

Reviews

[Editor's note: Selected reviews are posted on the Web at <http://www.computermusicjournal.org> (click on the Reviews tab). In some cases, they are either unpublished in the *Journal* itself or published in an abbreviated form in the *Journal*.]

Events

21st Century Piano Composition Competition Concert

This concert took place 23 February 2020 at the Foellinger Great Hall, Krannert Center for the Performing Arts, on the campus of the University of Illinois at Urbana-Champaign, Illinois, USA. For more information visit: <https://krannertcenter.com/events/annual-21st-century-piano-composition-competition-concert>.

*Reviewed by Ralph Lewis
Champaign, Illinois, USA*

Each year the University of Illinois at Urbana-Champaign presents a concert that highlights collaborations between its graduate composers and pianists. In the two decades since it first received funding from donors Richard C. Anderson and Jana M. Mason, it has made a space for emerging composers and pianists to examine the historical and contemporary roles of composer and pianist. Among the twenty years of selected presenters, some notable examples include Brad Decker and Soohyun Yun, John Nichols III and

ANNUAL 21ST CENTURY PIANO COMPOSITION COMPETITION CONCERT

Tatiana Shustova, and Juri Seo, who performed as composer and pianist.

This year's concert presented a program curated by composer Eric Zurbin and pianist Chia-Ying Chan that highlighted works for the piano and electronics. Selections included Kyong-Mee Choi's *To Unformed* and Peter Ablinger's *Billie Holiday*, as well as *Evening's Wave/Inner Noise*, the new commissioned work by Zurbin. Additionally, Chan performed solo piano pieces, including Tristan Murail's *Cail-loux dans l'eau* and Zurbin's *Moon Cicadas*.

The concert setting focused on creating an intimate experience, seating the audience on Foellinger Great Hall's stage rather than the usual audience section. In addition to helping the electronics be more present for listeners in the large concert space, this choice replicated the feeling of a smaller, more intimate hall. However, the lack of raised seating created situations where the soloist was simultaneously musically stunning but visually obstructed.

The first half of the concert was bookended by the piano and electronics works by Choi and Ablinger. Choi's *To Unformed* presents intriguing starting points for the audience. Chan wonderfully performed this piece, managing the work's tasteful post-Impressionistic piano harmonies, while matching the energy level of the composition's deft use of studio processing techniques. In addition to establishing the general emphasis on piano and electronics, Choi's work allowed for a natural segue to the following work on the program, Debussy's *Feux d'artifice*.

In each work, Chan excelled at bringing out their gauzy gestures, especially in the more percussive moments.

After a rollicking performance of the third movement from Leo Ornstein's *Four Legends*, Chan played Ablinger's *Billie Holiday*. As a movement from Ablinger's *Voices and Piano* series, it follows a similar approach: The piano mimics or moves in parallel with a recording of a celebrity's speaking voice. The graininess of the original recording and Holiday's fast, slippery storytelling create unique challenges for a performer as well as listener. Not quite a soloist with electronics backing her, and not quite an accompanist in support of the recording, Chan approached her role with sensitivity and meticulous care. Through her careful performance, Holiday's narrative and Ablinger's sonic transcript successfully existed side by side.

The second half of the concert focused on Zurbin's music, beginning with his *Moon Cicadas*. In this work's opening moments, cycling musical gestures percolate into the foreground. Chan gently built up the spectral-like harmonies that often quivered on the edge of comfortable consonance. On a larger scale, variations of the music's material emerged repeatedly at various junctures much like cicadas with different life cycles. Paired with the Murail that followed, the somewhat mysterious, resonant sound world first introduced in the Choi, at the start of concert, was continued.

Evening's Wave/Inner Noise, for piano and live electronics, showcased Zurbin's compositional practice and Chan's skills as a performer in more extensive ways. Across its nearly 20-minute duration, *Evening's Wave/Inner Noise* poetically wades through imagery of an oncoming darkness, protest, rage, and helplessness.

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According to the composer's program notes the title is an anagram of "never again means never again is now" (after removing the letters of 'anagram' from the original phrase).

A longtime student of UIUC's Experimental Music Studios, Zurbin's strengths with electronic music were on full display. The work pairs his skills in acousmatic music processing with highly dramatic prepared piano writing. Portions of his process in creating the work included using spectral analysis of materials for inspiration for the piano part. SuperCollider played a role in not only organizing the electroacoustic information, but in live-sampling Chan and bearing out the work's many contrapuntal layers. Chan, equal parts pianist and percussionist throughout this performance, successfully connected her energized piano playing with the wide variety of ways Zurbin had her use the piano's interior.

Beginning contemplatively, with its electronics arriving in waves, the piece draws energy from the counterpoint between the percussive writing for the piano's interior and keyboard, and the increasingly disturbed electronics. As the work moved beyond its surging central moments, live-sampling of Chan's piano interior performance increasingly influenced the music, with the virtuosic preparations reduced to single bowed piano strings set against gently trembling sustains.

Chan and Zurbin presented a coherent, intriguing program that reflected on music that inspires them and demonstrated a sustained engagement with the intersection of piano and electronic music expression. As they continue to collaborate, I am especially curious about where *Evening's Wave/Inner Noise* will lead them.

New Interfaces for Musical Expression (NIME) Conference

NIME took place 3–6 June 2019 at the Universidade Federal Do Rio Grande Do Sul in Porto Alegre, Brazil. For more information on NIME visit: <https://www.ufrgs.br/nime2019>.

