

Metric Displacement: **The Sound of Network Friction**

Brian House

Amherst College, USA

Annie Aries

Bern University of the Arts, Switzerland

Marcel Zaes Sagesser

Southern University of Science and Technology, China

You might be sitting in an office, or maybe on the couch at home. After an instinctual glance behind you, you open your laptop and click on the link to the “meeting;” Zoom comes to life with the words, “Connecting...,” and then you’re in. But instead of a phalanx of faces, there are no people at all—just three spinning turntables. Each is sitting on a plinth and lit from above, and though the equipment looks the same in each square, the rooms are all different, gallery spaces with windows that show traffic outside, or trees; one day-lit, another apparently in the middle of the night, a third in the gloaming. Each Zoom rectangle is labeled with coordinates, revealing places that are distributed across the planet’s longitudes. And instead of entering a conversation, you’re immersed in rhythm.

It’s a polyrhythmic pulse of clicks and drones, experimental electronica that might work for a dance floor if not for its meditative bent. At first, it seems to be highly repetitive. But as you listen, endless micro-variations become subtly audible. The structure of the beats is unstable

as the tracks wobble against each other in time, producing a rhythmic feel that ebbs and flows—and occasionally skips, drops, and stutters. These musical effects are in fact the result of the contingent network connections between the three turntables and your computer.

This is *Metric Displacement*, an “installation” produced by sound artists Annie Aries, Brian House, and Marcel Zaes that incorporates physical spaces in three cities as well as a Zoom meeting (figure 1). Network infrastructure works hard to create an illusion of simultaneity between users in distant geographical locations, facilitating virtual interactions that feel as seamlessly in sync as possible. First staged in 2021, *Metric Displacement* inverts this bias to highlight the temporal displacements inevitably in play with digital networks and to use them toward aesthetic ends. In this article, we explore the socio-technical context of the piece, which was developed at the height of the COVID-19 pandemic, and discuss the result of artistic research into the implications of our quarantined collaboration. We propose *Metric Displacement* as an example of how sound art can be used to point to sites of power that might otherwise be left implicit. And as it draws on strategies used in music-making that index materiality, we suggest that the work offers an alternative and perhaps more sensible means of relating to an ever-more-dominant, yet perpetually fallible, network infrastructure.



The idea of making a video call is perhaps as old as the telephone itself, regularly appearing in science fiction such as Stanley Kubrick’s *2001: A Space Odyssey* (1969). By the 2010s, broadband internet had made virtual meetings technically feasible, but regularly seeing each other face-to-face became truly widespread in the United States only in 2020 with the COVID-19 pandemic. As businesses and schools went to online formats, Zoom—previously a modestly successful service in the shadow of Google and Microsoft—saw its usage grow from 10 million

to 200 million people in just a few months. It trumped its competitors largely due to its ease-of-use, support for large meetings, and video quality, features that to some extent came at the expense of security and privacy when they bypassed the safeguards of users' computers (Fleishman).

