



**CENTER FOR NEW MUSIC & AUDIO TECHNOLOGIES**

**SPRING 2021 NEWSLETTER**

Welcome to the CNMAT newsletter, published in collaboration with the CNMAT Users Group and the faculty and staff of CNMAT.



*Left to right: Maija Hynninen, Carmine Emanuele Cella, Matt Schumaker, Ken Ueno. See inside for more details.*

**CNMAT facilities continued closure during Spring 2021**

In compliance with UC Berkeley [policies](#) related to the Covid-19 pandemic, CNMAT's facilities at 1750 Arch St. remained closed during the Spring 2021 semester. Our building has only been open to approved faculty and staff for limited research and instruction. The University has announced "an expected return of students, faculty, academic appointees and staff to in-person instruction across the state this fall." Visit the CNMAT [website](#) for up-to-date information about our concerts, lectures and other events.

Visit CNMAT online at [cnmat.berkeley.edu](http://cnmat.berkeley.edu)  
Support CNMAT with your donation [here](#).

People, projects, news...

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**Graduate students**

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**and more...**

Updates on recent CNMAT research projects, interviews with faculty...

## GRAD STUDENT SHOWCASES

### OREN BONEH

*Oren Boneh is completing his PhD. in music composition this Spring 2021. In this interview by Danniell Ribeiro, he discusses his current projects.*

*Danniell Ribeiro: What have you been working on lately?*

Oren Boneh: I'm working on a dance show with a Belgian choreographer, and I'm doing the music for the tour in March/April of 2021.

*Would you mind commenting on the music that you're writing? Including what instruments and/or technologies you're using. In what way does the project dialogue with your work? Also, how did it come up? How did you two meet and would you also be going on tour with the show?*

The choreographer Ayelen Parolin and I were introduced to each other by IRCAM. The piece that we're working on together is called *With* and it will be choreographed for two dancers. It's the first of two pieces that we are set to work on together, the other being called *Simple* for three dancers, which will be done in collaboration with IRCAM. The piece is meant to go on tour in March and April in Belgium, France and Spain, but this is up in the air due to the pandemic. If it happens, I will indeed be going on tour with the group. The music that I'm creating for this piece is all electronic, all fixed electronics with the potential exceptions that Ayelen is also interested in playing with some live and potentially improvisatory elements.

The project provides me with several new challenges. One is that the piece is evening-length, so it's around an hour of music. I hadn't had experience working with such large-scale pieces before this. Another is collaborating in this type of way; normally, when writing pieces for ensembles and musicians, we do collaborate, but that collaboration is usually limited. The musicians give me feedback on techniques and particular passages, but rarely do we get into discussions about the musical content itself from an aesthetic point of view. With Ayelen, I send her the music that I've composed every 1-2 weeks and we speak quite in depth about what she likes and doesn't. I go back and change things significantly according to these discussions. It's our first time working together, so we are also getting to know each other from aesthetic points of view. We also exchanged quite a lot of music that we each like that somehow related to this project in order to establish some sort of common ground. This type of collaboration is new and exhilarating to me and I'm very curious to see how things will develop further once rehearsals begin. Finally, from an aesthetic point of view, given that there are no musicians involved, Ayelen was interested in finding ways to give the piece an acoustic feeling some of the time and using very rhythmic material as opposed to feeling as though we were in a purely elec-



tronic world made up of textures. The first basic ideas that she gave me as starting points were the pounding rhythm from *The Augurs of Spring* from *The Rite of Spring*, and ritualistic rhythms. Since then, we have discovered that we both have urges to create eclectic music that draws from many styles of music, and this common ground has made the process really exciting. All of these starting points have led me to paths that I haven't explored before, which has been very fun and very educational for me from technological and musical points of view.

A link to the project on Belgian choreographer Ayelen Parolin's website:

<http://www.ayelenparolin.be/#/with-2021/>

Oren Boneh's calendar for 2021 including the project:

<http://www.orenboneh.com/calendar.html>

### MAIJA HYNINEN



While the pandemic has proven to be a challenge for all involved, composer [Maija Hynninen](#) has maintained an active schedule through creative adaptation to this current moment in history. Some highlights include the Finland premier of her work *Incandescence - Oboe Concerto*. Performed for live broadcast by the Finnish Radio Symphony, the work has been a long time in the making. Origin-

nally written in 2016, the work was not able to be performed at the time due to an unrelated injury to the soloist. Now the work will get the premiere that it deserves, broadcast live, and archived at this link on the 10th of February.

Hynninen is also busy working on a piece commissioned by contrabass clarinetist, Heather Roche in the universe everything is a circle. As another adaptation to the current limits on travel, Hynninen and Roche have been working together remotely. They had originally planned on working on the project in person in London, but those plans also needed to be adapted. Hynninen has been working with the Orchidea package for MAX/MSP developed by Berkeley Professor, Dr. Carmine Cella, to develop the musical content of the work assisted with artificial intelligence. Hynninen notes: "In a nutshell this piece is about finding different and partly

unexpected ways to orchestrate certain timbres that I find interesting, e.g. the sound of breathing." A video recording of that work is expected to be released in February.

And to add to all of that, she is completing her dissertation titled *Secret Inner Garden*. That work is building on her current Orchidea research that will result in a composition for a larger chamber ensemble with no electronics. Again augmenting the compositional process with artificial intelligence has opened up new orchestration possibilities expanding Hynninen's compositional palette.

Composition during a pandemic creates unique challenges as well as opportunities through remote collaboration and new paradigms for composition. Hynninen has met this moment with grace and has prevailed. There is no doubt Hynninen will have some very interesting projects in the future.

