Multi-Voicing Spatial Songs —How do we work with sound in space

This anthology is one outcome of *Voicing Spatial Songs*, an artistic research project hosted by RMC (Rhythmic Music Conservatory) conducted by Sharin and Louise Foo (aka SØSTR). Over the course of two years, we have shifted from writing and performing music in stereo to exploring a new spatial aesthetic.

We've been "going spatial", as Laurie Anderson and Dr. Edgar Choueiri put it in their 2021 article of that title. They argue that space in music creation (spatial audio) is emerging as an element we must learn to understand almost from scratch:

> *"The spatial 'color' has largely been missing from the composer's palette… It is as if the color red were always missing from the painter's palette for purely technical reasons … Consequently, all paintings in our museums lack a hue of red, and we have grown accustomed to this incongruence between nature and art."*
> Anderson & Choueiri

2 Karlheinz Stockhausen was among the first composers to explore spatial sound actively, beginning in the 1950s. In his 1972 lecture *Four Criteria of Electronic Music*, he argued that space is a composable dimension, as essential as pitch or timbre. His practice involved organising multiple independent sound layers that move through space, each with its own trajectory, texture, and timing – laying crucial groundwork for what is now expanding.

What is new today – and what lets us discover those "uses of the color red" – is the growing accessibility of spatial-sound technologies. Tools once confined to research labs or elite studios are reaching a wider range of artists and communities. And at the same time, no setup is truly "plug-and-play" and moving between speaker configurations often demands intricate adjustments.

As the title *Multi-Voicing Spatial Songs* suggests, this anthology explores the relationship between space and music – and does so through a multiplicity of approaches. In this context, "songs" are not confined to "short poems or lyrics set to music," but expands

into a much broader scope of approaches to sound, including practises within performing arts, sound art, popular music, artistic research and even astrophysics.

The word “voicing” carries a double meaning: musically, it refers to how harmony is constructed – how the same notes, arranged differently, can result in radically different sonic outcomes, so with “voicing” referring to method, approach, and process, we emphasise and celebrate the differences in artistic practice. The second meaning relates to voice as expression, agency, and opinion – reflecting on, and engaging in, dialogue about music and sound in relation to space, and the communities that emerge through those conversations. Our research has not only transformed our own practice in SØSTR, but has also sparked a curiosity to connect with others exploring spatial sound, since it has become clear to us that there are as many ways to work with spatial sound as there are practitioners.

We’re excited to bring together a wide range of voicings: strategies and approaches to spatial sound creation from eleven artistic practices (20 individual artists). The scope of our curation was shaped by the local spatial sound practices we encountered throughout our research, as well as by the availability of practitioners.

We find it both intriguing and thought-provoking that we can’t present the actual sounds discussed in this publication. The nature of many of these works – site-specific, immersive, multi-channel, or technically complex – make them difficult to document or share. This raises questions about how spatial sound can be preserved, communicated, and distributed in the future. What will the archive of spatial works look like? How might we imagine ways to share experiences that are inherently non-reducible to stereo or text?

Alongside the technical shift is a cultural one – in which we hope to see a growing emphasis on sharing ideas, methods, and conceptual approaches, not just final works. This spirit of openness, dialogue, and collective exploration is central to how spatial sound practices could be evolving.

We hope that this publication (and the Spatial Strategies deck) even without the sounds themselves, can activate your imagination – and perhaps inspire new inner sound worlds. Our aim is not only to document, but to invite further dialogue, exchange, and experimentation.

Enjoy the different voices!

Sharin & Louise (aka SØSTR)

DU—o;

Felia Gram-Hanssen og Jaleh Negari

Kinetic Score is an exhibition where we work with sound, performance and graphic scores. We are curious about how sound can function as a system of signs. Hanging from the ceiling, we install ink paintings and metal sculptures as scores– musical instructions that can be translated into sound and performance.

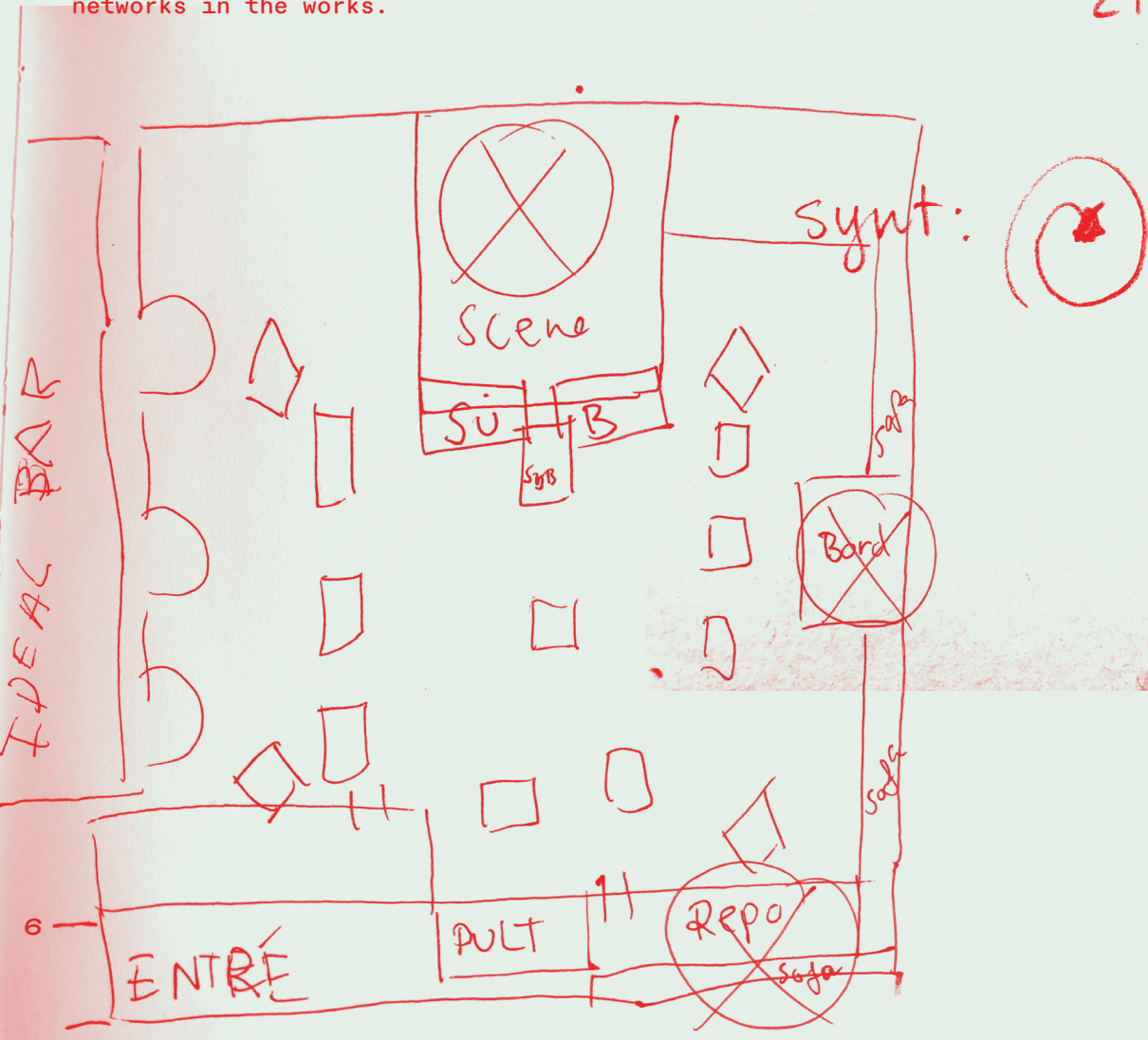
The signs have a clear graphic quality and convey information that leads to a series of translations from sculpture and sign to body and sound. We have 16 speakers playing a sound piece that forms the backdrop for a performance. We are inspired by the underground fungal root networks that connect trees with other organisms. This network is built on mutual exchange of nutrients and minerals across tree species and age.

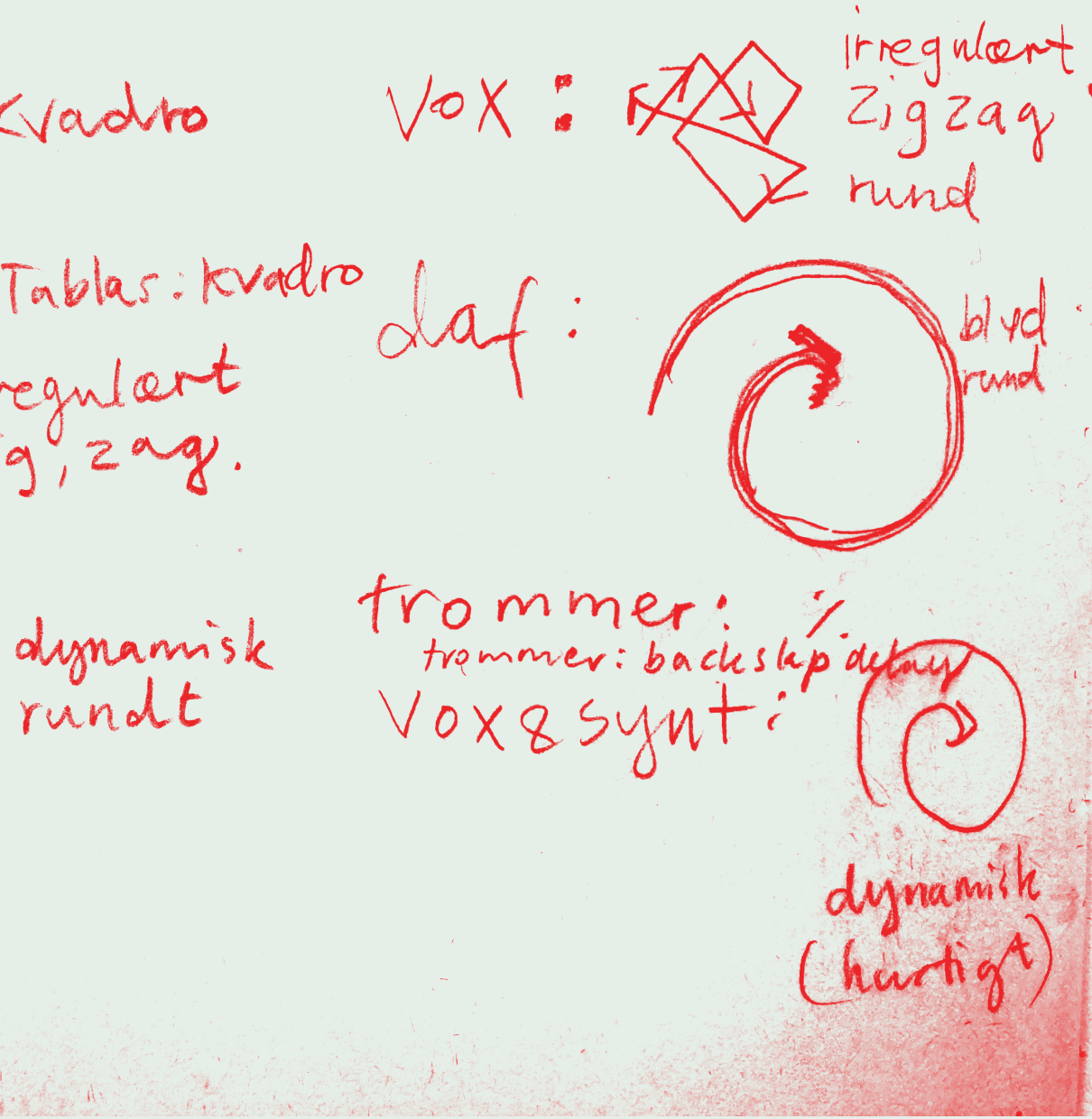
The vibrating metal sculptures, graphic elements and figures dictate choreographies, soundscapes and rhythms, which we carry out in performance and drumming. The scores are in constant motion, shifting and creating new readings in the space. The metal constructions and surfaces play a central role in the performative sequence, acting both in harmony and in contrast to the performer's movements and compositions.

Through this approach, we explore the score's potential as a transmitter and the performers

as part of the observing audience. We invite the audience to join in a shared reading of the work, which we translate into sound and movement. We investigate what happens when one element, by virtue of its energy, pushes another and sets it in motion.

The 45-minute sound piece fills the space from the 16 speakers. It consists of both produced music and everyday sounds in motion. The sound work helps to create a continuous pulse and direction in the performance and builds a bridge between the improvised reading of the space and the themes of fungal networks in the works.





Documentation 1. Work Overview: "Kinetic Score"
DU—o; Felia Gram-Hanssen and Jaleh Negari
Installation and performance.
Metal, 200 x 300 cm, 170x 170cm, spray paint.
Paintings, 132x 91cm, 91x 66 cm, 66 x 45 cm, ink and oil pastel on drafting film.
Immersive sound work, 45 minutes.
Vega Arts, Ideal Bar 2023
Documentation link: https://vimeo.com/901421403

Documentation 2.
Overview sketch of the floor plan at Vega Ideal Bar, with the placement of five metal sculptures, six double-sided paintings and three performance stages; 2x drum kits on the main stage, a percussion & vox setup on a floor carpet and a electronics & daf setup on a high table at the right side of the room


(blå)
Trummer 2
daf
Okta Track
(gul)
vox &
erkussion
setup
(grön)
yd pult

Jo Verwohlt

Jo Verwohlt is an astrophysicist and artist at DARK, Niels Bohr Institute, University of Copenhagen. Her research is on dark matter and galaxy formation in the early universe as well as in the local universe. She works with large-scale immersive installations that provide poetic and sensorial insight into challenging concepts and ideas at the frontier of astrophysical research.

$$c^2 dt^2 = c^2 dt^2 -$$

Documentation 1.
Special Relativity: Space Time.
Photo: Jo Verwohlt

Documentation 2.
Jo Verwohlt, Signe Heinfelt &
Mariam Gviniashvili, Evolution of
the Universe, Interference, Nikolaj
Kunsthal 2023.
Photo: David Stjernholm

$$- dx^2 - dy^2 - dz^2$$

This equation describes space-time in special relativity. The three spatial coordinates x, y, z – with time t introduced as the fourth dimension – are all connected by the speed of light. The speed of light is constant for all observers, meaning the speed of light remains unchanged regardless of the observer's motion. This description of the four dimensions shapes our understanding of the universe and our experience of it.

In 1905, Albert Einstein unified time and space - revolutionising our understanding of physics and the world we live in. He proposed that time and space are interconnected and form a single continuum; space-time. Time and space are no longer separate; they must be understood together. This challenges the idea of absolute time and simultaneity. With the theory of special relativity and the concept of space-time, causality becomes dependent on the observer, as the speed of light determines which events can influence each other.

This is very different from our intuitive, everyday understanding of time and space, and how we consider the past, present and future.

We typically perceive time as constant, flowing uniformly for everyone - but relativity reveals that time can stretch, and behave differently depending on the motion of the observer and the effects of gravity.

Where a sculpture exists in the spatial dimensions, music exists in time; it is transient. It cannot be experienced without the passing of time - it cannot be frozen. Once a note has been played, it's already in the past. Every sound is fleeting, momentary.

