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From Circuitry to Live Improvisation (and Back): Hacking One's Way Through Contemporary Electronic Music

Entretien avec Clément Canonne

Des circuits électroniques à l'improvisation live (et retour) : itinéraire d'un musicien hacker au sein des musiques électroniques

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Tribune

Nicolas Collins
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Interview by Clément Canonne (IRCAM-CNRS-Sorbonne Université)

*Nicolas Collins is Professor at the School of the Art Institute of Chicago. Influenced by Alvin Lucier, David Tudor and punk culture, his work is at the intersection of experimental music, computer music, and sound art. During his career, he invented numerous musical devices by hijacking or altering existing technologies: CD players that play the sound produced by a disc when it is paused (*Broken Light*, 1991); attached to a trombone, a signal processing system that combines a digital reverb and a Commodore 64 motherboard (*Tobabo Fonio*, 1986); or discarded electronic circuits "reanimated" by probes that interact with other electronic components to create feedback (*Salvage*, 2008). He also wrote* Handmade Electronic Music: The Art of Hardware Hacking *(Routledge, 2009), an influential introduction to the world of musical hacking. In this interview, Nicolas Collins describes his journey as an artist at the crossroads of experimental music, computer music and sound art, and explains why hacking matters that much within today's artistic practices.*

Influences

Both my parents were artist-oriented so I grew up in New York in the 60s with a deep immersion in the art world—where they took their children instead of to the circus was galleries of avant-garde art, Jean Tinguely, a lot of technological art. I didn't get interested in making music until high school, in 1968. I think it may have had as much to do with the idea of being *anti*-something as *for*-something. I liked the idea of the avant-garde, experimental music that was against the *status quo*. But then I branched into electronics, and weird things started to happen. I bought a reel-to-reel tape recorder to dub records, and it had a funny switch in it that made it feedback on itself, so it turned into this instrument. I built my very first oscillator circuit by finding information in some hobby magazines—you know, it was before Internet.

I ended up studying music in Wesleyan University, and the first time I met with my advisor in the Music Department, he said: "Do you know Alvin Lucier? You said you did electronic music"… And I didn't know him. I was from New York, I thought I knew everything. I knew Cage's music, but I didn't know Lucier's. And my advisor said: "Oh, you should meet him, he makes music with bats". And I thought: "Whoo… That is like so far beyond anything experimental I thought of, I have to meet this guy"—it felt like meeting the Che Guevara of music.

I worked with him for years (Bachelor and Master degrees) and he was a very big influence. Composers like Lucier, at that time, made the case that you could make music about *anything*. It doesn't have to be about Beethoven, it doesn't have to be about Mahler or Schönberg, it doesn't have to come from just that one stream. So here is a composer who's making music based on architecture, biology, neuroscience. And of course, for someone who didn't have a strong traditional music background like me, that was very liberating… It was a catharsis. I think we may have slightly misunderstood that lesson, because I think, in the end, there is still something fundamental about *musicality*. Lucier is very careful to say in his pieces, like I *am sitting in a room*, that this is not "a demonstration of a physical fact". He doesn't want to do science. The way those pieces work, and the way they last for 50 years, it's because they have a poetic quality, they're not just science. I think in the 70s, sometimes, there was a confusion, people thought they could do didactic works, but it didn't mean they were good "music". But, you know, we learned that difference eventually. The point was that it was a very liberating feeling and it made me think that I could become a composer even though my background was very strange. That was what pushed me on the road.

Electronics and indeterminacy

Lucier said in an interview: "I'm not interested in electronic circuits because they're two-dimensional, and sound is three-dimensional." But he encouraged his students to learn circuitry and computer programming—because he nonetheless thought this was the future of music. So he invited David Tudor and David Behrman, he introduced us to those people, he thought that was important for our education.