## LETTERS FROM PARIS

*Graduate student composers Clara Olivares, Jon Yu and Didem Coskunseven report from Paris during their residencies at IRCAM.*

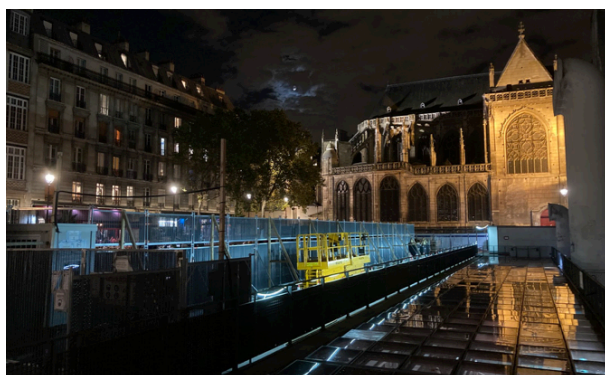
**CLARA OLIVARES:** My experience at IRCAM has been great so far. I'm learning every day on both technical and creative aspects of electronic projects, through theoretical classes combined with small monthly compositions involving electronics. I am especially excited about my final project, which includes glass instruments and for which I will use the software Modalys, to build synthetic sounds of glass. One thing that I appreciate the most is the 24/7 access to the recording studios: that gives me freedom to work for as long as I want, using excellent resources and gear in a very stimulating environment.

**JON YU:** Here at IRCAM's Cursus program, I'm currently working on a project for saxophonist Joshua Hyde that incorporates a video sculpture and live electronics. In a general sense, this project aims to explore the relationships among notions of space, distance, memory, and privacy. The performer and the video sculpture will be spatialized without a stage in the concert space such that they rest in the audience's periphery. The video will be made in collaboration with filmmaker Mareike Engelhardt and dancer Zoë De Sousa. The multidisciplinary nature of the project is something new to me, and I've very much enjoyed working collaboratively with Josh, Mareike, and Zoë. Their respective input and creative presence have been especially great during these strange Covid times.

**DIDEM COSKUNSEVEN:** First of all, I would like to share my gratitude for the support of IRCAM and UC Berkeley Music Department in these strange times. Although there are strict lockdowns and curfews in Paris, we still have the opportunity to book the studios at IRCAM, we are having intense classes on different subjects in computer music, and composing short pieces as part of the Cursus program. This year, IRCAM's pedagogical team joined forces with the Paris Conservatory's Dance department and the Beaux Arts, so we could collaborate with the dancers, choreographers and the visual artists. I believe that the collaborative approach IRCAM brings to this year's Cursus program is really precious and opens new ways of production.



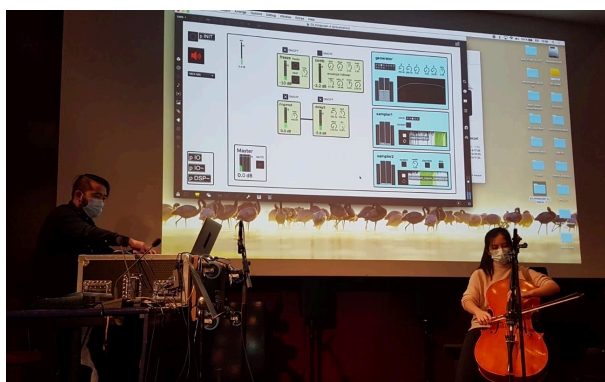
*Dance and Music workshop with Thierry de Mey and Marie Goudot. Photo: Didem Coskunseven*



*In front of IRCAM. Photo: Jon Yu*



*Dance and Live electronics workshop. Photo: Jon Yu*



*Cellist Zhou Yi and Jon Yu in an improvisation with cello and electronics. Photo by Jon Yu*

## MATT SCHUMAKER

*Matt Schumaker* (PhD. in Music Composition, 2015) composes concept-driven music arising from computer-assisted composition and interactive computer music research. During 2018–20, Schumaker was an MLK Visiting Scholar at MIT, where he continues to teach courses in computer music. Matt Schumaker was interviewed by CNMAT Director, Edmund Campion

EC: Matt, several of your pieces are deeply engaged with the sounds of engines and other mechanical sounds. What draws you to this material?

MS: I do love the sound of engines, for instance the howl of Formula One race cars being pushed to the limit, or the roar of jet planes making a low fly-by. These are fearsome sounds, an amalgam of dynamic noise and frequencies, always beautiful to me, and with powerful shape-shifting tonalities. I like to analyze and uncover the deep musicality of these sounds -- to use the models and source material in my own works as I did in the piece *Stream\_l\_i\_n\_e\_s* (after Robert Lawrence)

In fact, mechanical and noisy sounds have aesthetically appealed to me for as long as I can remember! As a teenager, I was drawn to the Bay Area's form of 'Industrial Culture', from the robotic performances of Survival Research Laboratories (SRL), to local noise bands like Factrix. Their art is creepy and ironic, probing the dangers of human interaction mediated through technology.

Industrial culture also introduced me to writers like J.G. Ballard, whose work still provides inspiring directives, like this one: "One has to immerse oneself in the threatening possibilities offered by modern science and technology, and try to swim to the other end of the pool."

EC: Tell me more about your piece *Stream\_l\_i\_n\_e\_s* (after Robert Lawrence)?

MS: That's a piece for clarinet and real-time computer accompaniment that I wrote as an homage to the pilot Robert Henry Lawrence, Jr, the first African-American selected for a space program. As a test pilot for the Air Force, Lawrence's search for self-

realization led him to confront the 'threatening possibilities' of science and technology on a daily basis. In 1967, he was selected to be a part of the Manned Orbital Laboratory (MOL), the Air Force's space program at that time. Lawrence was an erudite and experienced pilot who further distinguished himself by earning a PhD in Chemistry, an achievement and background that few if any other test pilots had attained at that time. In his work, Lawrence flew Lockheed F-104 Starfighter jets and provided significant

research on a difficult steep-descent gliding technique called the flare maneuver, work that became important to the Space Shuttle's development. Tragically, Lawrence died in a training accident a few months after his assignment, but in the 90's, his widow along with others convinced NASA to recognize Lawrence as a full astronaut. Now Lawrence's name is included with those of the other fallen astronauts on the Space Mirror Memorial at the Kennedy Center in Florida. (Coincidentally, my very first summer job as a kid was working for the San Francisco architecture firm that designed that memorial.)