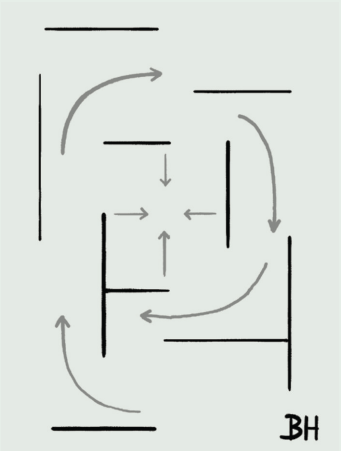
However, the way we experience sound in time exists not just in the singularity of a present event. The experience of sound is relative. Each note carries the memory of what came before and leads into what's next.

Music flows between past, present, and future, with each moment shaping the next.

Spatial sound allows us to explore all four dimensions by also considering a composition in location and direction. From our intuition of motion and the stream of time, and with our memory and anticipation of flow of music - spatial sound can form a playground for

Documentation 3.
Event Horizon panning diagram.
Sketch by Jo Verwohlt

Documentation 4.
8+1spatial sound installation.
Photo: Jo Verwohlt



experimenting with our experience of time and space. In an auditory space-time, we can create immersive and sensorial experiences that challenge our perception of time.

Human intuition is so strongly bound to the experience of space and time as they are part of the very structures through which we perceive the world. Spatial sound can explore ways for space-time to behave and evolve differently in e.g. a black hole or at relativistic velocities – events that are completely imperceptible and disconnected from ordinary human experience. These extreme conditions defy our intuitive grasp of time and space. Yet, through an exploration of spatial sound, we can evoke sensations of being immersed in an altered perception of time and space.

Reference.
1. Einstein, Albert. *Relativity: The Special and the General Theory*. Translated by Robert W. Lawson, Henry Holt and Company, 1920
2. Husserl, Edmund. *The Phenomenology of Internal Time-Consciousness*. Edited by Martin Heidegger, translated by James S. Churchill, Indiana University Press, 1964
3. Kant, Immanuel. *Critique of Pure Reason*. Translated by Norman Kemp Smith, St. Martin's Press, 1929
4. Kierkegaard, Søren. *Either/Or: A Fragment of Life*. Translated by David F. Swenson and Lillian Marvin Swenson, Princeton University Press, 1944


Lil
Lacy

Danish American Lil Lacy is a composer whose curiosity is at the center of her music. She works with the meeting of media and genres, focusing on the connectivity within music. Creating without the limitations of the classical structures, Lacy is also a performer, a singer and experimental cellist. This unique perspective offers her music a malleability to space. Lacy's music is born in the meeting with performers, audiences, and space. From installation to orchestra, she creates tailor-made universes, claiming the right to be heard. Lacy has composed for orchestra, choir, installations and electronics, and in collaboration with art films, theatre, visual arts and dance. Her curiosity allows her to move between worlds, bringing herself into each one, whilst absorbing a bit of them, each time. A reflection on our time and culture, Lil Lacy's music questions and inquires on who we were and where we are going, whilst dreaming of a better future. Her work deals with the big questions of her generation, human connectivity, society, our culture and heritage, climate change and nature.

Her first orchestral work *Aliento del Mar*, written for accordionist Bjarke Mogensen and Gävle Symphony Orchestra, is inspired by the movement of the tide, the push and pull of large forces. The music, as does nature, constantly transforms, from 'something that can barely be heard, to something that can barely be stopped again' (Arbetarbladet 2021). With her use of plastic bags, Lacy deepens the ocean sound, whilst highlighting the issue of plastic waste in our waters.

Lil Lacy studied composition at the Royal Academy of Music in Aarhus with Simon Steen-Andersen, Niels Rønsholdt, Bent Sørensen and Juliana Hodkinson. She also studied at the music department of Univerity of California San Diego with Anthony Davis, Mark Dresser, Katharina Rosenberger and Wilfrido Terrazas.

In 2020 she received the Léonie Sonning Talent Prize.

When working spatially in sound, I listen differently - this also invites a different path into my ideas for composing; how melodies, harmonies, and noises balance in a spatial atmosphere. How does a piece of music feel when sounds and impressions can come from all sides? The experience of sound changes enormously depending on, if it is coming from behind, the sides, above, below, or the front. The depth of material, communication, and therefore also information and layers in the music is rich in a different way and invites my brain and intuition to work, think, and feel differently than when I compose, mix, and imagine music and pieces in a stereo production or a physical concert format. This awareness is still quite new and I love to be able to explore the possibilities within imagining the pieces, composing them, recording them with new techniques, mixing and mastering them, and experiencing them in the end.

Documentation 1.
Frontpage. Photo by Lil Lacy

Documentation 2.
At the recording of 'Detached from Others' , Oct. 2024. Vor Frelser Kirke, Kbh, DK. Photo by Lil Lacy

Documentation 3. <—
Kammermusiksalen, Musikhuset, Aarhus, DK. At the pre-prorecording of 'you're somehow connected', June 2020. Photo by Lil Lacy

Documentation 5.
At the live-concert premiere of 'you're somehow connected', Oct. 2020. Symfonisk Sal, Musikhuset, Aarhus, DK. Photo by Lil Lacy

Documentation 4. <—
At the final spatial mix - where the dancer had to be present, to understand the hierachy and physicality of the body on stage together with the spatial sound, 'Detached from Others', Feb. 2025, Dansehallerne, Kbh, DK. Photo by Lil Lacy

Documentation 6.
The recording of 'you're somehow connected', Oct. 2020. Symfonisk Sal, Musikhuset, Aarhus DK.
Photo by Lil Lacy

Documentation 7.
The audiovusual multichannel performance of of 'you're somehow connected', August 2022. Kulturværftet, Elsinore, DK.
Photo by Rune Svenningsen

Documentation 8.
During the spatial mix production of 'Detached from Others', Jan. 2025. Husets Teater, Kbh, DK.
Photo by Jon R. Skulberg

I have shared images from the multichannel production of *'you're somehow connected'* a 76 min. experimental gesamtkunstwerk exploring dreams about the future between the real and the surreal across time, generations, and places (https://www.lillacy.dk/youre-somehow-connected). This is a piece I have been working on since 2020.
The piece has had many different formats:

1) An audiovisual live concert with acoustic music performed by accordion soloist, 14 musicians, and a conductor on stage, with 8+ speakers surrounding the audience, presented at Aarhus Festuge 2021.

2) An audiovisual multichannel performance with a staged smoke scenography presented in an abandoned shipyard at Kulturværftet, Elsinore, during CLICK-festival 2022.

3) A film and Dolby Atmos production of the piece premiered at Nordic Music Days in Glasgow, Scotland 2023. I am now working on an album release of the piece in 2026.

To work with a piece so deeply over such a long time is incredibly amazing. There are many layers of music, sounds, noise, and words in the piece, and they unfold differently in the different formats. Also to be able to explore the same music in different formats is a beautiful journey in learning about sound spatially - also in relation to where you are presenting and experiencing the actual production. Are you in a concert hall, an abandoned shipyard, a cinema, or inside your own head wearing headphones?

Furthermore, I have shared info about a new production "Detached from Others" (2025)

Documentation 9.
Detached from Others recording.
Vor Frelser Kirke. Photo by Lil Lacy

Documentation 10.
Detached from Others recording.
Vor Frelser Kirke. Photo by Lil Lacy

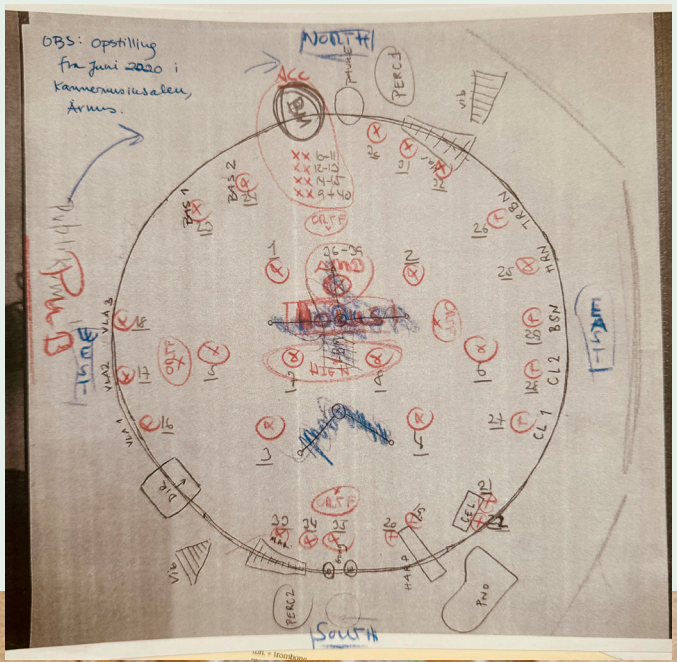
(https://www.lillacy.dk/detached-from-others) inspired by the experience of solitude, loneliness, and being alone. I composed 60 min. of solo organ music inspired by this theme. The piece was recorded in Vor Frelser Kirke in Copenhagen, Denmark by organ player David Bendix Nielsen, and sound producer Preben Iwan and Mette Due. We had structured the 16 microphones to be placed from far away (some pointing backward in the church), to extremely close to the instrument; inside the organ next to specific pipes and registers.

At some points in the composition, we had to record up to 14 layers of the piece (up to 224 tracks playing simultaneously). We mixed the piece into a multichannel production for the dance performance. We tried quite a lot of different methods of how to mix the many layers of the piece. Because of the complexity of the microphone set-up we had used while recording, the most interesting mix technique was actually to try to recreate the sounding space of the resonant church hall - so that we as the audience completely forgot that we were sitting in a black box in e.g. Dansehallerne.

The more I work with spatial sound, the more interested I get in creating the "natural" feeling - with a twist.

And also that I, when I compose, for an intended recording that should be mixed spatially, use this actively in the composition. When composing for "Detached from Others" I deliberately used the C side and the C# side[1] that an organ has in composing certain parts of the piece using whole tone scales.The results is a naturally experienced clear stereo left/right mix, that is very different compared to when experiencing a diatonic harmon-

1 https://organhistoricalsociety.org/OrganHistory/works/works05.htm



Documentation 11.
Pre-recording sketch
Photo and drawing by Lil lacy

Documentation 12.
Pre-recording test
Photo by Ida Skjerk

ic piece, or other scales/harmonies that are not based on the whole tone scale. Working in diatonic or other scales. You can also feel this sonic spatial change in the church hall, but because you as a listener sit further away from the organ, compared to some of the closer room microphones, the spatial experience of the stereo left/right mix of the whole tone scales caught on the recording.

I for sure become inspired to compose and research the material that I have as a sound source as e.g. the instruments I compose for differently, with a different awareness on spatial perception of the instrument in the space we listen and will record, when I know we will record and make a spatial sound production.

This way of listening has also inspired me when I compose for the orchestra; the orchestra is in it's own pure nature and size a spatial instrument as well. And this can, if used intentionally in the composition also be heard and experienced by the audience in the concert hall.

Also if I compose for e.g. singers or instruments that can move easily (such as brass ensembles), I am fascinated by how the source of the sound, the musician and instrument, can move around the audience as a part of the experience of the composition, orchestration and final experience of the piece for the view, ears, and perspective of the audience.

It is a very different discipline to work in spatial sound production and composition, than to work in more stereo-based sound productions and composition. One has to be very aware to not “overdo” or exploit the possibilities of movements within the spatial sound productions. It is easy to work beyond the human body and nature. Here I mean, that

Documentation 13.
Preparing the forest of microphones for the recording of 'you're somehow connected' in Symfonisk Sal, Musikhuset, Aarhus, DK.
Photo by Lil Lacy

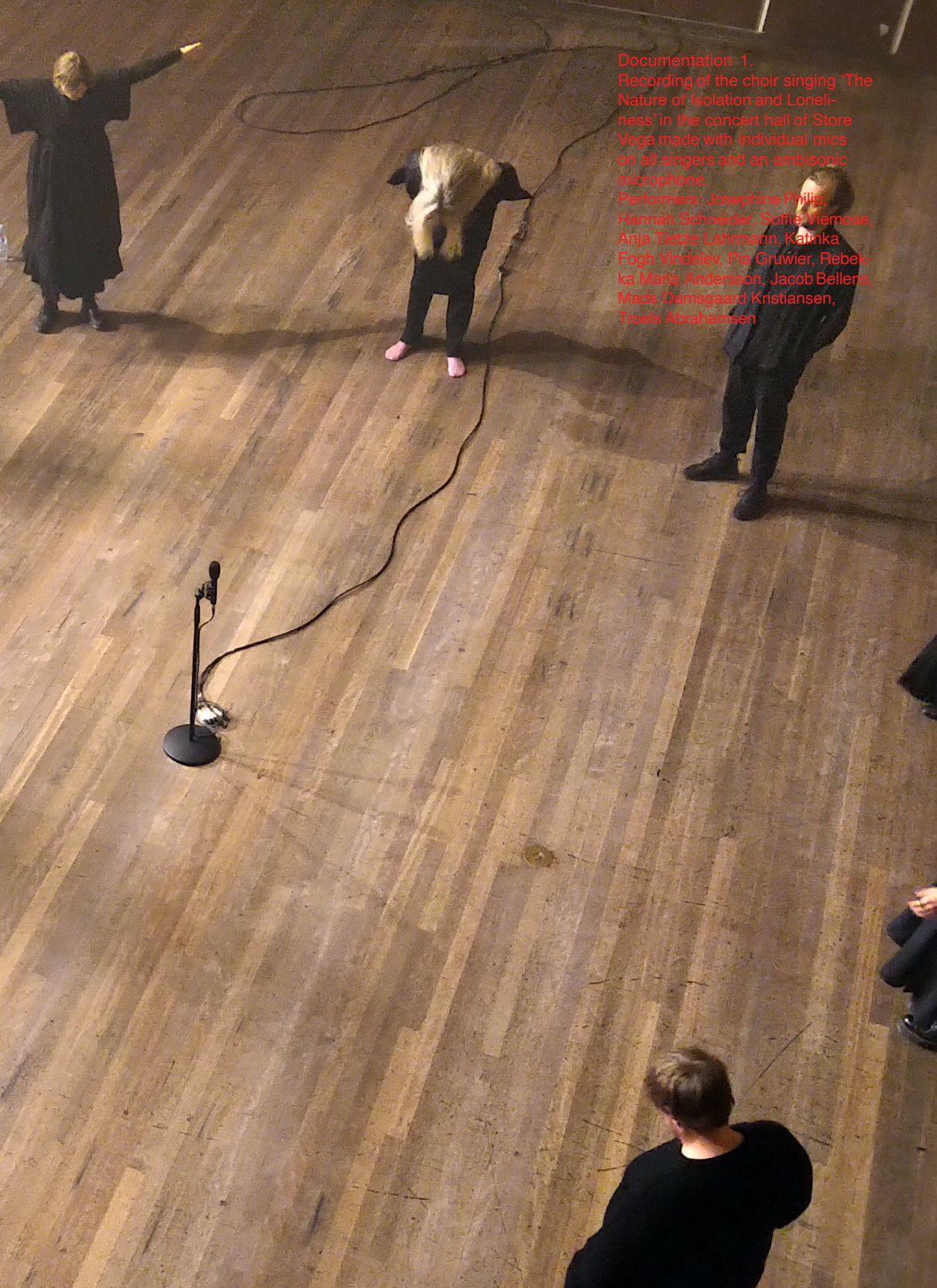
Documentation 14.
Mixing in the cinema for the premiere of the film and Dolby Atmos production of 'you're somehow ocnnected' in the CCA Cinema, Glasgow, Scotland, at the Nordic Music Days, 2024.
Photo by Lil Lacy

when I create music in spatial productions, then I always try to think of the position of the listener, and to create a sound world surrounding the listener, that will resonate with the experience of the physical presence in the space. So therefore not moving sounds faster or more hectic than the music, but also the experience of being a physical body in the specific resonating space, can bear or would feel was natural.