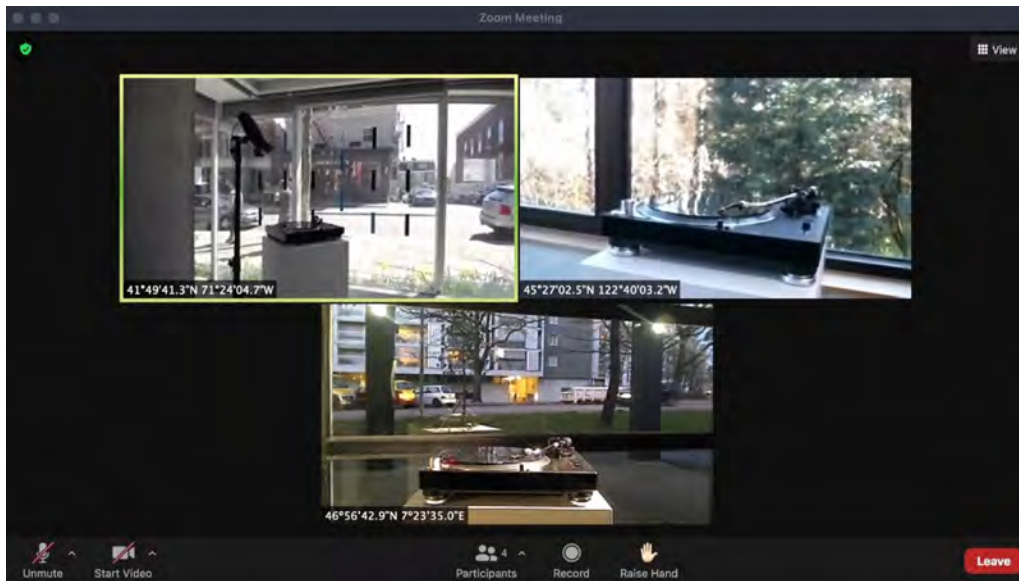


Fig 1. Screenshot of *Metric Displacement*, 2021 (© 2021 Aries House Zaes).

Zoom's stated mission is to "make communications frictionless," (Zoom, "Platform"), and in some ways, it has. But friction doesn't just disappear; it is obfuscated, deferred, and redistributed. First and foremost, the pandemic laid bare the divide between people whose livelihoods easily migrate online and those "essential workers" employed in physical work who are excluded from that option—disproportionally people of color and those without a college degree (McNicholas and Poydock). Such work necessarily includes the physical maintenance of data centers—Zoom utilizes around 50 facilities scattered across the globe—as well as the energy grids that provide them with power and the cables that link them across continents to connect with your home and office (Zoom, "Data center").

Such friction-filled work on physical machines in real places is obscured when the time it takes data to travel from one location to another appears to be zero. In the world according to Zoom, time and distance are uncoupled: I can talk in real-time to anyone, anywhere, as long as they have a connection. This is in line with how networks were originally conceived as maps of interconnected nodes, such as Paul Baran's now classic diagram (Baran 1, 9). Such visual representations of networks, which are now ubiquitous, reflect the idea that what happens on the way from one node to another is unimportant, so long as both nodes are simultaneously "visible" to the network. A network understood as a map, in other words, has no sense of duration (Certeau 35). But as much as this is a technological objective, it is also an ideological orientation (Chun 18).

As such, the engineering feats that make a network appear so timeless are kept behind the curtain. Mountains are carved up to run cables; data centers are built atop geothermal vents, in rivers, and even on the moon (Rabie); and time-keeping itself is redefined to wait out network latency (House 123). But all this materiality is desperately covered by a smooth interface (Burrington). Amazon wants its "Prime" service to signify free next-day shipping at a single click, not a behemoth of data-driven logistics, just as "tweets," "tiktoks," "snaps," and other weightless things appear to float up from social media apps to a "cloud" that instantly "streams" content back down to them. Furthermore, like Facebook co-opted the ordinary term "friend" to inconspicuously insert itself into a natural social relation, Zoom wants the "meeting" to be something that happens as readily via its software as in a physical conference room. Power lies with whoever controls the means of connection, and so it is possessed proportional to the degree to which a platform manages to make its materiality disappear into the fabric of everyday life—no matter the extraordinary effort made to maintain it.

Of course, network infrastructure is never perfect. We inevitably sometimes see the loading bar, “throbber,” or so-called “spinning beach ball of death” (Soon); failing that, our streams freeze, glitch, stutter, pixelate, or drop-out entirely. Depending on the situation, these effects can range from annoying to devastating. Even when everything is working properly, things can feel weird. As anyone who has attempted to sing Happy Birthday with a group over Zoom can attest, the appearance of synchrony is an illusion, and trying to match each other’s rhythms is the surest way to reveal the inherent delays. One consequence is that while musicians have attempted to “jam” over the internet since its earliest days, creatively compensating for the unavoidable latency is perhaps inevitably a central concern of so-called “telematic” performance (Weaver 1; Robinson 65).