Robert Henry Lawrence, Jr. (1935–67)  
Image courtesy of: LIFE Magazine



Composer Matt Schumaker (<https://mattschumaker.com/>) (PhD. in Music composition, 2015) in front of an F104 Starfighter at the National Air and Space Museum. In this interview by Edmund Campion he discusses his career and recent work.

In my own piece, I try to present a musical vision of Lawrence flying in the sky and conducting research on the flare maneuver. The piece depicts his work through four sonic viewpoints: a view of the imposing and loud planes on the tarmac, a view of contrails—those long white streaks that follow a plane, a view of the balletic flight maneuvers in the sky, and a view that depicts the turbulent forces that test pilots contend with. These musical views come back and are juxtaposed with one another in different and unexpected ways throughout the piece.

I wanted to build on the jet metaphor and to bring something from the sound and science of flight into the music. For this, I used computer-assisted composition techniques that I had begun learning and developing while at CNMAT. For instance, I began by analyzing audio recordings of the F-104 Starfighter planes that Lawrence flew and used these analyses to provide some of the harmonic elements in the work. I also developed a MAX/MSP patch to do real-time processing of the clarinet sound, filtering and transforming it to make it sound more like a jet plane in certain sections and triggering dense musical textures made from plane sounds to accompany the soloist in other sections.

Through the work of the wonderful people at the MLK Visiting Scholar Program, I also had the opportunity to be introduced to AeroAstro professor Wesley L. Harris, who kindly took time to introduce me to the streamlines and other related concepts on several occasions. I was struck at one point, when he pointed out that one technique they used to study aerodynamics involved making measurements from photos of aerodynamic streamlines. This led me to make my own method adopting this technique to music. And I went on to create programs in Max and OpenMusic to make musical lines from measurements taken of the contours of photographed aerodynamic streamlines. I then developed these ideas to make programs that create musical lines that interpolate in stages from one to the next, reflecting the way the streamlines appear to radiate away from the wings in smoothly changing curves.

Clarinetist Diane Heffner performed the premiere of the piece, which was commissioned by the Dinosaur Annex Chamber Ensemble, in April of 2019, as part of the Cambridge Science Festival. Over this last summer, I revised the piece working in consultation with clarinetist Rane Moore,

who went on to perform it with Winsor Music and at the Virtual SICPP 2020. You can hear Rane's wonderful recording on my site, here: [https://mattschumaker.com/stream\\_lines](https://mattschumaker.com/stream_lines)

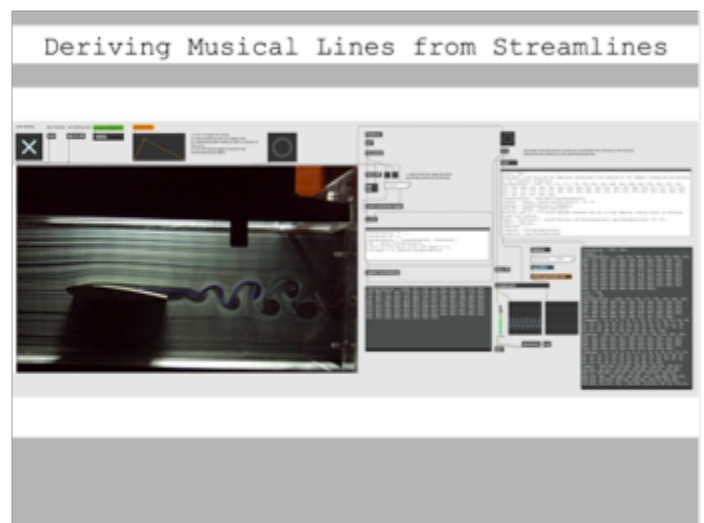
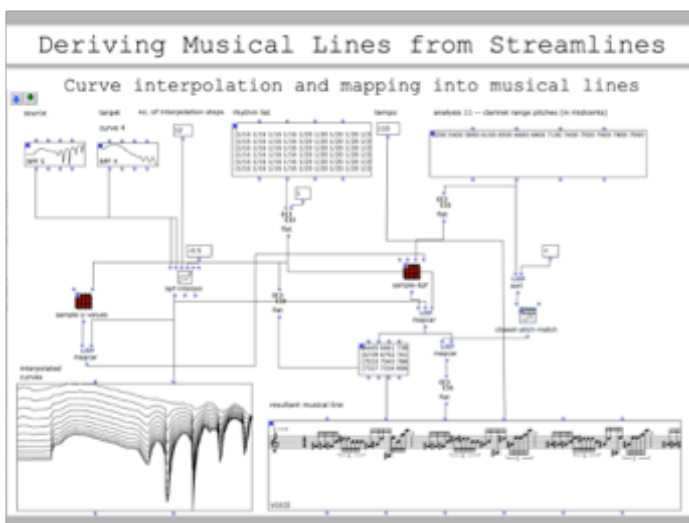
*EC: Matt, I see you make good use of CNMAT's odot tools in your Max programming and in the Lawrence piece. What have you learned in that regard?*

MS: I love working with [odot](#) and I use it all of the time in my own composing and in teaching. It makes programming in Max so much more enjoyable. It's wonderful to be able to use the OSC namespace, to create variable names that make sense, to unify the data in my patch in one big bundle that goes everywhere it's needed, and to use the expr. codebox as a place where I can write compact code to transform the data in many of the ways that I might need. My students do great interesting things with odot, too. In a recent class, one student programmed an elaborate series of Markov transition matrices in odot to create music in the style of Beethoven's Für Elise on the fly. We sent the music out to a Yamaha Disklavier in the classroom and marveled at how good it sounded!

*EC: Finally, can you comment on your overall experience with CNMAT through the years and share any recommendations for the future?*

MS: During my years at CNMAT, I was lucky to participate in a philosophy of learning that was a unique blend of artistic endeavor and technical research. The camaraderie and sharing between the composers inspired me as much as the research projects I participated in. One of those projects, Tessellate, involved me programming an algorithmic compositional toolset specified by you and with assistance from [Jean Bresson](#), creator of the [OpenMusic \(OM\)](#) environment and who was a Guest Researcher at CNMAT at that time. I now use OM regularly and have published in the [OM Composer's Book \(volume 3\)](#).