This is of course an estimate - and a very subjective one. Some pieces of music might not have this as a compass - but this is an important compass for me when working in spatial sound productions.

Philip | Schneider

The performance duo Philip | Schneider, consisting of Josephine Philip and Hannah Schneider, is an experimental duo with one foot rooted in music and the other in visual arts. With a common background in alternative pop/rock/electronic music, and an interest in the voice and its performative possibilities, they create spatial compositions, performance and sound works that engage both body, ears and mind. They work with the voice sculpturally and spatially, develop new performative collaborations, and experiment with its capacity and possibilities. Focusing on the texture of the individual voice and love for the harmony of the community, they explore interpersonal relationships.



Documentation 1.
Recording of the choir singing 'The Nature of Isolation and Loneliness' in the concert hall of Store Vega made with individual mics on all singers and an ambisonic microphone.
Performers: Josephine Philip, Hannah Schneider, Soffie Viemose, Anja Tietze Lahrmann, Katinka Fogh Vindelev, Pia Gruwier, Rebekka Maria Andersson, Jacob Bellens, Mads Damsgaard Kristiansen, Troels Abrahamsen

La la la la la // La la la la la

(The) Room is in your head
Your head is in the room

- Solitude……..

1.+2.v:
I could disappear
in between the notes
rest inside your ear
covered in the dark
I could raise my voice
like an avalanche
I could disappear
in between the notes

3. v:
Ride upon a breath
Carried by your song
Moulded like a vowel
Rising up for air
I could raise my voice
like an avalanche
I could disappear
in between the notes

We die alone
We die alone
We're born alone
We die alone

I have not been
As others were
I have not seen
As others saw
//:It was, it was
never again ://

The Nature of Isolation and Loneliness

Musik: Hannah Schneider/Josephine Philip
Tekst: Hannah Schneider/Josephine Philip/Hans Rosenström:

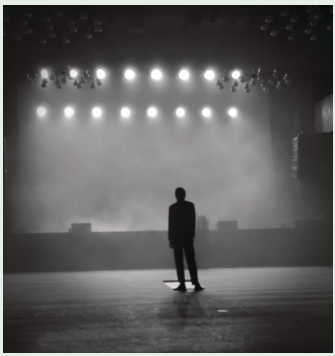
Documentation 2,3,4
Lyrics and score of the musical part of the piece.
Photo documentation of VR Performance for CPH DOX made at the theater Sort/Hvid in Kødbyen 2021 (Photo: Adam Jandrup).
Costumes by Henrik Vibskov.
Performers: Josephine Philip, Hannah Schneider, Soffie Viemose, Anja Tietze Lahrmann, Katinka Fogh Vindelev, Pia Gruwier, Lil Lacy, Jacob Bellens, Mads Damsgaard Kristiansen, Troels Abrahamsen

The Nature of Isolation and Loneliness (2019-2020) for 10 voices, is a performative study and manifestation of isolation and loneliness created by us and the Finnish installation artist Hans Rosenström. We thought it was an interesting piece to choose as we have worked with the material in so many different formats. In November 2020, the work was performed as a choral performance piece in Store Vega, as part of Vega Arts. In 2021 at CPH DOX the piece was transformed into a VR experience in collaboration with film director Andreas Kofoed. We also recorded the whole piece with individual microphones and an Ambisonic microphone and transformed it into an immersive sound installation for the group show 'Monstersuppe' at KØS (now MAPS - Museum of Art in Public Spaces).

The piece addresses the stigma of loneliness in a time engrossed in social media, self-staging, "likes" and virtual friends.

The work started in Stockholm in 2019, before anyone knew that there was something called Covid19, and without knowing how relevant this topic would become. In the light of the current situation, the boundaries between people changed its character - distanced in body, but connected in thought by a new common pandemic reality. When we performed the piece in Vega live for the first time we worked with the acoustic sound of the room and placing. The performers were taken down from the stage and placed in the audience who were laying down on the floor in darkness. We mapped the performers/singers in the physical room, making it an individual experience for the audience as the sound would change compared to where you were placed. In the VR format, the physical experience of the voices takes the feeling of loneliness and isolation

Documentation 5.
Store Vega, from rehearsal of 'The Nature of Isolation and Loneliness' Vega Arts 2020



Documentation 6.
In 2021at CPH DOX the piece was transformed into a VR experience in collaboration with film director Andreas Kofoed.
Photo: Adam Jandrup

Documentation 7.
Performance of 'The Nature of Isolation and Loneliness' 2020 at Store Vega (Vega Arts, 'The Great Reconnect')
photo: Nikolaj Bransholm

Documentation 8.
Press photo: Fryd Frydendahl

even further, but also enhances the sensation of human contact. The room is dark, a black box. In an island of light, the singers move in and out. As audience you alternate between being completely alone in the room to slowly be surrounded by the singers until they are almost too close - and then to be left again.

In the sound installation we wanted to create the feeling of being in the room with the performers, so each voice was mapped into one separate speaker in total ten speakers surrounding the audience.

We are interested in working with the individual voice and the sound of many voices together, enabling the audience to switch between these two different expressions. We felt that the musical composition called for different ways to unfold the piece, and the technical aspects of a live performance, a VR- and sound installation gave different perspectives of the piece adding to the theme.

Quiver

Oscar Friisgaard

Documentation 1:
Picture from inside MONOM. The towers shown in the picture are where the speakers are located. As shown, speakers are located in a grid-like structure, allowing for a very open interpretation of directionality and listening position

Oscar Friisgaard, working under the alias Quiver is a composer, with a masters degree in Music Creation [RMC, Copenhagen], specialising in spatial sound. His work is centered around a dynamic listening experience where time, space, and sound merge, inviting listeners into auditory realms that challenge their perceptions of sound.

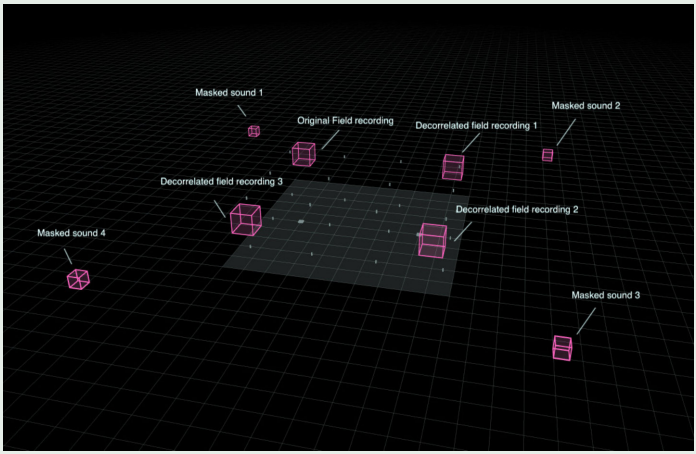
His work has led him to collaborate with renowned spatial audio institutions like MONOM (Berlin) and ZiMMT (Leipzig), while also presenting original spatial audio sound works in Copenhagen via his own concert project GAZE. He is also working as an intern with XTREME at the IT university in Copenhagen, a Horizon Europe funded project, researching multichannel audio, and mixed reality concert solutions.

Nothing Where Something Should Be (2023)

In fall 2023, I created the spatial sound work *'Nothing Where Something Should be'*. The sound work was developed through residencies MONOM in Berlin (48.9-channel system) and ZiMMT in Leipzig (32.2-channel dome). The creative process, was driven by an interest into liminal spaces - spaces that are transitional in nature, or invoke the sense of being in between - and how the emotional responses tied to such spaces, could be transcribed into a Spatial Audio experience. During the project I composed with 4DSOUND's object-based spatialisation software, using the same compositional material across various speaker systems.

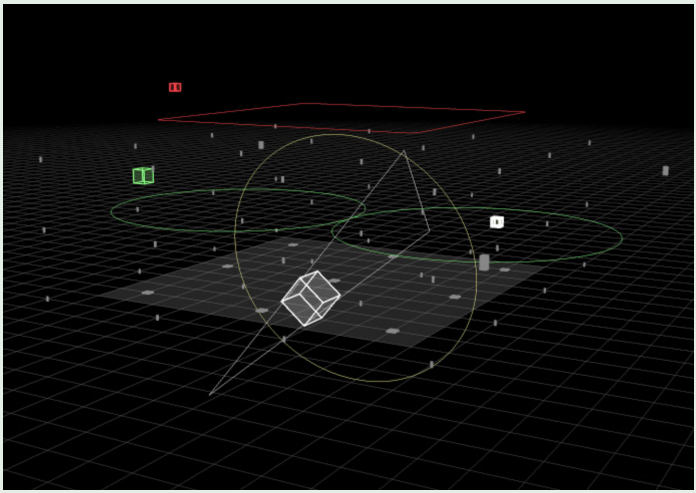
The 4DSOUND software allows you to move sound sources within a virtual soundfield. This allows for richer spatial sound design - sources can have attributes like shape, size, and trajectory, multichannel reverb and can be placed virtually outside the speaker array. This offers deep control over how a sound's character is shaped in space and introduces a new logic of spatial thinking.

The sound work was built around field recordings captured from abandoned spaces in Berlin. One method for composing, was sonically rebuilding these spaces through ambience recordings, within the speaker systems. This was done by decorrelating longer field recordings, and placing them at varying points in space. By decorrelating one field recording (meaning starting the same field recording from various points in time), you can use the same recording to recreate a sense of the recorded space, without having any audible phase issues.

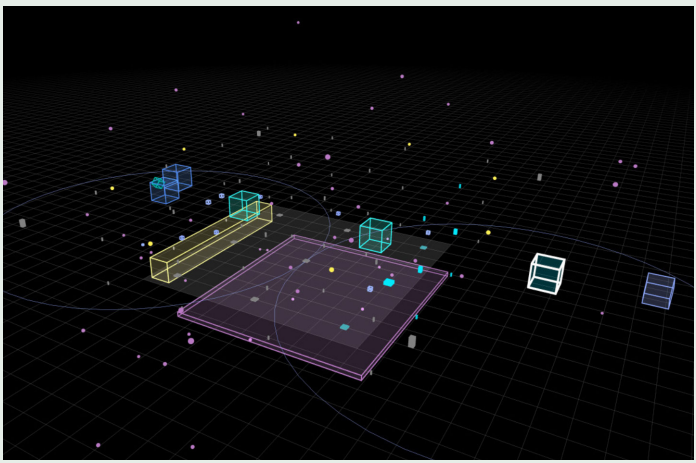


Composition 1.
Snapshot from inside 4DSOUND software, with soloed sources, showing examples of how to pan decorrelated field recordings and masked sounds. The masked sounds are panned to sound like they are coming from outside the physical boundaries of the speaker system, thereby affecting perceptual parameters such as volume and presence of higher frequencies.

The red squares showcase sources, where the grey objects showcase speaker positions



Composition 2.
Example of 4 different sources with different trajectories inside 4D.SOUND. The line marks the trajectory of the source (square)



Composition 3.
Example of more complex composition inside 4DSOUND

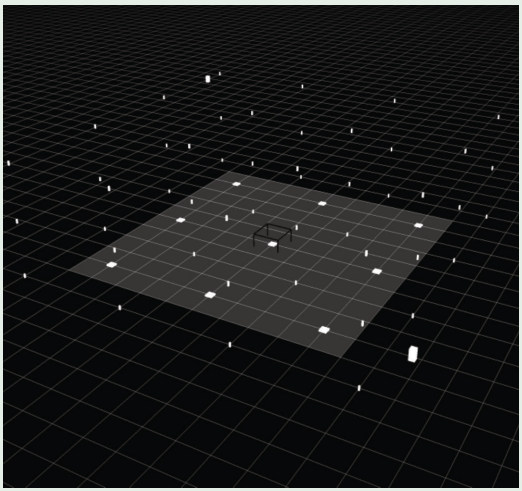
Through this technique, I created a scenery for the listener to be immersed in. I also worked with hiding sounds in the periphery of the space, and masking them into the scenery. This created a more subconscious experience of sound sources - ghostly figures that were not quite present, but were lingering in the outskirts of the perceived space. To contrast these soundspaces, I composed more abrupt and deconstructed sections. The method was sending smaller bits of audio to different source objects with unsynchronized trajectories in space. This allowed for a compositional interplay between sound, pauses in between them, the loudness of the soundbite, and the trajectories of the sources.

In Nothing Where Something Should Be, I worked across two contrasting speaker configurations. MONOM's setup places speakers within the audience, allowing sound to inhabit the center of the space. This eliminates a fixed "sweet spot" and invites open interpretations of direction and listener position. ZiMMT, by contrast, uses a 32-channel dome-shaped array focused on a central point, creating a defined "sweet spot". Rather than replicating MONOM's layout, I rethought the piece's spatiality to suit the distinct architecture.

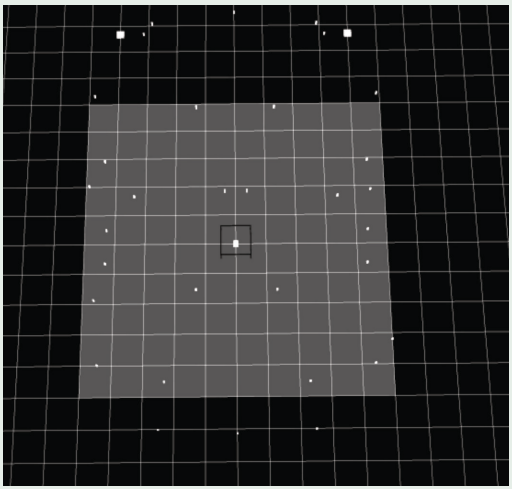
At MONOM, I encouraged the audience to move freely, exploring the composition from multiple angles. This fluid approach didn't have the same effect at ZiMMT, where I opted for a fixed chair setup at the center. The result was a more introspective, less interactive listening experience.

