

# *AGAINST AUGMENTATION*

## EN CONTRA DE LA AUMENTACIÓN

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**RESUMEN:**

Este artículo nace desde una conversación entre Jon Richards y Tim Shaw como respuesta al tema de la revista: Instrumentos Aumentados. En vez de enfocarse sobre un solo instrumento, los autores decidieron hablar más en general sobre sus estéticas y formas de crear instalaciones-performance. La conversación toca los temas de la aumentación, los instrumentos DIY, la imprevisibilidad, y ofrece al lector ejemplos de aparatos musicales hechos por los autores mismos. La discusión concluye con tres temas emergentes: el Reduccionismo, las Materias Primas y los Campos de Influencia. Los autores esperan que la transcripción de su conversación proporcione un punto de partida útil para los lectores interesados en el acercamiento experimental de Richards y Shaw a la música electrónica y al diseño idiosincrático de los instrumentos.

**Palabras claves:** instrumentos musicales, ecología de la performance, instalaciones-performance, música DIY, electrónica experimental.

**ABSTRACT:**

This article originated from a conversation between John Richards and Tim Shaw. The conversation is a response to the journal's theme, Augmented Instruments. Instead of focusing on just one instrument, the authors decided to talk more generally about their overall aesthetic and process of making performance-installations. The conversation touches on augmentation, DIY instruments, unpredictability, and offers the reader examples of their own self-made musical devices. The discussion concludes with three emergent themes: Reductionism, Raw Materials, and Fields of Influence. They hope this transcribed conversation provides a useful starting point for readers interested in Richards' and Shaw's experimental approach to electronic music and idiosyncratic instrument design.

**Keywords:** musical instruments, performance ecology, performance-installation, DIY music, experimental electronics.

## Introduction

John Richards (JR) and Tim Shaw (TS) have collaborated on performances, installations, articles, and recorded releases. Their ongoing collaborative efforts have revealed some particular collective concerns surrounding performance, electronic music making, and instrument design. The following conversation connects these issues through an open and discursive format. It was conducted in June 2022 in Newcastle-upon-Tyne, UK.

## To augment, to instrument

**JR:** There is a long tradition of the desire to augment acoustic musical instruments through technology. I am not sure where this fascination stems from. The motivation regarding the harnessing of technology for our own gain is age old. Think Prometheus.<sup>1</sup> Of course, such harnessing does not always lead to happy endings, but we have techno futurism and techno optimism, and the belief ‘technology will save us all’. I think this motivation, and more specifically desire to augment instruments is deeply rooted in an ideology of growth economics. Bigger, faster, louder. I have been more inclined to think the other way. We have already talked about reductionism (Bowers, Richards, Shaw, et al., 2016) and reduced instruments (Richards & Shaw, 2022); and there is the Raw Data, Rough Mix project (Bowers, Richards, Shaw et al., In Print). Then we have the Sacrificial Floors tour we did with Tetsuya Umeda (2018);<sup>2</sup> and being close to materials, our album Objects at Hand (2021).<sup>3</sup> But perhaps there is another way to think about augmented instruments.

**TS:** Augmentation is not a term that I tend to use when describing my work. I have used the term augmented soundwalk (Shaw & Bowers, 2020) before to describe some of my soundwalk performances but, due to the rise of virtual and augmented reality, I decided to move away from that term. I no longer identify with it. My rationale for calling them augmented soundwalks was that the technological system added something to the everyday listening experience, it was about expanding or extending perception. Augmentation as a form of adding to or enriching an experience somehow. Certainly, listening through microphones could be a way of augmenting an everyday listening experience. I would not usually call the things that I make augmented instruments either, probably because

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<sup>1</sup> In Greek mythology, Prometheus defied the god Zeus by giving fire, a symbol of technology and power, to the human race so that they could harness its power.

