as art and craft practices, in collaboration with children and youth for broadening their agency in public space. The PhD research employs an intersectional perspective and asks how this form of activity gives space to a plurality of voices and supports the making of alternative historiographies. It is related to the research project "A full loop of performance: from the perspectives of young citizens, through informal and formal spatial learning, to the reviewing of legal frameworks in multi-actor constellations, and back again".

The vantage point for the pilot is the question of how to initiate exploration together with young people, and adults in their vicinity. We do so by constructing and activating a mobile venue/laboratory to establish a space that allows the participants to interact and collectively explore in what ways creative practices, in the widest sense, can become meaningful tools for young people to investigate their own questions about how it is be in the world. How to make, name, materialize, portray and share the worlds they are part of.

Hence the participants are the authors and owners of the subjects to be explored. The mobile laboratory will act as a continuously innovated site that can be altered by the dynamics of place and space to meet the questions posed by the participants at hand. It offers the possibility to ambulate between different locations that are of particular interest to the creative processes - be it because of geographical specificity, the wish for exchange and collaboration with different communities, and other. Hovsjö community youth center in Södertälje is the first venue.

The project applies creative practices and environmental learning as tools for inclusive public spaces for children. The undertaking of collective exploration is met with multiple methodologies which involve ethnographic methods, intersectional collaboration, seminars, microscale workshops, participatory action research and interdisciplinary collaborations.

Depending on the questions that surface, as well as new objectives to further our research and intersectional knowledge production, we invite creative practitioners, to develop workshops with us, share their expertise, explore specific topics with the youth and us, and to build a growing network together with caring for young citizens' relations to public spaces.

To reach beyond syllabi, institutions, economic-, political-, social- and ideological interests as well as building continuity we focus on involving diverse players from schools, the municipality, civil society organizations, cultural actors, and others. Here the project aims at providing a common platform for collaboration that could lead to long-term and collective actions towards community-oriented practices.

The research is based on a group of young people choosing to collaborate with us and participate in this project as co-researchers. They form the hub around which the project has evolved into a space for collective exploration. We have used a caravan as a mobile research venue, to explore self-sufficient presence as well as the right to cultural commons for youth in spaces that are located between the home and the world.

Already at the beginning the qualities of a mobile site for hanging out became the focal point to examine. Later it became clear that the "hanging out" as action also reflects the young participants' main and preferred after school activity. Their initiative led to a series of workshops which in different ways included exploring how to expand and activate the caravan as space. In part it also came to be about the adaptation of a mobile site to different places, circumstances and conditions.

The workshops were done to build our own infrastructure for making a common space. Sites for the workshops include Hovsjö Fritidsgård and a recreational area by the lake Måsnaren in Södertälje, Uttringe in Rönninge and the Technical Museum in Stockholm. We considered sustainability issues when choosing material and methods for building extensions for the caravan in nature. We built furniture and functional items, such as a roof and seating, mobile pizza ovens and a multi-functional table, with own table tennis racks when transformed into a table tennis table. We built our own social media platform, through the application "Memories of the Future", and we used the Technical Museum's studio for making a podcast for deep conversations on topics of "allemansrätten" and what it means to have rights and to have agency.

Part of this project is also to reach out to inspiring colleagues and to build a larger network around questions of children and youth's citizenship and their public or common spaces. With the ambition to share experiences and encourage dialogue with diverse players three seminars were conducted within the project.

One seminar was based on the idea of activities and participatory methods to enable young people to play an active and influential part in decisions which affect their everyday lives. It was organized in collaboration with Department of Visual Arts and Sloyd Education at Konstfack with the keynotes by "MYCKET collaboration" (Sweden) and the artist Sibylle Peters (Germany). The second seminar introduced Claudia Hummel (Germany) and the project "Spieklub (Play club) 1970/2020" at Konsthall C, dealing with the reactivation of a children's "Play City critical of capitalism". Co-organized together with Läsfrämjarinstitutet (LFI) and Grafikens Hus in Södertälje the third seminar connects to a collective founding of a platform for interplay between different players within the municipality and civil society organizations.

So far in the process, what surfaced as crucial for the implementation of the project was the aspect of time and not forcing the process forward too fast. It also included sensitivity towards the perspectives of all participants/co-researchers and was based on a horizontal structure in terms of planning, organizing and decision-making. This proved to ensure the continued interest of the young participants for the project and at the same time encouraged them to take ownership of the research.

The young co-researchers also initiated and set the agenda for further exploration, which currently translates into an approaching mobile platform in the form of a podcast studio for dialogue and exchange with other youth-based communities in other parts of Sweden.

Project: Cultural Right of
Public Access
Place: Tekniska Museet, 2021
Photo: Rikard Nilsson

Project: Cultural Right of
Public Access
Place: Tekniska Museet, 2021
Photo: Rikard Nilsson

Project: Cultural Right of
Public Access
Place: Tekniska Museet, 2021
Photo: Rikard Nilsson

Designing the Sound of the Future

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Claudio Panariello   PhD student, KTH, Project member
Adrian Benigno Latupeirissa   PhD student, KTH; Project member
Iolanda Leite   Associate Professor, KTH; Project member
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Bresin, R., Pauletto, S., Laaksolahti, J., &
Gandini, E. (2020). Looking for the soundscape
of the future: preliminary results applying the
design fiction method. In S. Spagnol, & A. Valle,
(Eds.), Proc. of the Sound and Music Computing
Conference 2020.

Frid, E., & Bresin, R. (2021). Perceptual
Evaluation of Blended Sonification of Mechanical
Robot Sounds Produced by Emotionally Expressive
Gestures: Augmenting Consequential Sounds
to Improve Non-verbal Robot Communication.
International Journal
of Social Robotics.

Latupeirissa, A. B., Frid, E., & Bresin, R.
(2019). Sonic characteristics of robots in films.
Proc. of the Sound and Music
Computing Conference.

Latupeirissa, A. B., Panariello, C., & Bresin, R.
(2023). Probing Aesthetics Strategies for Robot
Sound: Complexity and Materiality in Movement
Sonification. ACM Transactions on Human-Robot
Interaction.

Panariello, C., & Bresin, R. (2022).
Sonification of computer processes:
The cases of computer shutdown and idle mode.
Frontiers in Neuroscience.

The overall aim of the project was to investigate the possibility to design the sound of the future informed by the sound of the present and of the past by developing new methods for the sound design of everyday scenarios inspired by combining methods used in documentary filmmaking and sound computing.

The starting point of our investigation was Erik Gandini's research project The Future through the Present, which explores how a documentary narrative can create a projection into the future, and develop a cinematic documentary aesthetic that releases documentary film from the constraints of dealing with the present or the past. In this context we wondered if it was possible to speculate, research and possibly design the sound of the future through our understanding of the soundscapes of the present, and through methods of documentary filmmaking, sound computing and human-computer interaction. Because of its interdisciplinarity, and in line with the philosophy of the NAVET centre, the project involved researchers and artists from different fields: documentary filmmaking, composition, sound and music computing, media production, human-computer interaction and social robotics.

In the project we adopted a speculative and hypothetical approach to reality that aimed to explore the "potentially" real, and the "what if" in the process of documenting the world and its sonic representation. Therefore we wanted to investigate how the ways of interacting in an highly digitalized world would redefine the soundscape of the future: Will new sounds develop and other resurface from the past?

In this context we wanted to understand the role that data sonification can have in the representation of facts in a documentary production and if it was possible to create the soundscape of the future through a documentary approach that avoids the established, but often cliched, vocabulary of Sci-Fi.

The way we approached our investigation was multifaced. We made use of a variety of methods and their combination: ethnographic studies, design fiction, voice sketching, sound design, data sonification. This helped in sketching sound designs for different societal situations, which would implicitly help the listener to become aware of the nature of both present and future scenarios represented by a soundscape.

More in detail, we organized a series of activities including a design fiction workshop on the soundscapes of the society of the future. At the workshop twenty-three international sound design experts predicted both positive and negative future scenarios, including both lo-fi and hi-fi sound-scapes. It emerged the awareness that people in the future will have the possibility of and tools for controlling how soundscapes should be, including their personalization. This in turn would entail an ethical use of sound design, which will help in re-discovering sounds that are easy to identify and related to nature of both today and the past.

Based on these results combined with considerations emerged in workshops with documentary director Erik Gandini, we came up with ways of sonifying data presented in documentary projects in ways that can represent both actual data and future data proposing alternative future worlds leveraging on emotions intrinsic to sound and music. These include the development of methods for the sonification of data about employees current low engagement in the world emerged from 155000 interviews, allowing to compare them with the sound simulating future scenarios with increased employees engagement.

Another experiment originated by a sequence in a documentary by Gandini was the sound of computers when they shut down in an open office space at the end of the working day. In this case we adopted a dramaturgy of the "computer death" for sonifying the software processes involved inside the machine when it is shutting down. We did this with a particular focus on the aesthetics of the sonic rendering that is often neglected in sonification projects. In particular with explored two different sound design strategies: one was influenced by the sonic characteristics of the Glitch music scene, and a second strategy was based on the sound samples of an unusual and special acoustic instrument, the subcontrabass Paetzold recorder, which unique sound has been investigated in the contemporary art music scene.

