

Ursula Damm & Birgit Brüggemeier: In the Language of the Flies

A conversation with [Peter Tepe](#) | Section: [Interviews](#)

Abstract: The artist Ursula Damm and the neuroscientist Birgit Brüggemeier talk about interspecies communication between humans and flies. Flies and people share habitats, but there is hardly any communication. Birgit Brüggemeier studied the song and dance of flies in her doctoral thesis and communicated with flies in experimental set-ups. Ursula Damm was inspired by this research and created Drosophila Karaoke Bar, where visitors can experience communication with flies.

The installation *Drosophila Karaoke Bar* - *Drosophila* is the Latin name for the genus flies belong to - results from a collaboration between the artist Ursula Damm and the neuroscientist Birgit Brüggemeier. Cooperations of this kind are important for w/k. The aim of this interview is to explore this type of collaboration as precisely and comprehensively as possible and to investigate the artistic concept on which the installation is based, in order to enable a deeper understanding of this art form.

Ursula Damm (D)/Birgit Brüggemeier (B): We are open to this.



Ursula Damm: *Drosophila Karaoke Bar* at MoMuseum Vilnius (2019). Photo: Ursula Damm.

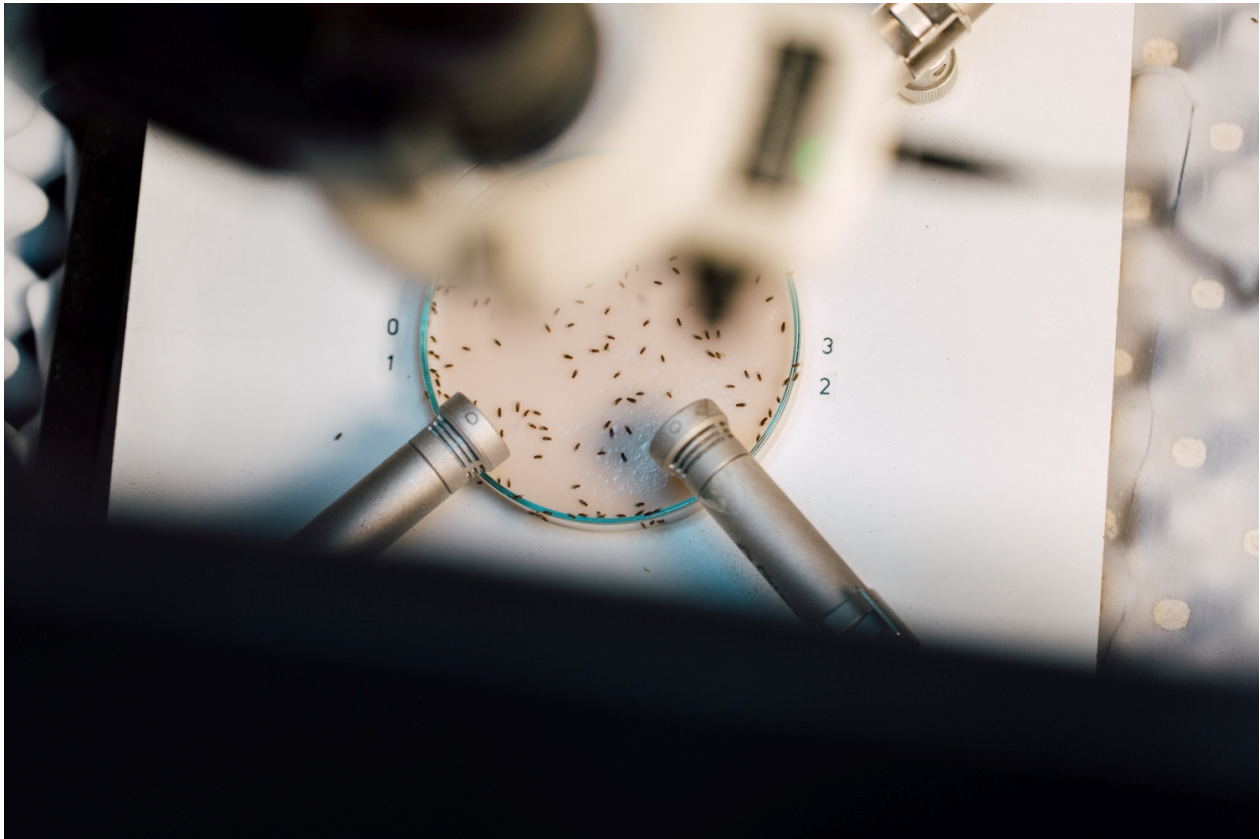
It would be good to start with a description: What can you see - among other things - in the installation?