As for the future, it's great to see the Department of Music's Professor Carmine Cella working at CNMAT and integrating his projects like Orchidea into the mix. I continue to encourage CNMAT to search broadly for the people who can contribute in significant ways to its core research and creative mission. That's a path that will only benefit the institution, helping it to remain vibrant, flexible, and relevant into the future.



Screenshots from patches for [Stream\\_lines](#) (after Robert Lawrence)

## TEACHING MUSIC 108: MUSIC PERCEPTION AND COGNITION

*Jeremy Wagner*

I first met David Wessel during a snowstorm in Minneapolis in March 2008. I was stage-managing his performance as part of the SPARK Festival of Electronic Music and Art hosted by the University of Minnesota Music Department, where I was a graduate student at the time. David was to perform as part of a trio including pianist/theorist Guerino Mazzola and woodwind improviser Douglas Ewart. The concert started late—Ewart had a flight delay due to the incoming blizzard. While we waited for him, Guerino Mazzola polished the keys of the piano and David gave me a tour of his new instrument. He was performing that evening with his recently-built SLABs instrument—a pressure sensitive array of tactile controllers developed in collaboration with CNMAT Research Director Adrian Freed. In combination with a custom interface and a set of Max patches, the device was capable of generating huge masses of sound, was impressively responsive and, as I later learned, functioned with exceptionally low latency.

The hour of the concert came, and we were still waiting for the arrival of Douglas Ewart. The hall filled. I was getting nervous, but David didn't seem worried at all. We stalled the best we could. About 20 minutes after the concert was to have started, we got a call that Douglas was outside. I ran out to the road in front of Ferguson Hall and waited as a heavy snow came down. Out of nowhere a tiny, beat up, rusty compact car made a quick U-turn in the snow, stopping right in front of me. Out poured Douglas with a mess of instrument cases and luggage. He had hitched a ride with a woman he had met on his flight and she graciously sped him from the airport. I helped him into the venue and got him set up in front of the increasingly impatient audience. Douglas didn't seem worried either—he simply proceeded to set up all of his instruments before a visibly annoyed, completely silent audience. It was surreal.

I got to know David a little bit during that festival. We had some interesting conversations about musical interface design and I remember him being intrigued by my suggestion that the SLABs might be even more expressive if the sensor array were given some kind of 3D contour. I ended up taking him to the airport on Sunday and we parted ways

with the obligatory “Drop me a line if you're ever in Berkeley.” Four years later, after completing my PhD, I ended up moving to California when my wife took a job at UC Berkeley in late 2012. When I got to town, David was my first call and over time, I managed to establish myself in an orbit around CNMAT, working occasionally as an audio engineer on larger CNMAT-supported concerts. After David's passing in 2014, I reached out to CNMAT to see if I could be of any assistance and by summer 2016 I found myself employed at CNMAT, first as the house audio engineer, then applications programmer, then as research composer and now lecturer. Throughout this time, I have been surrounded by David's legacy and I have come to know him even better through the extensive archive of materials he has left behind. The man kept everything—so much, in fact, that we are still (in 2021) struggling to catalog it all. Among his archive are thousands of hours of recordings (in various formats), rooms full of books and articles as well as digital resources that I have been involved in preserving. So, when I was asked to teach David's Music 108: Perception & Cognition, I approached the project as something of an archaeological expedition.

In the summer of 2019, I set to work. In the Wessel archive, I found several versions of Wessel's reader for the course, there were hard drives that offered tantalizing glimpses of presentations, syllabi, final projects, early versions of the MUTOR site, etc. I read all of it and little by little a picture began to emerge of the conceptual trajectory David had imagined.

The Music 108 course had been Wessel's brainchild in the early 1990's and served as a way to combine his two core research interests in Psychology and Music. As such, the course was originally offered as a cross listing between the Music & Psychology departments at UC Berkeley (although the Psychology listing lapsed as David shifted the focus of the course towards more technical topics). Wessel's course presented a survey of topics and questions related to the human experience of musical stimuli, broadly considered. In addition to providing a firm grounding in psychoacoustic principles and an introduction to cognitive theories surrounding music



*Jeremy Wagner is a Lecturer in Music Perception & Cognition in the Department of Music and a Research Composer & Technical Director at CNMAT.*

perception, Music 108 also served as a forum for exploring the implications of these ideas when extended as a theoretical basis for new modes of musical expression. Therefore, the course was fairly wide-ranging in scope, presenting both traditional psychological perspectives as well as emerging experimental and speculative work related to ongoing CNMAT research.

Over the past quarter-century, Music 108 has been a core part of the CNMAT/Music curriculum. It has also served as a catalyst for the development of many pedagogical resources in collaboration with various CNMAT alumni including Georg Hajdu, Psyche Louie, John MacCallum and Matthew Goodheart, among others. Over time, the collection of rich media documentation, interactive demonstrations and Max patches created in support of this course were compiled into a sort of online textbook that came to be known as the Music Technology Online Repository (MUTOR), more about which below. For my own version of the course, I wanted to incorporate as much of this history as possible while extending the material with current research and my own interests relating to the creation of musical meaning. Having reconstructed David's course, albeit in skeletal form, I decided to make that material one of roughly three concurrent threads running through my version of Music 108.

I condensed most of the material of his course, including the 12 MUTOR units, into the first 8 weeks of my course. During this time we engage a detailed treatment of the physical phenomenon of sound, we then trace the physiology of the ear and the pathways of the auditory signal as it makes its way into the brain. As a second thread alongside the Wessel materials, the students read the entirety of David Huron's *Sweet Anticipation* and we frame conversations in terms of his ITPRA model of perception. I have created new demonstrations with an eye towards perceptual modelling and machine learning. By the midterm we have covered myriad topics related to the psychology of auditory perception; we build computer models of the human voice; we perform statistical analyses of pitch, harmony and rhythm in various genres and use these to inform computational models that attempt to synthesize believably human compositions. (Of course, I am always careful to point out the ways in which these methods ultimately fail). The final thread of the course focuses on some of the more speculative topics hinted at in Wessel's syllabi: How and why did music evolve? What is music's relationship to the body? ...to motor function? ...to language? If music exploits positively-valenced reaction responses, why do we like sad music? Can music create meaning without reference to external sources of meaning? Etcetera.

