

Nanocosmic Investigations

The Exhibition

5–10 APRIL 2022

ARTISTS & SCIENTISTS

TIM BISHOP / BENIAMINO GENTILE

Sounding ESS Interactive computer sound work (for computer, audio interface, microphone and headphones)

The work

Through the capture of acoustic fingerprints of several spaces within ESS, 'Sounding ESS' allows participants to hear their own voice reflecting back at them from the restricted and inaccessible spaces inside ESS. By using higher-order ambisonic impulse response measurements, the work allows the listener to hear their own voice detached from their body; as if they are present inside ESS hearing an echo of their voice coming towards them. Participants can choose freely between acoustically measured positions in both the target and accelerator inside ESS, and are able to activate them using either a drum loop or their own voice.

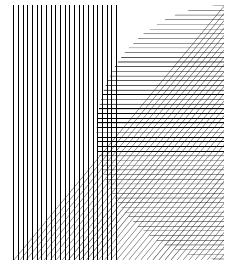
In this way, the work presents a unique opportunity to explore ESS through sound and our embodied experience of acoustics. Perhaps, we can intuit the scale and possibilities of ESS through hearing its unique spaces that are not easily, or not at all, accessible to us. Specifically, with the target, this area will soon be rendered permanently inaccessible to humans. 'Sounding ESS' therefore not only captures specific spaces, but also specific times when it was temporarily possible to record these acoustics before the facility is running.

The collaboration

Tim Bishop's collaboration with Beniamino Gentile began as most conversations, with a general discussion about their respective backgrounds and occupations, and then got more deeply into the specifics of Tim's artistic practice and Beniamino's work at ESS. They were both interested to avoid Zoom meetings where possible, so, they met for a walk outside ESS for their first meeting. Both of them found that they shared a mutual love for music and sound in general. And Beniamino's approach to outreach and educational work for ESS was also something that Tim wanted to explore artistically, opening up the concepts and work of this vast mysterious facility growing on the edge of Lund to a wider audience to appreciate, if not totally understand.

Part of Tim Bishop's artistic practice investigates the limits of knowledge and so Beniamino and Tim discussed using experience-based learning and shared knowledge – specifically everyone's experience of their own psychoacoustics – to open up ESS for people without requiring scientific knowledge to “understand” through intellect. ‘Sounding ESS’ is the result.

[Read more about the collaboration here.](#)



INTER ARTS
CENTER

CHRISTINE KETTANEH / NATALIA MILAS

Transverse video, 6 min.

The collaboration

For animation and film maker Christine Kettaneh, the discussions with accelerator physicist Natalia Milas were very insightful. Natalia helped her understand the different forces that were exerted and controlled in order to focus and accelerate the beam of protons. She showed Christine diagrams and simplified models to help her grasp the basics of the very complex electromagnetism world involved in the process. She showed her data that came out from simulations they had made for the whole accelerator as well as data collected from the actual trials they had conducted on the first built section.

What really stuck with Christine at the end of the discussions with the scientist Natalia Milas was the idea of a horizontal path, a horizontal travel, and all the efforts needed to make it happen.

The work

For us humans, we are very familiar with the horizontal. We have evolved from it to stand upright on our legs. Yet we still go back to it when we rest and sleep or pass away. Horizontal is home. Even our text and writing are linearly horizontal in reminiscence to our original reference of home. So perhaps through that accelerator we are traveling home but faster and deeper. We are perhaps traveling in time while being still – at home.

That transverse magnetism to the horizontal made Christine think of the positive sign + which has both directions, the vertical and horizontal. It is also the symbol that the proton carries. Christine was inspired to explore ways that the vertical could go into horizontal and eventually worked out the first part of the video, the animation which she developed with code. She was then interested to explore the different ways our bodies could go horizontal while we imagined ourselves preparing for a horizontal travel along the beam. For that Christine collaborated with artist and performer Clare Whistler.

[Read more about the collaboration here.](#)

AXEL STRASCHNOY / IAIN SUTTON

The collaboration

Iain Sutton is an engineer with a wide experience in the design and construction of neutron imaging facilities who introduced Axel to the technical aspects of neutron spallation and imagining.

But where they found the strongest common interest, was in the wider social context in which science takes place, so their ongoing conversations have been marked by avid debate and discussion about these more social and political aspects of the ESS facility.