*Reviewed by Margaret Schedel
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*Sonya Yuditskaya
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The New Interfaces for Musical Expression (NIME) Conference was held in the beautiful city of Porto Alegre, the capital city of the state of Rio Grande do Sul in Brazil. The organizers, including Rodrigo Schramm, Anna Xambó Sedó, Isabel Nogueira, and Federico Visi, did a fantastic job preparing for the conference and communicating complex logistics with the participants. During the conference numerous volunteers dressed in easily identifiable blue shirts, which made sure that participants felt taken care of. The opening reception was a celebration of Brazilian culture and music including an electric birimbaõ player who was also one of the organizers of the Open Jack Night at the end of the conference. The atmosphere was infused with *tropicália* tunes with sounds of the electric birimbaõ marinated in three flavors of *capiriña* and the ever-present Aperol spritz.

Within the broader scope of NIME's gesture-(re)action-perception themes, this year's trends explored virtual instruments, machine learning, mobile apps, XR (an umbrella

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term covering virtual reality, augmented reality, and other realities yet to come), and a commitment to accessibility. Overall, with regard to paper presentations, we would encourage presenters to deliver examples with video and front-load demonstrations to invite audience engagement early on in the experience.

Concerts were held in a beautiful hall on campus, and were immaculately produced. The timing between sets was kept to a minimum, and the lighting helped define areas on the stage. The first night the sound was a bit harsh in the high and mid frequencies. By the second night the system was balanced and the sound was clean and powerful. The emcee introduced each piece in Portuguese and English, while making concertgoers feel welcomed with sharp wit and gregarious humor. It was nice to see the wider community involvement, which spoke to the robustness of the NIME community support in the Universidade Federal do Rio Grande do Sul in Porto Alegre. The usual vast array of nations represented by attendees this year included a significant bump in conference participants from South American countries as compared with previous years. The International Computer Music Conference is in Chile next year; we hope it will also reflect the local community, continuing the precedent set by NIME 2019. In times of constrained budgets, conference organizers should think of creative

ways to encourage local engagement, as well as remote participation for international populations.

There was an incredible amount of innovation coming out of the NIME community this year, which included many incredible papers, performances, demos, and installations at the conference. We are sorry that we could not include them all here. The review is organized by themes and trends observed at the conference.

Beyond Accessibility

A great model to follow for active participation can be found in this year's paper "NIME Prototyping in Teams" by Anna Xambó, Sigurd Saue, Alexander Refsum Jensenius, Robin Stockert, and Øyvind Brandtsegg. This was a four-day workshop where participants worked in remote teams seven hours a day. Sounds were sent between locations, and there were observers and facilitators at each site. Issues arose with the portal that was used to connect the spaces, but the students' confidence regarding prototyping showed improvement despite the technical issues. It would be wonderful to have some of the NIME workshops support remote participation.

One of the observed trends was the idea of openness and access with inclusivity in education and performance. There was a commitment to human diversity as well as device and operating system diversity. Many programs were designed to be device-agnostic, letting users customize their own way of interacting with sound. There were wide walls to enable all kinds of users to be involved with NIMEs, and high ceilings to promote performance virtuosity.

This year, assistive NIMEs were categorized based on the materials or techniques they used rather than put

into a session set aside specifically for accessibility. Generally, assistive tech sessions are often not as well attended because only a subset of NIME attendees have the interest, funding, or support using human subjects in research. Program schedulers attention to include these NIMEs across other sessions was much appreciated, and future organizers are encouraged to do the same. A particularly successful paper was Lucas, Ortiz, and Schroeder's "Bespoke Design for Inclusive Music: the Challenges of Evaluation." The paper tackled the question of how to measure the success of one's assistive technology in a highly specialized situation. They concluded that technology has to be highly effective and enabling, but from whose perspective should the evaluation be made? They decided that the subject should make the evaluation in their own voice, "nothing about us, without us." The study involved making more accessible pots and knobs for an individual with multiple sclerosis, and addressed the ethics of working with disabled populations on assistive technology papers. It was nice to see an inclusivity of diverse backgrounds and abilities peppered throughout presentations. However, as usual, this NIME was not gender-balanced, but an ethical step was made by the organizers to make sure that the chairs of the sessions were balanced.

A workshop on the ethics of NIME, and how the NIME community should work with people, animals, and even single-celled organisms was scheduled on the first day. Eduardo Miranda's keynote address focused on his current research on biocomputing using *Physarum polycephalum* (a kind of slime mold) to create music. These creatures have nonlinear memory and can be used as memristors (i.e., nonlinear two-terminal electrical components relating electric

charge and magnetic flux linkage). Miranda argued that "biotech is the new digital." He illustrated how *P. polycephalum* can serve as a voltage control mechanism, process information, and then give feedback or response to the system in a musical environment. Miranda called this "biocomputer music" and showed an excerpt of a BBC performance at Peninsula Arts Contemporary Music Festival in Plymouth, UK, 2015. He raised a few questions, such as: What are the ethics behind bioart and bilabor? (These little biomemristors die extremely quickly . . .) Should we treat them just as "electronic components", simple organisms, or creatures that have lives or even more? Just like the current discourse in robotic, artificial intelligence labor, this might also be interesting to contemplate. These questions of ethics tie back into the conversation surrounding accessibility: Do research subjects have access to the choices that determine their lived world?

The human body itself became a new interface for musical expression in the installation *Somacoustics* by Marcos Suran Bomba and Palle Dahlstedt. Audiences were encouraged to "play" an artist who was blindfolded by virtual reality goggles (a powerful image perhaps commenting on our veil of blindness due to our addiction to technology) by moving his compliant body around like that of a puppet. The artist's physical body was made vulnerable, a controller for a NIME, the motions of which were tracked and translated into synthesized four-channel sound surrounding the participants. Through social-physical and aural interactions, participants played his instrument-body in a mutual dance of trust mediated by machines.