B: The first thing that strikes me is a large heap of sand, in which, when I get closer, I discover a framed wooden box. There is a wooden footbridge that leads me into the pile of sand to the box. Once there, I

can take a look inside the box with an open hatch and I see devices: a camera, four microphones and a loudspeaker. There is a flat, round glass bowl under the camera, which is filled with a gold-brown mass. This mass consists of corn flour, yeast and water, which is food for flies. From a distance, the flies appear like black dots on the gold-brown surface. I can see their wings, eyes and legs up close. They gather on the food and fly around in the box.



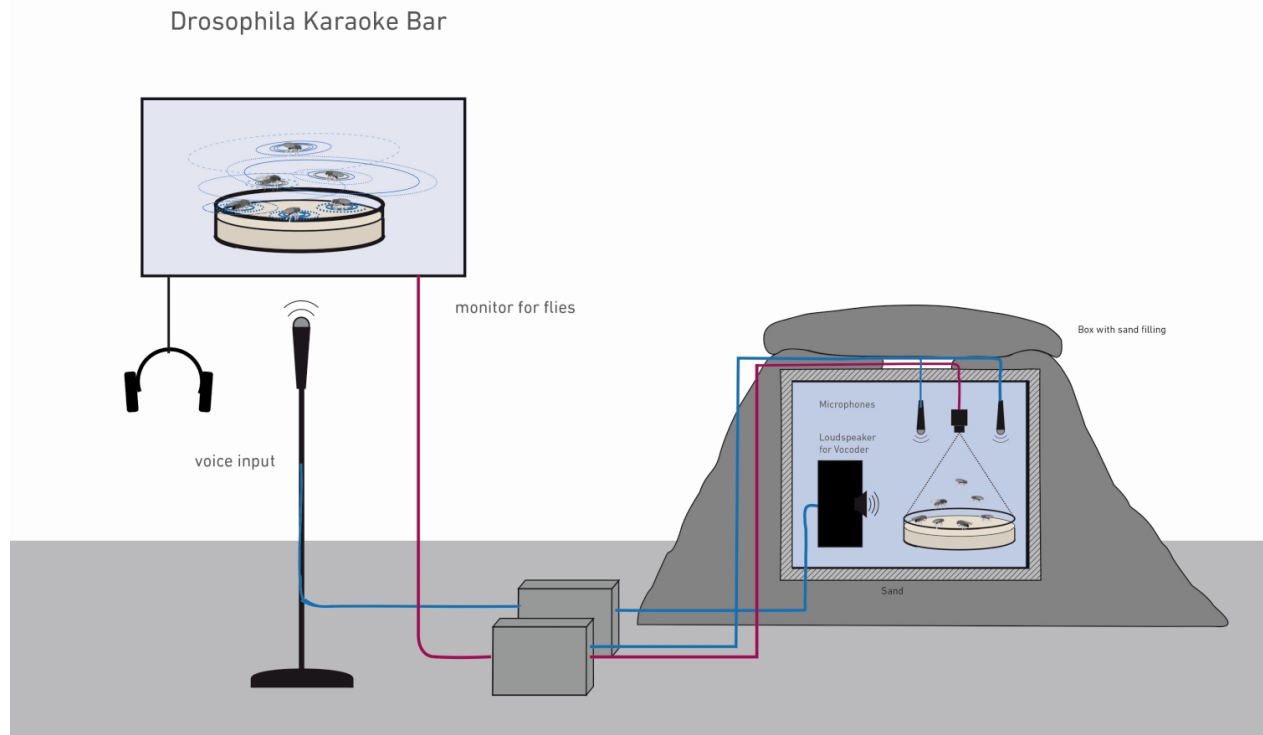
Ursula Damm: *View into the fly box of the installation* (2019). Photo: Rytis Seskaitis.



Ursula Damm: *The flies in the focus of the camera* (2019). Photo: Rytis Seskaitis.