These types of questions underly the final weeks of the course as the roughly 100 students complete a self-directed, individual final project. They are encouraged to tackle ambitious research questions: Some students choose to write original pieces of music that employ or exploit various kinds of perceptual phenomena, others replicate findings from the music perception literature by way of miniature, informal replication studies. Students from cognitive and computer science might write software models of music cognition that employ creative uses of artificial intelligence. Some students have applied complex models of language processing to improvisational algorithms. Etcetera. On the whole, these projects have been terrific. Even when not successful, the projects often reveal to the student the complexity and difficulty of the specific problem they attempt to address; the students are never penalized for negative results but are assessed on the papers they submit describing what they learned from the project's success (or failure). For me, the final project is the main focus of Music 108—as I believe it was for David Wessel—and in this sense I have come to regard the content of this course as preparing a fertile groundwork for the student's individualized exploration. My version of Music 108 is designed to prepare the student with a sufficient basis in the music perception and cognition literature that they are able to be-

gin asking meaningful questions and attempt to answer them for themselves. I hope that I have managed to inspire students to ask and answer productive questions around the nature of the human experience of music.

In 2020 I taught Music 108 in both the Spring and Fall semesters. Aside from 6 weeks of in person instruction, the pandemic has made this a largely online affair. Nonetheless, we have adapted. This past summer I received a 2020 Discovery Grant to update the online pedagogy for the course, which has supported work in collaboration with Georg Hajdu of the Hochschule für Musik und Theater in Hamburg, along with CNMAT alums Psyche Loui and John MacCallum in producing a brand new version of the MUTOR website and demonstration patches. This project, still in development, should be completed in time for the Fall 2021 offerings of the course.

With all of its history developing my version of Music 108 has been both an immense challenge and lots of fun. The students are bright and inquisitive and really keep me on my toes. I look forward to teaching it again (this time in person) in Fall 2021 and I am honored to have had the opportunity to immerse myself in this part of David Wessel's legacy.



## Who Was David Wessel?

"He was an amazing researcher and musician and will be incredibly missed by all of us."

"He was a genius at merging art and science, play and rigor, life and ideas."

"David conducted pioneering research in music perception, audio signal processing, and computer music, and he mentored dozens of students and postdocs. He had a clear head, a tremendous sense of humor, and a big heart."

"His impact at Berkeley was enormous. As the first director of CNMAT, David was responsible for bringing music research with computers and technology to the university for the first time."

"We would never know what nascent idea he would want to brainstorm with us next – each class discussion would simply develop a mind of its own and the 50 minutes would be done before we knew it. A truly brilliant mind – he always stopped to exchange a few words when we crossed paths."

David Wessel was a pioneer at the intersection of music, technology and cognitive studies who spent more than a quarter of a century as part of the UC Berkeley music faculty.

To learn more, visit:

<https://senate.universityofcalifornia.edu/files/inmemoriam/html/DavidL.Wessel.html>

[https://www.cirmmt.org/activities/distinguished-lectures/Wessel?set\\_language=en&-C=](https://www.cirmmt.org/activities/distinguished-lectures/Wessel?set_language=en&-C=)

## Recent research and fabrication at CNMAT

Jeremy Wagner



Figure 1: Pictured is a 2-segment adjustable locking arm

### Fixtures for Polyend Percussion

In our recent work with the Polyend solenoid percussion actuators, we have found that the system is highly sensitive to precise placement of the solenoid actuators with respect to their target. A deviation of just a few millimeters can cause the beaters to drift outside the operational range. Using traditional percussion mounting it is difficult to achieve this accuracy and things tend to come out of alignment very easily over time. For this reason, we have been exploring new ways of rigidly mounting the Polyend devices with both high rigidity and high accuracy. Jeremy Wagner designed a laminated armature system with force-multiplying locking hinges that allow for this combination of rigidity and micro-adjustment within the force plane. The system is designed to be highly modular, lightweight, scalable and inexpensive. All parts are designed to be quickly and easily produced from sheet steel using either CNC plasma or Fiber Laser cutters. As such, the pieces for a fully articulated arm can be produced in about 20 minutes.

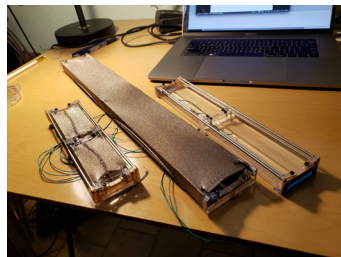


Figure 2: Pictured are fabric triggers in various stages of completion. The basic frame (right), a frame with the first layer of conductive fabric (left), and the fully assembled unit (center).

### Fabric Triggers

As part of our collaboration with percussionist Jean Geoffroy, we have been developing a range of silent triggers that integrate seamlessly into percussion setups. For the marimba, we have developed prototype trigger bars sized to fit between the sharps and flats of the instrument. Each bar is a rigid framework over which is stretched two layers of conductive fabric, separated by a small distance. Light pressure on the top fabric layer creates a silent electrical contact with the layer below, thus completing a circuit. When combined with the CNMAT Stompbox, these momentary switches can be used to silently trigger events during performance.

### CNMAT Stompbox 2.0

Just prior to pandemic we identified the need for a means of transmitting physical controller data over very long distances. In normal practice, whenever we need to get, say, a pedal signal from the stage to our mix position, we have always needed to deal adapting that signal such that it can be carried on an analog cable from the stage to front of house. This works fairly well for a single signal, but as CNMAT productions have explored distributing control to multiple members of the ensemble, we have found the need to interact with multiple trigger signals over a long distance. This quickly leads to a mess of adapters and hardware complexity as most MIDI interfaces have only one or two pedal inputs. At the same time, as much of the professional audio world moves to ethernet based protocols, ethernet cabling from stage to mix position is becoming increasingly ubiquitous. In late 2019, Jeremy Wagner and Luke Dzwonczyk began work on a revision of the CNMAT Stompbox that is designed to transmit up to 12 simultaneous pedal signals via a single PoE Ethernet solution. The box accepts 12 analog expression or momentary switch pedals and the state of each is sent along an ethernet connection as an OSC message. The unit can be powered via its PoE ethernet connection, a 5-volt USB supply, or with a LIPO battery for wireless operation. The unit also features 3 QWIIC connectors which allow for the easy connection of a host of I2C sensors and peripherals. We have worked out an efficient and effective means of establishing a connection between the Stompbox and host computer: once the unit establishes a DHCP connection, it displays its IP address and port. Once this happens, the user need only send an OSC packet to this address and the unit will begin streaming packets to the user's computer. Lastly, the Stompbox LCD screen can receive and display images and messages and can therefore be used as a cueing system.