Trust in the body and the intuitive, embodied practice of "making"

featured centrally in “Material Embodiments of Electroacoustic Music: An Experimental Workshop Study” by Enrique Tomas and Thomas Gorbach of the Tangible Music Lab at the University of Art and Design in Linz, Austria. The authors held a workshop in which participants played with clay to make mockup imaginary musical instruments to express their cognitive mappings of sound to form. Clay is a low-cost, easily accessible and malleable material that is perhaps one of the most versatile prototyping materials. It was refreshing to be reminded of the simple power of this material at a conference dealing with so many high-tech concepts. The resulting objects were analyzed anthropologically. An insight from the paper involved the role of materiality in the design process, and our ability as researchers to leverage our understanding of material engagement while practicing quantitative research.

Device accessibility was showcased in a number of papers, including “Practical Considerations for MIDI over Bluetooth Low Energy (BLE) as a Wireless Interface,” by Johnty Wang, Axel Mulder, and Marcelo Wanderley. This was primarily a technical paper about testing BLE’s performance working with MIDI as a wireless interface for sensor or controller data and intermodule communication in the context of building interactive digital systems. The comparative experimental results showed that the BLE MIDI is comparable in performance to Wi-Fi implementations with end-to-end (sensor input to audio output) latencies under 10 msec, under certain conditions. The authors believe that it is a big step for BLE MIDI. However, other parameters need to be tested, such as bandwidth, multiple devices, range, stability, and power consumption.

Vesa Petri Norilo presented “Veneer: Visual and Touch-based Programming for Audio,” a music DSP language designed to be relatively easy to use. It allows the user to grow as a programmer, which can be seen as accessibility in terms of learning to program music. Featuring multirate DSP, the program is deterministic at runtime, has no dynamic memory, and has zero cost abstractions. As such it seems like a promising language for writing music. Veneer is built in Closure and is run compiled in the browser, which makes it usable on low-cost computers like notebooks and tablets, making it financially accessible. The programming environment has a multitouch-based user interface that is hyper-adaptable for a world where Internet usage happens primarily on smartphones and tablets. The nodes in this graphical programming language can be disconnected with gestures such as a shake, the menu flowers off objects and touches, and subpatches open in browser tabs, creating an intuitive and expressive language.

Bertrand Petit and Manuel Serrano added a focus on user testing in school groups to their script-based language in “Composing and Executing Interactive Music.” Using the hiphop.js language, “Skini” is a platform for composing and producing live performances in which the audience participates using connected devices (smartphones, tablets, personal computers, etc.). Skini facilitates a score to be performed by the audience. It is simple in that instruments play one pattern at a time, while the multiplier comes in the form of group use. The platform is implemented in hop.js and the user interface and automation in hiphop.js. The writers found this language to be popular with kids in the south of France

where they are based. The power of the system lies in the management of group accessibility to portions of a live score or performance, thereby allowing many people to play, while maintaining artistic integrity of a cohesive composition.

Machine Learning

The main group of reviewers included in this paper met while taking Charles Patrick Martin’s machine learning workshop. The workshop was very well attended, comprehensive, and accessible. It used the online platform Google Colab for machine learning and running Python scripts. Participants were able to get things running quickly thanks to demo scripts and Martin’s clear, effective, and efficient planning. “Generating Convincing Harmony Parts with Bidirectional Long Short-Term Memory Networks,” a paper by Andrei Faitas, Synne Engdahl Baumann, Torgrim Rudland Næss, Jim Torresen, and Charles Patrick Martin, was written about the use of the same technology at a much higher level. The writers described how they created a long short-term memory (LSTM) neural network (NN) to input results and receive harmonic output to create music in the style of a Bach chorale. The chorales were quite pleasant to listen to, and the surveyed audience enjoyed them, especially the edge cases. The paper presented a search to “generate convincing music via deep neural networks . . . One part of this challenge is the problem of generating convincing accompaniment parts to a given melody, as could be used in an automatic accompaniment system. Despite much progress in this area, systems that can automatically learn to generate interesting sounding, as well as

harmonically plausible, accompanying melodies remain somewhat elusive." To generate the chorales they used an old standard: unidirectional LSTM architecture, and bidirectional LSTM, both successfully trained to produce a sequence based on the given input. Study participants preferred the bidirectional model by a significant margin.

Another paper using NNs was called "Small Dynamic Neural Networks For Gesture Classification With The Rulers (A Digital Musical Instrument)" by Vanessa Yaremchuk, Carolina Brum Medeiros, and Marcelo Wanderley. This was an experiment for determining best practices with NNs for gesture classification. It demonstrated: (1) dynamic networks outperform feedforward networks for sensor-based gesture classification; (2) a small network can handle a problem of this level of complexity, and recurrent networks of this size are fast enough for real-time applications of this type; and (3) the importance of training multiple instances of each network architecture and selecting the best performing one from within that set. It was a thorough paper with ramifications for the future research on how to train neural networks.

Perhaps one of the most evocative implementations of machine learning was "T-voks: Controlling Singing and Speaking Synthesis with the Theremin" by Xiao Xiao, Grégoire Locqueville, Christophe d'Alessandro, and Boris Doval. Using a Theremin for vokenesis, which is similar to vocoding, with T-voks they were able to control pitch, duration, vocal effect, timbre, and whether speech or song was voiced or unvoiced. The result is funny and novel, combining the love and history that the NIME community has with the Theremin. With machine learning used for vocal synthesis, we heard an eerie, yet familiar, machine voice

emerging from one of the oldest electronic musical instruments in existence. Although some aspects of the sound were presynthesized and sequenced (notably the consonants), the system resulted in a very expressive output. This project was particularly successful because it was also presented as a concert the day before, so the audience already had experiential familiarity with it. After the paper presentation, the authors walked the project down to the demo room where participants could ask further questions for an expanded, interactive question and answer session. It may be too much to expect that every paper also contain a demo or a concert, but the practical demonstrations, especially when front-loaded, did a lot towards cementing the reality of the presentation.