I continued building my own circuits in the 70s—it was a little more difficult then, there was less information. But there was an aesthetic post-Cage of accepting accidents and indeterminacy. So a circuit that didn't behave like a Moog, because it was glitchy or unstable, could work in our music—it might not work to play Bach, but it worked for the strange, post-Cagean ideas. This is why when I was a student, I worked with feedback a lot, because with feedback, you don't have to make a decision, you just turn up the volume, and something in the real world makes a decision for you. It's not my job to pick the pitch, and I just can manipulate by going from one to another that are just sort of given. And we were also always interested in live performance, I think that was the legacy of growing up on pop music, for my generation. My friends were not interested in doing studio work, we weren't interested in making tapes, we wanted to get on stage and play.

Then at the beginning of the 80s there was a big shift to the personal computer as the basis for live electronic music. MIDI was a very powerful tool, everything became much cheaper. You started to get application software like sequencers, so you didn't have to write you own code yourself. So it was a big liberation. But at the same time, MIDI was designed for the commercial music market, it was designed to sell synthesizers to people who made what we might call "normal" music. And

normal music is based on notes. But a lot of what people were doing in *my* world didn't have to do with playing notes, chords and melodies. We had other ideas about crafting sounds. The MIDI system was not so good for that. My friends who were working with computers were spending a lot of time kind of finding backdoors into MIDI equipment, so that you can do strange things with the synths. So in the 1980s, I worked with multiple technologies: I used computers for things that computers do well, which is mostly control; I used circuits for the things that circuits did well, like making strange noises, noises that weren't synthesizer sounds; and because my music was based on performance, I worked with musicians, because I needed players. I worked with musicians playing circuitry that I would build, but also with their musical instruments.

The thing was that, at the time, for the chamber music ensemble who would play contemporary music, there was still a lot of resistance to "open form" music. Even in the 80s, Cage was kind of a hot topic. Not everybody thought he was serious. And I think a lot of musicians who came out of conservatories basically either didn't know how to improvise or they didn't trust themselves doing improvisation. And so I ended up working with musicians from the improvised music world. They weren't a lot of people working with electronics but unlike a lot of the classical musicians, the improvisers were open to it. They would say: "Oh, that's cool, that's different", rather than "Oh, I don't know, where are the notes?"

Live performance

I built this instrument that was based on hacking an early digital reverb—I stuck a Commodore 64 computer inside a digital reverb and made connections between the two, and I essentially made a DSP-extension for the C64 by using the signal processing capabilities of the reverb and just hand-shaking to the Commodore for control. It was very good for instantaneous looping, sampling and sound transformation. It's like the looper pedals they sell now but this was 30 years ago. I liked the sound vocabulary of the transformations, which I could have done those in the studio, non-real-time. But I loved the idea of being able to do it fast, I loved the idea of sampling radio on stage, because it gave you this tension of… you know, it's now, I need it now! So the idea was that it was fast and it was live. So I built up this system and to control it—again because I wanted something big—I decided that I needed a big slide fader, and I thought: oh, a trombone! You know, a stupid joke! And I connected the trombone to half a mouse—a data entry wheel, a shaft encoder—and then I put a keypad on the trombone with 24 buttons, and then I could click and drag, to change any parameter of the program: change the pitch, change the length, change the program, change the filter. In a way, the trombone was just a mouse! But I didn't have to look at a computer screen, which meant I could be on a stage, I could concentrate on the other musicians, or on the audience. It had this intimacy on stage, even though it was obviously an electronic instrument—the sounds were electronic, I never blew into the instrument—it had

this acoustic presence. I started working with improvisers. I said: "Look, can we just try something?" And improvisers are funny because they don't say: "Let's go to the studio and try it out"; they say: "Oh, ok, I booked a gig, and I meet you at 8 for sound check". So it's a "trial by fire" as we say in English. I started doing that in 1987 or 1988 and that's what really opened up improvised music for me, because I finally had an instrument that felt right for me.[1]