When I step back from the box and look around, I see a screen with a live transmission of the flies on their food. The four microphones are also in the picture and concentric circles appear and vanish around them – following a principle that cannot be understood immediately. There is a microphone stand in front of the screen, and headphones are hanging from the ceiling. When I put on the headphones, I hear a buzz, sometimes a hum. The humming is produced by flies that court by vibrating their wings and thus produce a species-specific song. With the headphones on, I speak into the microphone and see the waveform of what I have said on the screen. When I growl loudly, it seems like the flies are reacting and forming chains that look like conga lines. I hear more buzz and hum from the flies. Then I take off the headphones.

Next to the screen is a tablet that shows a video, in which I explain the installation. I'm talking about fly song, fly chaining – the dance of the flies that they dance when they hear fly song. I explain that when visitors speak into the microphone, their words are translated into fly song. This is done by extracting amplitude structure, i.e. by the ups and downs of volume in speech and replacing the speech waveform with fly song recordings. The installation is intended to create an opportunity to enter the world of flies, to communicate with them.



Ursula Damm: *Schematic layout of the installation* (2019). Photo: Ursula Damm.

Before we turn to your joint project, I would like to know how it came about. When and how did you start to collaborate?

B: In September 2016, I received an email from Ursula, in which she told me about her artistic work on swarms of mosquitoes, which I loved. A few months before, I had given a lecture on fruit flies at the Free University of Berlin that Ursula had heard of. This is how we came together: Ursula found someone in me who was enthusiastic about the behaviour and sounds of insects, and I found someone with an artistic perspective on my research and a continuing interest in it.

Before we take a closer look at your collaboration that resulted in *Drosophila Karaoke Bar*, I ask Birgit Brüggemeier to summarize the most important results of her fly research, which have been incorporated into the installation, briefly and as generally as possible.

B: In my doctoral thesis *Is Drosophila song amplitude structure a communication signal?* submitted at the University of Oxford in 2017, I study fly courtship song. Researchers investigate fly song to understand basic neuronal and muscular processes that flies and humans have in common. Flies court to reproduce, and typically the males produce a song by vibrating with one of their two wings as they dance around the female. It is up to the female to decide whether she wants to mate or would rather run or fly away. In my work, I describe Song Amplitude Structure (SAS) in fruit fly song as a factor that flies use to make decisions about whether they want to reproduce. While working on my dissertation, together with two engineers, I built a machine that makes fly song audible, a *fly song box*. This enabled me to record the barely audible song of fruit flies. Fly song has been studied by scientists for over 60 years: the complexity of fly song and reactions of flies to it are impressive. For example, flies produce two types of song: pulse and sine song. Pulse sounds like a quick succession of beats on a drum, while

sine is quieter than pulse and sounds like a noisy sinus tone.

In my doctoral thesis, I show that amplitude, the ups and downs in the volume, of fly song is a communication signal. I prove that flies are able to perceive minimal changes in volume. In addition, my research shows for the first time that SAS is species-specific, i.e. different fly species produce consistent patterns.

Females of a species can tell from the singing of the males whether they belong to their species. I also found that male flies also react to SAS. In my research, I worked with fly chaining, the dance of flies. This unusual behaviour was first described by Daniel Eberl in 1997. Chaining is based on homosexual courtship behaviour: a group of male flies creates a kind of conga line, because every male in the group courts the fly male in front of them.

My next question addresses the artist: What did you take up from Birgit's research, and how did the concept for *Drosophila Karaoke Bar* evolve?

D: Initially I was impressed that Birgit's research showed that flies communicate. They seem to have some kind of language, and if they had no memory they would not be able to communicate. Birgit was able to tell me about fly song codes. These were codes that I was not aware of and they were different from the type of codes I already knew about, like codes in a computer or genetic code of our species (DNA). There are correlations between sound and meaning in fly language.

But it would be wrong to present our dialogue as limited to these simple facts. What fascinated me most was Birgit's sensitive observations of fruit flies, which she articulated in descriptions of highly complex social behaviour. She allowed me insights into a new cosmos.

Have you previously worked with insects?

D: Yes, I have indeed. My first experience was with non-biting midges (chironomids). These midges swarm, and you see them in swarms on mild summer evenings. I was fascinated by the coordinated behaviour of these small creatures, which is still not fully understood, and thus I began to work artistically with insects. This resulted in the artworks [Double Helix Swing](#), [The Outline of Paradise](#) and [Insect Songs](#).