<sup>2</sup> Sacrificial Floors Tour - John Richards, Tim Shaw, Tetsuya Umeda. Performances took place at: Northern Charter, Newcastle 26/9/18; Centrala, Birmingham 28/9/18; ikelectik, London 29/9/18; Arnolfini, Bristol 30/9/18. Video document by Luc Yu-Lun Sung <https://vimeo.com/359482714>

<sup>3</sup> <https://opaltapes.com/album/objects-at-hand>

I do not even think of them as instruments, but for the sake of this conversation, I will refer to them as instruments. I am more concerned with materials, spaces, or interactions between people and things, but it is interesting to think of our practices through the lens of augmentation.

**JR:** When we use a microphone, for example, I do not think that the sound is augmented necessarily, despite some of the subtle nuances of that sound often being revealed or heightened by the technology. Afterall, 'those sounds' are already inherent in 'that sound'. The same could be said about something under a microscope. If we look closely, it is not augmented as such, but such scrutiny can lead to a greater understanding or augment an awareness of what lies in front of the lens. Things can literally be brought into focus. I often think the idea of augmented instruments has parallels with instrumental extended techniques; so, going beyond the prescribed boundaries of an instrument in terms of how we play and think about that instrument. When I was younger, I read Stuart Dempster's book *The Modern Trombone: A Definition of Its Idioms*, which covered a lot of extended techniques for the trombone (Dempster, 1979). And you can see how instrumental extended techniques can fuel a certain type of compositional style. I am thinking of Berios' *Sequenzas* as good examples of this.

**TS:** But even that kind of musical practice has been instrumentalized, that way of studying an instrument where you have a certain formal structure. Within educational settings, when you study an instrument you study those extended techniques and augmentations. That method may have lost some of its radical edge because of institutionalisation. Like when you learn the trombone, for example, you spend weeks or months just doing one technique over and over again. I think the work that we are talking about in this article has quite a different character to it. I certainly do not practise or rehearse with my 'instruments'.

**JR:** Yes, these techniques then become part of the vocabulary of that instrument and, like we have pointed out, become deeply rooted in a musical repertoire and mode of practice. These techniques become established, much like other techniques, and become less a journey of discovery. In your work Tim, such predetermined vocabularies do not necessarily exist and there is an emphasis of finding and building these vocabularies live in performance. What are we actually augmenting in the first place? I think we both have a particular view of what we consider to be a musical instrument.

**TS:** To give a practical example, when we do a soundcheck, and the whole preparation and set up for a concert, there is a very particular way of doing things. You turn up to the venue where you set up your gear. You check the signal is going through the mixer, you work with the sound engineer to get the levels right and the mix between instruments to your preference. I always find this sort of process quite challenging because many of my 'instruments' are very unpredictable. It is hard to recreate a representative level outside

of the moment of the performance. I guess we will talk later on about how there is a lot of interaction between different instruments and systems that we have set up in our performance environments. That stuff is really difficult to soundcheck and I think that is partly because our performance devices do not have an instrumental character. It is not easy to have a kind of stable level or signal. It is something I had to find my own way to approach, but certainly when I was first doing performances of this kind, I would turn up with a bag of experimental circuits without knowing how to approach the soundcheck, which was sometimes quite challenging. I also think that some of the sound engineers I encountered were not so happy about that either! The point being, there is often a certain procedure to musical performance, which our practice does not always fit within. I guess we want to augment or develop the structural elements of certain music.

**JR:** I have recently spent some time looking again at the Hornbostel-Sachs musical instrument classification system and recent updates to this. In particular the Electrophone class or what constitutes an electronic musical instrument. Hugh Davies and Maarten Quanten have argued that electronic instruments are inherently modular due to the physical nature of electric sound signals (Davies & Quanten, 2014). It is very much an idea that informs our work. We have previously talked about, not augmented, but expanded instruments, expanded through the notion of assemblage, fields and distributed control networks (Richards & Shaw, 2022).

**TS:** I think musicologists would argue that all instruments throughout history have been assemblages of things, for example the piano is an assemblage of technologies that were available at the time of the construction of the first one. Maybe electronic media sort of intensifies this, I mean, those methods of combining and making things modular, though Hugh Davies' work is not all electronic, some of it is unamplified acoustic objects. Maybe it is the ideas that came out of the post-war, *avant-garde*, where the idea of an instrument becomes less fixed and more responsive.