Nevertheless, the ideal of a frictionless network is endemic to our time, in which everything is understood as a timeless map of interconnections, whether social relationships, the brain, ecosystems, or the global economy (Galloway). When a connection glitches, it’s seen as a temporary aberration. But what happens if we flip things around and instead embrace friction as the defining substance of network interaction? To focus on the materiality of the network rather than its ideological imaginary? As Anna Munster has put it, “although we might look at diagrams of the network ... It is never going to be possible to ‘see’ ... the coming (in)to experience of networking” (28). However, precisely because of our aural sensitivity to timing, we might be able to hear it, attending to the complex layers of mediation in videoconferencing by listening (Sagesser 90).



Metric Displacement began as a regular get-together of three sound artists, separated by continents, as a way to be creatively engaged during quarantine. Sharing our work over Zoom,

we found that the way in which the platform affected what we played was compelling in its own right. While continuous musical audio from multiple simultaneous streams is decidedly not Zoom's intended use, this was precisely how the most interesting and unpredictable rhythmic variations emerged; temporal distortion became a "matter of compositional poetics" in itself (Ferraz and Teixeira 10). Following a series of experiments, we came up with the piece. First, we'd make vinyl records with a selection of our beats. Then we'd play them back on turntables set up in gallery spaces in our respective cities (figure 2). Finally, we'd continuously stream the audio and video from each one to a 24/7 Zoom meeting, where visitors could log in and hear the layered rhythms filtered through their own network conditions (figure 3).

As musicians, we're interested in how the "feel" or "groove" of music is linked to the body. This subtle variation in micro-timing is inherent to physical performance (Iyer 398). Digitally produced music can explicitly incorporate it, although a lack of variation—such as in the regular pulses of techno—is also an important aesthetic (Danielsen 4). Regardless, "feel" is central to how our bodies receive music and are induced to move. In our case, the micro-timing would come from the network—derived from the "body" of cables that traversed the thousands of miles between us. And in turn, we'd intuitively try to find some corporeal sympathy with the rhythms rather than experiencing them as a disruption.

We used various hardware and software synthesizers to construct our initial beat-oriented material. When this is filtered through the network, the musical result is in dialog with the "glitch" style of electronica. In particular, work from the early 1990s by artists such as Oval, Autechre, and Ryoji Ikeda explicitly incorporates the sounds of skipping Compact Discs and artifacts of digital encoding into highly rhythmic compositions. Exposing the physical limits of this emerging technology allowed that music to subvert the association of the digital with the

precise and the pristine, instead expressing what it was to live as an embodied human immersed in an emerging media environment (Cascone 12–13). Our work operates similarly, only the site of malfunction has grown from the CD and the DAC to the scale of fiber optic cables and data centers.



Fig 2. Turntable with lock groove record (© 2021 Aries House Zaes).

Incorporating vinyl records and turntables into this otherwise digital ecosystem is a way to make visible the work's concern with its own materiality. Whether through the spin of the platter or the texture of the grooves, no other means of sound reproduction showcases its own medium quite so effectively (figure 4). In this respect, the use of records also invokes the turntablism of Hip Hop's DJs, in which musical content is recontextualized by direct manipulation of the medium (Miller). Additionally, cutting our records on a lathe links them to the "dubplates" of sound systems in Jamaica and the UK, which have used the same one-off manufacturing process to play exclusive mixes of reggae and related styles since the 1960s (Veal 51). Lathe-cut records degrade significantly on repeated plays, which is especially true in our

case as we use only lock grooves—1.8-second loops that play repeatedly until the needle is manually moved to another track. As the grooves wear out during an exhibition, docents randomly select new ones. Because every loop on our records is the same length, whichever way they are combined will generate a sense of musical meter. What changes is how the tracks are displaced relative to one another, both as a result of when the needles are placed on the platter and through the subsequent network effects.