I realised that designing how the audience listens is as important as the spatial sound itself. Free movement offers agency, but can

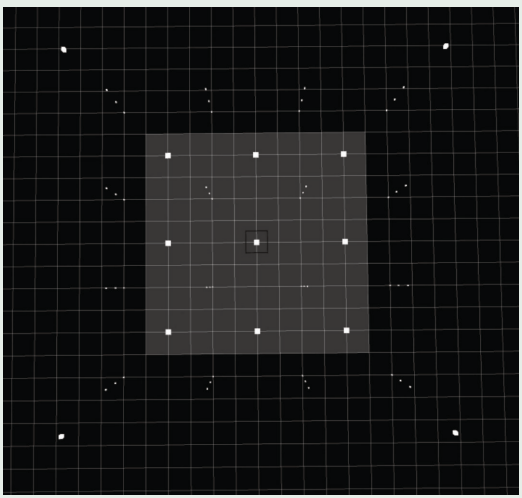
Architecture 1.1:
Showcasing MONOM as seen from the side inside 4DSOUND software. The greygrey objects show speaker positions. Bigger squares near the base show subwoofer position



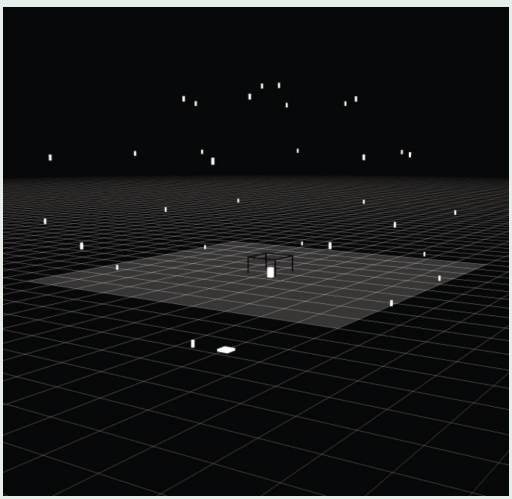
Architecture 2.1:
Showcasing ZiMMT as seen from the side inside 4DSOUND software. The greygrey objects show speaker positions. Bigger squares near the base show subwoofer position



Architecture 1.2:
Showcasing MONOM as seen from the above inside 4DSOUND software. The greygrey objects show speaker positions. Bigger squares near the base show subwoofer position



Architecture 2.2:
Showcasing ZiMMT as seen from the above inside 4DSOUND software. The greygrey objects show speaker positions. Bigger squares near the base show subwoofer position



also overwhelm; a fixed position intensifies the experience, but becomes less interactive. In my view, listener placement is not just practical - it's compositional.

'Nothing Where Something Should Be', was built from a foundation of field recordings I captured at abandoned spaces around Berlin. The compositions delved into the unique sensation of being in-between, channeling the haunted state, and mystique, of these abandoned spaces. The compositional strategies I described earlier, were developed to create this feeling of in-between-ness, by both having sound that was 'almost' present, hidden in a scenery, and by mixing real world sound with digital and spatial effects.

Aligned with my theme of in-between-ness, I wanted the sources to feel both familiar and unknown (organic yet unidentifiable, like an outline of their sonic origin). Though abstract, spatialising them (especially placing them directly in front of the listener at MONOM), gave them a tangible, character-like presence. This was made possible by 4DSOUND's ability to apply real-world acoustic behaviors to abstract sounds, mimicking how we perceive sound in physical space. That, to me, is the strength of object-based software.

The two compositional elements that I described earlier - the soundscape and the sudden sonic outbursts - create distinct listening modes. The soundscape fosters a more diffuse, immersive listening, where the whole experience takes precedence over individual sounds. In contrast, sonic outbursts demand immediate attention, anchoring the listener and heightening their sensitivity to sound.

By combining both approaches, I created a dynamic listening experience that moved

between immersion and focus, engaging the listener through shifting levels of listening attention.

When I work with Spatial Audio, I find that my compositional elements and sound-design, become naturally extended in space. And I don't experience the medium being especially limiting to my creative output.

However, composing with spatial sound does present challenges. Our perception of sound has limits. Too many moving elements in a dense soundscape can blur together making the spatiality feel less distinct. While this might be a creative choice, it can lead to the spatiality being more confusing for the listener, or even perceiving something as dynamically static even though it involves a lot of spatial movements - Like in mixing, "if everything is stereo, nothing is." I've realised that spatial audio isn't just about movement; thoughtful placement, contrast and empty space, can be more effective than constant motion.

Also, unique speaker configurations add another layer of complexity. Specific systems shape the composition, making it difficult to translate pieces across setups without altering the experience. While this might be an annoyance, I see this as part of the medium's poetic nature - The musical experience is deeply anchored in a physical encounter with the music in a certain setting.

Each system comes with its own "bias", much like a bandmate with unique strengths that influence how you compose. I find that getting into that logic, and realising that there are both limits and also unique qualities to every system, has helped me frame the

way I approach composing for a new system. My hopes for the future of Spatial Audio, is that its use as a creative medium and compositional framework will be more pronounced.

With more mainstream venues investing in multichannel systems, I think a broader audience will begin to interact with spatial audio, normalising the experience and opening doors for new productions. My apparel to the same venues is to understand that fully utilising spatial audio systems, requires time, building a compositional/performance framework when using them, and using them as premise of the production (and not just as a quick add-on to a concert production, or a smart way to sell more concert tickets by listing concerts as 'immersive'). That is where you fully harness the power of spatial audio, and create new listening experiences - Which means that they should give artists the possibility to do so.

Furthermore, I think that accessing the capabilities of spatial sound will be made easier, shaped by more intuitive software that produces more immediate artistic results. Just as experiencing spatial sound doesn't have to require an academic background (the experience itself is inherently human - listening in three dimensions is what we do naturally), neither should its production.

In my view, creating a spatial experience should be about trial and error - experimenting, adjusting, and understanding how spatial choices shape the listening experience, not necessarily understanding every academic or technical aspect of it.

Documentation 2.
Listening position at ZiMMT,
showcasing a fixed chair position
during the presentation of ‘Nothing
Where Something Should Be’

Sitrekin

Kirstine Stubbe Teglbjærg

Sitrekin is the new project from Danish singer, producer, and songwriter Kirstine Stubbe Teglbjærg, best known as founding member, lead singer, and songwriter of the award-winning Blue Foundation. She is the voice behind the multimillion-streamed song "Eyes on Fire," featured on the US Grammy-nominated soundtrack for the first *Twilight* film.

Sitrekin launched in 2021 with the debut single "Open Chest," which reached number one on Danish National Radio. In September 2023, Sitrekin inaugurated VEGA's immersive sound system with the opening concert of their immersive series at Ideal Bar, and also performed an immersive concert at the Sonic Days festival at Sonic College in Kolding. Her live shows blend songs from her full career, reimagining Blue Foundation classics alongside her new Sitrekin material.

Documentation 1.
Sitrekin listening to Dyre Gormsens Dolby Atmos mix of her song “Open Chest” at Black Tornado in Copenhagen

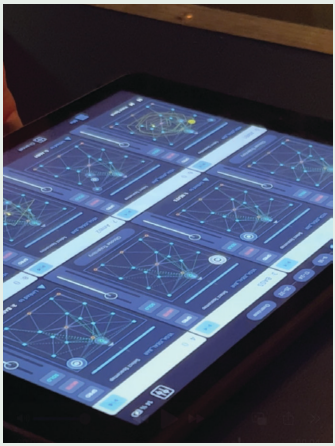
In July 2024, she performed with British DJ Michael Bibi at London's largest-ever electronic music event, playing for 45,000 people. In April 2025, she staged a special performance in Berlin with a choir of 60 young singers. Sitrekin is now on a live hiatus, focusing fully on recording her debut Sitrekin album, to be released in both stereo and Dolby Atmos.

Alongside her creative work, Kirstine co-founded and served as co-CEO of the award-winning concert concept and record label HUN SOLO (2016-2023), promoting greater diversity in the Danish music scene.

My debut single with my new project Sitrekin "Open Chest" was among the first songs ever released in Apple's Spatial Audio format (Dolby Atmos) in July 2021. Mastering engineer Dyre Gormsen mixed the track in Dolby Atmos at Eastcote Mastering in London. During the Covid-19 lockdowns, Dyre had begun building a Dolby Atmos studio and experimenting with spatial mixing. While mixing the stereo version of "Open Chest," he asked if he could also create an Atmos mix. It turned out so well that Dolby selected it to demonstrate the new Spatial Audio format at their London press event in 2021.

SPATIAL SONGWRITING, PRODUCTION AND MIXING: Hearing my music in Dolby Atmos for the first time was a revelation. It was as if everything fell into its right place. The mix was so close to what I had been imagining - it just sounded right! In my music and productions, I work a lot with depth, width, and movement, and - looking back - it seems as if I have always been trying to create a spatial experience within the stereo format. So

Documentation 2.
Mixing in Spacemap Go at Ideal Bar, VEGA in Copenhagen



Documentation 4.
Sitrekin preparing the live set for her immersive concert at Ideal Bar

Documentation 3.
Mastering engineer Dyre Gormsen mixing in his Dolby Atmos studio at Eastcote Mastering in London

it was very satisfying and natural for me to move my music from stereo to Dolby Atmos.

Since then, I've committed to releasing all my music in both stereo and Dolby Atmos. To date, I've released four tracks in both stereo and Atmos: "Open Chest," "Eyes on Fire Remake," "Water Me," and "As I Moved On." For each, I send my stereo files and a rough premix to Dyre, who mixes in both formats. Interestingly, the final stereo mix often only truly comes together after completing the Atmos mix.


JOMFRU
HOUFJELDSSOL

Documentation 5. <—
Sitrekin's band Henrik Sundh and Sara Lewis Sørensen rehearsing for the immersive concert in Ideal Bar VEGA

Documentation 6.
Artist talk about spatial audio at Ideal Bar VEGA

When possible, I review Dyre's mixes remotely with headphones, or I visit Black Tornado Studio in Copenhagen, which has a certified Dolby Atmos setup.

Working in Atmos has made me even more conscious of layering, panning, using delay and automation. Recently, I've worked with a large choir, which I think would sound amazing in spatial audio.

Dyre intuitively understands my musical vision, elevating my productions both in stereo and in Atmos.

SPATIAL LIVE/CONCERT PRODUCTION:
When preparing for my opening concert for VEGA's immersive series at Ideal Bar in 2023, we held a three-day workshop and sound design session at the venue to get hands-on experience with the immersive sound system.

The participants were: My band (Henrik Sundh and Sara Lewis Sørensen), sound engineers (Dyre Gormsen and Bjørn Winnem), and I. At the actual concert, we worked with four different formats: mono, stereo, immersive sound design using Spacemap Go, and full Dolby Atmos combined with Spacemap Go live mixing.

One highlight was a "mono moment" where I played a tiny music box miked-up with no effects. It was a stark contrast after a loud, detailed, immersive track. The room suddenly stood still, and all you could hear was this small, metallic and quirky melody. Gradually, we added reverb and delay, moving the sound into stereo, and then expanded it out into the full room using the 18 speakers – like a thousand "Tinkerbells" surrounding the audience.

We played with contrasts throughout the concert to keep the audience engaged and aware of the different sound formats.

During the workshop - where we did a lot of trial and error - we found that the kick and the bass worked best kept centered and grounded. We kept the vocals quite dry and upfront in the middle, but with a long reverb and delay tail moving through the room and all the way back behind the audience and around in a circle. The brighter frequencies of the beats, as well as synths and guitar effects, were allowed to move, creating swirling, dynamic textures.

Dyre and Bjørn made it possible to also play full Dolby Atmos mixes at Ideal Bar, so three of my songs at the concert had Dolby Atmos backing tracks playing together with live vocals, guitar, and synths, mixed live in Spacemap Go. This created a truly immersive experience.

Our goal was to create a live concert that felt dynamic, natural, and sonically inspiring – wherever you stood in the room. Because my music is a hybrid of songwriting and sound design, it was important to balance a genuine concert feel with the more experimental, immersive possibilities of spatial audio.

Artistically, working with immersive sound has been incredible inspiring. But practically, it takes effort to build a live set that really explores spatial possibilities while at the same time gives the audience a genuine live concert experience.

One challenge is that audiences need room to move around for the full immersive effect,

Documentation 7.
Sitrekin and Bjørn Winnem working in Spacemap Go at the 3 day workshop at Ideal Bar VEGA preparing Sitrekin's immersive concert

Documentation 8.
Screenshot from Ableton Live mix to Spacemap Go for Sitrekin's Immersive concert at Ideal Bar VEGA

which limits ticket sales – and that is an economic challenge for the format.
I also believe spatial sound has a huge potential in cars – the cabin size is perfect for the immersive experience. I love listening to music in the car and can't imagine anything better than a spatial mix filling that space.

Beyond that, I hope and expect to see more concert venues offering immersive live shows, and I believe immersive sound also holds potential for healing and therapy.

Documentation 9.
Dyre Gormsen and Sitrekin talking about the Dolby Atmos mix of Open Chest in Black Tornado

Sofie Birch

Documentation 1.
Photo taken by mysterious and naked photographer Chloë Sassi during Terra Forma Festival in 2022

Sofie Birch is an ambient multi-instrumentalist, vocalist, and sound magician whose music bridges the seen and unknown realms.

Her compositions unfold like dreamscapes, inviting deep introspection and connection with the subconscious. With a profound understanding of sound as a transformative essence, she improvises immersive, meditative performances that lead listeners into altered states of awareness. Her work is an intricate web of electronic textures, acoustic instruments, field recordings, and the embrace of her voice, creating harmonious yet layered musical landscapes. Sofie's live performances are more than concerts – they are ritualistic journeys, often accompanied by scenographic elements and costumes that merge sound and space into a holistic, sensory experience.

In 2022, she released Holotropica, a solo album resonating with healing frequencies and deep organic flow, and Languoria, a collaboration with Polish vocalist Antonina Nowacka which explores the liminal space between voice and silence. Both albums received widespread international acclaim.

Sofie has performed at renowned festivals such as CTM, CPH:DOX, and Unsound, and in venues like The Barbican and King's Place with Laura Misch. Her work extends beyond the stage, finding its way into award-winning art installations, animated films, and sonic environments. Beyond Sofie's recordings and performances lies a deep reverence for sound and vibration as healing forces. She is a certified sound healer through Amsterdam-based Stacey Griffin and has facilitated immersive sound ceremonies, including collaborations with sound practitioner Rosángela Acosta at Shamballa Space in Copenhagen.

From producer to co-producer, Sofie infused Otooto's 2024 album, 2nd Quake, with

her instinctual direction. Her ability to mix rich sonic soundscapes stems from a fusion of technical expertise, self-taught exploration, and a formal education in sound design from Sonic College at University College South, Denmark. She also curates Ambient Abracadabra, a monthly sonic exploration aired on NTS Radio, offering listeners a gateway into ethereal, liminal soundscapes. In 2024, she performed at Casa Montjuïc in Barcelona, the Intonal Festival, and the Munch Museet in Oslo alongside Alabaster DePlume. Sofie aims to continue expanding her aural universe of sound and spirit into the collective.

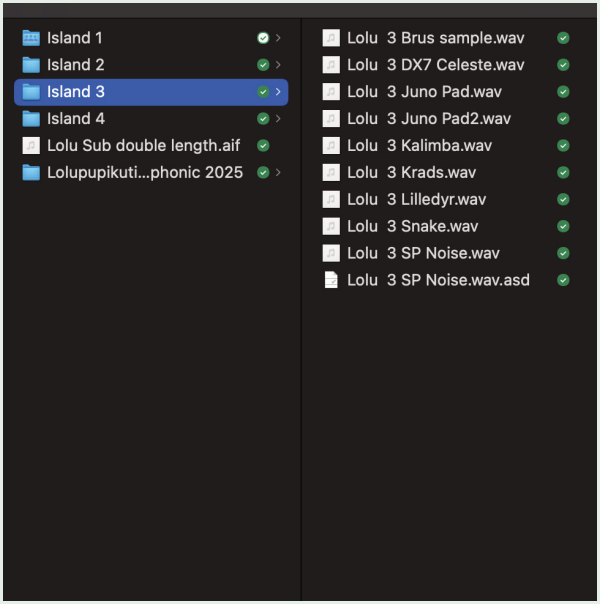
Documentation 2.
From improvised live performance for Elektron Super Sekvens showcase at Intonal Festival 2024, taken by Camilla Rehnstrand

Reference.
'Lolupupi Kutiku' By Sofie Birch, 19.12min, 2022
32 channels mixed by Sofie Birch & Alfred Bundgaard
ATMOS for 7.1channels mixed by Sofie Birch & Phil Rochefort
Originally created with support from Strøm Festival

’Lolupupi Kutiku’ is a land of invisible forests of crackling plants, humid melodies and cooing flowers that lull you into a silky, mysterious trance.