**JR:** Paul Théberge said “musical instruments are better understood in terms of their place in a network of relationships — an ‘assemblage’ — with other objects” (Théberge, 2017: 59). If you think about the origin of electronic sound and the early recording studio, not all sound-making devices were ‘instruments’. A filter, for example, has not always been called an ‘instrument’. ‘Desk’, ‘console’, ‘machine’, ‘bay’, ‘equipment’ are all words associated with the recording studio.

**TS:** Well, the speaker is a good example I guess, in lots of music *pre-Musique Concrète*, the speaker is just a method for reproduction rather than a material object or artefact. This is also true of a lot of contemporary music. The Acousmonium at GRM (Tutschku, 2002) would be a good example of a system where the tools or technology are taking on an instrumental quality.

**JR:** One of the things I have been prioritising is thinking of amplification as an integral part of an electronic instrument rather than part of a means of the reproduction of sound. This has become central to my practice. I avoid in-house PAs. I mean, we could think of the amplification of an electronic instrument — amp and speakers — as a form of augmentation. I tend to try and include the amp and speaker in the instrument design.

**TS:** Yes, the same with lights as well, not taking for granted the lights or the sound system of the venue. Deconstructing the premade or pre-determined and working with these things as part of the musical practice or part of the characteristic of that particular performance-environment. You could say that this is a type of augmentation. Chris Cutler from Henry Cow has a nice podcast on the MACBA radio station. In that, he talks about how music and space have always been interlinked. So, a symphonic composition is a music which would be played in a large space with a lot of reverberation. The composition of this music folds in and allows for those reverberant characteristics. On the other hand, chamber music, which usually consists of a smaller ensemble in a small space, would open up different possibilities for the composer. His argument is that within the history of music there has always been a site specificness to the way that composition has been approached. Then you get to electronic or recorded media, and something changes because there is no longer a fixed acoustic chamber or space. Maybe we are arguing that our approach to electronic music does rely on space, and the material characteristics of that space, and that could be seen as a way of approaching augmentation.

## Examples

To route our thinking in practice, we will now give two practical examples of our own DIY instruments which we have used in collaborative performance-installations.

### **JR: Capacitors, DIY Faraday Generator, and Hacked Disposable Camera**

For many years now, I have been preoccupied with looking at the rudimentary components of electronic sound generating circuits, in particular the capacitor. I think of the capacitor as a form of envelope generator. A capacitor can be charged and discharged over time. The bigger the capacitor the greater the charge that can be stored and potentially the longer the envelope. I can shape sound events through exploring the charging and discharging process of a capacitor.

The piece *Charge/Discharge* (2012) is a good example of this preoccupation. Well, it is also a sound-making circuit that consists of a bit of wood and nails, a primitive breadboard device, with two wire rails from which multiple capacitors are attached in parallel. You can visually approximate how much charge the bank of capacitors will hold. The charge

from these capacitors would then power a simple low frequency oscillator and open and close a low-pass filter. The current is created by a DIY Faraday generator: a tube containing magnets with a copper coil winding shaken by a performer. The raw current becomes central to the timbre and shaping of the sound over time, its envelope. The more capacitors, the slower the attack and longer the decay/sustain and release of the sound.

Related to this, sound artist Kanta Horio introduced me to the circuit of a disposable flash camera. I found this circuit exciting in that a transformer is used to take the voltage of a humble AA battery up to hundreds of volts to trigger a Xenon tube. This charge is stored in a large capacitor. I felt the magic of this circuit was worth hanging on to and not 'disposable'. And I also became fascinated with the charging mechanism. The circuit acted as a study. I built another simple timer circuit to loop the triggering of the flash, so the capacitor in the camera continuously charged and discharged; and another circuit designed around an optocoupler (DIY Vactrol) to sense, track the charging of the capacitor. This, in turn, controlled the pitch and waveshape of an oscillator. I even transcribed this process of the charging and discharging of the disposable camera circuit for a piece with acoustic instruments and dance (see *Still* (2013)).