In another strand of the project we investigated how a humanoid robot should sound in the future when interacting with humans in public spaces. By analysing the presence of robots in movies we extracted sonic elements used for representing their movements and intentions. By applying this knowledge in different scenarios (e.g. shopping mall, restaurant) we found that people preferred more machine-like sounds for a robot helping customers in a mall, and more soft swish-like sounds for a robot welcoming guests in a restaurant.

Results have been presented at international conferences (SMC Sound and Music Computing 2020, Nordic SMC 2021, HRI Human Robot Interaction 2020 and 2021, ISon Interactive Sonification Workshop 2022), at public exhibitions and workshop at Tekniska (The Swedish National Museum of Science and Technology), and documented in international peer-reviewed publications.
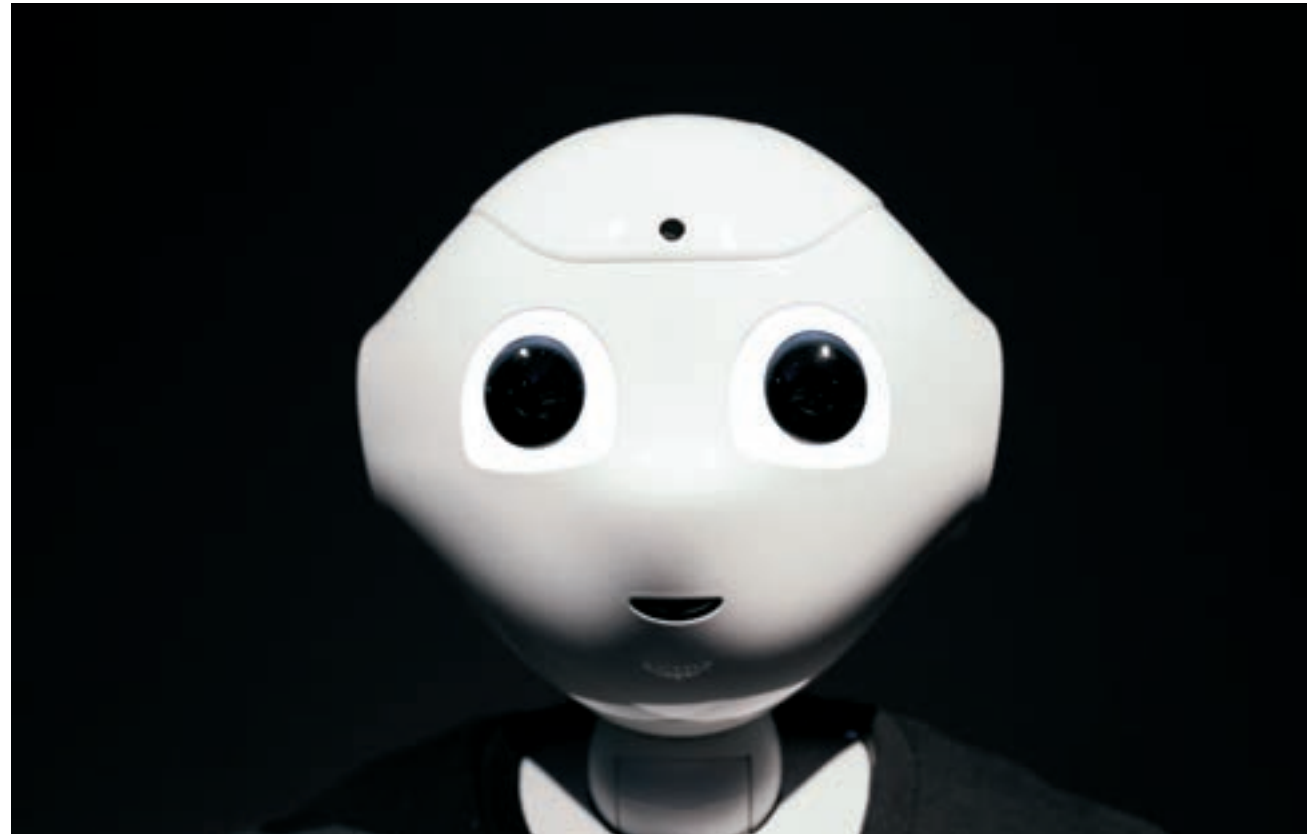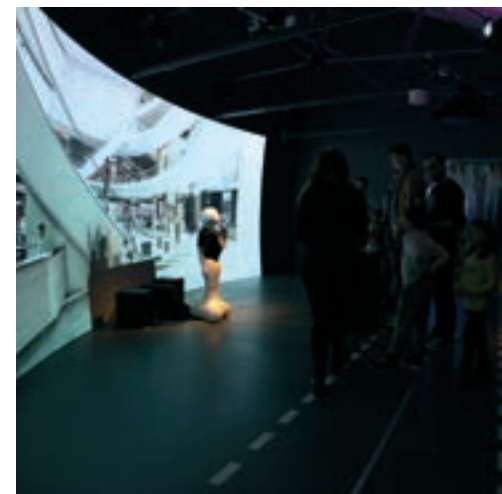
Project: Designing the
Sound of the Future
Place: Tekniska Museet,
2021
Photo: Rickard Nilsson

Project: Designing the
Sound of the Future
Place: Tekniska Museet,
2021
Photo: Rickard Nilsson

Project: Designing the Sound of
the Future
Place: Tekniska Museet, 2021
Photo: Rickard Nilsson

Project: Designing the Sound of
the Future
Place: Tekniska Museet, 2021
Photo: Rickard Nilsson

Project: Designing the Sound
of the Future
Place: Tekniska Museet, 2021
Photo: Rickard Nilsson

Project: Designing the Sound
of the Future
Place: Tekniska Museet, 2021
Photo: Rickard Nilsson

Digital Bodies –
Motion Capture Acting

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Publications:

Kammerlander, R. K., Pereira, A., & Alexanderson,
S. (2021). Using Virtual Reality to Support
Acting in Motion Capture with Differently Scaled
Characters.
In Proc. of VR 2021 - 2021 IEEE Conference on
Virtual Reality and 3D User Interfaces, 402-410.

Valle-Pérez, G., Henter, G. E., Beskow, J.,
Holzapfel, A., Oudeyer, P. Y., & Alexanderson, S.
(2021). Transflower: probabilistic autoregressive
dance
generation with multimodal attention.
ACM Transactions on Graphics, 40(6).

In an age where the line between the physical and the digital becomes increasingly blurred, where physical bodies and environments are scanned with 3D scanners, motion is captured with sensors and transferred to digital characters, and interaction takes place in mixed reality or virtual worlds, the questions about digital performances seem more relevant than ever. Digital Bodies is part of a larger effort to investigate human motion, AI and virtual characters. The project takes departure in a motion capture acting perspective and investigates the process of enacting a digital character in real-time. We then deepen the sense of embodiment of the actors by allowing the interaction to take place in an immersive virtual reality scene. We finally explore how machines interpret and learn to mimic human motion using deep generative AI models.

Motion capture technology has long been used to provide the film and video games industries with digital characters and creatures. The technology allows the digitalization of an actor's performance, and a subsequent complete transformation of appearance. This kind of metamorphosis offers many creative possibilities, but it also raises many questions on how to act with a body and shape which is fundamentally unfamiliar for the actor. Is the digital body to be considered a new form of digital mask and makeup, or should it more be considered a type of digital puppet, manipulated by the actor? More broadly: does motion capture acting require a new type of acting methodology and training? How does the visual style of the digital character affect performance? What feelings and ideas do they give back to the performer or transfer to a spectator? What kind of automaton is born when an AI is trained to mimic these performances?

Digital Bodies sets out to explore motion capture performance both from a qualitative and quantitative standpoint, and involves two different classes of expressive performance: acting and dance. Concretely, the project has

two goals. The first goal is to generate new knowledge about motion capture acting, and thus contribute to the artistic research at SKH. We do this by a systematic assessment from a mime and method-acting perspective, letting actors portray digital characters along a varied scale of physiognomies and behaviours. The second goal is to provide valuable data and insights for ongoing research on controllable motion synthesis at KTH. This research aims to automatically generate gestures and other non-verbal behaviours for virtual characters and robots, and require large amounts of high quality data for different styles and different types of motion such as locomotion, co-speech gestures and dancing.

The core project activities, that took place in the PMIL motion capture lab at KTH during 2020-2021, consisted of three distinct but related parts: a series of motion capture acting workshops, a quantitative study and a performance data collection.

In the acting workshops, actors Matthew Allen, Alejandro Bonnet and Stephen Rappaport were outfitted with motion capture suits and head mounted face capture cameras and could in real time see their performances transferred to a digital character projected on the wall. This made it possible to explore properties of digital embodiments and acting techniques in a direct way in order to come up with useful practices. In particular, we explored the effect of real time feedback on improvisation, settings and scenarios for structured improvisation and effects of character proportions and level of realism. Some takeaways from the workshops include: real-time feedback helps the actor to project a personality to the character and adapt the nuances of the acting. The level of realism of the character plays a big role, where visual styles in between cartoon and realistic seemed to spark more imagination to the actor than a pure cartoon style. The detachment of the performance and body raises new questions about ethnicity and gender.