I experience fruit flies quite differently: They are not simply coordinated, i.e. uniform in a swarm and hence subordinate to a recognizable rule (which we can describe with a swarm algorithm), but they are highly individual, even cultivating friendships, which results in rather chaotic behaviours, which makes them lovable in a completely different way.

Is working with flies a new orientation in your artistic work?

D: That's true. For a long time, as an artist, I worked exclusively with computers and was occupied with sets of rules and algorithms. Now I wanted to explore environments, situations, habitats: How do the habitats, i.e. the physical/geographical/biological environments and spheres of survival of humans and flies overlap? Where and why do we encounter each other? Do we have meaning for one another in our respective worlds? Inspired by the writings of Jakob von Uexküll, I investigated how a form of sensual coupling of animal and human spheres of experience can be achieved beyond the boundaries of species-specific "Umwelts". Meeting Birgit led me to singing – of people and of flies.

Fly songs sound less like singing than confidential or intimate conversation. Sine song sounds like a

mixture of sighing and “Hmmm”, pulse song reminds me of excited chatter. In reference to Birgit Bruggemeier’s dissertation on the ups and downs in the volume of fly song phrases, we have used a vocoder that modulates the human voice with the envelope of the singing of the fly (a vocoder is a device – in our case a software – with which any (text) information is modulated so that it sounds as speech).

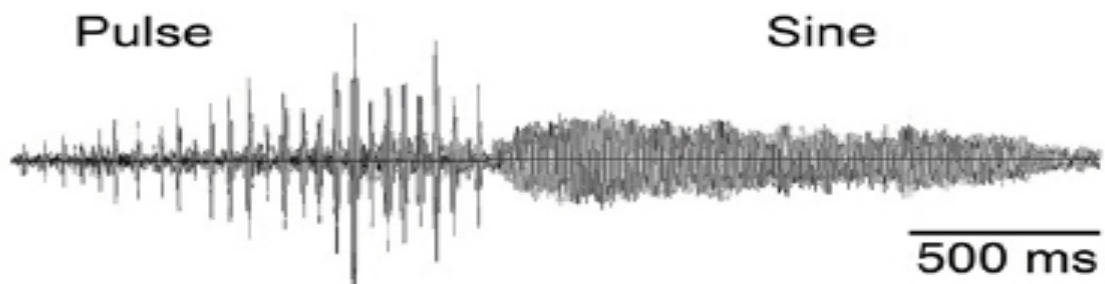
The visitor in the exhibition needs a while to understand these sounds, which is why we are currently thinking about an additional interface (i.e. a technical structure to facilitate communication) – as well as a visualization of fly song and – to improve the previously used vocoder – its translation by software that can imitate voices via artificial intelligence.

Did you incorporate *chaining* of flies, which was mentioned by Birgit earlier, in your artistic work?

D: Yes, I was actually particularly intrigued by fly chaining. Science still has no explanation for this behaviour of male flies. We can explain their eating and mating behaviour, even their singing has a necessity. Chaining, on the other hand, immediately leaves the impression of a cheerful, funny frolic. The chains of flies look like processions, forming when excitement increases.