This trombone was the first thing that actually behaved like an instrument. That is, one day I could play wedding with it, and the next day a Bar Mitzva (well, not exactly). It was really my introduction to being an instrumentalist. When I would play with musicians on stage I would grab the very first noises they'd make, maybe just tuning or taping the keys and then I'd make 2 minutes of variations on it. I was very attracted to DJ culture, from rather early on. You know, I started listening early hip-hop DJs in 1980, when they were just beginning to emerge in the consciousness of the white world. I really wanted to be a DJ, but the problem was that it was a lot of equipment and I had all this other equipment that I had to carry for the other pieces—I couldn't carry one suitcase of electronics for the electronic pieces, and then two turntables and a box of records. So with the trombone instrument, I was basically DJing with the sounds that the other musicians were making live on stage.

Someone once said that I was responsible for slowing down improvised music, because everything I did was a question of extension. In improvisation it used to be that as soon as you did something, you could move away. And now, thanks to me, you couldn't, because what you threw away was still there, I was sustaining it. My education took place during the minimalist era, when minimalism was really a strong force in the music field. Things were *slow*. The trombone extended things, it basically slowed things down. And many of the systems I built suffered from too much tranquil beauty as a result of my minimalist background. There are hints of Muzak or easy-listening music in a lot of what I did. I wasn't, you know, like a meditative, Californian-mind type of person; I was a New Yorker and there was always a certain tension where I'd have to figure how to get edge in my work. And when I improvised with other players, of course, that was easy, because the other musicians could do something sudden. But I could never initiate an aggressive act without their input. This nagged me. And what was interesting about getting involved in circuitry in a more intense way, for the second time of my life, was that it allowed me to work with, shall we say, more aggressive sounds and less beautiful sounds.

Circuitry

There was always this idea in my circle that the circuit actually wasn't just the sound instrument, but there was an element of a score in it. The circuit implies the piece. So very often, you'd make one circuit and you would only use it for one composition,

1 Pour un exemple, voir : https://www.youtube.com/watch?v=89jbl0ZuaH4&t=65s (consulté le 31 juillet 2019).

as it were. For example, I have this piece called *The Royal Touch*, which is based on connecting a simple circuit I built to a dead circuit board I found in the garbage.[2] Now, I don't know what's on the found circuit board, I think it's an input channel from an old mixer. I know that on the one side there are resistors and capacitors, integrated circuits, etc. but I don't know what's what or what is where. So what I do is: I just push small contacts around on the side of the board with the traces connecting all those components, and I get a bunch of glitchy sounds. I push them around some more and suddenly you'll hear a clear pitch. I try to sustain it but my hands are moving a little bit, the pitch will vanish. I move a fraction of a millimeter, kind of rolling my finger, trying to get the tone back or find another. That's basically the performance.

Now here is the thing. The oscillator tuning is a function of two components: One is whatever components lie between the two contact points on the dead circuit board, and then, inside the circuit I built each voice has a capacitor, which sets the range of the oscillator. When I built my circuit I selected a capacitor for each voice, so that one of these voices will always be too high to hear, one will always be so low as to be a rhythm, and the others are in between; when they collide and interact on the board, they modulate each other, create side bands and other effects. I know that each voice lies in a specific range of frequencies, I don't know which one is which, but I know that statistically I'm going to get a wide distribution of pitches, and I'm going to get certain types of modulations. Then, it's just a question of how much work I have to do to find sounds and rhythmic patterns that I like: how often can I work it continuously and how often do I need to shake things up a bit. The piece does require "technique", it's not like playing a Bach partita, but you do learn from playing it.