‘Lolupupi Kutiku’ asks you to ask yourself: *What is inside you if you really listen?* Can you visit nature, from right here where you are, just by closing your eyes and listening to the puzzle of your organs, the wind of your breathing and the rushing waves of your blood? Can you abolish the boundaries between nature, the city and the body and rediscover yourself in a greater whole?

The work intertwines nature recordings, synth and sound therapy instruments distributed over 32 loudspeakers and is an experiment to create a contemplative public space that embalms the busy spirit and incites work strikes and meditation orders. Namaste.



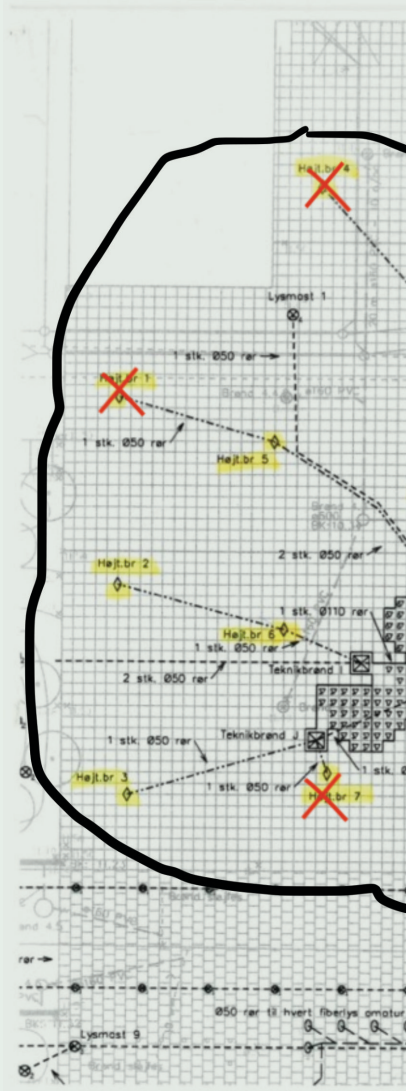
Documentation 3.
Screenshot of one of the folders marking “an island” with different sounds from my own sound archive

I created the whole piece as an idea of the space without having experienced the actual space, so i worked kind of blind folded with the idea of the space in the process. I thought a lot about the distance between the speakers, and knew that a lot of sound would sound like lesser sound in such a big space outside. So on purpose I made a rich sound palette in my stereo mix in ableton. I created 32 channels that all played at the same time more or less, so mixing this was rather chaotic for a stereo picture. For this reason i got inspired to make 4 “islands” of sound, so four groups with each 8 mono channels.

Each island had its own mood but in full perspective all sounds were working together and played in same key. Important for each island was to have something melodic, something high freq/noise/rattling, something nature like/ birds/water and something atmospheric. A constant work with zooming in and out of the islands. Making sure everything happened all at once but still make sure to have space, like a breathing organ, like waves and movements. I wanted to create a land. Something breathing alive, dense and yet see-through.

Later i exhibited the piece in montreal during Mutek Festival, and we mixed the piece for a very small space, in collab with Phil Rocheford. Here we thought about making the sounds move around the audience, and we added more sub frequencies to the experience.

I never got to experience this in person at the museum, only through an online spartial mix software across the atlantic. More like visual objects moving on the screen and me being aware of the constant experience with something breathing, alive, high freq rattling and melodic. The piece is very static in a way and in that way hypnotic. On purpose a hypnotic trance experience with organic sounds, like the description says: forcing the listener to be still, be non-moving. In May the piece will be exhibited again in a new version for Tetra Sonus in Berlin. In this version i have cutt out density in the mix and worked on a version with more stillness. Like a light quadraphonic version with more space for the physical room to be present. I want it to be a lighter experience for the meditating audience. I cut out the melodic channels to create less confusion about the musical composition.



Documentation 4.
Map over Solbjerg Plads with the 32 speakers/well, decided into islands

Documentation 5.
Photo from workshop on Slowness with Laura Misch at Ideal Bar march 2025. By El Hardwick. Here the participants are receiving a guided sound story around the alter. Amazing morning where other musicians shared their experience with electronic music, tour life and burn outs in a very vulnerable shared space

Documentation 6. —>
Photo from home studio taken by Ulrik Nørgaard for an interview for AM Clean Sound in 2022. I love little colorful spaces to work from <3

Documentation 7.
Photo by Camilla Rehstrand for a live show at Dream Music in Malmø in 2022

Originally I was invited by Strøm Festival to create a multichannel experience for 32 speakers in Lydbrøndene Frederiksberg.

I worked with the idea of creating a sonic experience relating to my experience with acoustic sound baths. I am a trained sound therapist from Stacey Griffin in Amsterdam and learned to create healing spaces with sound from gongs, rattles and crystal bowls on her course. This knowledge and passion inspired me to create a public space that would force the busy people to stop and meditate on their way to work:)))

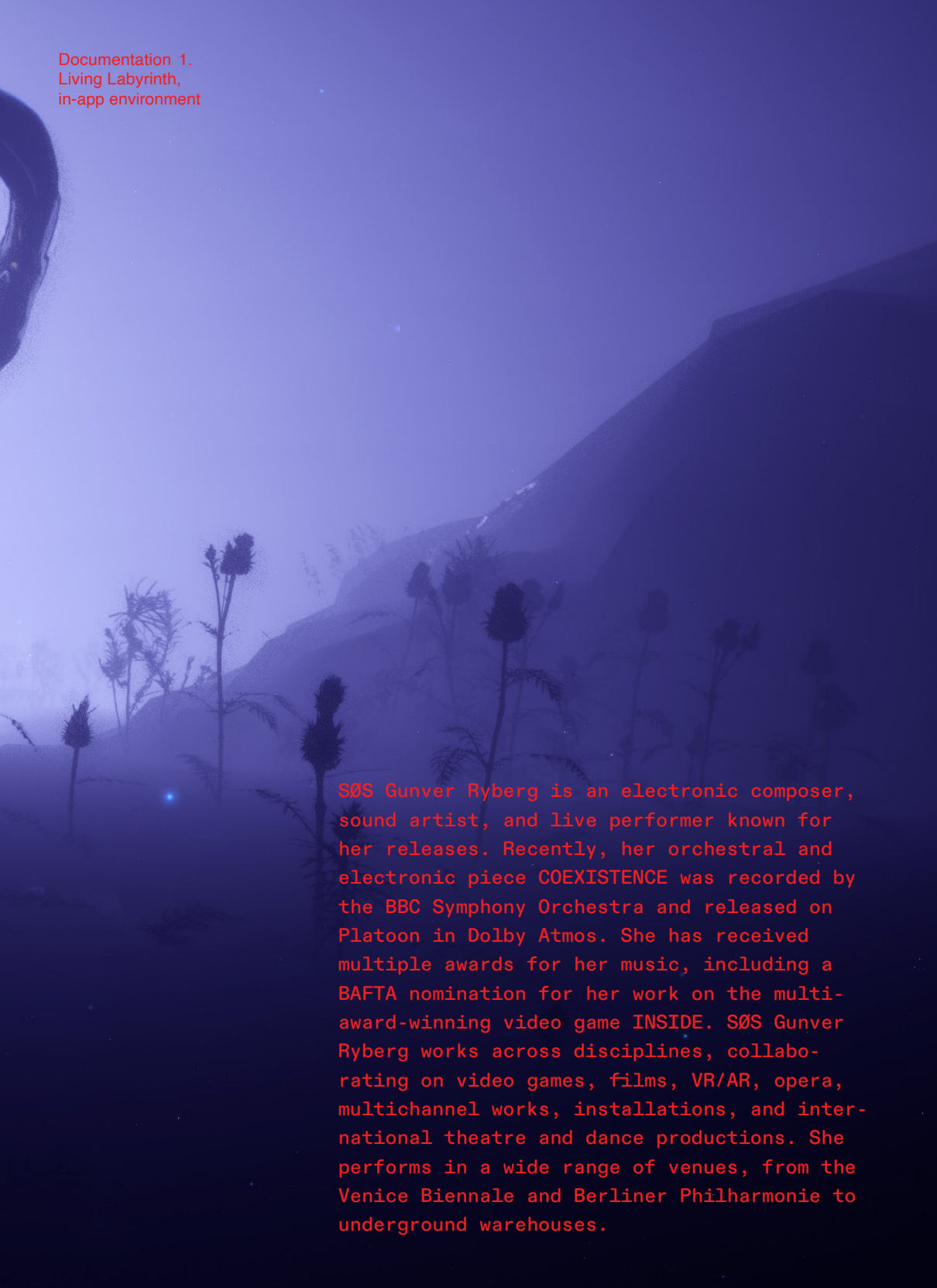
Working with electronic sound and music my whole life gets me into some kind of exhaustion around gear and technical setups. I feel

limited in general about technique and the fact that my visions and sounds always have to go through this complicated setup of cables and speakers.

In the same way i am kind of tired when working with very complex spatial setups with uncountable channels, positions and software to accommodate my dreams. I somehow feel trapped, i feel trapped in general by the multiple options the internet, the phone and the computer offers me. We struggle so hard to mirror our reality, to re-create our physical spaces into something we created ourselves, and I can't help at this point in my life, longing back to more acoustic experiences like fx a church. I am fascinated and motivated by how they are built to carry the sound naturally around the space. How the windows are placed to catch the light in a certain way and how the object inside are placed to work in collaboration with waves. Frequencies. Energies. This is what interests me at the moment. I am curious to see how we can, in all levels of our society right now, re-engage nature with science, acoustic with technique.

Documentation 8. —>
From improvised live performance for Elektron Super Sekvens showcase at Intonal Festival 2024, taken by Camilla Rehnstrand


SØS Gunver
Ryberg



Documentation 1.
Living Labyrinth,
in-app environment

SØS Gunver Ryberg is an electronic composer, sound artist, and live performer known for her releases. Recently, her orchestral and electronic piece COEXISTENCE was recorded by the BBC Symphony Orchestra and released on Platoon in Dolby Atmos. She has received multiple awards for her music, including a BAFTA nomination for her work on the multi-award-winning video game INSIDE. SØS Gunver Ryberg works across disciplines, collaborating on video games, films, VR/AR, opera, multichannel works, installations, and international theatre and dance productions. She performs in a wide range of venues, from the Venice Biennale and Berliner Philharmonie to underground warehouses.

Living Labyrinth is a cross-platform app where a player explores different 3D worlds. It's an interactive experience in which the player navigates a virtual environment, and the music dynamically modulates based on their location. The accompanying documentation comes from *Unreal Engine*, showing selected audio zones, represented as yellow/orange spheres. Also included is a sketch from my creative process, mapping out the distribution of sounds in one of the worlds.

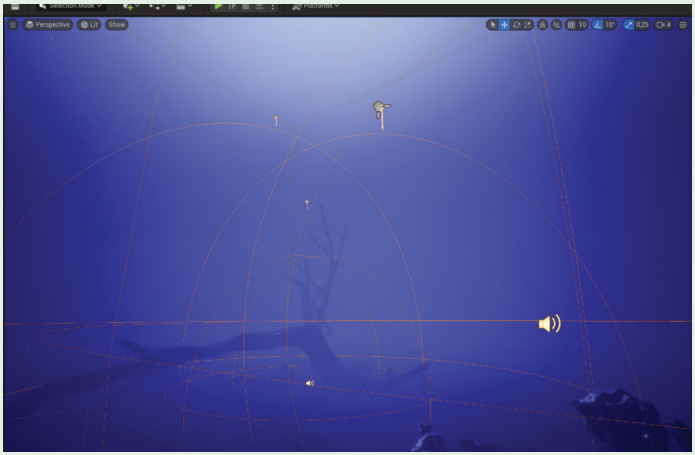
In projects like *Living Labyrinth*, I integrate audio with 3D environments using game engines such as *Unreal Engine*, assigning specific spatial coordinates for audio triggers. This allows the music to evolve dynamically in response to the listener's movement, creating a non-linear, interactive experience. Concept, Music Integration, Build & Development : SØS Gunver Ryberg. Art & Animation: Ida Lissner. Supported by the Danish Arts Council.

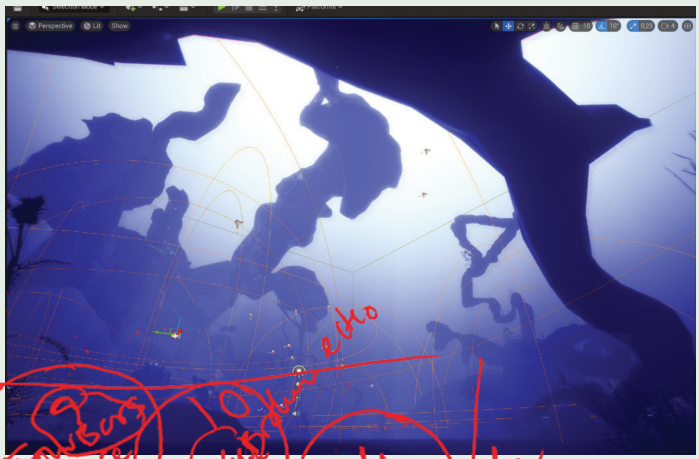
Documentation 2.
In-app environment

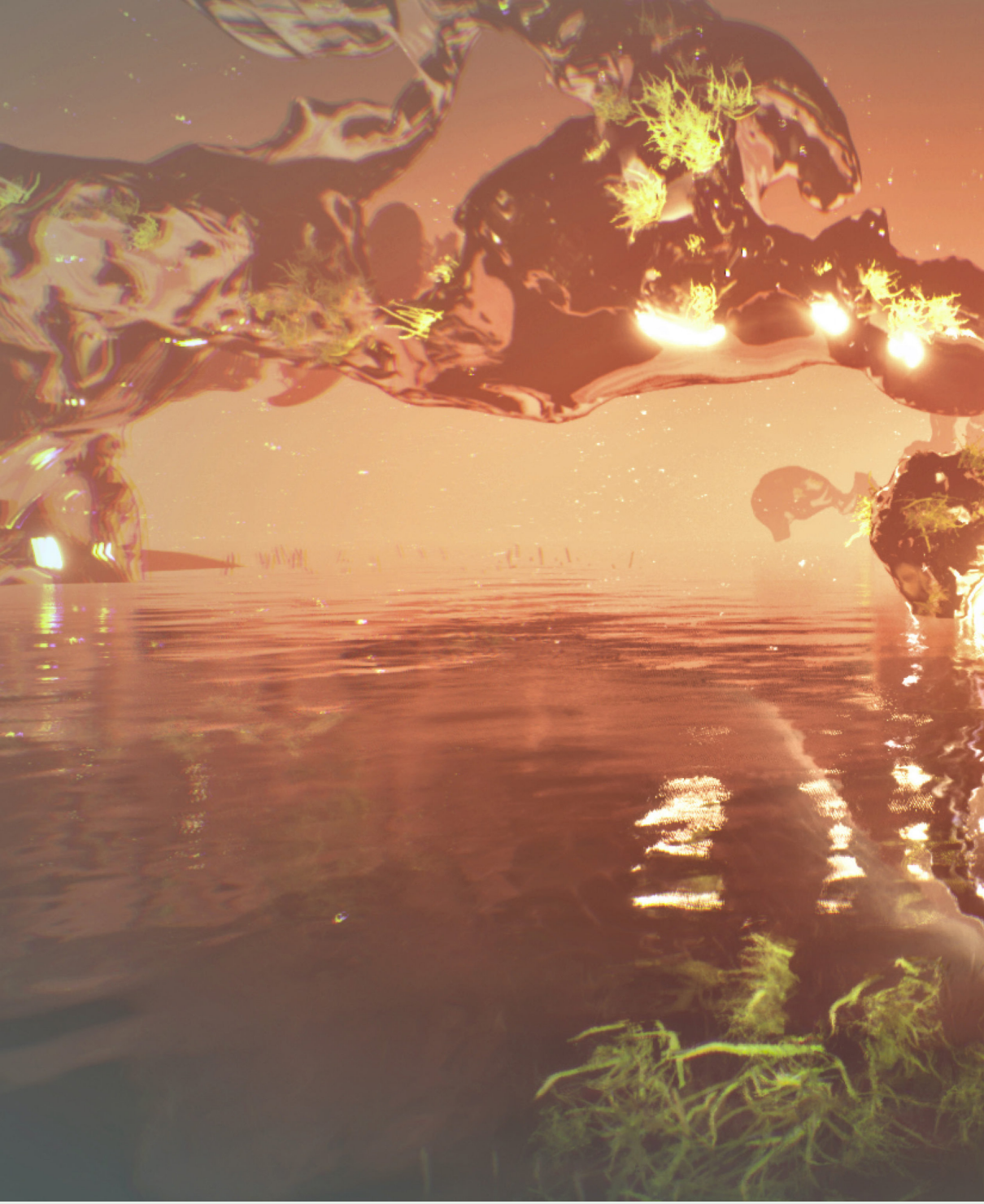
Documentation 3.
Audio zones (Unreal Engine)