The work

The central question in their research has been how a facility like ESS changes the way we see or what it means to see. Both from a physical and a social point of view.

The project Axel and Iain are working on addresses the core of ESS: the neutron moderator – its sun, which allows to see it. They will take a photograph of the moderator taking by exposing a pixelated gold plate to its neutron stream.

The portrait will remain invisible to the naked eye, encoded as radioactivity. It will be made visible by exposing photographic paper to the irradiated gold plate.

A project like this necessitates the collaboration of people across different parts of the ESS community. The team thus assembled will be a different kind of portrait, depicting the organization as a social body.

As the ESS is not on line yet and some technical decisions are still to be made, the project exists in a sketch form. In the exhibition at Inter Arts Center we will present a sketch of the gold plate.

[Read more about the collaboration here.](#)

ASHLEY MIDDLETON / SWATI AGGARWAL

Mechanism of Action, 2022, 3D animation and soundscape, dimensions variable

The work / The collaboration

‘Mechanism of Action’ is a sensory response to the micro-world of protein crystals. In collaboration with structural biologist and former ESS PhD student Dr. Swati Aggarwal, the 3D animation and soundscape rescale the microscopic realm of protein crystallography to a macro- cosmos of molecular interaction. From the organizational lattice of atoms and molecules, which mark the molecular beginnings of protein crystallization, to diffractive patterns that incite the production of modern medicine, ‘Mechanisms of Action’ is a world of scientific fact enfolded in fiction and sensoriality.

Relations between body- and cosmic- materialities are imagined through a virtual experience of anti-gravitational space and an embodiment of sound. The soundscape, produced in collaboration with Agnieszka Czeszumska, includes a translation of DNA and amino acids (the building blocks of proteins). Mixed with recordings from ESS’ biology lab, the body’s cellular machinery is repositioned through earth’s frequency to provide a psychic space to sense into the quantum body.

[Read more about the collaboration here.](#)

ISH S / BRYAN JONES

TWO SQUARES, 8 Channel Audio / 2 Channel Video

The work

This installation is an interpretation, a rendition of various states of the neutron, its influences from the subatomic level to the cosmological (Neutron Star). The neutron has peculiar properties both inside and outside the nucleus, for example, its spin, its instability, its magnetic moment. The main focus is on the continuity of listening and perception as observers. Artistic abstractions using music compositional tools like Indian Classical Ragas and musical intervals (Melodic and Harmony based),

sound synthesis, along with the movement of sounds and spatialisation becomes an important aspect of this installation. Various philosophical quotients make an important overlap here while artistically interpreting these observations and further application of the Study of Phenomenology to form the basis of the installation.

The most potentially significant direction for Ish S is to further the relationship between science and art, not just as the translation of data into visual and sounds (as Objective Realism), but to re-interpret the ideas about space-time and subjective abstraction of subatomic principles, across various mediums, while having roots in perceptual systems of sound, movement, and visuals. Ish S has presented here in this first iteration, a work as an eight-channel sound installation in which various states of neutron are captured along with the abstraction of spatial dynamics and its translations into sound. This installation also contains 2 channels of video. Here, the phenomenal becomes a mode of perception and the knowing as experiences.

Ish S is looking forward to a newer understanding of these subatomic and quantum / cosmological structures / states and configurations – so these can be abstracted as phenomenological knowledge-based experiences. The center point here is Techne, which in ancient Greek philosophy signifies 'a mode of knowing', being able to see, hear, inhabit, and experience in the widest sense, and essentially, apprehend what is present as a continuum and the phenomenal.

For Ish S especially the 'essence of knowing' as Alethia, which brings into the present the processes and activities of creative reflections and abstractions, is the focus.

The collaboration

The time and exchange of ideas and research that Ish S had with Brian Jones was very fruitful. Ish S has always been interested in the particle and theoretical realm of Subatomic Physics and its influence on derived reality and philosophy, especially, how time space is understood and configured around us. Through this opportunity Ish S could study and learn more about neutrons and their subatomic activities as undertaken through experimentation at ESS. Here he could expand his enthusiastic but basic understanding of this subatomic space and its tiny minutes of constructs that make everything around us. The interaction with Brian brought together the study and research material that could be encountered (read) again with newer perspectives. So, their interactions lead to artistic participation along with individualized scientific inquiries.