But even if I can learn from playing it, I don't consider this circuit is really an "instrument". It's like asking a drummer: "Have you ever thought of doing a 3-week tour of concerts, improvising with these other musicians, with just a triangle?" A lot of my circuits are like a triangle. In the right context, it's the perfect sound, but do you want to hear it a whole night of solo triangle music? I have made circuits that make incredibly beautiful sounds, but I would have to say that, generally speaking, they have a limited range of sound and performance options. When people build analog synthesizers, they have several different modules, so that you can have variety. But I only have 4 or 5 "drums". And the way of playing them doesn't really give me, as a performer, enough variation. Here's the problem: real musical instruments are amazingly nuanced. You get somebody out there with a guitar, with their voice, I even know people who do solo snare drum performance (maybe not triangle), and you get so much range, so much flexibility. And I'm sorry, I've been building circuits since I was 17 years old, and I'm a pretty good builder, but I will never be able to build a circuit that will have the expressivity of a snare drum. I don't have that ability. I simply don't feel comfortable doing that.

2 Voir : https://www.youtube.com/watch?v=DtGcueEsuDE&t=71s (consulté le 31 juillet 2019).

Making

My newfound interest in DIY and circuits is also strongly linked to the teaching job at the School of the Art Institute of Chicago, which had a department called "Sound"—not "Music" but "Sound". It was a very digitally-oriented school; everyone was using computers. I often say that command-X/command-V is the most powerful tool an artist can have. Suddenly you have one "pencil" that you can use to edit words, edit films, edit videos, edit sounds, edit website code, edit illustrations… It's amazing! But at the same time, it is a very non-physical tool. And artists, unlike composers, generally speaking, even digital artists, they always started messy. Everyone who decides to go to art school started out scribbling, drawing with crayons on the kitchen table. Maybe that will change, maybe in 10 years we'll finally have a generation of kids who never touched paper. But in my students, I saw this kind of schizophrenia: they were very electronically-oriented sonically, everything they heard was through earbuds or speakers, none of them played acoustic instruments, none of them listened to concerts of acoustic music, if they went to music events it was always clubs, so they were immersed in electronic sounds; but they wanted to do something with their hands. You know, it's like these kids had a digital hangover: They woke up one morning and said "Too much computer, give me a circuit!" And I gave them a circuit. I always had little bits of circuitry in my music, and I was always doing minor hacks on things: no mixer or effect processors that came into my house remained unmodified for more than 30 seconds, I just opened them up and changed something. But most my attention by the end of the 1990s was focused on software, that's where you can really work and get things done. Urged by my students I looked back at what I knew about circuitry and I thought: What of this is relevant today? I was looking for things computers do badly. You know, I'm sorry if this offends people, but there's really no point to try building your own analog synthesizer from scratch. I mean, come on: A/ You can get beautiful synthesizer emulators that run on your computer and you don't have to carry an extra piece of luggage, and B/ there are wonderful designers making these modules and they're not terribly expensive so why not just buy them? But there are things that computers do badly, and the performance instrument is one of those weaknesses.

So I did this class which was mostly making performable circuits, things that you can really interact with directly, things that you would touch with your skin. And the other thing was that we made unusual microphones. Because, again, all of my students—and everybody else in the world—were working with sample-based music creation; some of the samples were computer generated sounds, but a lot of them originated from the acoustic world. They have to get from the acoustic world into the electronic world. And if you can design you own microphones, it's like designing your own ears: You can change the way you hear those sounds. Some of these mics are really simple and inexpensive to build, so why not? Also, if you build a mike for two euros, you're much more willing to do something crazy with it, like putting it in

the middle of the street and record what it sounds like to have a garbage trunk run over a mike—you won't do that with a Neumann, unless you're a very rich person.

Hacking

Hacking, in American English, it always had a meaning of sort of improvisatory solutions. And you use it in a number of ways, you can say: "I was hacking around the house", which means I was doing little repair, like "fiddling" or "tinkering", which often means a kind of work that's not hugely productive or isn't very expert. Our vocabularies are rich with words like this because it's a very human activity.