The second part was a study on using virtual reality (VR) to support motion capture acting. Many actors witness the poor acting conditions associated with motion capture recordings. Instead of detailed sets, costumes and props, they are forced to play in empty spaces, with imaginary bodies and out-of-place co-actors. In the study, 22 actors (mainly students from the Stockholm University of the Arts), were invited in pairs to play out a scene about a girl confronting a nightmare monster. By using VR and combining it with full-body motion capture, the actors' performances were transferred into a virtual scene where they could see and interact with each other in a first person view. Our quantitative assessment found that our VR setup significantly improved the sense of embodiment and immersion when compared to a real-world interaction. Interviews with the actors confirmed the efficiency of the system, both as a rehearsal and a production tool.

In the final part of the project, a data collection was carried out where different dance styles performed by professional and amateur dancers were captured. The dances will be rendered on 3D scanned puppets and displayed at the museum of performing arts in Stockholm. This closes the loop between the real and digital, rooting it in a long tradition of the illusion of life. The collected data is also used in ongoing efforts at KTH exploring generative motion models, such as AI-generated dancing.
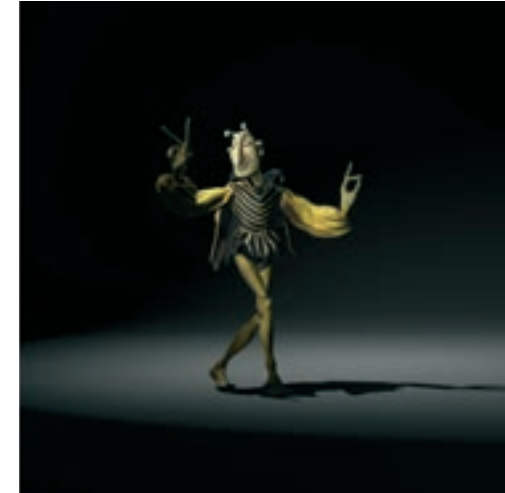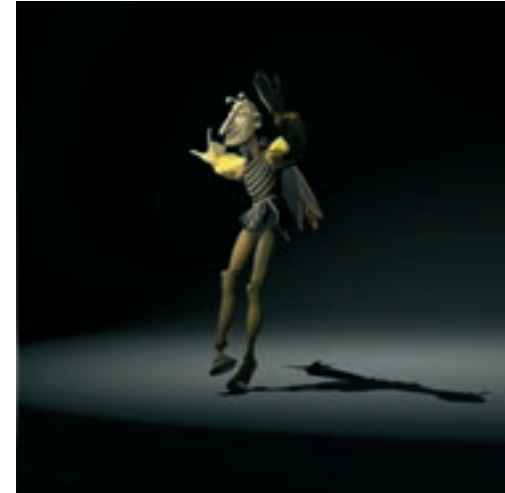
Project: Digital Bodies - Motion Capture Acting
Place: Scenkonstmuseet, 2022
Sequence from a video by Esther Ericsson: Mephistopheles dancing puppet trained with Artificial Intelligence

Project: Digital Bodies - Motion Capture Acting
Place: KTH Royal Institute of Technology
Photo by Simon Alexanderson: Motion capture acting, 2021

Project: Digital Bodies - Motion Capture Acting
Place: KTH Royal Institute of Technology
Photo by Simon Alexanderson:
Scene from an acting workshop, 2021

Project: Digital Bodies - Motion Capture Acting
Place: KTH Royal Institute of Technology
Photo by Simon Alexanderson:
Scene from an acting workshop, 2021

Fictitious Soundscapes

Participants:

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Klas Dykhoff   SKH - Soundscape design
Kjetil Falkenberg   KTH - Project leader, concept, installation, experiment
Robert Andreas Gabrielsson   Visual artist, painter, installation
Albin Lindetorp, Albin Design   3d graphics, animation, video production
Hans Lindetorp   KMH - Sound design, concept, programming, installation
Sandra Pauletto   KTH - Concept, experiment design

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Fictitious soundscapes is a project that investigates sonic preferences in the future city soundscape. In particular, the target is to learn whether hearing-impaired pedestrians have different preferences than normal hearing pedestrians. This is realized with an interactive exhibition where the visitor can affect the sound design of a number of futuristic electric vehicles. We register how users tweak the sound designs we provide through an interface consisting of three circles without written or visual explanations of the sonic manipulations taking place. In a controlled listening experiment, sound designs from hearing impaired and normal hearing populations are contrasted in A-B tests to find evidence of differences and preferences.

The background for the project comes from observations in communities of hearing impaired that suggest that cities' sound environments are not suitable or pleasurable for persons with hearing problems. There are conflicts between wanted and unwanted sounds, between necessary and unnecessary sounds, and between personal and common sound spheres. While these conflicts exist for everyone, hearing impaired, as a generalization, will be particularly and negatively affected by a chaotic sonic environment.

Since a few years back, electric vehicles and especially cars are required to alert their surroundings through sound, for instance when going slowly and silently on electric power. There are no formal regulations for other silent vehicles at the moment, but there is a considerable discussion about the risks involved with silently approaching vehicles like electric scooters. It is not at all unlikely that a near future will require even these to emit sound.

This leads to some questions: who should design the future urban soundspace, by which ideals, and for whom? We propose through this explorative and provocative study that we need to understand preferences of the hearing impaired population with more criteria than just personal safety. If this population chooses sound designs created by the same population rather than created by normal hearing, what are the implications?

The project's exhibition premiered November 27 in Visionslabbet at Tekniska Museet and finishes in February 2022. Visitors are invited to interact with a touchscreen interface placed in the middle of the room, in front of a curved 10×3 meter wall with a projected 30 second looped 4K video. The looped video shows three vehicles moving across a modelled city square, making small turns and short stops. All graphics and animations have a high degree of realism to create a sense of immersion. The vehicles are futuristic: a "hoverboard" (flying skateboard), a "gyrochair" (gyroscopic wheelchair), and a "hangflyer" (a drone which you hang from).

The installation features eight-channel sound. Four speakers are placed in front of the visitor in painted boxes on the floor to augment the video and hide the electronics. Two speakers are placed above the screen, and two overhead behind the visitor. The front floor speakers pan sound from the hoverboard and gyrochair, while the hangflyer is played mostly from the above front speakers (and some through the floor speakers). Both overhead stereo speaker pairs play a random composition of environmental sounds, creating a realistic soundscape.

Visitors can tweak the sound design for each vehicle using the interface on the touchscreen. Each design is accessed using a circle where you can fade and mix between four sound design "families" with different qualities, some musical and others more engine-like. Within this circle, you even change effects such as reverberation and filtering. In addition to the sound design, vehicle sounds are affected by how they move, depending on their characteristics (speed, acceleration, turns, heading, vertical movement).

The interaction has been programmed and implemented to make it as easy as possible in order to invite all museum visitors to participate. On the touchscreen, you can only move around within three coloured circles that represent the three similarly coloured vehicles on the main screen, and also click two buttons marked with "I'm done" and "Restart". These two buttons are not necessary for the experience but are needed for collecting data. To guide the visitor further, a laser-cut cardboard plate with holes for the three circles and two buttons is placed on top of the touchscreen.

The combination of a realistic video, full-wall projection, multichannel surrounding sound, physical objects to hide electronics, a minimalistic interaction device, and complex sounds to change, provides the visitor with a rich immersive experience. Data from visitors is collected from the exhibition period.

Project: Fictitious Soundscapes
Place: Tekniska Museet, 2021-2022
Photo: Rickard Nilsson

Project: Fictitious Soundscapes
Place: Tekniska Museet, 2021-2022
Photo: Rickard Nilsson
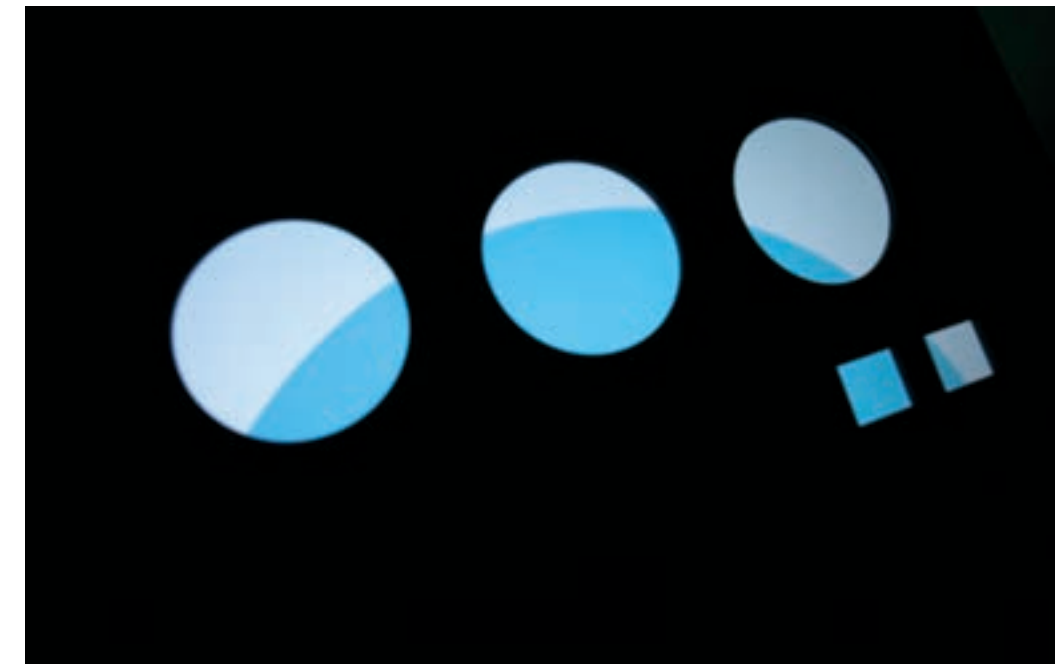
Project: Fictitious Soundscapes
Place: Tekniska Museet, 2021-2022
Photo: Rickard Nilsson

Knitting Concrete

Participants:

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Ulrika Mårtensson
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Publications:

Hernández Vargas, J., Westerlind, H., & Silfwerbrand, J. (2022). Grading Material Properties in 3D Printed Concrete Structures. Nordic Concrete Research, 66(1), 73-89.