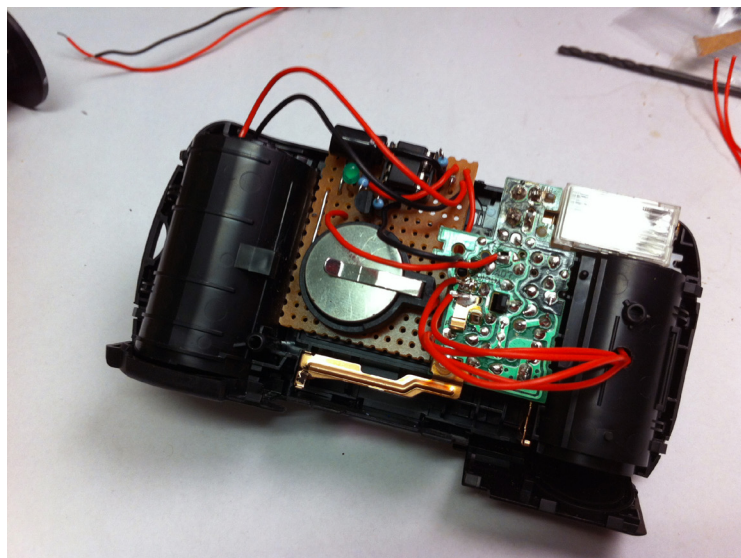


Fig. 1. *Still*: hacked disposable camera by John Richards

So that is all well and good, but one of the more interesting things about this work, which I was initially unaware of, was that the charging process and flashing Xenon tube produced a significant Electromagnetic Field (EMF). I placed the cameras next to radios that acted as an ear listening in on and amplifying, thus making the charging process audible. Then I started putting other electronic devices and sound circuits in the vicinity of these cameras and explored how the devices interacted within the field. I found sounds that I did not

initially predict or was unaware of, invisible things if you like, the ghost in the room.

### TS: Spirit Spark Gaps

Talking of ghosts, my spark gap device is related to some research I was doing around paranormal investigation. A while ago, I was looking at how paranormal researchers investigate environments and the devices they use. There are a lot of companies online where you can buy these quite extravagant looking devices which allow you to explore spaces to find ghosts and spirits. I personally do not have a fixed belief about those things, but I am generally interested in the way that technology or media changes the way people experience the world. How certain listening technologies allow for things to be revealed that might not otherwise. Maybe augmenting reality so much so that you actually experience a paranormal presence or energy. One of the things that is commonly used is an electromagnetic pump. It is a similar kind of circuit that you were talking about in your disposable camera, you take a low voltage, and you increase it to make it a high voltage. You have a coil of wire which you charge with high voltage and that injects an electromagnetic field into a space which is supposed to energise the dormant spirits within that space.

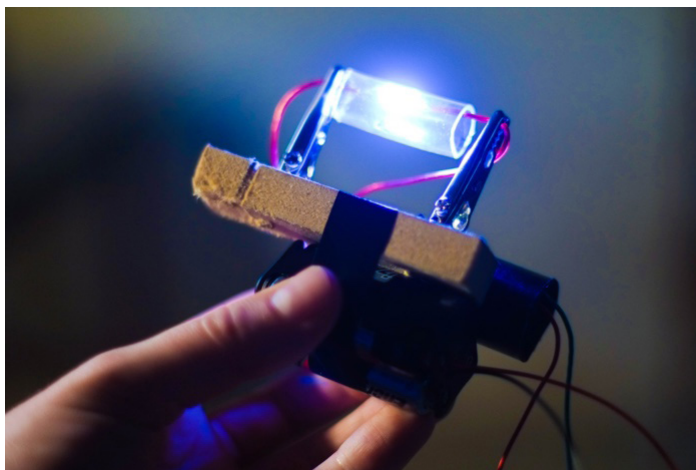


Fig. 2. Spark Gap construction by Tim Shaw (Image: Sara Lana)

I was looking at this and I was reluctant to buy one from one of these companies, so I decided to make one myself and consequently I discovered a circuit which creates a spark to dissipate a large amount of electromagnetic energy into a space.