Tanzende Drosophila melanogaster



Signal des Balzgesangs

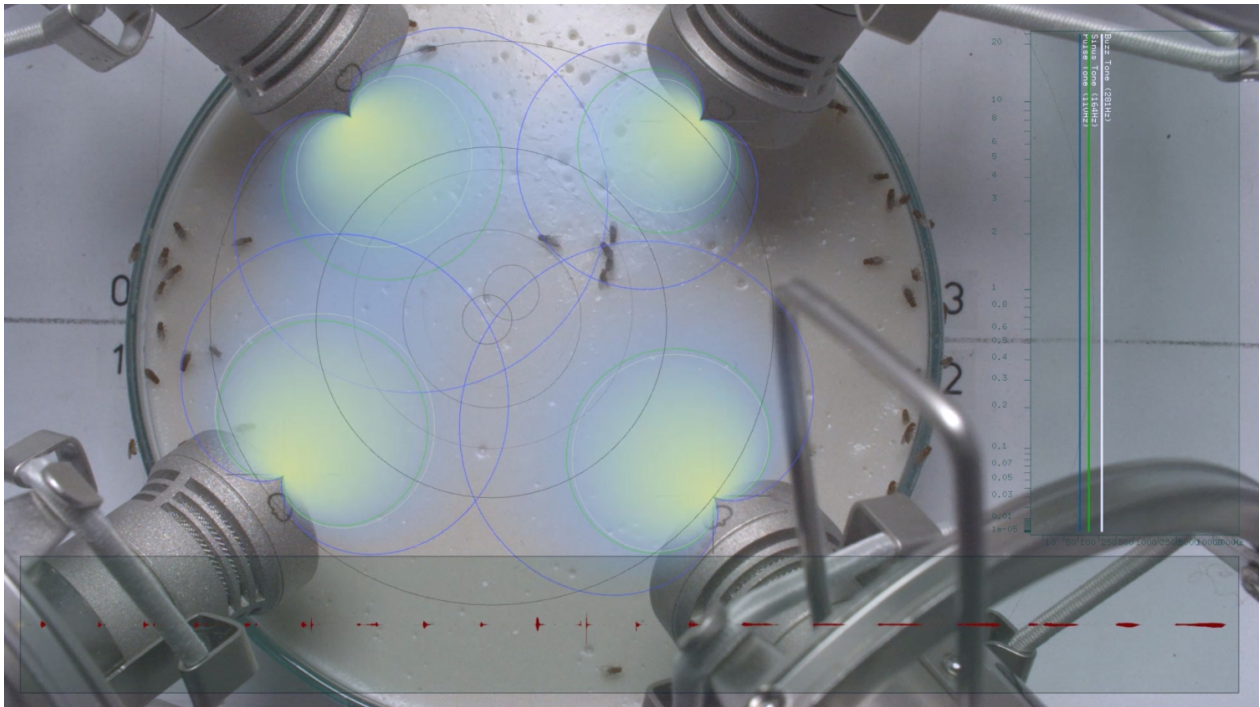
Ursula Damm: *Drosophila during Chaining* (2019). Photo: Toshihiro Kitamoto (top), Birgit Brüggemeier (bottom).

Have you gained particular insights into chaining?

D: I gained insights especially when observing responses to our karaoke. If you sing repeatedly to flies with our vocoder voice, they become stimulated, and start to chain.

In the evening, around 7 p.m., a kind of party time begins: Then you can experience, sometimes without further intervention, that flies have a higher activity level than for example at lunchtime. Here it would be an option to use video surveillance to analyze the flies' behaviour, e.g. with a fly tracker, and examine their activity levels over time. A fly tracker is a special video tracking software, which is

optimized to record the movement traces of flies.



Ursula Damm: *Screenprint of the installation* (2018). Photo: Ursula Damm.

What stays with visitors after experiencing *Drosophila Karaoke Bar*?

D: The installation shows that flies and humans live in different worlds and have limited awareness of each other. After all, five cubic meters of sand are necessary to attenuate outside noises of human civilization and make fly song audible to us. Flies are known as synanthrope (species that follow humans): They choose to follow humans because we collect the fruit that fruit flies like to eat. Is there something in the song of flies that makes it interesting for us to follow flies as well? Not only Birgit and I have answered this question with “yes”, hundreds of scientists have also become fruit fly followers in a certain sense, for example when they research genetic diseases (which occur in fruit flies in a similar way to humans) or when they do brain research. Thus, a great many people look at themselves and our civilization through the eyes of the knowledge we have acquired from fruit flies.

My next question refers to a passage from the w/k report by Irene Daum and Moritz Niehues [on the current Biennale](#): “A thematic focus of the Research Pavilion is the relationship between art and biology. In the project *Insect Karaoke* sounds produced by insects are presented and visitors are asked to imitate and interpret them using contact microphones. In connection to this, Tuula Närhinen exhibits on the subject of *Entomological Encounters* .” Is your collaboration between an artist and a scientist connected to similar science-art constellations?

While Tuula Närhinen and Tytti Arola refer to a scientist’s publication from 1952, our cooperation is based on current findings by Birgit personally. Furthermore, there are also differences in terms of content: Närhinen and Arola carry out an aesthetic evaluation of the different insect sounds. In contrast, we are concerned with attempting to enable an aesthetic experience in the installation itself and leave the evaluation to the visitor. In order to obtain a coupling of communication between insects and humans, we modify the real-time acoustic signals of people with a vocoder so that flies can

perceive them; in this way, we enable flies to react to human sounds, thereby creating the possibility of a certain form of understanding.

Instead of dealing with insect sounds in an atmospheric, metaphorical interpretation by the artist, we try to mediate by providing immediate, repeated and mutual feedback. That's what is new for me about our installation. Even if the aesthetics of sounds is and remains the leitmotif, it is also about irritation and breaking of listening habits in order to expand the sphere of our (aesthetic) understanding.