"From Mondrian to Modular Synth: Rendering NIME using Generative Adversarial Networks" by Akito van Troyer and Rébecca Kleinberger discussed how the research team used machine learning to teach their software to make a good interface based on Eurorack, Moog, Korg, and other popular synthesizers. They taught their software how to make new instruments from images of both musical instruments and stylistically distinctive art from the MIT image library, to combine symbolic versus subsymbolic mappings. Although some of the images of instruments were unsuccessful, a number were visually beautiful and many participants said they wanted to buy these hybrid chimeric art/synthesizers.

Another paper regarding conceptual design for an instrument was "Grain Prism Hieroglyphic Interface for Granular Sampling" by Gabriela Bila Advincula, Don Derek Haddad, and Kent Larson. The design is still in development but they showed a gorgeous handheld small black pyramid with strange, golden hieroglyphic-

type markings that somehow referenced circuitry and music without being overtly understandable. We were enticed and want to know more.

"The Slowqin: An Interdisciplinary Approach To Reinventing the Guqin" was an instrument-focused paper by Echo Ho and Alberto de Campo that showcased an augmented *guqin* with electronic complements and microprocessor that can input, control, and map many sound synthesis and processing effects through the performers' gestures. We found one of the most fascinating parts of the talk to be about ancient Chinese philosophy and the history of *guqin* combined with cutting-edge engineering. The first author explained how the ancient *guqin* notation system and the finger techniques were designed to be seamlessly aligned with the phenomenology of Mother Nature. During lunch, the author revealed that her next step in this research would be using deep learning to develop a neural network that can learn and interpret the connections between the music phenomenology and the finger techniques' meaning-making. Ho showed a video of herself performing in environments ranging from busy traffic circles to quiet forests, to highlight the versatility of the instrument.

These systems were built to enable virtuosic performance of complex electronic systems, whereas "Adaptive Multimodal Music Learning Via Interactive Haptic Instrument" by Yian Zhang, Yinmiao Li, Daniel Chin, and Gus Xia presented a design of an interactive, haptic flute that aims to help accelerate the learning process of beginner flute students. There was a "clutch mechanism" that can turn haptic feedback on or off for advanced learners. This was presented to great comedic effect: a human-machine performance of a

robot forcing a human to learn how to play music through physical force.

“Women’s Labor: Creating NIMEs from Domestic Tools” by Margaret Schedel, Jocelyn Ho, and Matthew Blessing showcased a coal iron embedded with sensors that uses machine learning to make live music. During the Victorian era, feminine instruments were traditionally smaller and made to be played in living rooms instead of concert halls. The portable violin was considered too coarse and grotesque for a lady to pursue. In this project, the authors made visible and audible the tools of ordinary household work. Often times the tools of household labor are portable, but secreted within the home, rendered invisible, as is the labor made with them. This project considered material engagement theory and used machine learning through the Wekinator to map the pressure points, both physical and psychosomatic, on traditional tools of women’s labor. This paper was a factor in determining the Pamela Z innovation award, given to Margaret Schedel at the end of the conference.

We offer to future organizers the following observation: It is rewarding to see a single NIME in multiple contexts. The T-vox and V-vox in particular touched upon the most categories. We first saw it in a concert, the following day it was presented to us as a paper, and finally we got to jam with it at Open Jack Night. Open Jack Night showed that the NIME really works in casual settings, as well as in exalted intellectual discussions. Natascha Lamounier’s dress was presented as a demo, and in a concert. It was great to see the dress up close, interact with the sensor, see the fabric react, and have a chance to talk with its developer. The distinction is rewarding because seeing it as an audience member is totally different from seeing it

up close, trying it, touching it, and interacting with it. Experiencing the technology in person also helps with the appreciation for the virtuosity of the person that has learned or made the NIME. In this same way the Open Jack session was one of the most rewarding performances because we were able to experience NIMEs up close in an improvisational setting, after seeing them presented in concerts and installations throughout the week.

Gesture-(Re)Action-Perception

The final category that stood out during the conference was what we will call Gesture-(Re)Action-Perception—specifically, when expressed by connecting things to other things, which can be thought of as a meta-category of NIME. Common themes included: a performer in a wearable or a performer on a controller, self-standing objects—almost sculptural in nature that were played by their creators, and objects that needed to be activated with the body of the performer to take shape in an embodied space.

“Bendit.I/O: A System For Networked Performance Of Circuit-bent Devices” by Anthony T. Marasco and Edgar Berdahl focused on designing an innovative input and control system called “Bendit.I/O” that wirelessly allows circuit bending in distributed musical practice. The system contains a board, a server, and a custom-made application that interfaces with the board. The latency is significant, however, the concept is innovative. We were pleased that the custom electronics of circuit-bent portable CD players with dangling wires made it through TSA security. This exploration of the “ready made” using accessible tools seemed related to *Ausynthar*, by Pedro Pablo Lucas, an android app that used computer vi-

sion to create a lightweight, portable augmented reality setup.

The demo and paper “Separating Sound From Source: Sonic Transformation of The Violin Through Electrodynamical Pickups and Acoustic Actuation” presented by Laurel Pardue (and written with Kuriijn Buys, Dan Overholt, Andrew P. McPherson, and Michael Edinger) had great appeal in terms of the excellent sound world it conjured as well as its level of craftsmanship. The already evocative gestures of playing a violin were combined with the cleverness of technological augmentation to bring a strong and novel instrument into being. Unlike most actuated acoustic instruments, in this case, the physical inputs of the instrument are acoustically separated from the resonating body. The team uses the string itself as the wire carrying the induced voltage, allowing any variety of samples to be processed through the strings and manipulated through traditional violin techniques.