Westerlind, H., & Hernández, J. (2020). Knitting Concrete. In F. Bos, S. Lucas, R. Wolfs, T. Salet (Eds), Second RILEM International Conference on Concrete and Digital Fabrication. DC 2020. RILEM Bookseries, 28, Springer, Cham.

Knitting Concrete explores synergies between two material practices typically considered to be widely apart: that of knitting textiles and concrete fabrication. This is made possible by using 3D printing technology in which the shaping of fresh concrete takes place, not through the imposed rigidity of a static mould, but along a programmable path performed by a numerically controlled machine. To unlock the full tectonic potential of this additive process, the research takes inspiration from knitting – a craft with a long history of turning a continuous length of yarn into three-dimensional shapes. Similar to how a single strand of thread can be converted into many different types of patterns through the application of various stitches, the shape and organization of the path of deposition can turn a continuous strand of concrete into complex material structures and lead to new ways of controlling the density, porosity and surface articulation of this traditionally massive material. Seen in this light, the shift from traditional formwork-based techniques to 3D printing represents, not only a new fabrication method, but also an opportunity for re-evaluating norms and design methods that so far have shaped concrete as a monolithic and uniform building material.

In knitting, the intermeshed loop structure offers great flexibility in forming different stitches that can be repeated and combined to make up patterns with specific characteristics and properties. In machine knitting, in turn, the skilled hand movement of the knitter is replaced with the regulated movement of the machine to convert yarn into knitted loop structures and like 3D printing, machine knitting requires no user intervention during the fabrication process itself. The skill instead lies in the programming of these machines. This intersection between knitting, programming, and 3D printing led us to team up with colleagues at the Textile department at Konstfack with the aim to develop a design thinking based on the concept of the "stitch", rather than solid geometry in concrete fabrication. The project builds on previous work in which a digital design tool has been developed to be able to programme and visua-lise print paths and translate them automatically into fabrication instructions for the 3D printing machine. To explore the full creative potential of this design tool the project turned to prototyping in clay as a way of testing out ideas at a smaller scale and to facilitate a more playful and experimental design process that could allow for unforeseen discoveries to take place.

Learning more about various pattern techniques in knitting and methods of varying stitches to create different knitted shapes helped us to identify several important improvements to our digital design tool. These included the ability of combining different "stitches" in the same printing layer and the possibility to decrease and increase the number of "stitches" in specific layers to achieve three-dimensional effects. Taking inspiration from the great diversity of knitted patterns we were further impelled to introduce colour as a parameter in the generation of print patterns as it would dramatically increase the range of possible outcomes.

To predict how a generated path will turn out as a printed pattern requires, not only a good understanding about the material behaviour of fresh concrete, but also the ability to easily shift between a two-dimensional and three-dimensional design thinking. To train this skill, clay was chosen as a suitable material for fabricating prototypes due to it being much easier to work while at the same time having similar viscoelastic properties to concrete. A new printer machine for clay was subsequently developed especially for the project to be able to pursue the possibility of multi-material printing. It was designed based on an open-source Delta printing system and incorporates two mounted nozzles connected to separate material feeding cylinders to be able to print two different batches of clay in alternating layers within the same object.
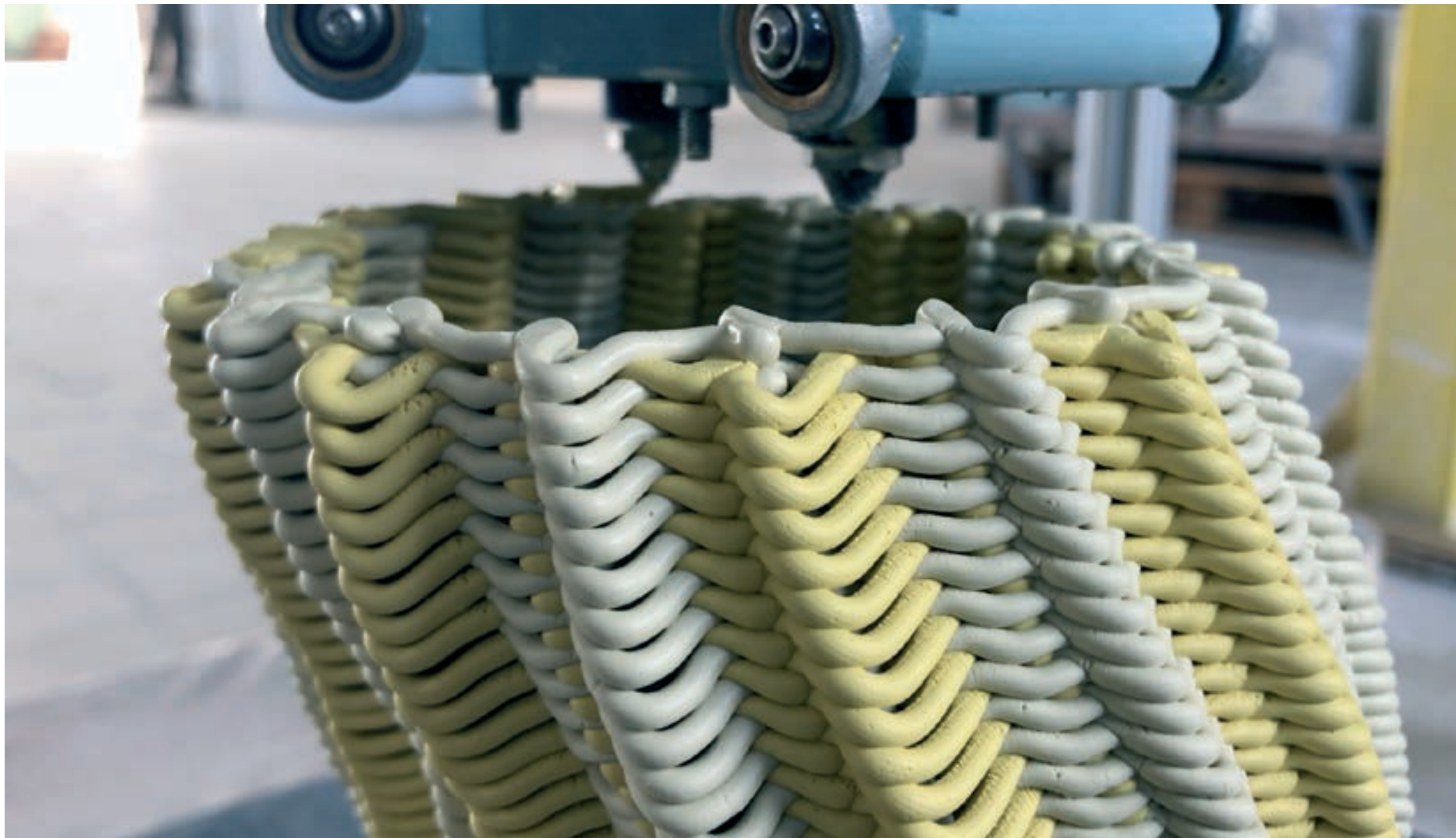
In our initial project plan we had intended to conduct a workshop at Konstfack to let students with experience in knitting try out our digital design tool. However, because the project period coincided with the restrictions of the covid pandemic, we were not able to carry out this plan. Instead, we conducted a one month-long residency at the Ifö Center at Bromölla in the summer of 2020 during which we set out to explore the possibilities and limitations of the new improved tool. After initial weeks of tweaking our new printing machine and testing to find the right composition and consistency of the clay mix, we were able to achieve a smooth printing workflow. What then followed was a period of playful experimentation in which a great number of test objects were fabricated based on different combinations of "stitches" and colours.

After being fired in the kiln the different colours of the printed prototypes appeared much stronger, Ifö Center in Bromölla, 2020.
Photo: Helena Westerlind

Printed prototypes based on different combinations of "stitches" and colours, Ifö Center in Bromölla, 2020.
Photo: Helena Westerlind

The project's dual colour clay printer set up at the Ifö Center in Bromölla, 2020.
Photo: Helena Westerlind

Experimental printing during the residency at the Ifö Center in Bromölla, 2020.
Photo: Helena Westerlind

A new dual extrusion 3D printer for clay was built by José Hérnandez Vargas to be able to print two different coloured batches of clay in alternating layers, Ifö Center in Bromölla, 2020.
Photo: Helena Westerlind

Mixing and Matching the Luminous Colour Palette: Towards a Designer Toolbox

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The use of luminous colours is increasing in design and art due to new technologies in colour-tunable lighting. Our project addresses the lack of guidance and perception based systems when working with additive mixing of luminous colors, including their interaction with surface treatments. Many are not aware that the perceived brightness of colorful appearing light currently cannot be predicted. In addition, when light and paint colors interact, various effects can be observed ranging from changes in hue, saturation and spatial hierarchies. When working with paint, designers can draw from documented knowledge developed by both color scientists and artists/ designers. The same is not yet available when working with additive mixing of colored light. Our project objective is to help develop a perception toolbox and practice-informed guidance for spectral mixing.