How did you develop your working method, and what discourses do you take up?

The first artwork in this context was *Sustainable Luminosity*, an integral part of *The outline of paradise*. In *Sustainable Luminosity* we propose swarms of self-luminescent mosquitoes as illuminated advertising. The question was: Is it possible to teach mosquitoes to swarm in the form of letters? With this speculative art project we wanted to investigate whether there was a scientific basis that would make such a product possible. In a performance that took place in 2010, we formed a group of nine people, blindfolded ourselves and experimented with how often we had to clap our hands until our group could form a letter. We found that we were successful with four claps: The clapping enabled us to locate our neighbours and position ourselves in the middle of the group. *Sustainable Luminosity* was shown at *Elements of Art & Science* in the Ars Electronica Center (Linz) in 2015.



Ursula Damm: *Screenprint of Sustainable Luminosity* (2012). Photo: Ursula Damm.

In [Insect Songs](#), communication between insects and humans is even more explicit as the focus of artistic aesthetics. Christina Meissner, Teresa Carrasco and I met in Weimar to explore the song of swarming chironomid midges (*Chironomus riparius*), which are used as model organisms in Ecotoxicology. In a studio environment we experienced their ability to respond to our music.

Normally we cannot hear the faint sounds of non-biting midges. Only when they swarm they cross our perceptual threshold with their collective singing. In a feedback situation, we amplified the sounds of a

swarm by using traditional studio technology to adapt the insects' sounds to our senses in order to better understand their messages.



Ursula Damm: *The midge box during the performance* (2017). Photo: Ursula Damm.

In a first performance, we discovered that Christina Meissner was able to stimulate lethargic mosquitoes to intensive swarming with her cello by playing stimulating sounds. We were thrilled to discover that it is so easy to blend into the cosmos of mosquitoes as humans; swarming took place in dialogue.

In our second concert, we didn't want to force the midges to swarm anymore, but rather to develop a kind of question and answer game in order to respond to phrases of the midges.



Ursula Damm: *Simultaneous performance of mosquito and chello player* (2017). Photo: Ursula Damm.

How did you handle this in detail?

To aid understanding, we visualized the behaviour of midges and, using software (a difference filter, combined with technically standardized video tracking), we drew continuous tracks of the midges. This visualization shows changes in the speed and direction of midges in real time to make it easier to recognize their reactions to cello playing. It was our aesthetic decision to use only one basic technology and instead to motivate the audience to pay attention to the quiet sounds of midges in peace. The work consists of the performance, but needs a simulated habitat for the mosquitoes. They are bred in a box with water, light and air conditioning.

This installation, similar to *Drosophila Karaoke Bar*, aims to highlight the different environments, i.e. “Umwelts” in the sense of Jakob von Uexküll’s biosemiotic concept. There is now a lively international discourse on interspecies communication, of which I would like to mention here only Heather Barnett’s article *Being Other Than We Are ...* She speaks of “embodied modes of inquiry” and of practices of a “shared experience” in which one is on the threshold of another kind of knowledge. With our installation *Drosophila Karaoke Bar* we add further practical experiments to these discourses: we focus on ways of (natural) self-expression of animal and human, search for intersections of our perception window and spheres of common interest, and enable the open-ended feedback of an interaction. We are less concerned with being or becoming an animal ourselves, but rather with forming a new common sphere of experience.

Birgit Brüggemeier, Ursula Damm, thank you for this productive conversation.

Picture above the text: Ursula Damm: *Drosophila Karaoke Bar* at MoMuseum Vilnius (2019). Photo: Ursula Damm.

Further Informationen

About: [Ursula Damm](#) & [Birgit Brüggemeier](#)

- ▷ More on [Drosophila Karaoke Bar](#) (+ [Videodokumentation](#)), [Insect Songs](#) (+ [Video](#)), [Sustainable Luminosity](#) and [Double Helix Swing](#)
- ▷ About Tuula Närhinen [Insects among us](#), [Epistemic Bugs at Worldmaking](#) (2020, forthcoming)
- ▷ [WING BEATS – a Karaoke Booth for Insects](#)

Tags

1. Biology
2. Birgit Brüggemeier
3. fly research
4. Peter Tepe
5. science-related art
6. Ursula Damm