There is a connection between hacking and power that I think is very important. When you hack the telephone system, the telephone system is a very powerful thing. In 1970, to be able to hack a free long-distance telephone call from New York to England, woah, it was probably the equivalent of a hundred euros at that time. This is like significant power. When you got access to a big computer system for an insurance company, that was a million-dollar computer system with all these data in it, it represented power.

One of the early aspect of hacking in American culture, before the telephone, was hot rod cars. The engine boxes of cars were designed very conservatively, and the hole for the cylinder had a lot of metal around it. And if you made this bigger, the engine would be stronger, because it was more displacement on the engine. So they begin this movement of increasing the power of your car by doing this machining in your home garage. This was like circuit bending: You take the toy and you do thing that the factory doesn't want you to do. These engines represented power. In other words, there was more power in the engine that they gave you, because it was under-utilized. So when you were over-drilling this, it was like making free long-distance calls, you know, suddenly you got the power yourself. But here is the thing: Whether it was the hot rod people, the phone people, or the computer hackers, they didn't always use the power to its fullest extent. What was interesting for the hacker was often just to expose that power.

Now my situation with hacking is very similar to the hot rod car persons. I learned a little bit of circuitry, I made a few simple circuits, but then I would finally buy something, I would buy a mixer or an effect pedal. And I would look at it and say: There is more in here than they're letting me have. So I would open it up and I would make a change to give me access to something that was there but that the manufacturer wouldn't let me access.

One of the things I very often did, for example, when I bought something like a Makie mixer was—they would have very nice power supplies inside—drill hole in the box and put a connector on it so I could use the power supply of the Makie to power some other circuit of mine. What this meant is that I didn't have to bring along on the road this second big power supply that I needed for my circuit, I used the Makie. That was a question of simply taking something from it. At the same time, there was this journal called *The Audio Amateur*, which would publish articles about an amplifier that you can buy that's quite good, but if you open it up, and you take out these two capacitors, and you put in these two better capacitors,

you will have an even *better* sound. So in that case, the hack was to improve something, not to turn a stereo into a 4-channel amp, but to improve its performance. When I tap the power supply from the Makie, I'm *adding* something. When I change the capacitors, I'm *improving* it—both are parts of the same hacking aesthetic.

There is a big generational change between my father's generation and the generation of my students. My father was an academic, but he was a man who grew up in a world of mechanical things, with the assumption that you have to understand your mechanical world to keep it going. And the assumption was that the world was "open". If you couldn't do it yourself, maybe your neighbor could. And now, we live in a world where the technology is either remote—where is "the Cloud"? I have no idea—or it's closed—how often have you opened up your MacBook?

One of the things I get constantly in my workshops is people using that cliché word *empowerment*. They say: It was empowering because I never thought I could open this thing. It's as simple as that, a lot of what we are doing in these workshops is opening something: We open a radio and we touch the circuit board; or we connect a loudspeaker directly to a battery. It is about *opening*. Even when we build a circuit, in a sense, it's an opening process, backwards. Afterwards we understand what's inside the boxes we buy. This may be naïve on my part—and as a New Yorker, I'm bitter and twisted and cynical by nature—but I think that there is a political value to giving someone a sense of control over the material in their life, so you don't feel that you are always a victim of something. I think that one of the things about hacking that has value that goes beyond just making weird noises is: It makes people aware of how things work, it either gives them a sense that they have a little bit more control over something that they otherwise couldn't, or it means that they don't have to believe what other people tell them. You know, like when you're having problem with the cable for your television and phone support says: "Oh, there is nothing that can be done because the cable junction at the next block is broken". Then you can say: "No! They can go to the cable junction, they can open a box, and they can put a jumper wire in!" And then they go: "Woah! How did you know that?" In other words, it means that you can challenge the people who depend on the "closedness" of their system for control. Which gets back to "power": as long as the power is enclosed and is invisible, it's mysterious and has power over you. But when you get access to it, you know what the mechanism is, and you realize that it isn't absolute and that it has limitations.