Documentation 4.
Audio zones (Unreal Engine)

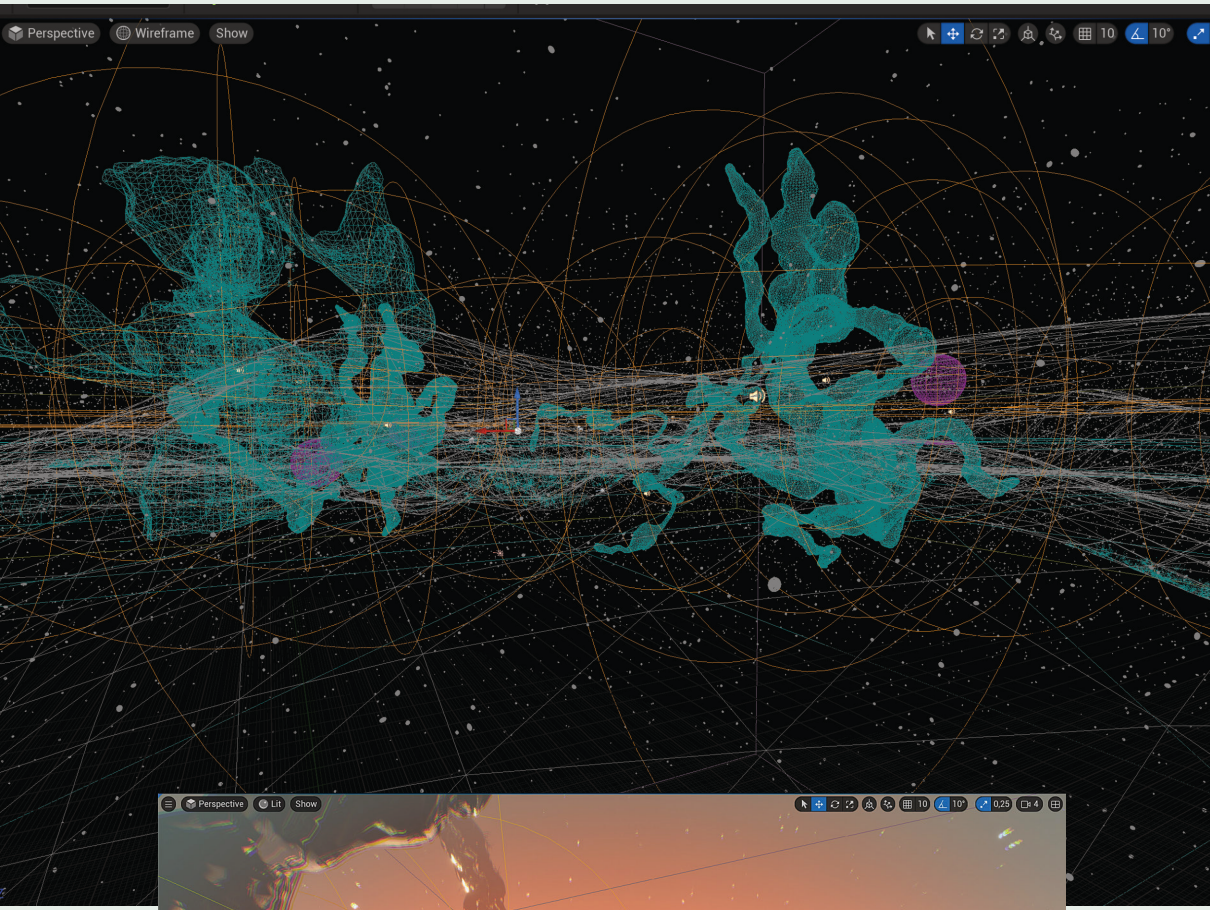
Documentation 5.
Audio zones (process sketch)



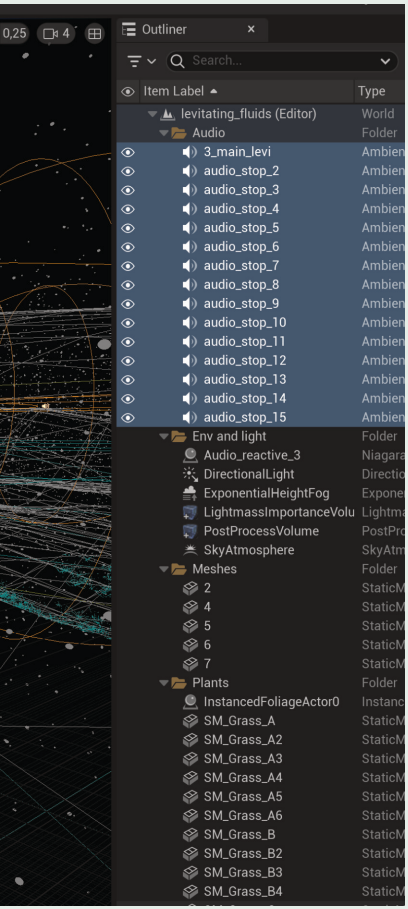




Documentation 6.
In-app environment


Perspective
Wireframe
Show
10
10°


Perspective
Lit
Show
10
10°
0.25
4



Documentation 7.
Audio zones (Unreal Engine)

Documentation 8. <—
Audio zones (Unreal Engine)

My creative process is rooted in an exploratory, interdisciplinary approach that combines sound, space, and embodied experience.

I often begin by formulating a conceptual framework or a central question — one that challenges perception, invites participation, or probes existential or emotional dimensions. From this foundation, I develop immersive sound environments that push the boundaries of how music and sound are experienced.

One of the main challenges with spatial sound is accessibility and infrastructure. Not all venues or platforms are equipped to present spatial audio in its full dimensionality. This can limit how and where a work can be experienced as intended. Another limitation lies in the translation of spatial concepts to different audiences or systems. The experience can vary greatly depending on the playback setup (e.g., speaker layout, headphones, software compatibility), which means that a piece may need to be adapted or partially reimagined for each new context — requiring flexibility but also posing constraints on artistic consistency.

Spatial sound holds unfolding potential — not only as a technical innovation, but as a powerful medium for reshaping how we perceive, feel, and interact with sound and space.

I believe the future of spatial sound lies in its ability to transform listening into an active, spatial, and embodied act — and to bring us into deeper contact with our environments, our inner worlds, and with one another.

SØSTR

Documentation 1.
Handmade 3D artwork, non AI, by
Katherine Rymer Mills of OFuture

Sharin Foo is one half of internationally acclaimed rock duo The Raveonettes. The band has since their debut in 2002 had an international career, toured the world, released 12 full length albums, and influenced generations to come. Sharin is also an associate professor at the Rhythmic Music Conservatory (RMC) in Copenhagen, where she is part of the faculty of artistic development work (KUA).

Louise Foo has besides duos SØSTR and Glas (with Lisbet Fritze) a sound and visual arts practice. She works with multichannel, interactive installations and her recent work counts near real time sonification of Greenland's ice melt for the Icefjord Centre and "planetary" ceramic/glass sound objects with FOO/SKOU for Tycho Brahe Planetarium, Nikolaj Kunsthal and Trapholt. Forthcoming is a solo show at BRICKS Gallery and a project for Elsinore's CLICK Festival.

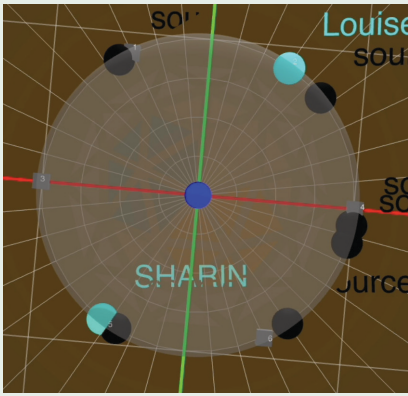
In SØSTR we merge together our different perspectives and during the past two years, we've been exploring the intersection of songwriting, performance, and spatial sound through our research project *Voicing Spatial Songs*.

Our first real encounter with spatial arrangement was re-versioning existing songs, originally recorded and released in stereo, for a listening session at DKDM for their 48 speaker system *Ny Sal* - in collaboration with sound engineer Peter Barnow, working in the software SPAT. For about a week, we tested various spatialization logics and strategies but the experience and outcome left us somewhat disillusioned. Our songs felt fragmented. The lo-fi textures didn't translate well to a high-definition context. We struggled to articulate our intentions, and even basic actions - like rotating a sound - took frustratingly long to implement sonically in the room due to SPAT being a very "heavy" software to work with. We realized we were looking for a more intuitive, hands-on approach.

This led us to some new approaches to our setup. One was designing our own custom-built interfaces and controllers to engage with sound in space in a more embodied and tactile way. Another was to embrace a more scaled down DIY setup. We worked in a circle of eight speakers using the free Source Panner for Ableton, making movements with LFO's. Later we found a 3D sound plugin for Ableton Live called xp (xp4l), and arranged a workshop and Salon at VEGALabs with the creator of the software, Eric Raynaud (aka Fraction), who inspired us with his very performative approach to spatialization.

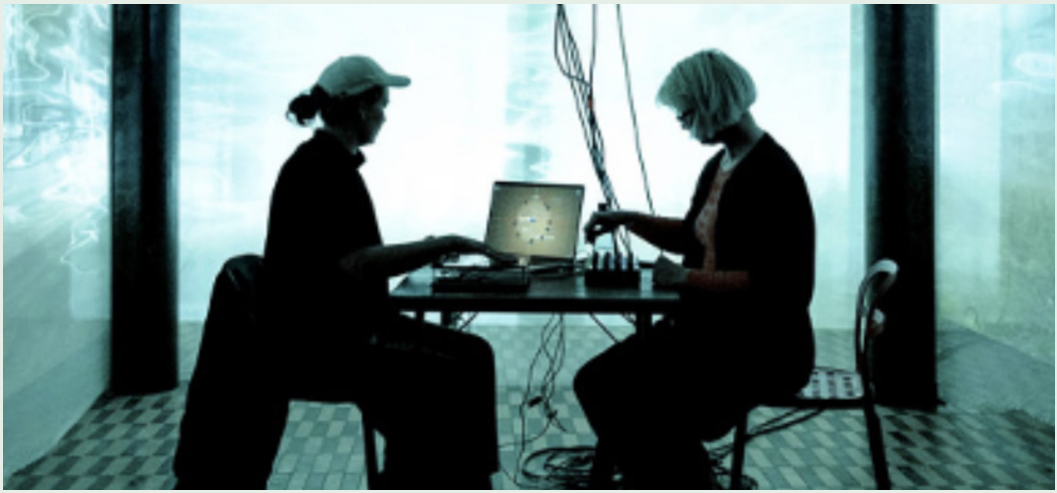
For an early spatial version presented at

Documentation 2.
The software XP for Ableton Live with Sharin and Louises voices opposite from each other in mirrored orbit



Documentation 3. —>
Circle of eight speakers at Sound Art Lab, Struer, 2022

Documentation 4.
Testing live performance setup
within our immersive audio/visual
installation at VEGALabs, 2022

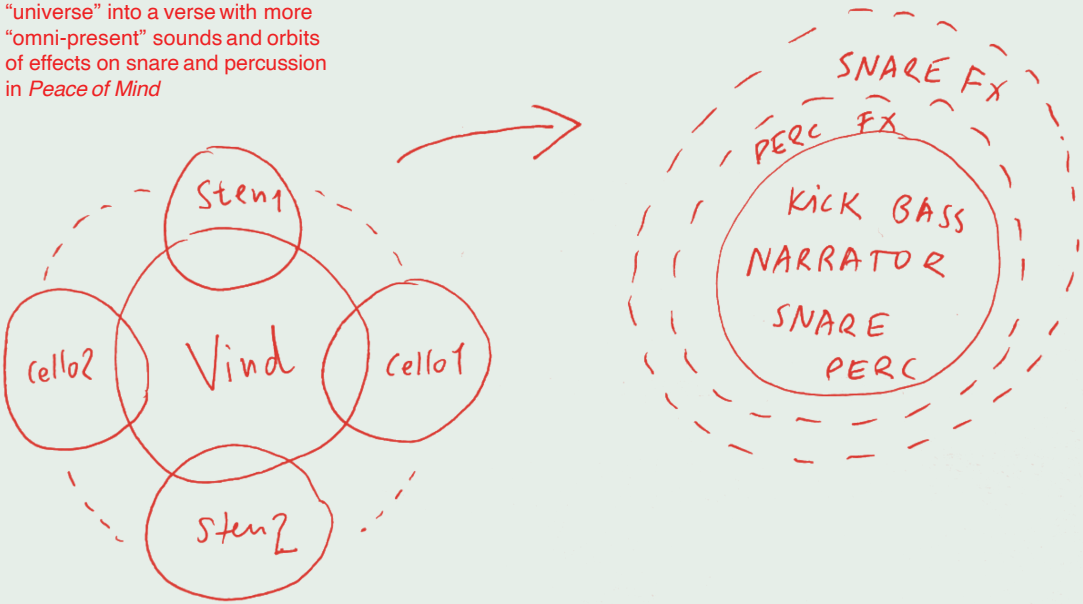


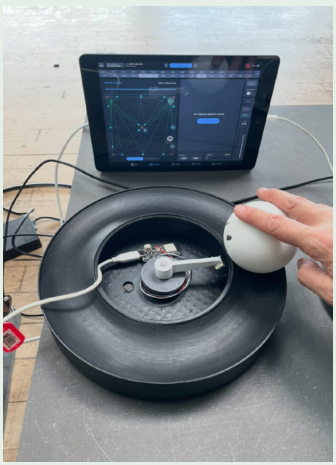
VEGALabs, we reimagined our songs by sampling recorded material into eight groups. We added effects and multi-tracked live, improvised versions - raw and chaotic. The unpredictability sparked an excitement for spatial improvisation, even if the musical results weren't always compositionally "successful".