The most prominent celebration of Gesture-(Re)Action-Perception occurred during the concerts. The first piece of the conference, *Gira* by João Nogueira Tragtenberg and Filipe Calegario, was the perfect choice for a dramatic opening for the series of concerts. The lights went out on the stage and a spot slowly came on at the side. A sole player wearing a long canvas wrap skirt walked into the light and sat down in the style of a flamenco guitar player. His NIME had the style form factor of an Oud covered in buttons and knobs. He began to play arpeggios via the instrument, which was linked to a Prophet synthesizer. From the description on the NIME Web site: “Pandivá is an instrument inspired by the gestures of a trombone and a Brazilian tambourine from piston-like controllers and twelve buttons grouped in three sections of a circle. The pistons select

a set of notes, and each button plays each of the notes from the set. It was designed in a similar way to a guitar, where one hand selects the chords, and the other excites each note of the chord in a rhythmic pattern. Instead of complex guitar finger dispositions, the 4 piston controllers allow 16 different combinations and buttons afford a tambourine rhythmic gesture to play them." It was clear that the performer had complete control over his instrument. Like Yuditskaya's circles, this performance linked light, sound, and dance. Eight sodium orange PAR cans arranged in a circle slowly cycled in tune with the music. In the middle a dancer spun. He wore a gourd on his chest and forearm and was dressed in the same wrap skirt as the musician. He turned around clockwise, like a Sufi dancer and there was something reminiscent of Hapkido in his movements. The lights created a zoetrope effect behind the dancer, throwing time dilation into his spin, sometimes the patterns changed and clashed with the dancer's position and the arpeggiation, sometimes it felt perfectly in tune. Towards the end of the dance the dancer emitted a guttural scream as the lights clicked faster and faster, or maybe it just seemed that way, created by a magical vaporwave Sufi world.

VERSE N°1 by Luiz Naveda and Natacha Lamounier was a performance on the first night of concerts with a servomotor pushing the dancer like an actuator. It went out as it began, in sync PAR can glory, with a dancer with a wearable in the middle of the stage and an audio-controlling performer at the side. This time the controlling performer was on the other side of the stage. The dancer wore a costume equipped with two servomotors, one at her solar plexus and one at her back. There was a single spotlight on the controlling

performer, who cast a huge shadow of a figure hunched over a control board. The dancer emerged from that shadow, invisible but for a faint red indicator led glowing through her flesh-colored tunic. The performance was a stunning interplay of light and dark, live dance and automation, humans and their shadows.

While the first night celebrated dance and the body, the second night of concerts went smaller, focusing on gesture. *Colligation* by James Dooley used a short armband sensor with synthesized sound with consistent mapping. The sound was noticeably noisier towards the back, and the left hand made more pure tones. This piece had welcome silence between phrases, and utilized panning that was not directly related to the Cartesian position of the hands. The third performance, featuring a self-built instrument by Jiyun Park had a cellist enclosed in architecture, with a noisy bow, low frequencies, and pedals—gestures turned into architecture and a resonating hull.

The third night moved to a new, more casual venue, and had a multichannel system. Romano Gomez's performance set the tone for the rest of the performances of the closing night exploring a great variety of technical and aesthetic approaches. All three concert pieces that evening seemed to prepare the audience for the more informal Open Jack session at the end of the night.

Herstory

Marcelo Wanderley's keynote address presented past and prototypical NIME conferences and technologies such as the International Computer Music Conference (ICMC) of 1970, and the MIDI boom of the 1980s. He cited a paper by Jörg Piringer that categorized 100 interfaces at the first NIME conference. Early NIME workshops

marshaled the 2008 transition from instruments to papers, and brought ICMC and CHI together with the ACM Conference on Human Factors in Computing Systems (CHI). Marcelo's conclusions were that NIME is a dynamic field for research because it integrates instrument design, art, science, and engineering, in a truly interdisciplinary fashion. However, he warned that although human-computer interaction models can be useful to define musical interaction, contexts and instruments need to be responsible and reliable. Wanderley was a coauthor on a paper revisiting an older NIME: "Rebuilding and Reinterpreting a Digital Musical Instrument—The Sponge" by Ajin Jiji Tom, Harish Jayanth Venkatesan, Ivan Franco, and Marcelo Wanderley. This research provided an invaluable perspective about rebuilding old digital musical instruments, and reevaluating and reinterpreting the design of an original digital musical instrument with new materials. The older material is not flexible enough to be twisted, stretched, and pressed, and so was both clumsy and fragile. It is worth revisiting the ideas of the past and updating them.

"Reanimating the Readymade" by Peter Bussigel and Stephan Moore was a paper that stood out because it engaged with a longer history of art. They started out by mentioning objects with hidden noise, and then re-framed the history of "readymades" as part of the legacy of sound art. Their paper began with Marcel Duchamp's fountain. It's important to also note contributions of the baroness Elsa Von Freytag-Loringhoven that cycled through John Cage's *Water Walk*, Carolee Schneemann's *Noise Bodies*, David Tudor's *Rainforest*, *Transmogripher* (a workshop of improvisation), Moore's own *Chorus for Untrained Operator*, and ended with a quote from Alex

Galloway's *Interface Effect*: "Offering a counteraesthetic in the face of such systemic efficiency is the first step towards building a poetics for it." A useful phrase indeed in the context of a scientific conference about music, which is after all, an art form.

Sofy Yuditskaya's installation *Markov Magic Circles* was a celebration of female power. The magic circles in this project were a digital interpretation of the magic circles in Gogol's "Vie," a fable about a witch getting the best of a seminary student who abused his place in society. This piece used a Markov prediction algorithm to flip virtual coins in order to activate three large LED rings. Based on the three salt rings in Gogol's "Vie," the installation creates an atmosphere of an invocation, summoning unknown presences with pattern and repetition, all while trapping the listener in a brutal soundscape, an extended stay in self-determining probability cycles. The conceptual strength of directly amplifying the electromagnetic transduction of the LEDs as sound sources made the link between image and sound clear, and while the curatorial choice of putting it in another building than the conference was at first surprising, walking over there with fellow attendees created a sense of adventure and camaraderie.