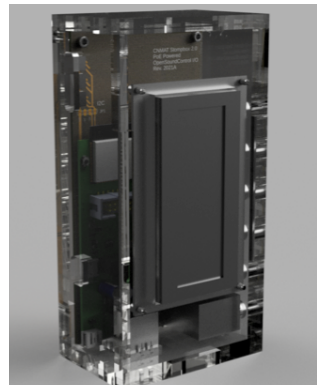


Figure 3: CAD rendering of Stompbox 2.0

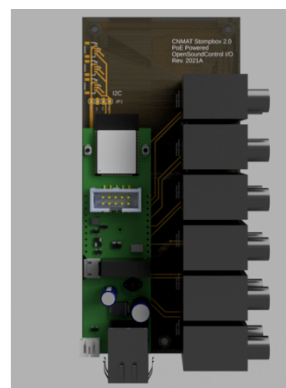


Figure 4: Detail of Stompbox 2.0 PCB showing the Olimex ESP32-PoE-ISO, Neutrik TRS jacks and I2C connections.



## Demonstrations of electronically prepared piano

In January, Prof. Carmine Cella and Jeremy Wagner produced a video demonstrating various methods of electronically preparing the piano. Cella demonstrates a number of techniques involving a tactile transducer and a contact microphone attached to the piano sound board. The signal from the contact mic is processed in various ways and fed back via the transducer. This setup allows for a number of ethereal effects including cross synthesis, glisses and harmonic transformations. Wagner opens the video with a demonstration of his Magnetic Resonator Piano. This device was constructed based on designs by Andrew McPherson and Per Bloland, but Wagner has added a number of new features including a micro-adjustment system, quick release magnets for rapid de/installation, improved custom coil designs that mitigate failures due to heating and a re-designed power amplifier enclosure with properly sized heat sink for silently dissipating excess heat. The device resonates individual strings with magnetic fields that are modulated by audio signals. When the magnetic coils are fed sinusoidal signals the, the device acts much like a guitar ebow. However, when excited with more complex waveforms, the strings can produce other types of effects. These demonstrations can be viewed on the CNMAT YouTube channel via the following link: [https://youtu.be/aIFiHCmSv\\_8](https://youtu.be/aIFiHCmSv_8).

## SPRING 2021 RESIDENCIES

The CNMAT Users Group organized virtual residencies with two electronic musicians, composers, DJs, and producers.

On February 13th from 1-2:30pm, **Jlin** <https://jlin.bandcamp.com/> gave a public artist talk detailing her approach to electronic music, recent work and collaborations, as well as answer questions from the audience.

Jlin is the recording alias of [Jerrilynn Patton](#), an electronic music producer from Gary, Indiana. Initially associated with Chicago's footwork scene, her music evolved far beyond that style, exploring unheard rhythms and placing her in a category of her own. Her debut album, 2015's [Dark Energy](#), was filled with twisted, volatile tracks that seemed far more concerned with venting frustration, anger, and depression than providing dancefloor fodder. The album was an immediate, unexpected success, causing her to quit her job as a steel mill worker and pursue music full-time. One of the most acclaimed experimental electronic artists of the 2010s, she has shared the stage or collaborated with artists such as [Björk](#), [Ben Frost](#), and [William Basinski](#). Additionally, she has ventured into contemporary dance, composing the music for Wayne McGregor's *Autobiography*, which premiered in 2017.

Patton began producing music in 2008, and while her early tracks relied on heavily manipulated soul samples (as is common with the genre), her mother encouraged her to find her own voice. Her subsequent material featured samples from horror films such as *Mommie Dearest* (1981), but she otherwise largely abandoned samples. Jlin first reached the public's consciousness in 2011 when her tracks "Erotic Heat" and "Asylum" were included on Planet Mu's [Bangs & Works, Vol. 2](#) compilation of the Chicago juke/footwork sound, which also included tracks by [DJ Rashad & Gant-Man](#), [DJ Clent](#), [RP Boo](#), [Traxman](#), and other notable producers from the scene. A few Jlin tracks appeared on online footwork compilations, but her debut release didn't arrive until March of 2015, when Planet Mu released her first

full-length, *Dark Energy*, which included a collaboration with experimental electronic artist [Holly Herndon](#). The album was an immediate critical success, earning rave reviews from numerous publications, including Pitchfork, FACT, and Resident Advisor. *Dark Energy* was eventually included on a multitude of year-end best-of lists, and was named Album of the Year by both *The Quietus* and *The Wire*. A follow-up EP titled [Free Fall](#) also appeared on Planet Mu that November.

Patton subsequently quit her job as a steel mill worker in order to concentrate on writing music and touring. In 2016, she remixed [Factory Floor's](#) song "Wave" and released a few songs online, teasing her second album. The *Dark Lotus* EP appeared in February of 2017. Jlin's highly anticipated sophomore full-length, [Black Origami](#), arrived in May, and included a collaboration with composer William Basinski. Also in 2017, Patton embarked on a project in collaboration with British choreographer Wayne McGregor, soundtracking a dance performance piece called [Autobiography](#); the performance was designed to replicate aspects of the human genome. Jlin's soundtrack was eventually given a physical release in 2018, again on Planet Mu.

**Lotic** also gave a public artist talk with a specific look into her DAW workflow and discussion of how her music has changed over time, as well as answer audience questions.