For this NAVET small visionary pilot project, our approach was multi-fold. Students from Konstfack and KTH explored possibilities to mimic natural phenomena with electrical light and material and to manipulate the perception of space and form through light and colour. The outcomes of this "lighting machine" design workshop were several light and colour perception stations that were displayed as part of a public installation.

In addition, we developed a pilot research installation, using multi-channel LED lighting. Several near-metameric (equivalent) colour pairs were shown, matched in both light level and colour coordinates, however not in spectrum. The colours chosen were the secondary colours indigo-violet, cyan-turquoise, lime-green, and amber-orange as well as a cool and warm white.

The light illuminated two painted panels that showed rectangular patterns in bold colors, selected to either match or complement the light. The objective was to test visual effects and demonstrate:
–   Differences in the rendering of surface colours (limitations and opportunities)
–   Differences in the perceived brightness of colours, and the different properties of luminous colours and surface colours
–   Opportunities in manipulating spatial effects through the interaction of coloured light and paint

The bottom half of the panels used common RedGreenBlue (RGB) light mixtures to mimic the respective "equivalent" colours achieved by different, non-RGB, non-mixed LEDs (indigo, cyan, lime, amber). These were used to illuminate the top half of the panels.

In addition, we explored the topic of reproduction and simulation, producing a digital image of the "paint + light condition" and projecting it, equal in size, next to it. This provided the opportunity to explore the differences in perceived qualities when reproducing lighting on paint as found in real world applications using RGB digital projection as found in simulations.

As part of this project we first developed and explored our common questions, defined a study framework and developed the light and colour conditions for the first pilot study described here. This pilot was targeted to inform the development of a perception toolbox. The installation was set up at Tekniska Museet in November 2021, and 57 museum visitors participated by filling out a survey.

When comparing the video-projected images and the illuminated painted panels, 52 participants indicated that they experienced a difference in how they perceived the illuminated, painted panels compared to their video-projected representation. Most described the projected colours as duller, faded, less intense or less saturated. Some also described that the projections had less contrast and sharpness and were perceived as pixelated. However, a smaller number reported that they thought the projected colours were more saturated and clearer.

As for the painted panels, the conditions were matched in light level to enable perceptual comparisons. The vertical light levels for the light falling onto the panel for all except the indigo conditions were matched to ~60 lux, and the indigo light condition was set to ~20 lux. The video projection also closely resembled those levels.
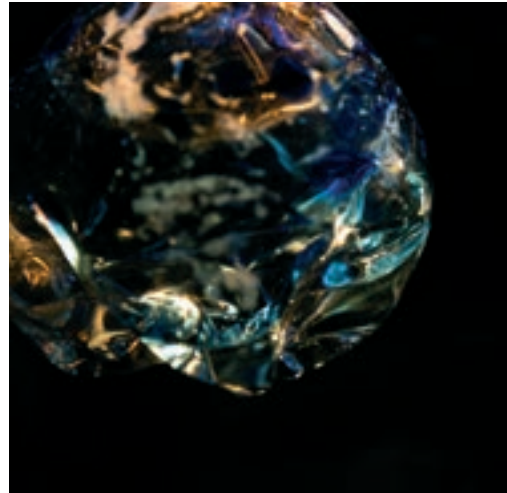
When focusing on the painted panels illuminated by the sequence of different lighting conditions (indigo, cyan, lime, amber, cool and warm white), we directed the visitors' attention to one paint colour – purple. After looking at all light conditions, the majority of participants commented that the purple paint would pop out and look most vivid under the cool-white light that was mixed using lime and indigo LEDs, with the cool white using an RGB mix coming second, followed by the indigo-blue lighting. The majority also indicated that the purple would pop out least, recede and look dull under the amber colored light that uses amber LEDs, with the amber mixed using red and green LEDs coming second. In the latter case, these results can be explained by amber being the complementary colour to violet/purple without light energy in the frequencies needed to enable the perception of purple-violet colour, rendering it brown-black. On the contrary, lighting that contains such frequencies can enable the vivid perception of those colours.

In addition, we organized conversations with focus group participants that have professional experience in working with light and/or colour to gain input on the components and properties that would be most relevant for a useful designer-toolbox.

Generally, consensus from conversations and the pilot was that the interactions of colour-mixed light/ luminous colours and coloured surfaces are underinvestigated, and that such interactions can alter and support experiences of spatial proportions, hierarchies, dimensions and orientation. The responses also suggest that there is a clear potential to systematically describe those effects and develop a system/toolbox to enable and inform design decisions.

This project was conceptualized as an exploration and feasibility study to conceptualize a future larger study and project collaboration. As such it marks the initiation of what we hope will become a fruitful longterm collaboration between researchers and students from the Konstfack Perception Studio and the KTH Architectural Lighting Design Lab.

Project: Mixing and Matching
the Luminous Color Palette.
Place: Tekniska Museet, 2021
Photo: Rikard Nilsson

Project: Mixing and Matching
the Luminous Color Palette.
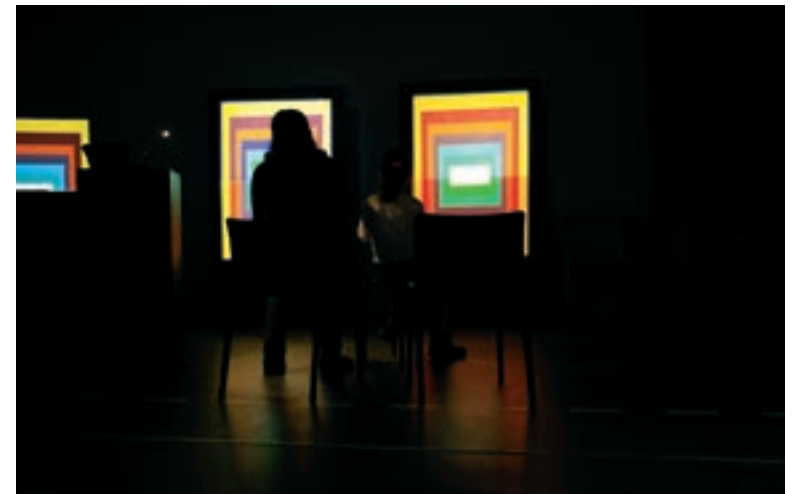Place: Tekniska Museet, 2021
Photo: Rikard Nilsson
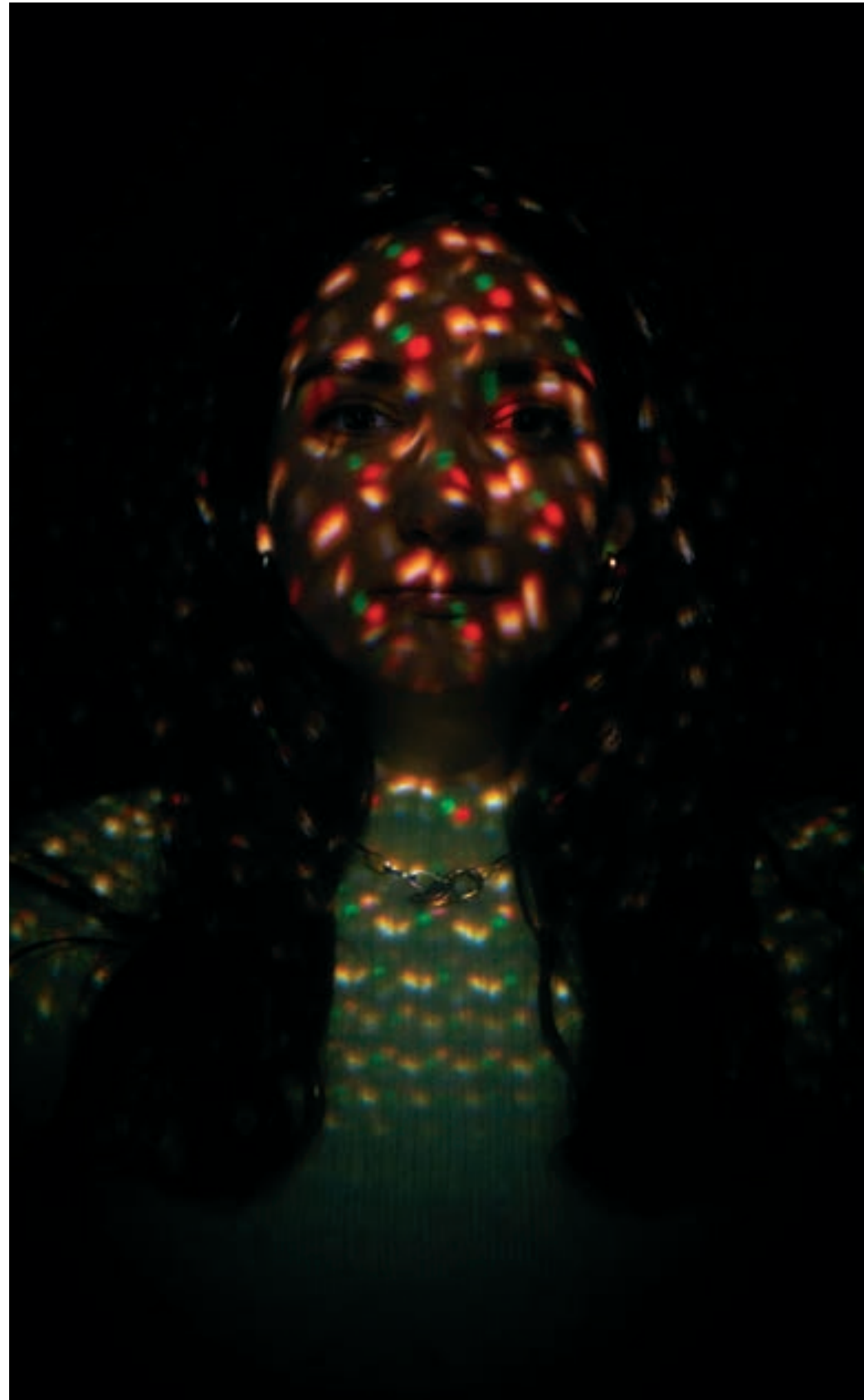
Project: Mixing and Matching
the Luminous Color Palette.
Place: Tekniska Museet, 2021
Photo: Rikard Nilsson