The (re)formation of the thought structures and creative paradigms that could connect became the subjective core of the work and this drew an interesting territory for Ish S to explore. This led him to forming processes and structures, while creating and outlining scientific parallaxes, so to speak. The amalgamation of the research and discoveries which were a part of this residency led him to make the first iteration of an artwork as TWO SQUARES as subjective abstracts of the paradigms/states encountered during this research. These are presented as immersive experiences as multi-channel sound installation focused on heterogeneous phenomena, concepts and experiences.

[Read more about the collaboration here.](#)

JEANNETTE GINSLOV & KEITH LIM / EMIL ROFORS

Nanocosmic Aesthetics: *Scatterdance* (2021) xr/mr technology, sound from [freesound.org: dylanthefish/442180](https://freesound.org/dylanthefish/442180), [caboose3146/3450110](https://freesound.org/caboose3146/3450110), [diboz/sounds/211683](https://freesound.org/diboz/sounds/211683)

The work

The collaboration between Screendance artist Dr Jeannette Ginslov (embodied technologies), Keith Lim (Interactive Performance/Installation), and Dr Emil Rofors (nuclear physicist), intended to discover how bodies, visualising techniques and visual media may be re-imagined, re-visualised and re-embodied, by exploring Small-angle neutron scattering (SANS). Questions revolved around modes of interaction, interfaces, and embodied access to neutronic information, to experience a nanocosmic aesthetic. This resulted in the *Scatterdance*, a representation of SANS, a technique that uses neutron scattering at small scattering angles to investigate the structure of various sample substances at a mesoscopic scale of about 1-100 nm. These scattered neutrons are captured by the detector board to create a distinctive pattern. Scientists use these patterns to interpret the internal structure of the sample - where and what the atoms are doing.

Scatterdance demonstrates how SANS work, how the “neutron balls” are fired at a sample, in this case the dancer or visitor to the interactive installation. Using Mixed Reality & ESS inspired simulations *Scatterdance* visualises what happens when these neutrons scatter off the dancer. In this way the dancer in *Scatterdance* embodies the avatar in the installation, through their own movement and interactions with it, with the neutrons flying toward them. Through these embodied interactions they create a unique *Scatterdance* pattern on the detector wall behind them.

You can also try to do some analysis on your own unique *Scatterdance* image? Are there some patterns that appear from wilder arm movements or perhaps a direction of the dancer that can be inferred by looking where the neutrons registered on the detector? Good luck with your research and shake loose! In *Scatterdance*, the audience is the sample. "You are the sample".

The collaboration

When Keith Lim and Jeannette Ginslov were paired up with Emil Rofors, they had discussions about the spallation process, human embodiment, and technologies. This evolved into exploring human embodied interactions, using VR technology to simulate what happens during the spallation process that enabled us to image things that are much too small to be seen using regular microscopes or too fast for existing neutron facilities. They continued discussing how to re-create the abstract imaging processes that appear in real time small angle neutron scattering experiments or SANS using a human being as the sample.

They decided to visualise this process through performative interactions with technology that will also enable the generation of a new visual aesthetic. To do this they pooled all their skills exploring dance and embodied interactions with Mixed Reality and ESS-inspired simulations to create an interactive Mixed Reality installation. This enabled them to re-visualise the beautiful patterns that are produced when neutrons bounce off dynamic samples in the name of science. Here however the sample is a dancing human body. To make the process of extracting information from a sample understandable, Jeannette, Keith and Emil have explored how to simulate neutrons scattering onto a dancer in an interactive installation. What we see is how neutrons behave, like we were throwing ping pong balls

onto this life-sized object that scatter or bounce off the object differently depending on the movement and structure of the sample. According to Emil Rofors: if we were to throw ping pong balls at a bike, for example, some balls would find an opening straight through, some would scatter right back towards us, and some would alter their course and continue in a new direction. After scattering thousands or even millions of ping pong balls on the bike, eventually we would be able to understand the exact structure of the bike, only by looking at the directions of the ping pong balls! To register these scattered neutrons, special neutron detectors are used to show us where each neutron goes after scattering in (or going straight through) the bike, or in this case the dancer.

[Read more about the collaboration here.](#)