During this process we played a concert at Vegas immersive music venue Ideal Bar. We had some days to work in the actual space on the immersive concert format, but an issue we encountered, was that when situated on the actual stage in the venue, we were outside the sound field of the immersive speaker setup. Therefore we could not really hear what was going on, when live spatializing our sounds, and we had to leave the live spatialization to our sound engineer. We were interested in having our own hands in the spatial mixing and "play the space" so to speak. Since then we have positioned ourselves as performers in the center of the multichannel speaker setups, sharing soundfield with the audience.

Repositioning the stage and being bodily situated within these spatial sound setups, has reoriented our perception of and engagement with not only the sonic material, but also the performing experience and our relation to ourselves as performers, and our relation to the performed sound. Perhaps it doesn't sound like a radical change to be in the same sound as the audience, but coming from more conventional pop and rock clubs and concerts, this has been quite a profound change having historically often played with "the worst sound in the house" : the monitor mix, or the in-ear mix for instance. And being in the same body of sound as the listener, somehow feels like a more shared experience.

Documentation 5.
Diagram/notation example of moving from an improvised "universe" into a verse with more "omni-present" sounds and orbits of effects on snare and percussion in *Peace of Mind*





Documentation 6.
A magnet traces the metal ball inside the Space Halo, and data is sent from a rotator sensor to Spacemap Go

Through these explorations of transitioning from stereo to spatial sound, we've developed a hybrid approach - of trying to balance the composed with the improvised, structure with chaos. We started to identify what we call "omni-present" elements: stable, anchoring sounds like the rhythm section (beat/bass), the grounding sounds in a track and the lead vocal(s)/main narrator. These are contrasted with more transient, dynamic sonic elements, and at other times we deliberately challenge these hierarchical relationships. Our songs "unfold" in the spatial domain so to speak. To name an example; the intro of our song *Peace of Mind*, once featured just a few seconds intro of birdsong, cello textures, and asmr sounding pebble-stones. We've since expanded these segues into minute-long "universes" - open-form sequences that serve as improvisational zones. These fluid sound

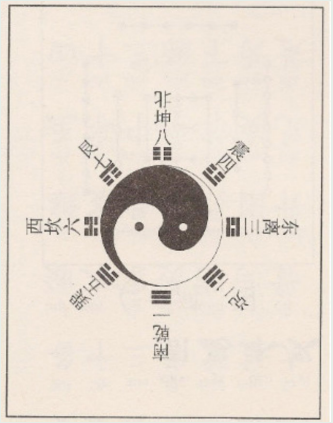
worlds blur the line between composition and performance.

As mentioned, we have been designing our own custom-built interfaces and controllers to engage with sound in space in a more embodied and tactile way. We have designed two custom controllers, that we call *Space Halos*. They determine the position of any chosen sound source within an orbit. When we place the white ball (sound source) at the center of the *Space Halo*, the voice becomes fixed in the center, it is omnipresent; when rolling along the orbit, the sound source moves, maintaining a consistent proximity to the center. We typically only have a few elements at a time that have movements/trajectories, and only when there's a sonic or narrative intention. One of our favorite approaches is mirrored rotation - two similar sounds, but with subtle differences in characteristics moving opposite from one another. It's minimalistic, yet creates a sense of spatial tension. We've also designed the magnetic *Chaos Pendulum* to spatialize effects with unpredictable trajectories and the *Bagua* to trigger one-off samples and sonic "snapshots".

Vocals and our voices are a main musical focus in our duo, and we're drawn to the potential of spatializing the voice - how it can become a disembodied, fluid, ghostlike presence. Techniques like delay, spectral processing, granulation, distortion, formant shifts, slicing, and echo allow us to stretch and morph the voice into new shapes. The voice becomes a shape-shifting entity in space.

Our initial curiosity in "going spatial" was about exploring what seemed like a new frontier, something to be explored and developed

Documentation 7.
We have developed an interface inspired by the Bagua - a Chinese system of eight trigrams representing balance through opposing forces



Documentation 8.
The self-designed custom-built
Space Halo.
Made in collaboration with Hjalte
Hjort (programming) and Nicolaj
Spangaa (construction)

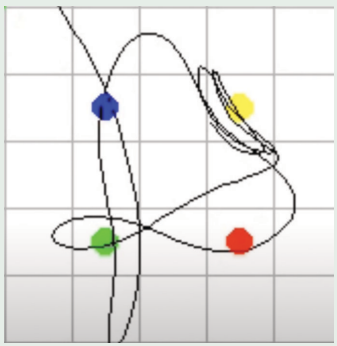
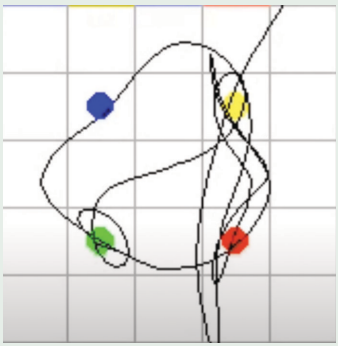
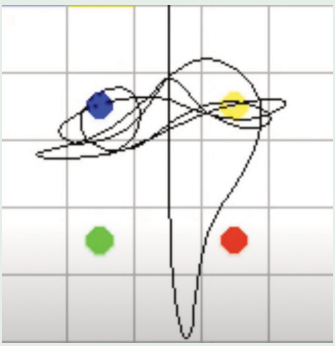
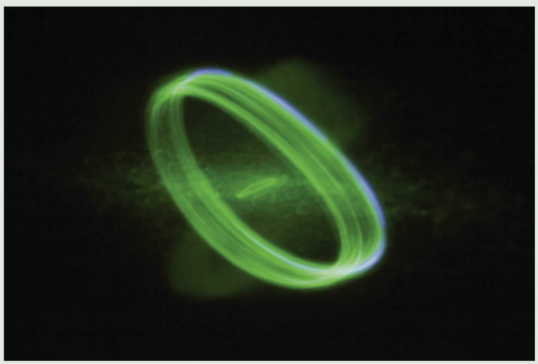
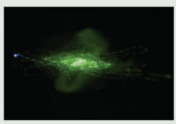
Documentation 9.
Sharin Foo (L) Louise Foo (R) aka
SØSTR.Photo Credit:
Rita Christina Biza

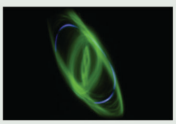
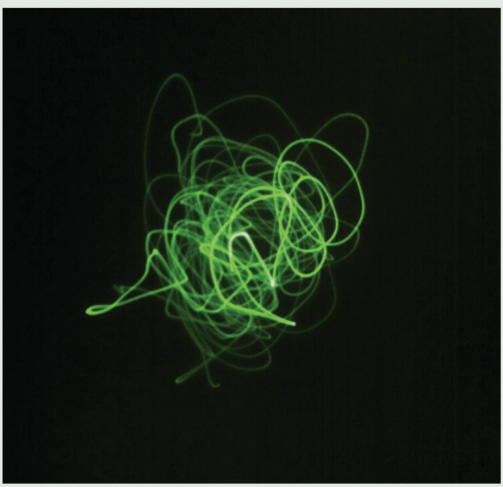
and further articulated on the artist's side. Not as an after-thought in the post process, or in the hands of someone else, but to take ownership over the process, methods and tools and dive into creative, compositional and performative potentials.

Our sound controllers (Space Halo, Chaos Pendulum and the Bagua) give us a hands-on approach to playing/spatializing the sounds, but they are also a way to incorporate visual feedback of the performed and spatialized sound. This visual feedback between movement and sound, together with 3D visuals that listen and react to our sounds unfolding in space, is yet another attempt to invite the listener to become immersed in the experi-

Documentation 10.
Examples of the kind of "chaotic behaviors" we expect the *Chaos Pendulum* trajectories to transmit to Spacemap Go, if using four magnets

Documentation 11.
The *Chaos Pendulum* has a built-in UV laser, that will create a trail of light visualizing the trajectories

Documentation 12.
We will have the option to play with any number of magnets, and move them around to create differ ent spatial behaviors

ence. (We've been developing 360 degree visuals in close collaboration with creative technologists/visual artists Nina Franziska and Louise Lessel aka Uberørt and 3-D artist Katherine Mills Rymer of OFuture).

Despite its possibilities, working with spatial sound can be frustrating and technology often slows down the creative process. But this friction is also generative - it pushes us to invent new tools and develop new languages. A major practical constraint is portability. The notion that we can only perform this music in specific multi-speaker venues (which there are still only a few of), feels like a constraint. From a touring artist's perspective, the inability to easily transfer between speaker setups is a major hurdle - one we hope to see solved also through open-source, community-driven solutions.

Looking ahead, we imagine spatial sound enabling more fluid, immersive, and varied listening experiences that expand on the formats of more conventional concerts as we know them. We're especially excited by how spatial sound is not just placing sound in spaces, but about using sound to create new spaces. And we're excited about the sound experiences we haven't even imagined yet.

We're pretty sure that we're just scratching the surface of what's possible in working with sound in space - and we're curious to see what awaits beyond the stereo-centric paradigm.

Note: There is a QR code on the last page of this anthology, that links to our exposition in Research Catalogue which elaborates on our research.

XYZ Sound Collective

Documentation 1.
Amalie Ulla Pontoppidan Witt -
“LydFelter på Cykel”

XYZ Sound Collective is an international sound collective that focuses on the in situ and spatial experience of sound. With members living in Denmark, Sweden, France, and Iran, the group gathers in Copenhagen, which serves as their base for organizing sound experiences.

Through performances, collaborations, and workshops, members of the collective – along with invited sound artists – create unique and accessible sound experiences that engage audiences both figuratively and concretely.

Often, participants are invited to take an active role in shaping the work through participatory methods, becoming co-creators in a shared sonic journey. The collective’s work aims to expand the understanding of what sound is – and what it can do.

Since 2018, XYZ Sound Collective has initiated a range of projects, including *acousmonium concerts*, *Kulturnat’s SoundCinema* at *KU.BE*, a residency at *Inter Arts Center*, *a spatial bike ride* through Frederiksberg, an *artistic celebration of Else Marie Pade’s 100th birthday* at Lydbrøndene, and most recently, a collaboration with *Gadens Stemmer* and *Betty Nansen Teater* exploring the soundscape of belonging.

Current members:
Lotta Fahlen
Ingvild Skandsen
Amalie Ulla Pontoppidan Witt
Stefani Wisting
Lasse Munk
Arash Pandi
Lola Ajima

https://xyzsoundcollective.dk/
https://www.instagram.com/xyzsoundcollective/
https://www.facebook.com/xyzsoundcollective

LydFelter på Cykel was a bicycle tour featuring six immersive sound experiences that created new encounters between audience, art, and public space. Along the route, participants met members of XYZ Sound Collective – musicians equipped with a quadraphonic speaker setup – who performed newly composed, site-specific sound works. Each piece explored movement and transformation: acceleration, collision, breaking, turning point, and return.

The format unfolded across time and geography, threading through a part of the city dense with public meeting places. Here, sound art and artists awaited – not only to be heard, but to listen. The works wove together cycling culture, everyday life, and the sonic landscape of the city, blurring the line between art and environment.

It was a shared excursion – a meeting with ourselves and each other. With silence and sound, life and death, speed and stillness, present and past.

To be in public space added a vital dimension: the unpredictable, the unknown. Sounds we could not control, and ears we reached without knowing. Together, we stepped into that uncertainty.

The city itself became a collaborator – shaping the work in its own way. A sense of togetherness in motion. Moving like sound waves.

The journey passed through Under Bispebuen, Landbohøjskolens Have, Frederiksberg Hospital Garden, Skyggens Plads, and ended in KU.BE's garden. The sun was shining, and the audience was beautifully mixed – children and parents, bike lovers, elders, and curious passersby.

The creative process began with exploring the city – searching for locations with distinct sonic qualities that resonated with the themes

Documentation 2.
Julie Østengaard
- Under Bispebuen

Documentation 3.
Lola Ajima - Landbohøjskole Have

Documentation 4.
Arash Pandi / Ingvild Skandsen - Frederiksberg Hospitals Kirke

of cycling and movement. Each sound work was composed specifically for a quadraphonic set-up, creating small, intimate bubbles of sound within the larger urban landscape.

The process found its momentum in the pairing of traffic-related words with specific sites. From there, each location unfolded its own story – sound became a way of drawing out its mood, memory, and motion, shaping a shared dramaturgy across the route.

Throughout the development, we held collective listening sessions, offering feedback and reflections on each other's work – tuning in together, shaping the experience layer by layer.

We work primarily site-specific, seeking to reach new and diverse audiences for spatial audio and electroacoustic music.

By stepping outside the black box and traditional performance settings – and into the fabric of society – our work demands a high degree of precision in both theme and storytelling.