It is a very simple instrument, a voltage conversion circuit, a pair of electrodes which you place close enough together to create a spark, and a battery. It is also effective because it generates light and sound together. Often when I am working with these things, I work with them in multiples, I have three or five, or more. I usually start my performances with the spark gaps and allow them to dissipate until the battery runs out, so there is a kind of



unpredictability to their behaviour. It is a really loud sound, and you hear it acoustically. There is no electronic amplification and it does not even have a resonator or anything, so it is a very raw sound, and it has a very sharp attack. I have not heard another musical instrument that has such a fast attack. When you have multiple spark gaps, you can place them around the space, and you have this kind of spatial perceptual environment, light and sound interacting with one another. Like your circuit John, they also give off a large electromagnetic field so you can amplify these fields using radios, coils or even bat detectors. You can also use the spark gaps to interact with other circuits and this can lead to very unpredictable and chaotic events, which I love!

**JR:** Having worked together, and also having built some spark gaps, I started trying to interact with the sparks in a very direct way, so if you like muting them, putting something between the gap, something physical like a stick or beater to make the sparks intermittent. I like performing with two spark gaps and sticks to create polyrhythms. This becomes like an extension of the instrument or extended technique. I think in this case, it is another way in which the material, simply the space between the electrodes, the gap, is central to the sound generation. I often incorporate a radio so I can hear how muting the sparks disrupts the electromagnetic field. I also noticed recently that the EMF produced by the sparks also interfered (in a good way) with some of the microprocessor circuits I have designed.

**TS:** Yes, I built one of your Radical Chips onto a perfboard and it sat in one of my storage boxes for a long time.<sup>4</sup> I found it recently and completely by accident I realised that when you pump electromagnetic energy into a space, like these paranormal researchers were doing, you can actually change the parameters of the synthesiser, completely wirelessly. The electromagnetic discharge from the spark gap, which is already a chaotic system, is pumping energy into the space and that energy is sensed by the pins of the chip on the circuit and changing its parameterisation. So, you can actually play this circuit using a spark gap. This was a very nice discovery because in my performances I am very interested in creating chaotic systems that I do not have complete control over, where the events are determined by the activity of the circuits and materials, rather than being a direct consequence of a performers' actions. So, the spark gap has a long history with its connection to early experiments in electricity, with, for example, the Franklin Bells, which are bells played using electricity harnessed from Thunder. This would charge one electrode, and another electrode would be grounded; this creates an oscillation between two electrodes visualised by a small piece of metal hanging between them. The spark gap was also used in early forms of radio, whereby Morse code was transmitted via spark gaps and the dissipation of broadband electromagnetic energy. The problem is that when you have lots of people trying to communicate with very broadband radio signals, they obviously interrupt and

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<sup>4</sup> See Radical Nails [https://dirtyelectronics.org/docs/radical\\_nails.zip](https://dirtyelectronics.org/docs/radical_nails.zip)

interfere with one another. Marconi used a kite to charge energy from the clouds and used that to create a spark. This is an interesting system, which connects the sky to the ground to create a high voltage radio broadcast. There are a lot of interesting media archaeological connections with both of the circuits we are talking about here.

## Discussion

Below we provide some reflexive discussion surrounding our collaborative findings. We offer three subheadings: Reduced Instruments, Raw Materials, and Fields of Influence.

### Reduced Instruments

**TS:** As mentioned, one of the projects we have been working on recently is Raw Data, Rough Mix with colleague and collaborator John Bowers (Bowers, Richards, Shaw et al., In Print). That project is about exploring electronic music using very few component devices. John Bowers also did this with his Victorian Synthesiser (Collins, 2020), which is just a battery and speaker cone connected to one another. Both the battery and the speaker cone were technologies available to the Victorians. This simple circuit is a way of approaching electronic musical practice through very reduced devices. Though, the circuit is very simple, you can find complexity in combining multiple instruments together by working with these devices in ensembles, for example. Working in this way gives you a very tactile and material-led approach.