Project: Mixing and Matching
the Luminous Color Palette.
Place: Tekniska Museet, 2021
Photo: Rikard Nilsson

Project: Mixing and Matching
the Luminous Color Palette.
Place: Tekniska Museet, 2021
Photo: Rikard Nilsson

Production Novellas
– Crafting Sound Books

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Publications:

Holmquist, A. L. (2021). The Production Novella
as a Textual and Visual Narrative Method in
Craft-Based Design. In T. Westerlund, C. Groth,
G. Almevik (Eds.), Craft Sciences (pp. 272-290).
Sweden: Kriterium.

Holmquist, A. L., & Ahlsell, C. (2020).
Production Novellas [Exhibition].
Exhibited at Form Design Centre Malmö
14 March – 10 May 2020.

Holmquist, A. L., & Ahlsell, C. (2021).
Production Novellas [Exhibition].
Exhibited at Rian Design Museum in
Falkenberg 19 September – 22 November 2020.

Holmquist, A. L., Magnusson, M., & Livholts,
M. (2019). Reinventing tradition: Exploring
the creation of new meaning through innovations
involving craft-based design. Creativity and
Innovation Management,
28(1), 124-137.

The overall research approach used in this project is inspired by Research Through Design(RtD) (Frayling, 1993). RtD generates knowledge through the practice of making and designing innovative artifacts, models and prototypes, and reflecting upon the same. The research projects evolved from observations and reflections on design practice work at studio Folkform in Stockholm. The research project contributes to the field of practice based research, where designers use their own work as an outset for reflection and knowledge production. In this project we gather knowledge and engage in traditional modes of production that might otherwise be lost to future generations. By means of this research process, we create pieces of unique artistic expression, informed by free and unconstrained processes. The methodology is inspired by research into design and short stories contained in "Production Novellas", a textual and visual narrative framework based on the writing of memoirs, letter correspondence and photography gleaned from the inside of manufacturing. Design case research builds on design work carried out at Studio Folkform in collaboration with innovation researchers KTH and Craft researchers at Konstfack.

During the Small Visionary Project we explored the craft of bookbinding and in parallel made audio recordings of our Production Novella writings. An old book is not just literature but often a hand crafted artefact in itself. Like an archaeological object, it can provide us with far more besides information about the author and the text content. How could we, through craft-based innovation, rethink the book as an academic artefact? How could we develop the format of an academic "sound book". How could new digital sound technology and the old craft and materials of bookbinding be combined? How could we find new ways to communicate our research through exploring tensions between the old craft of bookbinding and new digital sound technology and innovate traditional forms of academic textualisation. The final sound books and the experimental bookbinding interventions were exhibited at Museum Vandalorum in Värnamo and at Rian Design Museum in Sweden during spring 2021.

The "Small Visionary Project" was run by Folkform design studio, an art and design studio founded by Chandra Ahlsell (b.1973) and Anna Holmquist (b.1978) in 2005. Holmquist is currently a PhD candidate at a joint programme at Konstfack and the Royal Institute of Technology in Stockholm.

The audio recordings consisting of Production Novellas were developed during the Small Visionary Project and exhibited at "Rian Design Museum" and "Form Design Centre in Malmö". The experimental sound books are a methodological contribution to communicate materiality and experiences from co-creation stemming from manufacturing practices at Folkform between craftspeople and designers. This form of practice-led research communication shares an inside perspective with the design and manufacturing process. Experiences from the design and manufacturing process were described in the form of short written memory fragments and photographs.

The Production Novellas as a narrative multimodal composition, where the processes of manufacturing the artefacts are visualised and recorded as sound, could be a contribution not only to craft and design research but also to the field of Industrial Heritage studies. The personal, subjective, emotional and aesthetic qualities of the Production Novellas are an important part of the composition and documentation. By combining a research-through-design approach using the Production Novellas, I introduce the audience to the collaborative process between the craftspeople and the designer and the handcraft which prevails inside factories and large-scale production in Sweden. Through my Production Novellas, I wish to make local manufacturing cultures more visible. Hopefully I will inspire craft practitioners and academics to further develop narrative methods in craft research and to explore new, creative, practice-led strategies from an inside perspective in the making of knowledge.

Project: Production Novellas
– Crafting Sound Books
Place: Rönnells antikvariat, 2016
Photographer: Gustav Karlsson Frost

Project: Production Novellas
– Crafting Sound Books
Place: Rönnells antikvariat, 2016
Photographer: Gustav Karlsson Frost

The Radio Sound Studio Project

Participants:

Sandra Pauletto

Rod Selfridge
Andre Holzapfer

Henrik Frisk
Michael Johansson
Josefine Hölling

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There is an increasing need to give voice to silent digital objects. This, as well as the emergence of new forms of digital art and interactive story-telling, challenge existing sound design production methods.

Sound design research is in its infancy when compared to music or speech research. Key to its advancement is an increased understanding and connection with current and historical practices which are mainly situated in media production (radio, TV, film).

The Radio Sound Studio Project investigates the creative space between sound design tools and digital instruments. It is based on an ongoing collaboration with Sveriges Radio sound engineer and sound maker Michael Johansson, which provides us with access to both expert knowledge and a vast archive of sounding objects used in radio drama productions.

The project aims to develop novel sound design tools by modelling historical sound effects and sounding objects utilising methods from sound computing, ethnography, and design.

Through physical modelling and procedural audio, a number of sounding objects from the radio sound studio are digitalised into sound models. Through the expansion of their sonic capabilities by, for example, increasing their parameters´ range and exploring a number of different interfaces, we see great possibilities emerging for both artistic sound practices and more utilitarian sonic interaction designs for new objects.

We aim to create flexible tools capable of producing both familiar sounds from the past and new sounds that could be embedded in future digital objects, to develop methods for performance, composition, and sonification, and also to explore new haptic and kinesthetics affordances.

Finally, we aim to contribute to research on how a digital archive of sounding objects and practices might be designed, creating new opportunities for radio, TV and Foley studios.

A semi-structured interview with sound engineer and sound maker Michael Johansson, as well as a session observing his sound practice, allowed us to gather information about his approach to sound design, and about the radio sound studio.

From this, three very different sounding objects were selected to be the focus of the project. The first object is a wooden spoon wrapped in a wet cloth that is rubbed on stones. This sounding object was used in the radio play "Turid - A Viking saga", where Turid, a 15-year old royal daughter, needs to spread butter on a "Holy rock" to make a sacrifice to the Gods. Turid would have been likely to use a wooden utensil, and the wet cloth simulated the layer of butter between the stone and the wooden spoon. We were interested in how these mundane objects could be used to portray something quite specific to the story. We wondered whether this combination of objects could be expanded to portray other feelings: for example, the act of caressing a body.

The second object is a pair of old Swedish clogs with a wooden base and a thick leather top. This was also used in Turid for footsteps, but also, more interestingly, to create a sense of presence. Even when the characters were meant to be standing still, the sound of little movements and clog-to-clog impacts would provide a "body" to the characters´ voices.

The "squeaky box" was selected as final object. It consists of a wooden resonance box and two handles made of wood and metal at the opposite ends of the box. It makes squeaks and creaks when one rotates one or both the handles. Used to produce the sounds of imaginary doors, floors or boxes, this is not an everyday object, but an acoustic model of a sound with no other function in real life than producing these sounds. We were attracted by its unique potential for creative sonic interactions.

Digital models were created for all three sounding objects and the performability through simple interfaces (such as a circular and a 30cm strip potentiometer, and a rotary encoder) evaluated.

A series of sketches for new interfaces and interactions for these sound models were developed through a design ideation workshop at KMH Royal College of Music.

Three of these sketches have been developed into digital sound design tools that will be evaluated further during a two-day workshop with the public at Tekniska Museet in Stockholm. Further work includes optimising the sound design tools, running workshops with professional sound designers, and the formalisation of this digitalisation process in order to inform the future development of digital archives of sound effects and sound practice.