Ana Maria Romano Gomez delivered her keynote address as a concert presentation. Her prose statements were made with sampling that was poetically, affectively, and effectively used, combined with composition techniques. As the final keynote of the conference it was fitting that it was a concert. As musicians we speak a language that is not the language of words. It felt important to have a keynote speaker who came from a minority within the NIME community, but we are sad that she was the only one. The conference closed out

on her music and lyrics, which were delivered in a warehouse-like building evoking an underground space. The music was highly danceable and complex while also educating us on a journey through the history of women's rights.

We ask ourselves if this choice of keynote represents a self-confirming bias. The performance let us come to our own conclusions—whereas studies presented in papers were a small sample size of experiments lacking the validity for strong conclusions. This was important mostly in Romano Gomez's piece since it was the only actively multichannel piece in the whole concert. Her piece was an interactive, psychoacoustically informed, spatially rich piece using four channels. Two of them were located where the stage starts, and the other two were in rear corners, not symmetrically located, near the curtains where the stage was separated from the main bar area. There was a decent amount of noise in the background but it did not mask or greatly affect the performances. The sound synthesis in her piece was rich and of high quality. Each part within the 28-minute long performance blended in together and the transitions were smooth. She used elements from natural sounds like a bass turning into heartbeats and then transforming into train rumblings, women's speech, protest slogans, and moaning sounds. There was a great balance between the use of natural, synthesized, and processed sounds. This piece was musically and politically powerful, and her presence on the stage was interesting to watch. She did not move or show off expressive gestures significantly but her interaction with the interface and the sound was observable. You could see the tension in her posture behind the laptop as she played sirens, alarms, and drone sounds, adding a compelling visual

component to her performance, and overall it was captivating.

There was camaraderie on the final night, but the authors also experienced some cognitive dissonance. There was more interaction that night because of the casual party atmosphere, and the conference cohort had an opportunity to feel part of the town instead of the more formal atmosphere of the university. In the future we suggest that conference organizers try to integrate these more informal community moments into the conference as a whole so participants can meet each other in settings undifferentiated by the role they are playing in the conference hierarchy. We often relegate these more colloquial concerts, the "off" concerts, to late night events, marking the difference between the 9 a.m. paper crowd and the late night crew. It was really great to see the blue-shirted students who were helping all week present in their street clothes, with their friends and partners. We had a similar moment at the beginning of the conference, when we listened to the electric berimbau infused tropicalia jazz while enjoying drinks in the beautiful lobby of the engineering building. As a counterpoint to structured proceedings this open-ended time was a gift to explore new interactions with colleagues from other lands we didn't know we had.

Even though the concert hall was packed for the final night, specifically during Romano Gomez's keynote performance, the setting in Agulha's stage gave opportunities for the audience to move around, interact, and experience her performance in different ways. The formal concert was followed by the traditional NIME closing, the Open Jack Session, which as usual was one of the most compelling and fun performances of the conference. Seeing all forms of DMIs performed and improvised all

together for hours was motivating and fit into this year's theme. Keeping track of who performed with which instrument was challenging, but to the extent that we could follow up on individual performances, along with Pandemonium Trio's synthesizers and Federico Visi's myo-band, XioaXiao's Theremin solo improves were one of the highlights of the jam session. Later on, Laurel Pardue joined the session with her violin controller and bubble physical model, while Sofy Yuditskaya and Stephan Moore played along on laptops. It was a unique mix of instruments, performers, and sounds not only on the stage but also in other corners of the bar where conference attendees were jamming on the piano and singing along. It was the perfect ending to a well-organized, perfectly produced, intellectually stimulating NIME conference.

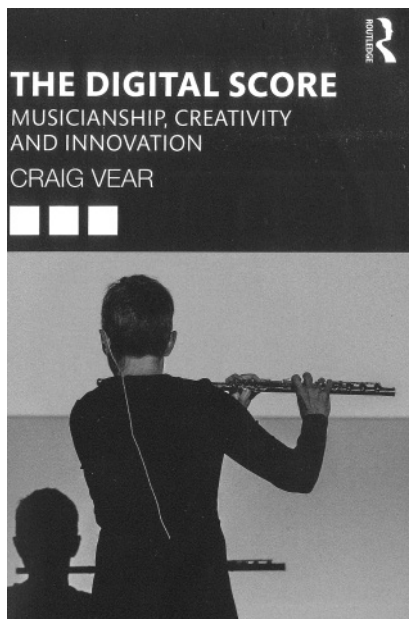
Edited with contributions from Doga Cavdir, Hannah Wolfe, and Jiayue Cecilia Wu.

Publications

Craig Vear: *The Digital Score: Musicianship, Creativity and Innovation*

Hardcover, 2019, ISBN 978-1-138-58666-6; Softcover, ISBN 978-1-138-58668-0, 227 pages, available from Routledge, 52 Vanderbilt Avenue, New York, New York 10017, USA, routledge.com. Suggested projects are presented in each chapter, supported by demo apps written using Max that can be downloaded from <https://github.com/craigvear/digitalscore.git>.

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Reviewed by Ross Feller Gambier, Ohio, USA

The Digital Score: Musicianship, Creativity and Innovation aims to serve as a guide through new areas of technology and discourse opened up via animated and graphical scores, artificial intelligence, and digital scoring contexts. The author, British composer and researcher Craig Vear, demonstrates from both theoretical and applied vantage points that the digital landscape offers new possibilities for performer-composer interactions not necessarily possible in the predigital age. Vear largely bases his research on a considerable, and growing, amount of experimentation in this field. His insights were also drawn from interviews with 50 musicians from around the world.

Vear begins the book by stating "This book initiates a conversation about how the music score is being transformed by digital technology. The aim is to present a specific and

cohesive theory with which to understand the shifts in musicianship, creativity and innovation caused by such transformations." Because this "conversation" has already been occurring for years, this book can be read as a report or summing up of the values and techniques that musicians have been using. The book presents metatheoretical language that is supported by real-life case studies.