The cultural organization Swissnex San Francisco produced the first exhibition of the piece, running it 24/7 for a full week, and *Metric Displacement* has since been staged at the New York City Electroacoustic Music Festival. The most distantly linked trio of cities has been Portland, Oregon in the US, Bern in Switzerland, and Shenzhen in China. While the piece could have been understood as a concert, we've presented it as an art installation to emphasize, once again, how materiality is central to the work, and hence an assemblage of objects both seen (the records, the galleries) and unseen (the network cables, visitors' homes and workplaces)—but all heard. In this respect, it eschews Cage's dictum to hear "sound in itself" (Kahn 559) while

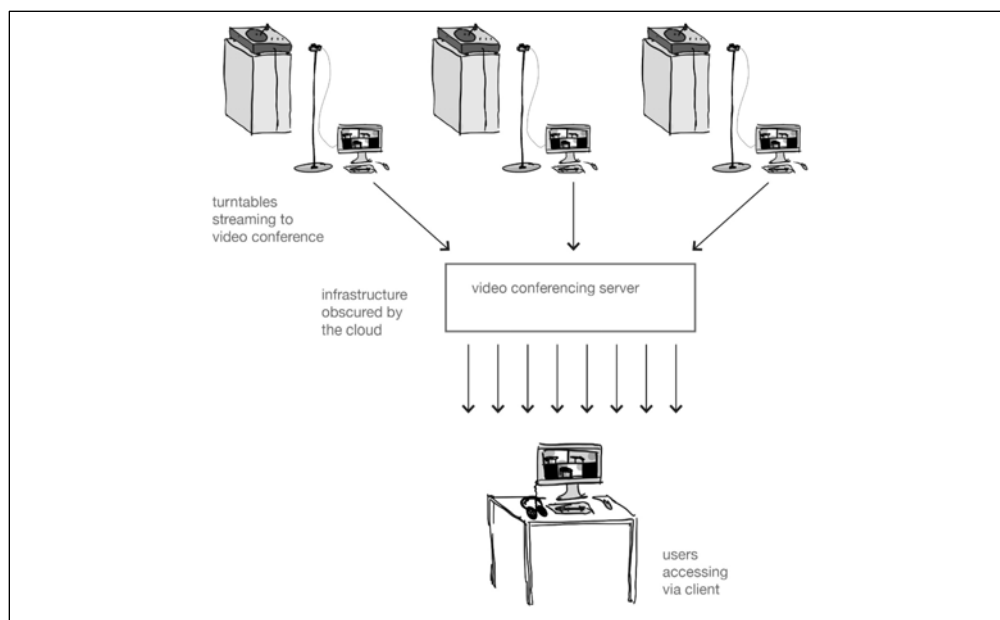


Fig 3. Installation diagram with record players in three different geographical locations streaming audio and video to the audience via a Zoom meeting (© 2021 Aries House Zaes).

embracing, as curator Caleb Kelly has written, sound as “part of a political ecology in which it is deeply linked to various histories ... that form and hold the materials of [its] making” (Kelly 1).

Visitors have initially encountered the work as a reframing of the videoconferencing experience, as it destabilizes the norms of a meeting; there is no greeting or sign off, only audio equipment and the “background” of the three galleries are on view, and though visitors can see if other people are watching and listening, there’s no possibility of interacting with each other (the video and audio of visitors remain off). This defamiliarization of the platform opens a space of possibility (Shklovsky 6). *Metric Displacement* fills it with the performance of the medium itself, as carried by music. For some, this has been disconcerting, grating, or simply boring. For others, the glitching audio streams, perhaps counterintuitively, have led to a greater sense of connection than they have otherwise experienced on Zoom. We believe this is because the polyrhythms felt by visitors derive from the actual material conditions of the network rather than an imagined simultaneity.