**JR:** In our work there is a motivation or, if I can use this word, aesthetic to find the origin of something or work with raw materials. It is a form of brutalism. Brutalism in sound. So, through reductionism, we also focus on primary or raw materials. It is difficult to separate reductionism and the prioritising of raw materials. Let's discuss raw materials a bit more later. But sound, in relation to reductionism, might be thought of as the sine wave, or possibly we could consider the grain as a primary building block for sound-making. Our reductionism is geared toward resources for sound-making. And of course, the fundamental resource of electronic sound is electricity. The examples we have discussed arguably show that we are looking for the 'sound' of electricity itself. The spark gaps illustrate this. Or the examples I have discussed that sonify the flow of electric current.

**TS:** Again, it is also about not taking things for granted. With a laptop, you are taking many things as a given, you have a pre-built mechanism which implies and imposes a particular way of working. Many of the elements are proprietary: it is fixed in a black box; you can't open it up; and it is either on or it is off. Working with very simple materials gives you a completely different way of thinking about the instrument and its environment. Most performances that happen on a laptop require a PA or amplification and a certain signal

path for the sound to go through before an audience can hear it. Through working with these smaller assemblages of very reduced instruments, you open up new fields of possibilities. In terms of its spatiality, they can be placed around the space. There is a very material character to this approach. You can see the instruments working and being activated, so the process and the mechanism is available to the audience.

**JR:** To summarise, you could say that this interest in reductionism is to try and simplify the world around us and give us a better understanding and direct or clearer relationship with the things we are working with, as well as possibly having an indirect political stance in terms of working against this proprietary technological culture that dominates. So, it is not only for us, reducing things to help us understand, but it could also be argued that this reductionism also helps the audience's understanding of the sound and music. It kind of helps demystify the process of electronic music, but ironically of course, it just leads to the revelation of further complexities in the sound and the relationship between sounds. So, a reduced instrument does not necessarily lead to a reduced soundworld; in fact, it is often the opposite.

**TS:** Through the process of reduction, other things come to the foreground, like the ambient sound of the venue or the material characteristics of the space, the wooden floor, or the chairs that people sit on, the perceptual field changes for the listener. If you just perform with ten spark gaps, for example, you create a field, a sonic, spatial, and temporal environment. This may appear very minimal but it allows other elements in the environment to become present: its acoustics, where you are in relation to the different objects, where these objects are placed around the space, how many of them there are, the duration of the piece, etc. Steve Reich talked about this, on minimalism, and how in his work the mechanism of the music and the compositional process are considered equal. "What I am interested in is a compositional process and a sounding music that are one in the same thing." (Reich, 1974: 10) So whether you like his music or not, I like this idea of the mechanism being very open and clear to the audience.

### Raw Materials

**TS:** Much of our collaborative work explores the idea of performance environments and performance-installations (Richards & Shaw, 2022) whereby we inhabit an environment (gallery, performance space, squat, forest, etc.), placing multiple devices around a space and performing with them in various ways. When we have toured together, we have found many of our materials, objects, and things along the way. We have not set out with a fixed set of resources but we have actually incorporated found materials into our performance environments. We refer to this as Sonic Wayfaring (ibid: 9). In wayfaring, which is also connected to ideas of cybernetics (Pickering, 2010), you do not have a fixed journey which