This book was written for composers and performers interested in using digital score systems, publishers interested in digital score formats, and artificial intelligence and music researchers. It contains six chapters, a preface, lists of figures and projects, and two appendices. Chapter 1, which serves as an introduction, begins by stating its purpose: "to understand how the digital score presents a different set of propositions and signatures to the notion of a music score, and therefore is to be considered as a new type of music communication interface worthy of its own tradition of inquiry." Vear shows how scores have been transformed from their roles as documents to "a space for creativity." The digital score, in the author's view, "is a direct response to a need to communicate ideas within this new emergent space. . . . This is because older, traditional methods of scoring are no longer able to support . . . a new music culture that innovates, explores, and expands its creativity through digital technology."

Vear describes what he calls "three strong beliefs" that have served to anchor his approach to the topic of the digital score. The first belief, which infuses the entire book, is Christopher Small's concept of musicking: "to music is to take part." His second belief is that the best way to discuss digital score concepts is from the perspective of a "practice-based approach." And his third belief

is that the digital score is not “a new paradigm different from the traditional score” but rather serves to highlight creative opportunities opened by the new digital landscape. Throughout the book, this third belief is at times a little bit hazy, as the author often presents his case as if it were a new paradigm.

After outlining his three strong beliefs, Vear goes on to define his terms and creates a copious amount of new ones. For example, he notes that the term “digital” is “distributed rather than confined” and that it “suggests flexibility, adaptability, un-fixedness . . . insofar that the design is in the computational domain and is therefore easy to revise with updates.”

New technologies such as video tracking, haptic controllers, and networking have served to move the concept of the digital score beyond the mere screen display of paper scores, transforming traditional ideas about composition and performance environments. The digital score can embed hyperlinks and supportive online material that contextualize a work. The very purpose of scores has transformed from “a place of documentation to space for creativity.” This was also true for the graphic scores from the 1950s and 1960s, but without the advantage of having access to new digital technologies. One of the primary differences between digital and nondigital scores is that rather than being a representation of sonic events, the digital score requires “a dynamic computer-based system.”

Digital scores insist on the “active presence of the composer.” Digital scores can “prioritise the creativity of the performer by placing them at the centre of the decision-making process in musicking.” Digital scores “are being written with the behaviour and aesthetics of specific musicians or ensembles in mind.” Digital scores “make it possible for musicians to

engage with interactive scores in new and engaging ways that have more in common with game play.” Digital scores make it possible for musicians from different locations to “perform collaboratively in the same music space.” These are some of the many things that, according to the author, can be accomplished with digital scores. He himself, over the course of two decades, has experimented with different ways to engage with digital scores including “creating autonomous laptop musicians and generative score systems, employing multi-media environments and screen-based scores.”

Much of the author’s understanding is based on the answers he received from questionnaires he gave to 50 musicians who had performed his scores. According to Vear, “Their responses signified that something meaningful was happening between these musicians and these software scores.” He continues: “I hypothesised that there was some correlation between the aesthetic embedded in the software and the musicians’ experience.” This may be true, but his sample size would seem to be too small to make these claims.

He asked his respondents questions such as: “How intuitively (musically) did the generative score system feel?” and “Did you feel a humanness to its logic?” From how the questions were worded one can clearly understand that feeling intuitive and human logic are two positive attributes of the digital score equation. Vear included quoted excerpts from his performers’ answers, ostensibly to bolster his claims that his score systems felt intuitive and carried the quality of “humanness.” Given this rather unscientific method one can’t determine much, even whether the respondents’ feelings might have been any different with nondigital score contexts. All claims aside, the

two questions reveal a value structure that might not be beneficial to the context of a digital score, because the author bases so much of his argument on personal experience. I will explain what I mean by my statement with my own personal story. Several decades ago I performed with composer/trombonist George Lewis’s Voyager system. It contained several aspects of Vear’s digital score systems. As an improviser I found that Voyager responded to my efforts in highly unusual ways that ran counter to my notions about intuition. In fact, I remember thinking that the system had made various decisions that no human improviser would have made. This in turn made me play in a completely different way, reassessing how I viewed fundamental concepts about intuition, and even what it meant to be human. In short, there is nothing inherently beneficial about a digital score system feeling intuitive or exhibiting human logic.

Another instance of an assumed value occurs in the author’s discussion of an animated Beethoven score in his own handwriting. Members of a string quartet who played this score from their laptops described the experience as “thrilling” and that they felt “freer” and it “made” their group perform better. In order to separate the hype from fact one would have to determine whether the same results were replicated by a variety of string quartets, and whether the results were appreciably different from simply viewing paper copies of the same pieces of paper.

In addition to the over-reliance on anecdotal evidence, another weakness of this book can be found in the author’s sprawling attempts at defining his subject, using numbered lists and sublists. The reader cannot be blamed for losing the thread of the argument, especially in instances where definitions overlap or where

lists are redundantly printed just a few pages from where they first appear in the text. Also, the emphasis on the author's own compositional work makes the book read more like an expanded dissertation rather than a neutral study.

The overly optimistic trust in technology, slathered in an overabundance of definitions and categories (some of which can easily be applied to nondigital scores), leave one with the sense that this is a wide-eyed and bushy-tailed book. Nevertheless, this book represents a bold attempt to grapple with new technologies and new score concepts. It is informatively illustrated with figures, contains pedagogically sound suggested projects, and is supported with online materials, including a set of custom-made apps.

Recordings

Agostino Di Scipio: *Concrezioni Sonore*

Compact disc, 2018, Stradivarius STR 37100, available from Stradivarius, www.stradivarius.it/.

Reviewed by Ross Feller
Gambier, Ohio, USA

Agostino Di Scipio's Stradivarius recording *Concrezioni sonore* contains a treasure trove of contemplative electroacoustic compositions for piano and live electronics. This disc features three multimovement and two single-movement pieces. According to the liner notes the five works represent Di Scipio's

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entire piano oeuvre as of today. They “seem to reflect various manners of conceptualizing and reshaping the piano, by situating it in a hypersystem of live electronics means.”