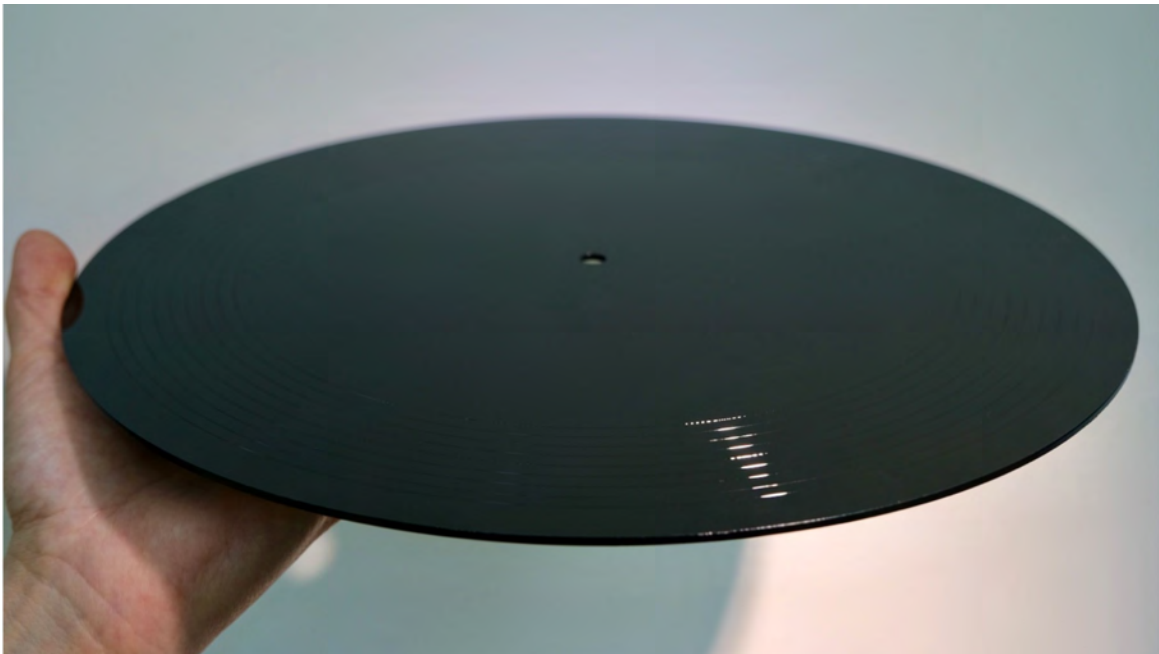


Fig 4. Lathe-cut *Metric Displacement* record showing lock grooves (© 2021 Aries House Zaes).



Quarantines have been lifted, but many of the shifts engendered by the pandemic are here to stay. Online work, healthcare, and education have been normalized. Meta and Apple have made enormous investments in specialized hardware for virtual meetups and digital avatars, even as Zoom has smoothed over some of the rough edges that first made our installation possible: the pursuit of frictionless experience is as spirited as ever. At the same time, we have the rise and fall of cryptocurrencies and NFTs, instability in global markets, the implosion of Twitter as a “public” forum, and logistics infrastructure buckling under climate change, all of which point to the fallibility of networks as a general principle of connection when divorced from the specifics of their implementation. In such an environment, we might seek out aesthetics that allow us to navigate networks as they are, rather than as they aspire to be.

We have proposed that the affordances of sound art hold particular promise to do so. When the globe is spanned by networks, friction manifests temporally. While our eyes might be inclined to overlook skips and jumps, when they are incorporated into music, these traces of the underlying physical infrastructure come to the fore. Though conceived under quarantine as a means of reckoning with the constraints of online collaboration, the political valence of *Metric Displacement* remains pertinent under our continued networked condition, and it points to future work that re-centers materiality—and the social conditions with which it is entangled—otherwise obfuscated by technological dreams.