Project: The Radio Sound
Studio Project
Place: Tekniska Museet, 2021
Photo: Rickard Nilsson

Project: The Radio Sound
Studio Project
Place: Tekniska Museet, 2021
Photo: Rickard Nilsson

Project: The Radio Sound
Studio Project
Place: Tekniska Museet, 2021
Photo: Rickard Nilsson

Project: The Radio Sound
Studio Project
Place: Tekniska Museet, 2021
Photo: Rickard Nilsson

Project: The Radio Sound
Studio Project
Place: Tekniska Museet, 2021
Photo: Rickard Nilsson

Transforming Practices

For a presentation and intervention at Tekniska Museet, we decided to make a film about urban mining and propose that it become a permanent part of the mine-exhibition, and that the museum neutralize the climate impact of this film (7,2 co2-eq). We also made a video essay work elaborating on circular perspectives in relation to the mine exhibition at Tekniska Museet, expanding the perspectives on what mining is and could be and reflect together with the museum visitor on how images shape our view on what futures are possible and the role of nature as a resource.

Participants:

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Daniel Pargman   Associate professor, KTH Royal Institute of Technology,
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Martin Hultman   Associate professor, Chalmers, advisor
Mirko Lempert   Assistant professor, SKH Film och media, advisor
Lena Kempe   SKH Film och media, advisor
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Publications:

Björklund, A., & Persson, L. (2021, Sep 8).
Using a Tailor-Made Climate Footprint Tool
to Integrate Sustainability in Higher Education
[Conference presentation].
10th International Conference on Life Cycle
Management.

Persson, L. (2021). Klimatavtrycket för
projektet Klimaträttvist Världande: Rapport
av livscykelanalysen av forskningsprojektet
Klimaträttvist Världande. The SKH
Publication Database DiVA. http://urn.kb.se/
resolve?urn=urn:nbn:se:uniarts:diva-1095

Persson, L. (2020, Nov 26). Shutdown: Art
Intervention in the form of energy shutdown
at SKH [Presentation]. Working together -
The Swedish Research Council's symposium on
artistic research. https://www.uniarts.se/
english/news/news/news-autumn-2020/skh-
participates-in-artistic-research-project-by-
staging-a-shortage-of-electricity

Persson, L., & Björklund, A. (2020, Nov 26).
Performativity & Quantitative Analysis -
The Disruption [Presentation]. Working together
- The Swedish Research Council's symposium on
artistic research.

Persson, P., & Björklund, A. (2021).
The human mine. Presentation and
Artistic intervention at Tekniska Museet.
https://www.researchcatalogue.net/
view/848335/1398423/0/0

Persson, P., & Crippa, B. (2022).
Elsa - Online climate calculator for the
Swedish film industry. https://www.elsa.film

Transforming Practices. LCA perspectives on film production within the context of performative artistic research. A collaboration between Anna Björklund, associate professor/docent, Dept. of Sustainable Development, Environmental Science and Engineering (SEED), KTH and Lina Persson, senior researcher, Department of film and media.
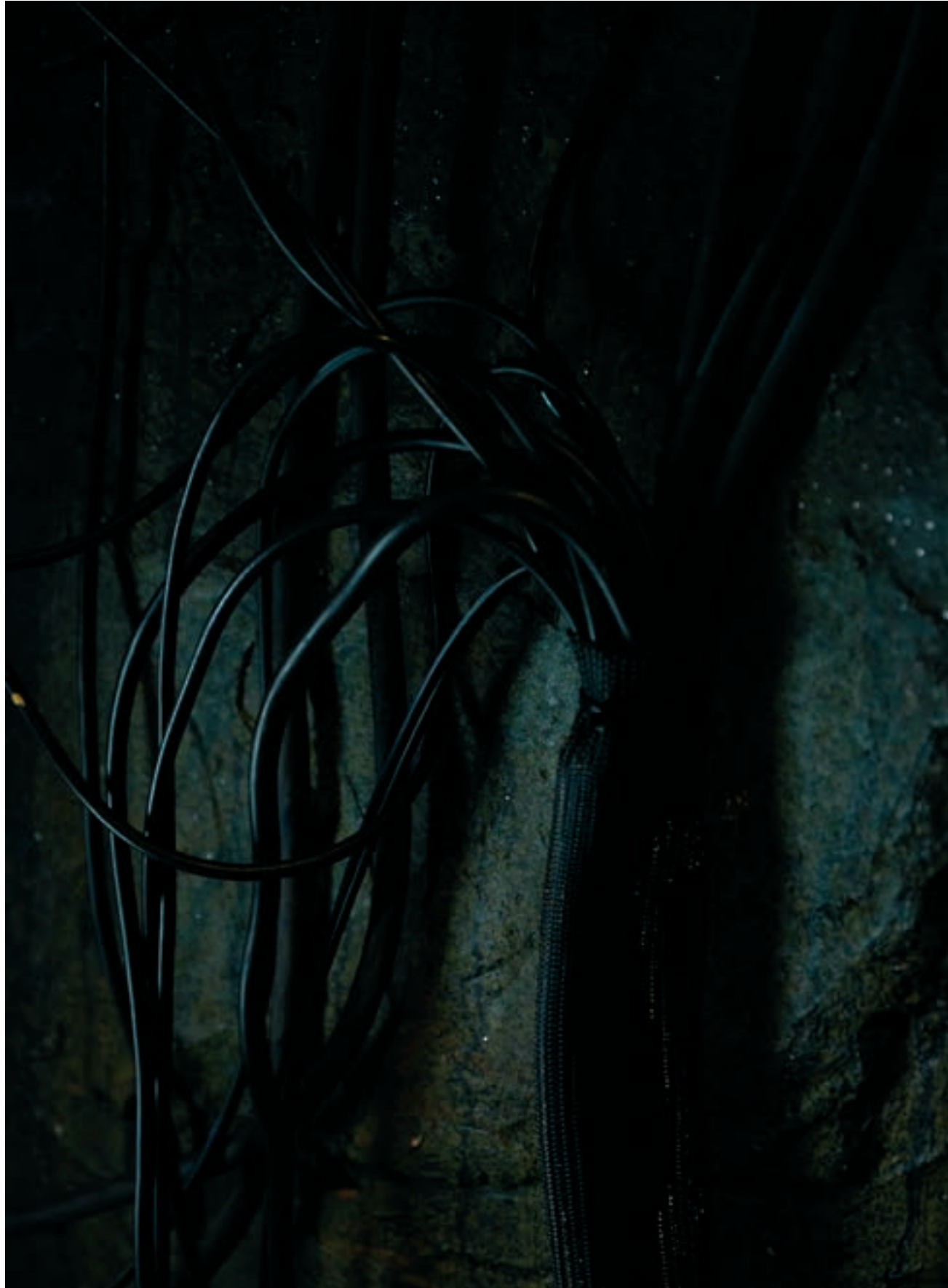
In our transdisciplinary collaboration we work with specific places and situations. We critically examine their sustainability aspects by assessing their climate impact and analyze how different images, stories and visions are at play in directing us at different versions of possible future. Based on the results of these investigations we make artistic interventions and provide tools or interventions for making sustainable transitions of practices.

For example, we carried out life-cycle-assessment on practices in film and media, on an individual researcher's level and on an organizational level with student's teams. We evaluated the climate impact of these artistic processes and developed tools like climate calculators and climate budget templates that can support students in shifting their productions towards films with smaller climate footprint. An online climate calculator form film production is under development.
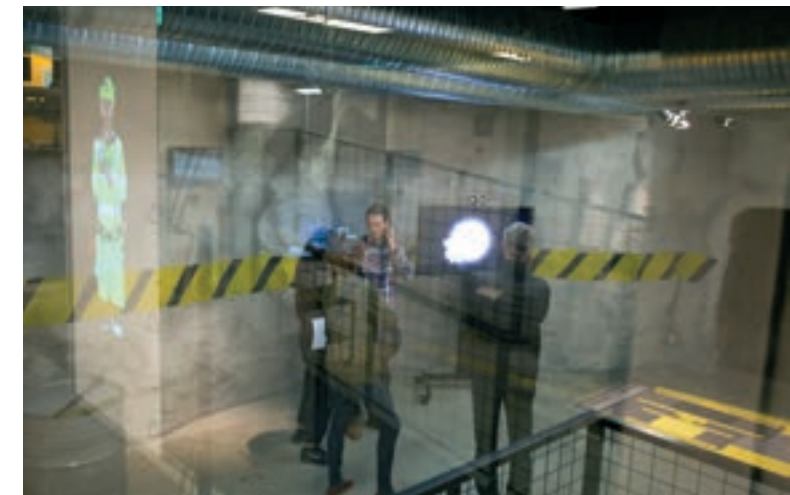
For the presentation "Performativity & Quantitative Analysis, The Disruption", at the Symposium on Artistic Research 2020, we created a video work based on the life cycle assessment of that very video work and Stockholm University of the Arts carried out an electricity shutdown to balance the climate footprint (6,8 co2-eq) of that video.
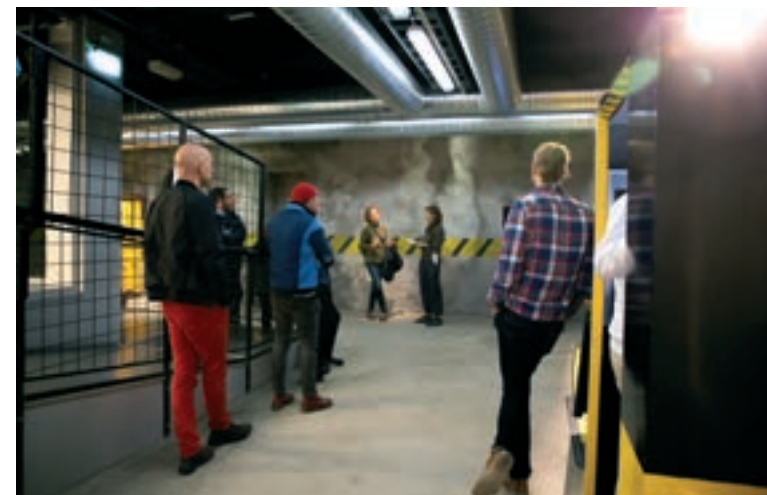
Project: Transforming
Practices
Place: Tekniska Museet,
2021
Photo: Rikard Nilsson