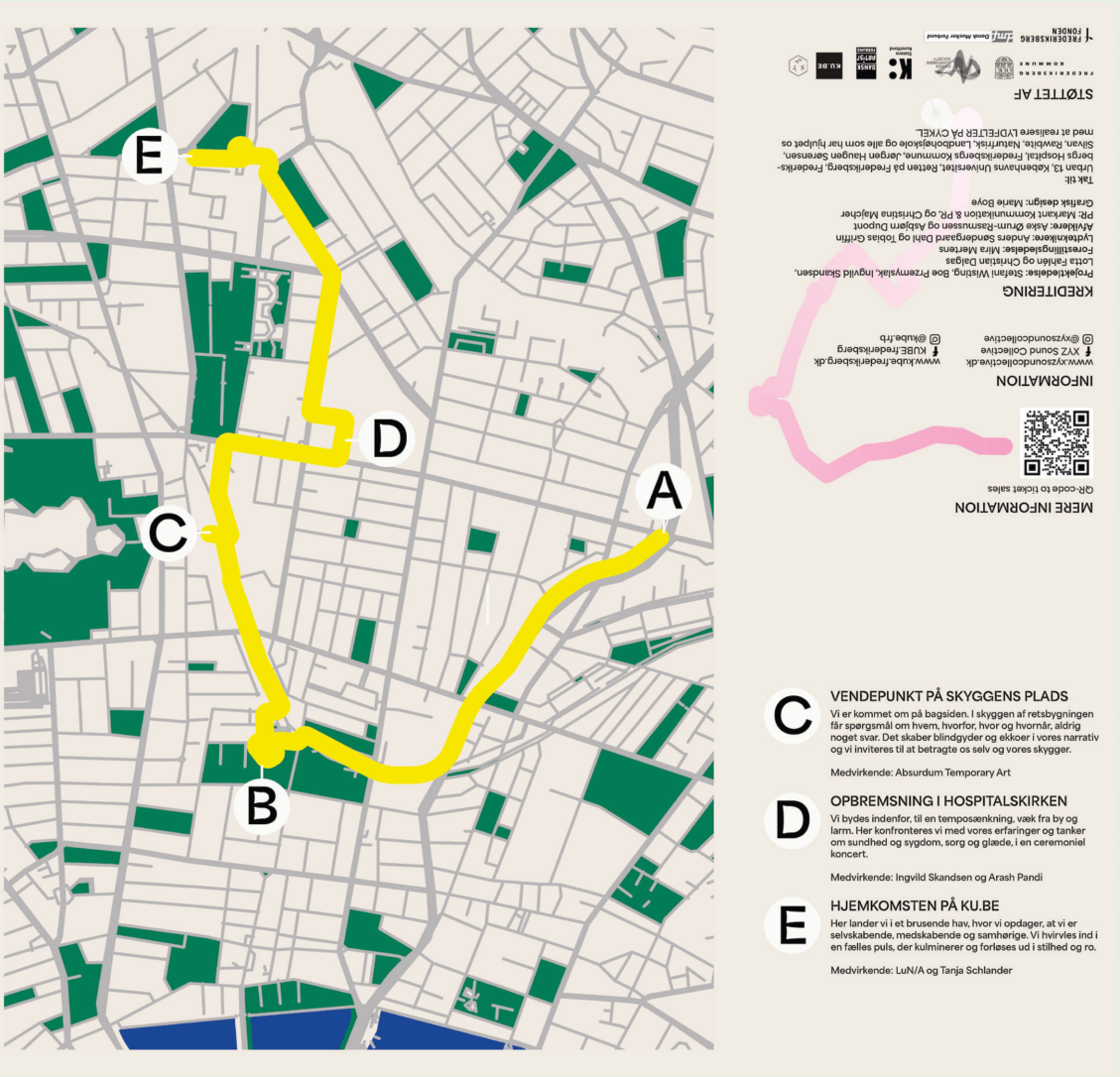
In public space, we can't take anything for granted: not the audience's attention, their expectations, or even silence. Every performance takes place in dialogue with its surroundings – where other sounds, human activity, and the unpredictability of the environment become part of the composition.

This way of working challenges us to consider not just what we create, but how it will be perceived. It's a demanding and inspiring context – one that gives the music immediacy, presence, and a sense of agency. It's a living, breathing work environment that keeps us alert, grounded, and connected.

One of the recurring challenges we've faced is simply finding places or festivals equipped with enough loudspeakers to present our work as intended. This limitation was a driving force behind the creation of our sound collective – a way to take matters into our own hands and create our own platforms for immersive sound experiences.

Working with multi-speaker setups demands more from every stage of the creative process: more time to compose, more careful thought about acoustics, spatial limitations, and budget constraints – not to mention the practical challenge of sourcing and calibrating the speakers themselves. Floors are rarely integrated into the spatial design, and the technical setup can feel overwhelming.

Paradoxically, the abundance of spatial possibilities can also become its own challenge. With so many beautiful and compelling ways



Documentation 5.
Map of the bike trip with
“LydFelter på Cykel”

to spatialize sound, it can be difficult to choose a single direction – and there’s no definitive roadmap to follow. Unlike more established forms of music composition and mixing, spatial audio lacks accessible information and tutorials, leaving many artists to explore uncharted territory on their own.

For nomadic artists – without a fixed studio, city, or home – working in spatial sound can feel even more limiting. Many of us have had to imagine entire pieces on headphones or

laptops, without access to the speaker systems required to fully realize them. And yet, this very limitation has also been a creative force – pushing imagination to fill in the gaps, and helping us develop new approaches to composition and listening.

The potential of immersive audio is, in many ways, limitless. We are always surrounded by sound – always in it – which makes immersive listening feel inherently natural. Spatial sound offers profound opportunities to create sonic oases: spaces for healing, for music as medicine, for exploring the effects of sound on the body and mind. There is a growing frontier in researching how spatial audio might enhance focus, relaxation, emotional processing, or even physical regeneration.

It allows us to step into someone else's soundscape – to be transported to a place across the world, or into a moment we could never otherwise access. Its immersive power makes it an especially compelling medium for addressing social and environmental issues.

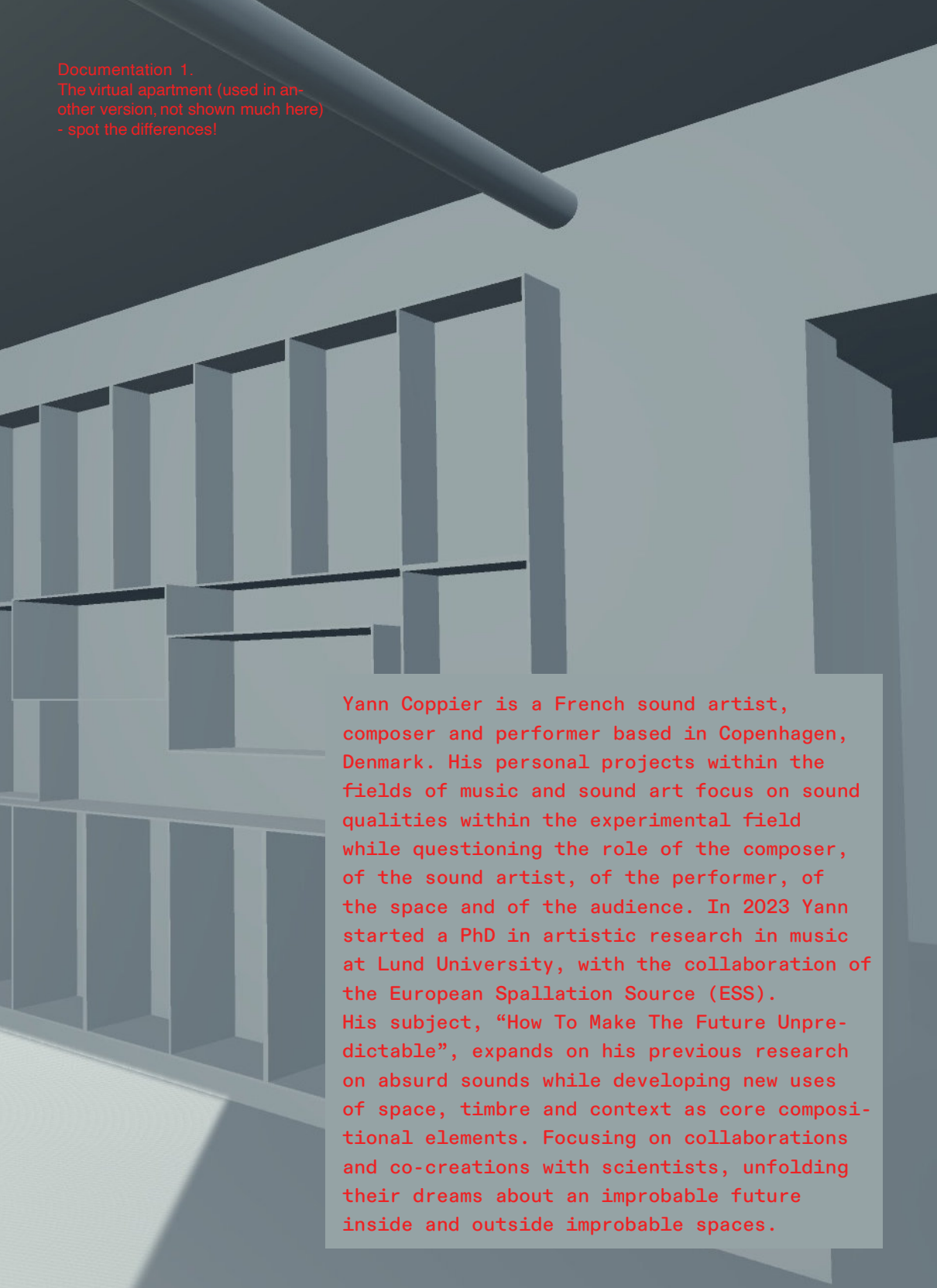
Sound can surround us, hold us, and make us feel a problem – or imagine new futures – in ways that are immediate, embodied, and accessible.

It also offers the possibility to journey beyond what's physically possible: into vast imaginary spaces, deep underwater soundscapes, or movements through sonic architectures that leave physical impressions with our eyes closed. A storm that isn't there. A dream space we didn't know we could visit. Immersive sound invites us to experience entire worlds – from the comfort of a living room – that we might never see, but can still hear and feel.

Documentation 6.
Stefani Wisting / Tanja Schlander - KU.BEs Have

Documentation 7.
Absurdum Temporary Art - Lotta Fahlen / Lisa Mårtensson - Skyggens Plads

Yann Coppier



Documentation 1.
The virtual apartment (used in another version, not shown much here) - spot the differences!

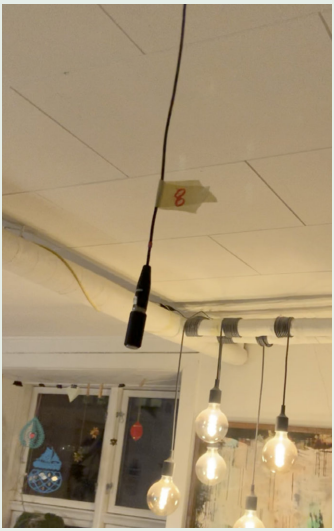
Yann Coppier is a French sound artist, composer and performer based in Copenhagen, Denmark. His personal projects within the fields of music and sound art focus on sound qualities within the experimental field while questioning the role of the composer, of the sound artist, of the performer, of the space and of the audience. In 2023 Yann started a PhD in artistic research in music at Lund University, with the collaboration of the European Spallation Source (ESS).
His subject, “How To Make The Future Unpredictable”, expands on his previous research on absurd sounds while developing new uses of space, timbre and context as core compositional elements. Focusing on collaborations and co-creations with scientists, unfolding their dreams about an improbable future inside and outside improbable spaces.

This is a piece called *"Family Life - Recomposed"*, which re-creates a central Copenhagen apartment and the people that inhabit it on 8 to 24 loudspeakers (depending on the versions). It is a non-anthropocentric, yet full 3D incursion into a family of four, celebrating the musicality in everyday life where intimacy and brutality, tensions and resolutions, power and abandonment are all intrinsically linked together. The piece was created using a seemingly chaotic array of omnidirectional microphones during an entire month during the great pandemic. It aims at generating both the feeling of being invited into someone else's highly realistic (yet composed) memories, and the impression of being a ghost touching upon another inhabited dimension, invisible but so present.

16 omnidirectional microphones are placed inside an apartment at specific places. Each microphone records the whole space, simultaneously, from that specific place. They will later on provide 16 points-of-listening, between each one of which the audience will move, generating their own perspective - or spatial mix. Life goes on, long enough for the microphones to be (almost) forgotten, despite a lot of cabling. The composition (or re-composition) consists in creating stories and tensions out of the recorded material between the different areas of the apartment, whether it is empty or inhabited, whether it is the theater of an accident during new year's eve or an early morning encounter in the kitchen, while everybody still sleeps.

Using a combination of spatialization software and game-engines, the idea was to make the piece viable in the real-world as well as in virtual reality, and eventually to develop it by recording various families in

Documentation 2.
An example of a mike placed in the apartment (there were 16 matched omnis especially made for the project).



Documentation 3.
The apartment at its
(hopefully) worst.

their own environments, potentially in various countries.

The original intention was to capture the dramatic essence of everyday life, that which you don't want others to see or hear, that place where you are not (and usually don't want to be) invited... although it is constituted of insane tensions and resolutions, love and despair, calm and anger, chaos and order. It expanded then when recreating the apartment inside a 100 m2 space WITHOUT any walls, suddenly realizing that the whole piece was actually recorded from the apartment's perspective: somehow a binaural (or multi-aural?) recording for apartments. The compositional part pushed the accent on intimacy though, something rarely presented when

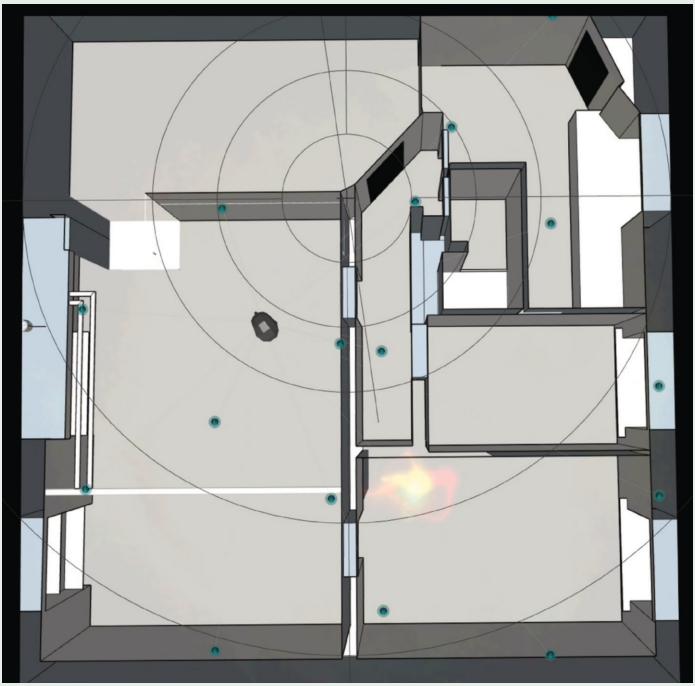
Documentation 4.
The Calls, here with DR Vokalensemblet recording. The same system has been used for a symphonic orchestra, for outdoor recordings

working with spatial audio. The highly immersive spatialisation setup itself (which I called the “Invisible Choreography”) brings life to the material, without which the project would make no sense.

That kind of work requires a lot of calibration while generating huge amounts of data, and a lot of background noise. That means countless hours of cleaning and even more of listening to the same material from different perspectives. Composition becomes a complex matter then. Also, any added effect will eventually ruin the phase alignment, an essential component in the system. I have developed specific techniques in order to be less dependent on such things and more flexible in the number of speakers during installations, adding possibilities to create cuts and loops on some microphones only, effects in one specific room at a certain

Documentation 5.
The apartment in the sound installation, with walls drawn on the floor with tape. Here visitors can walk around

Documentation 6.
An example of the virtual apartment with sound coming from the bedroom, behind the listener (using headphones and a hacked head tracker)



time, bringing focus on a certain area while making another essentially become an abstraction etc. But technically, I could work on this piece for my whole life and never exploit fully the recordings, which after 4 years and months of work I still haven't fully explored.

I mostly think of more surprises and less static listening (as in sitting in a cinema watching a front screen). More depth, and ways to make the audience - who will all hear a different piece - discuss together in order to get the full compositional puzzle. Pieces in which reproducibility is not paramount, and in which nobody can hear the full composition, in which sounds go away from you, only to be heard by someone else. Pieces that change our understanding of the world by changing perspectives and dimensions.

Also, I do hope artists will take space more seriously into account and take it away from engineers in a near future, customizing it and bringing it into their personal visions. I actually think space is the new frontier, also for sound, and that we are only touching its brim.

Documentation 7.
The Calls, mike placement for another installation (composition by Niels Rosing-Schow) using the same technique

Documentation 8.
The apartment in another version of the sound installation, in full darkness. Here the visitors are sitting in specific positions.
All photos by Yann Coppier


ADAM
FISCHER
THAD
JONES

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