Works Cited

- Baran, Paul. "On Distributed Communications Networks." *IEEE Transactions on Communications Systems*, vol. 12, no. 1, Mar. 1964, pp. 1–9. *IEEE Xplore*, doi.org/10.1109/TCOM.1964.1088883.
- Burrington, Ingrid. "Effortless Slippage." *e-flux Architecture*, vol. May 2018, no. Dimensions of Citizenship, May 2018. e-flux.com/architecture/dimensions-of-citizenship/178279/effortless-slippage/. Accessed 1 Nov. 2023.
- Chun, Wendy Hui Kyong. "On Software, or the Persistence of Visual Knowledge." *Grey Room*, vol. 18, Jan. 2005, pp. 26–51. doi.org/10.1162/1526381043320741.
- Danielsen, Anne. "Introduction: Rhythm in the Age of Digital Reproduction." *Musical Rhythm in the Age of Digital Reproduction*, edited by Anne Danielsen, Ashgate, 2010.
- De Certeau, Michel. *The Practice of Everyday Life*. University of California Press, 2002.
- Ferraz, Silvio, and William Teixeira. "Musical Time in Network Interaction: The Case of Unfinished Line." *Journal of Network Music and Arts*, vol. 5, no. 1, May 2023. commons.library.stonybrook.edu/jonma/vol5/iss1/4. Accessed 1 Nov. 2023.
- Fleishman, Glenn. "Every Zoom Security and Privacy Flaw So Far, and What You Can Do to Protect Yourself." *TidBITS*, 3 Apr. 2020. tidbits.com/2020/04/03/every-zoom-security-and-privacy-flaw-so-far-and-what-you-can-do-to-protect-yourself/. Accessed 1 Nov. 2023.
- Galloway, Alexander R. *Network Pessimism*. 11 Nov. 2014. cultureandcommunication.org/galloway/network-pessimism. Accessed 1 Nov. 2023.

- House, Brian. "Synchronizing Uncertainty: Google's Spanner and Cartographic Time." *DATA BROWSER: Executing Practices*, edited by Magda Tyżlik-Carver et al. Open Humanities Press, 2018.
- Iyer, Vijay. "Embodied Mind, Situated Cognition, and Expressive Microtiming in African-American Music." *Music Perception*, vol. 19, no. 3, Mar. 2002, pp. 387–414. doi.org/10.1525/mp.2002.19.3.387.
- Kahn, Douglas. "John Cage: Silence and Silencing." *The Musical Quarterly*, vol. 81, no. 4, 1997, pp. 556–98.
- Kelly, Caleb. "Editorial: Materials of Sound II." *Journal of Sonic Studies*, no. 18, July 2019. researchcatalogue.net/view/656681/656682. Accessed 1 Nov. 2023.
- McNicholas, Celine, and Margaret Poydock. "Who Are Essential Workers?: A Comprehensive Look At Their Wages, Demographics, and Unionization Rates." *Economic Policy Institute*, 19 May 2020. epi.org/blog/who-are-essential-workers-a-comprehensive-look-at-their-wages-demographics-and-unionization-rates/. Accessed 1 Nov. 2023.
- Miller, Paul D. *Rhythm Science*. MIT Press, 2004.
- Munster, Anna. *An Aesthesia of Networks: Conjunctive Experience in Art and Technology*. MIT Press, 2013.
- Rabie, Passant. "Florida Startup Moves Closer to Building Data Centers on the Moon." *Gizmodo*, 6 Mar. 2023. gizmodo.com/startup-moves-closer-building-data-centers-moon-1850192177. Accessed 1 Nov. 2023.
- Robinson, Jason. "Improvising Latencies: Telematics, Improvisation, and the Paradoxes of Synchronicity." *(Re)Thinking Improvisation: Artistic Explorations and Conceptual Writing*, edited by Henrik Frisk and Stefan Östersjö, 2013.