has very easy plottable points, but more you set off on the journey and you respond to the sort of material conditions of that journey, change your path depending on those conditions, and eventually you get there. This can also be applied to the idea of musical instruments. Our definition of instrument is wayfared, discovered on route, and the details of that instrument will be refined or decided upon as it is being developed. This is sometimes referred to as iterative design, it is not that you have a prefixed idea in your head, rather you embrace the prototypic. A lot of our instruments are never fully completed; there is never a fixed end goal. In this way, you could describe these instruments as raw materials, so you are not really working with something that has been instrumentalized or a complete black box but something that is more materially oriented. Tim Ingold's idea of the relationship between material and maker and how this is not an instrumentalized relationship, it is constantly being reciprocated between those two actors (Ingold, 2013). He also uses the term hylomorphism (Ingold, 2010), which is the practice of making through a kind of predetermined idea: the artist has an idea, and then does everything in their control to make that idea a reality. That is very different to working in a very material-led way, which is what we do, working with the kind of characteristics of material and allowing that to inform our artistic process. We do not set out with a fixed image or a fixed idea because the ideas are actually developed in conjunction with the various material explorations we do.

**JR:** As already mentioned, electricity itself as a material has become one of my preoccupations; the battery or power supply, for example, are often neglected or overlooked when we talk about instrument or sound design. They are far more significant to the sound than we often think. We take them for granted, but as soon as you start playing around with the power supply in some kind of sound-generating circuit, you realise how integral it is to the sound. I like to engage in the finite resource of electricity. If a circuit is starved of electricity, there is maybe a cut-off point where sound ceases, yet often there are interesting thresholds or edge points. Everyone knows that when a battery runs out on something, you have this kind of semi chaotic system with some circuits that actually give surprising and unpredictable results. Yeah, a power starve control was a key feature on many circuit-bent instruments. I often think of electricity as the raw energy source of an instrument much like how you would think about the breath when, for example, blowing into a clarinet. Controlling this energy source is often deemed desirable when playing it. Yet, when thinking about electronic instruments, you do not have to regulate the power in any way, or include smoothing capacitors in the power supply, and those little details in the power supply — energy source — will influence the sound. I am always looking for things in the electronic sound generation chain that might be overlooked, and what we might think of as 'material' in such a chain or system. For example, I have been making my own digital to analogue converters (DACs) for digital instruments, such as the Radical Chip, essentially, first and second order low-pass filters, and, in some cases leaving out these

DACs completely as in the Radical Nails. By doing this, you suddenly realise how the DAC 'is' musical as well, in its own right. The timbre can change, a larger cap alters the speed of the filter, we get glisses between events; so I am often looking for those lower-level things to reveal some kind of music.



Fig. 3. Radical Nails by John Richards. Microprocessor-based instrument. Instruments Magnus Cooper

**TS:** Anthropologist Vasilina Orlova writes about *Malfunctioning Affective Infrastructures* (Orlova, 2021). One way of getting to know an infrastructure is by studying its failures, how that failure reveals its mechanical assemblage. We take for granted, for example, wireless Internet until it fails, and then we proceed to check the router and the cables etc. This procedure reveals the mechanical aspects of the infrastructure. I guess one thing we are doing with our instruments is revealing their mechanisms, through their failures or through their idiosyncrasies. This can also be applied to thinking around materials in a broader sense, materials break eventually, you find their limits, or they dissolve and become workable in a different way, so part of the excitement here is finding the limits of the materials we work with.

### Fields of Influence

**JR:** Where does the instrument begin and end? This is also something I have been grappling with for a long time. Georgina Born has said that “music has to be grasped as an extraordinarily complex kind of cultural object — as an aggregation of sonic, visual, discursive, social, corporeal, technological, and temporal mediations” (Born, 2017: 44). Can

we think of instrument too as some form of aggregation? We have previously considered this through the idea of instrument as a distributed, mesh-like structure (Richards & Shaw, 2022). Our approach to performance stems from the idea of creating an ecology (Waters, 2007) (Green, 2008) or environment whereby things are placed around and in a space, and we perform within this space. We are not performing from behind a table or on a stage but working directly with the space as a material constraint. When working in this way, there are unexpected and uncontrollable fields of influence; so, for example, things that have a large electromagnetic discharge influence, other things that have an electromagnetic discharge, and so on. From this, we can think of the whole space as an instrument, and individual components or devices become subsumed in the 'whole'. These instruments are not repeatable as such and are unique to a particular setting. They last just the length of a specific performance. The instrument is made in the space in front of the audience, and this is interesting because every space leads to a different musical result, and every performance is different through playing this mesh-like structure.