Project: Transforming Practices
Place: Tekniska Museet, 2021
Photo: Rikard Nilsson

Project: Transforming Practices
Place: Tekniska Museet, 2021
Photo: Rikard Nilsson

Project: Transforming Practices
Place: Tekniska Museet, 2021
Photo: Rikard Nilsson

Project: Transforming Practices
Place: Tekniska Museet, 2021
Photo: Rikard Nilsson

Transforming the Colonial Archive

Participants:

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Publications:

Järdemar, C. (2021). Reframing the encounter: From repressed colonial pile to a collaborative decolonial counter-archive. In Proc. of the International conference Photography and History, 67-68.
https://www.calameo.com/read/006919654ef3f12a86e44

Järdemar, C. (2022, January 25). Reframing the encounter [Presentation]. In J. Habib Engqvist (Ed.), Curiouser & Curiouser: Programme for Konstfack Research Week 2022. Stockholm.

The aim of the project was to begin the work of turning an archive of glass plate negatives and films photographed by Swedish missionaries in the Congo 1890-1930 into an interactive archive-object.

In the Congo DR, not many photographs from the historical period remain. The Swedish missionaries active in the country were part of a process whereby they documented the existing culture in the places they settled – then set out to change or even destroy it. Boaventura de Sousa Santos terms this epistemicide: "the destruction of knowledge and cultures of populations, of their memories and ancestral links and their manner of relating to others and to nature." We still retain the scattered remains of this epistemicide in Sweden. In this project we explore how intercultural artistic research combined with interactive technologies can intervene by finding new ways of making the material accessible to its communities of origin. We do this by developing a set of requirements and design prototypes for the interactive archive-object, in collaboration with artists and the source communities in the Congo DR.

The project is situated in a growing conversation on the post-colonial implications of cultural heritage, media technologies, and repatriation. Museums and institutions in Europe hold vast archives of materials collected during colonial exploits, and a common strategy when faced with demands for their return is to digitize and publish online. But a lack of access to both electricity and mobile connections in parts of the Global South render digital archives inaccessible, replicating what visual culture theorist Nicholas Mirzoeff argues defines colonial orders:"the right to look without being looked at."Kentaro Toyamo, writing about the effects of technology design, refers to this an as amplification effect – the existing power imbalances are not resolved, but amplified.

How can we instead use interaction design methods to return archives to their communities of origin? Letting the new archive-object act both as an interactive exhibition piece inviting engagement by communities that have limited access to and experience of technology, and as a repository for memories, interpretations and new inscriptions, filling in the original gaps of the Swedish archive: the Congolese viewpoint.

The project has been conducted through arts-based research in conjunction with a research-through-design process. RtD places emphasis on how the design processes, including material design and social relations, generate knowledge. Such knowledge generation includes not only how a technology will appear and function, but how it will be used and made meaningful. Research assistant Nadia Campo Woytuk devised a simple torch-run slide projector, and with that we arranged a first workshop in November 2019 in Matonge, Kinshasa, Congo DR. With the result of the workshop, the Ipad application Bukondoli was created in collaboration with Think Active Labs. The application works as a first iteration of a digital counter-archive object, where archival films and photographs can be displayed, and stories, memories, names and other information can be inscribed into the archive. The prototype was trialed during a trip to the source villages in Manyanga, Congo DR in October 2021. We held a series of Songa Kinkulu workshop with elders, and 5 open public screenings in the villages Mukimbungu, Kibunzi, Kanga Kibunzi, Kingoyi and Luozi.

Public Screening # 3
Place: Kibunzi, Congo Centrale, DR
Congo, 2021
Photographer: Cecilia Järdemar

Testing the prototype
torch projector during
public screening # 1
with Freddy Tsimba
Place: Matonge,
Kinshasa, DR Congo, 2020
Photographer: Cecilia
Järdemar
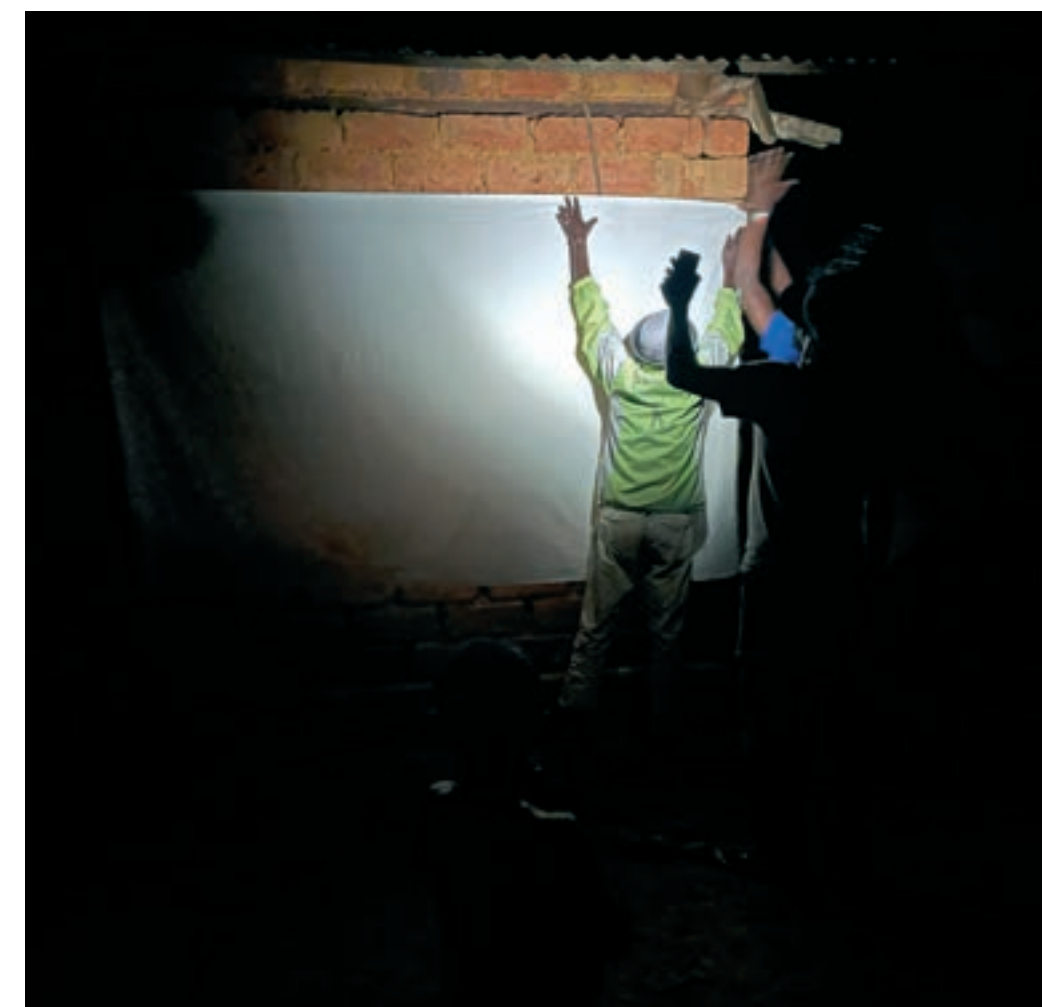
Preparing for public screening #
4 with Serge Lanyanga and Freddy
Tsimba
Place: Kanga Kibunzi, Congo
Centrale, DR Congo, 2021
Photographer: Cecilia Järdemar

NAVET

Projects 2019-2021

Partners	KTH Royal Institute of Technology
	KMH Royal College of Music
	Konstfack University of Arts, Crafts and Design
	SKH Stockholm University of the Arts
	Scenkonstmuseet – Swedish Museum of Performing Arts
	Tekniska – National Museum of Science and Technology

Projects 2019-2021	Biomenstrual
	Browser Chance Music
	Cold Works
	Cultural Rights of Public Access
	Designing the Sound of the Future
	Digital Bodies
	Experiencing Presence in a Time of Distance
	Fictitious Soundscapes
	Knitting Concrete
	Mixing and Matching the Luminous Color Palette
	Production Novellas
	Radio Sound Studio
	Transforming Practices
	Transforming the Colonial Archive

| Book curated by | Roberto Bresin |
| | Ludvig Elblaus |