- Sagesser, Marcel Zaes. “A Digital Archive of Participatory Location Rhythm Performances: Listening as a Way of Attending to the Pandemic.” *Sounds of the Pandemic: Accounts, Experiences, Perspectives in Times of COVID-19*, edited by Maurizio Agamennone et al., 1st ed., Focal Press, 2022. doi.org/10.4324/9781003200369.
- Shklovsky, Viktor. *Theory of Prose*. Translated by Benjamin Sher. Dalkey Archive Press, 1990.
- Soon, Winnie. “Throbber: Executing Micro-Temporal Streams.” *Computational Culture*, no. 7, Oct. 2019. computationalculture.net/throbber-executing-micro-temporal-streams/. Accessed 1 Nov. 2023.
- Veal, Michael E. *Dub: Soundscapes and Shattered Songs in Jamaican Reggae*. Wesleyan University Press, 2007.
- Weaver, Sarah. “Editorial.” *Journal of Network Music and Arts*, vol. 4, no. 1, June 2022. commons.library.stonybrook.edu/jonma/vol4/iss1/1. Accessed 1 Nov. 2023.
- Zoom Video Communications. “Platform Data Sheet.” explore.zoom.us/docs/doc/Zoom_Platform_and_Company.pdf. Accessed 23 June 2023.
- . “Data center abbreviation list.” support.zoom.us/hc/en-us/articles/360059254691-Data-center-abbreviation-list. Accessed 23 June 2023.

Brian House is an artist who investigates the rhythms of human and nonhuman systems. Through sound, subversive technology, and multidisciplinary research, he makes our interdependencies audible in order to imagine new political realities. House has exhibited at the Museum of Modern Art; the Museum of Contemporary Art, Los Angeles; Ars Electronica; the ZKM Center for Art and Media; the Contemporary Arts Center, Cincinnati; and the Brooklyn Botanic Garden, among other venues. The New York Times Magazine, WIRED, The Guardian, and TIME’s annual “Best Inventions” issue have featured his work, and his academic writing has been published in Leonardo, Journal of Sonic Studies, Contemporary Music Review, and e-flux

Architecture. House holds an MA in media studies and a PhD in computer music from Brown University and was an Associate Scholar at Columbia University's Center for Spatial Research. He is Assistant Professor of Art at Amherst College. Website: brianhouse.net. Email: bhouse@amherst.edu.

Annie Aries is a Swiss-Philippine composer and musician based in Bern, Switzerland. She holds an MA in music and media arts from Bern Academy of the Arts and studied historical musicology at the University of Bern. In 2017, Annie lived in Berlin and studied in the program Popular Music History & Theory at Humboldt University, specializing in experimental practices within pop and club culture. Since 2019, Annie has been on the faculty of the Sound Arts program at Bern Academy of the Arts. In the world of modular synthesizers and patch cords, Annie explores, performs, and composes, thereby opening up sonic spaces between electronica and experimental. For her artistic work, she received an honorary mention by the Giga-Hertz Award 2020 as well as a production grant by the City of Bern for 2021. Her stage persona Annie Aries is a contribution to a more gender-inclusive world of electronic music. Website: anniearies.com. Email: annieruefenacht@gmail.com.

Marcel Zaes Sagesser, also known as Marcel Zaes, is an artist and researcher in sound, digital media, and music composition. He currently is an Assistant Professor in media arts and technology at the School of Design at the Southern University of Science and Technology in Shenzhen. He holds a PhD in computer music and multimedia from Brown University, and MA degrees from the Bern Academy of the Arts and Zurich University of the Arts. Marcel focuses on how humans craft their relationships with sounding technologies. His research includes work on experimental rhythm machines, digital sound archives, sound in public space, popular culture, and the intersection of sound and technology. He has been awarded several grants and prizes, has played numerous concerts and exhibited his artwork internationally, and has repeatedly been an artist in residence. To date, he has published 12 musical records. Website: marcelzaes.com. Email: marcelzaes@gmail.com.