**TS:** One of the exciting things about thinking of the instrument as a field is the way that it opens up new scales and possibilities. The way in which you can move around or locate the electromagnetic energy in the space. You can look at the history of western classical music as extending the trajectory of instruments getting louder and performance happening in larger spaces with bigger audiences, consequently the orchestra gets bigger and louder. When considering an instrument as a field, it is possible to highlight smaller, quieter sounds by manipulating the relationship between the audience and the performer; arranging the space, so that things are closer to the audience.

**JR:** These invisible fields are like some kind of pseudo wireless network, but there are often physical things within this field as well. To start with, the audience and performers and their movement or position within a space influence the field. We often work with things like radios and coils that can sense this field, and we both amplify or make present its activity using an array of electromagnetic circuits. Thinking again about the use of microprocessors, they can be switched on within a circuit but disconnected from an audio output. They appear silent, we perceive nothing is happening, but of course, the microprocessor's internal clock is producing high frequency, and if I move a radio near the microprocessor, I can stumble across interference and interesting sounds.

**TS:** One thing which is exciting to me as a performer is when, through the act of performing, you discover something new about your instrument or your devices. Quite often this has to do with fields of interaction. I rarely set up all of my equipment outside the moment of the performance, so the performance is a space whereby things can be discovered. What is very satisfying to me is if I get to the end of a performance and I have discovered something new about my performance ecology and how the different things interact within it. Even

if it is a 'bad' performance, at least I learnt something. One thing we have not really talked about in detail yet is that idea of playing an instrument, and actually I think in our case, we are often trying to find new possibilities for playing our instruments.

**JR:** Being present in the field makes you an actor or performer even if you are standing still and seemingly doing nothing. This is interesting when thinking about the concept of 'playing' an instrument. But what is more interesting is when the environment starts to play and perform itself. I have been drawn to the idea of what Claire Bishop calls delegated performance, an approach to outsourcing authenticity where "everyday people are hired to perform on behalf of the artist" (Bishop, 2012: 4). She talks about this within the context of participatory art, but actually, within our mesh-like structures we have a number of actors — the physical environment, performers and audience — that can play 'our' instrument in a delegated way. We can start considering, for example, how the environment might play this instrument, or how the audience might interact with the electromagnetic field, possibly by accident, by simply standing in a certain position in the room. The performance of such mesh-like structures then is taken out of our hands. The 'playing' of the instrument then is delegated to others and environmental conditions.

**TS:** Something could also be said here about feedback. Fields of influences are also a form of feedback. For example, the Radical Chip being played by a spark gap, which triggers a light that disperses its own electromagnetic field; it is picked-up by a coil and fed back into the spark gap; then, it is connected to a loudspeaker cone that jumps and vibrates and shakes five bottle tops. It is about mediation or a form of feedback whereby the fields of influence inform different ways of experiencing and playing the instrument. It is more than a chain reaction because each reaction influences and impacts the other.

## Conclusions

In this conversation, we initially set out an argument against augmentation and augmented instruments. This is logical given our gravitation towards reduced instruments and working with raw materials. Yet, throughout the conversation, we suggest another way of thinking about augmentation in relation to instruments; so, not 'against' *per se*, but 'another' understanding of augmentation. We ask the fundamental question related to musical instruments: "What are we augmenting?". The instruments presented here raise a number of important questions relating to definitions and categorisation of musical instruments. There are prototypic devices, assemblages, and ghost-like fields all under the banner of 'instrument'. From this, our conversation has led us to think of the augmented instrument as a complex intertwined mesh-like structure in which there exists a field or network where things interact and influence one another. Within this structure, there are

many actors that include us as performers, the audience, the raw materials of our devices, and environmental conditions. This 'augmented instrument' challenges our notion of performative control and how we might 'play' such an instrument. Paradoxically, through the process of reductionism and 'brutal aesthetics', we open up new ways of thinking about augmented instruments.

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