From Lotic's AllMusic bio: Producing intense, provocative music informed by ballroom culture, noise, R&B, and hip-hop, Lotic (J'Kerian Morgan) is one of the most notable figures associated with the loosely defined experimental club scene. Originally from Texas, the Berlin-based artist released a series of well-received mixtapes during the first half of the 2010s, including 2014's *Damsel in Distress*. Following 2015 EPs *Heterocetera* and *Agitations*, Lotic released their full-length debut, *Power*, in 2018.

## PROFILE

### Carmine Emanuele Cella

Assistant professor in Music and Technology

*Interviewed on Zoom by Music Composition graduate student Kevin Lo, conversation has been condensed and edited for clarity*

*KL: Hi Carmine, tell us a little about yourself!*

CC: I started composing at six and writing software at seven, and I've never stopped. I did my studies in Italy in Pesaro, the same town as Rossini, and did my PhD in composition in Rome. I then moved to Paris and I was also studying math at the same time. There, I got a job at IRCAM as a researcher. This job turned out to be an important step because I developed a tool that many people used: *IrcamDescriptor*.

It's a tool to describe sounds from different perspectives. This has been a central component of my research for many years now. I then decided to do a second PhD – I quit IRCAM and took a second PhD in Science, Cognition and Technology – a kind of interdisciplinary PhD between computer science and applied mathematics, and I worked on mathematical models for music and acoustic signals.

*KL: Where then did you focus your research?*

CC: I focused on defining new symbolic ways to define music and sound, and developed something called *Sound-Type Theory* – a mathematical theory of sound description. This theory is made of a number of layers that goes up in abstraction. In other words, you can view an object in different ways. Each way would be different from the others.

Deep learning, very used today, shares with *Sound-Types* this idea of having multiple layers to describe an event or a phenomenon. I was interested in describing sound and finding new representations for sound, so we as composers can manipulate these representations and achieve new results – transform sounds and generate new sounds.

*KL: What happened after your PhD?*

CC: After my PhD, I went back to IRCAM as a composer. I was commissioned to write two pieces – one for orchestra, and the other for orchestra and live electronics (*Reflets de*

*l'ombre*, 2013).

This piece was the first professional connection between my scientific life and my musical life, because it was a commission for orchestra and live electronics where I used *Sound-Types* to create the electronics. From this point on, people started understanding that I was doing both things, and accepted that I was to some extent an expert in both fields.

*KL: Is there anything difficult in straddling these two different worlds?*

CC: The difficult thing for me was to be accepted in communities that are usually more contained. Either you're an applied mathematician, or you're a composer, and being both is not standard. I passed some time at IRCAM, and moved to Madrid where I was a fellow of the French Academy in Madrid (*Académie Française*), and I took this time to compose my opera (premiered in Kiev three years later). I then moved back to Paris again, and this time I took a job at *Ecole Normale Supérieure* in the math department, under the guidance of the French mathematician *Stephane Mallat*. I was applying math to music, but this time, it was much more math heavy and scientifically oriented research. I did that for roughly two years.

*KL: When did assisted orchestration fit in?*

CC: I went back to IRCAM in 2017 to take over an important project on computer-assisted orchestration. There is research that dates from 2003 at IRCAM about how we can use computers to help composers orchestrate. I took over this project and the new version was called *Orchidea*. This has become the standard framework for assisted orchestration, and many institutions and composers



use this tool for their own work or for teaching. This led me to 2019 when I started my job in Berkeley.

*KL: That's a long pathway to you now being here at CNMAT. What about this place drew you?*

CC: I decided to come to Berkeley because I saw this place as a place where I could connect all these lives – research, composition and teaching. Before in Europe, I was travelling up and down between Italy, France and Germany – commissions in one place, research in one place, teaching in one place. Going to CNMAT meant I could do my three things in the same place. I'm still in the process of learning how to do this job – being a professor involves many things. It's not only about teaching or doing research, it's also about interacting with a system that is quite complicated, somehow structured, and you need to learn how to deal with this situation. I think it's going well, but I still feel I'm fairly new and in the process of learning. The good point of being in Berkeley is interacting with the students. Especially at the graduate level, you have really nice interactions, and I learn a lot when I teach, which is very rewarding for me.

*KL: How do math and music coincide for you?*

CC: Both applied math and music have been in my interests since the very beginning as far as I remember – these now are merging more and more in a field that I would call creative computing for music applications. I'm using computers more and more to merge these two fields – having the help of computers to create or modify signals for sound.

I decided to make it more real by designing a new course – Creative Computing for Music making – which should start in Spring 2022 all going well. This course is meant to gather a large audience of people from different backgrounds – computer science, math, music, social sciences – so that everyone interested in music creation can use tools that I develop in this course. This course is also a good opportunity for me to develop my book. I'm writing a book on the same topic – the idea is to have this as a companion for the course at some point. Not immediately – it could take a couple of years to achieve this.

*KL: How do you balance these two fields in your work life?*

CC: I never do the two things together. When I compose, I don't do research. When I research, I don't compose. In 2019, I had two major commissions that took me a lot of time. In 2020, also because of the COVID situation, everything was canceled, so I focused more on research. I tried to publish papers, to put my research in a shareable format. Sometimes you don't know how to share your work unless you develop a software, write a paper, something like that.

*KL: And what about now – what projects are you currently working on?*

CC: The next two years are more composition focused. In 2021 and 2022, these commissions that I had canceled because of COVID should restart. One piece for large orchestra will become part of a disc, a monographic CD of my work for orchestra, in Kiev in Ukraine.

Another is a piece for large ensemble and electronics, a co-commission between IRCAM and an ensemble in Paris called L'itinéraire. This ensemble was founded by the spectral movement – Grisey, Murail – they created this ensemble and they are still working in this context. This is what I will focus on in the next two years, these major musical projects – and in the meantime, I will keep teaching and eventually develop this book that should go together with my course.

Even when I focus on musical projects, at times I need to stop and do something else. I do a couple of months in music, and then I need to cut a little bit, do some math for one month or something and go back to music. This helps me to refresh my interests.

It's a busy life being a professor at UC Berkeley, but it's an exciting life too! I still feel that I haven't completely found my balance – I'm looking for it, because there are many things you need to learn and do. It's still an ongoing process, let's see how it turns out.

*KL: Any final notes?*

CC: There is some pressure in the academic environment for publishing papers. There's peer pressure for publishing more and more – you know, the old saying “publish or perish.”

Something I would like to share with students is that you don't need to have an outcome right away. It could be that your research takes years before giving a real outcome. It's good to find a balance between being connected to community with papers and being present in conferences or concerts – but at the same time, you need to be able to cut some time for you, without any pressure, and take as long as you need to finalize ideas, and go towards some longer-term projects. These are indeed the driving force for my life. If you don't have a longer-term project, you feel like you are navigating day-by-day, and it doesn't feel good. You may want to make compromises but still have a general direction for you – that even if it's not so efficient, it could still mean something to you.

## Visit CNMAT online...

The [CNMAT YouTube channel](#) has videos of featured artists and guests, including [Eco Ensemble: Berkeley New Music Project 2021](#), [The CNMAT Users Group Presents: Jlin Public Artist Talk](#), [The Augmented Piano](#), [Live@CNMAT: Kyle Bruckmann Solo Works](#), [Jon Kulpa : qubits for Ars Electronica](#), and more.

On the [CNMAT web site](#), our News postings and [Events](#) pages have announcements about our recent and upcoming performances and projects.

## INTERVIEW: KEN UENO

*Professor Ken Ueno is interviewed by graduate student composer Hallie Smith*

*Hallie Smith: In looking at two recent pieces, [History of Breath](#) and [Ghosts of Ancient Hurricanes](#), there are many elements to both the underlying performance practice and to the inspiration points that feel dialectically related (for example—consideration of creation and destruction myths, relationship between self and megaphone, between self-megaphone and surrounding architecture, between person-specific writing and “transportable” writing). These illuminate the relationship between music and psyche.*

*Can you talk about any techniques or practices that allow you to work with/through difficult experiences that may inform your music? Is putting an emotional/personal element in your work something that you do a lot of planning for? Do you find that personal growth (non-musical, non-career oriented) has come from developing your vocal/megaphone practice, for example?*

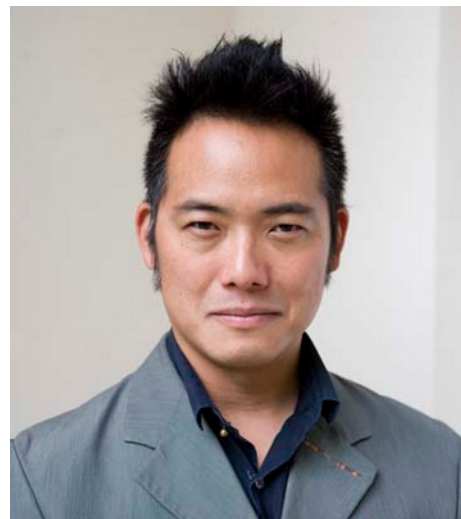
Ken Ueno: I have, indeed, depended on my work as a kind of salve or exorcism ritual to cleanse myself of negative experiences. For example, when I was a graduate student at Harvard, there was a time when I was persecuted by a clique of non-friends. I used reading software for the blind to convert their emails into sounds for a quadraphonic electro-acoustic work – knowing that they would be there at the concert, I wanted to have their own words surround them. I throat sang with my mouth closed (I felt I was being censored by my peers), only opening my mouth at the end of the piece to exhale. In that early piece, looking back, initiated some nascent trajectories still important to my work (breath and auto-archaeology, etc.).

The most difficult experience in my life was a life-changing injury I suffered while at West Point. You can read about it [here](#). In short, this life I am leading presently is Plan B. My Plan A was to go to West Point, serve my country, become a general, come back to California and become a senator. I worked

hard in high school and did well enough to get a congressional nomination and an appointment to attend West Point. I survived, what is still, the hardest year of my life: Plebe Year at West Point. Going into the second year, I suffered an injury in a training exercise. It was bad enough that I had to leave. It was devastating. I had worked so hard to get there (especially after surviving Plebe Year). I convalesced for two years. I didn't know what I was going to do with the rest of my life, now that Plan A was taken away from me. Thankfully, the year before I went to college, I discovered Jimi Hendrix and started playing guitar. During my convalescence, besides going to physical therapy every day, I was playing guitar 8-9 hours a day. By the time I was healthy enough to think about finishing my education, I was writing songs and playing in bands. Somehow, I got an inkling that I could do music. I knew I couldn't go to a legit school like Juilliard, since I was playing in metal bands, but I found a school in Boston – the other Berklee – which worked out, since around that time, I was getting into Jazz too. At Berklee, I discovered Bartok, and it was that music that inspired me to become a composer. Music saved my life. What had been the worst thing to happen to me became the most pivotally transformational in a positive way.

Inspired by the Hendrixes and the Coltranes, I cannot separate my practice from my life. My practice is my life. Part of my mission is to transpose the “person-specificity” that is intrinsic in Rock and Jazz into Classical music. In my music, the intricacies of performance practice are brought into focus in the technical achievements of a specific individual fused, inextricably, with that performer's aura.

Auto-archaeology and my bespoke vocal practice are elements that help articulate “person-specificity” in my work. When I was



*UC Berkeley Professor Ken Ueno is a composer, vocalist, improviser, and sound artist.*

six, I had a tape recorder and made non-linear musique concrete. I also vocalized and sang multiphonics. Now, I think I was perhaps subconsciously pre-disposed to multiphonic singing when I first heard it in my late 20s. My vocal concerto starts with some of those recordings of my six-year old self vocalizing and I sing live in counterpoint with it. The person-specific gambit in this piece is that it would feel different were someone other than me to sing with the recording of my six-year old self. Auto-archaeology is an authenticating gesture. But more than that, it's a decolonizing gesture. I am saying, “if you want to hear this music, you cannot replace people who look like me. If you want to hear this music, you have to hear THIS Asian body perform it.” In an increasingly digitized world, “person-specificity” takes a stand against the forces that render all of us anonymous. It runs counter to the neo-colonial tradition of transportability in Western Classical music.