In the first work, *3 pezzi muti (dalla superficie al fondo)* [3 silent pieces (from top to bottom)] “the pianist makes contact with the keys yet does not really play—not depressing the keys hard enough as to have them hit the strings . . .” Gestural noises produced by the contact points between the instrument and the performer are captured and transformed by the computer. This intriguing idea produces an audible, yet understated, drama.

The piece begins by slowly fading in sounds that resemble birds and water. There is also a soft, repetitive clicking sound that is heard periodically. After about a minute we hear the first sounds that obviously belong to the piano—clearly articulated high register pitches. Simultaneously, we hear the slight presence of feedback, which is haunting. Toward the end of the first silent piece there is a single pitch (F#5) that is repeated as it speeds up and then slows down. This gesture, which happens twice more in the succeeding silent pieces, serves both as an ending and as an initiation of the next piece.

The second silent piece begins with sounds of the processed piano along with the previously heard clicking sounds, but now they have more dynamic presence. Low register piano pitches appear followed by long, poignant, decay trails. The music thus far is ambient and sparse, and represents some of the best principles of acousmatic practice. The composer has successfully created an imaginary sonic landscape that conjures more than it represents. As in the first silent piece, toward the end of the second we hear a single repeated pitch (this time it's a C#5), which serves to close the second piece and as a bridge to the third piece.

The third silent piece is texturally the busiest and uses the extreme piano registers for its processing fodder. There is a cyclic use of materials, which serves to ground them. Toward the end we hear another but different single pitch (D#5) repeated as before. These three pitches can be heard as part of a structural pentatonic scale. In short, there are no traditional melodies or harmonies to speak of here. The focus is clearly on texture and timbre. This is an evocative, understated piece that conjures up imagined places via the composer's use of processing techniques.

The next work on this collection *6 studi (“dalla muta distesa delle cose . . .”)* [6 studies (“from the silent expanse of things . . .”)] consists of six short studies for piano and live electronics from 1995–1997, and is the oldest work on the disc. The short movements carry a sense of material compression. At times it sounds as if the same sounds or techniques were being used in each of the movements, but in slightly different ways.

The first study begins with single repeated note attacks. Unlike the manner in which this technique was used in the previous piece, here the notes frequently change

pitch. Each new grouping seems to trigger live electronic processing that alters the overall timbral shape. In the second study it sounds like pitch following was used. Also, percussive sounds emanating from the piano, including muted notes, are captured and processed. The third study is in many respects similar to the first two, but includes an occasional dissonant chord and granular processing techniques to create some interesting envelope distortions. The fourth study contains sounds that appear like they came from the pianist playing the inside of the piano, including muted strings. The fifth study uses more granular sounding techniques and an emphasis on resonance. The sixth, and final, study sounded like it contained fragments from the previous studies in various combinations. There is a long fade-out at the end to close out the piece.

The middle work on this five-piece disc is entitled *Settimo studio* (“*dalle brume . . . l’evidenza . . .*”) [Seventh Study (“from the mists . . . comes evidence . . .)]. Composed between 2017 and 2018 it represents the most recent piece on this collection. According to the liner notes it “takes over from where the six studies had ended, twenty years earlier” and is “the one (piece) featuring the most linear and predictable interaction between instrument and electronics.” It can also be described as a slow burn.

The piece begins with various groupings of notes that are followed by long fade-outs or decay trails, almost until the sounds completely decay to silence, a process that can take many seconds on the piano. There is an effective, subtle use of electronics, as an echo, or distant memory, of the previous material. Some of this involves sonic “whiffs” of simple amplitude modulation.

As in the other works on this disc, the composer uses electronics to slowly build texture largely by altering timbre. The slow rates of harmonic change work well with this compositional approach, which relies upon slow development and lengthy sonic decays. About halfway through the piece one begins to wonder if anything substantial will change. But this is not a music that contains catastrophic change or sharp corners. Rather, it is one that represents with nuance an inner, contemplative world.

Later on we hear waves of similarly articulated and processed sounds. One wonders what would result if the composer used more tracks or channels to enhance the basic sonic image of this piece. At the end of the composition there is a softly repeated G♯-A half step that occurs within a rubato texture, almost sounding like the resolution of a leading tone to the tonic.

The penultimate work, *chpn3.2*, makes intriguing use of electrodynamic actuators designed and built by Giorgia Klauer called “self-sensing actuators.” They are used as part of a complex process described in the program notes thus: “In the performance, these actuators are used by the two pianists to ‘inject’ in the strings a number of selected recordings of Chopin piano music (chosen by the performers. The piano strings into which the injection is made, are themselves selected according to any Chopin piano music fragment. The tiny resonances of the injection, are taken up in a larger electroacoustic chain, with microphones and speakers positioned just next to the piano or inside, whose sound loops back into the string via the actuators.” This complex process yields a fascinating and elaborate feedback system.

chpn3.2 is separated into three sections or parts that contain similar treatments. They each begin similarly

and then veer off in slightly different directions. The first part begins with liquideous sounds that suggest movement below a surface, either subterranean or underwater. There are other sounds that suggest that sounds of the human performers were embedded into the texture. All of this occurs within an extended, slow dynamic buildup. About 45 seconds from the end of the first section we hear a prominent tapping sound on the body of the piano that quickly fades out. This tapping also occurs in the second part, in a similar location. The second and third parts begin like the first part, only with somewhat busier textures and more layers added. One wonders if each section contains a different run through of the same processes or structures.

The final work, *Dal fondo* [from the bottom, or from the background], is the longest piece on the disc, clocking in at 17’45”. The liner notes describe this piece as “a slow adagio growing out of the noise of piano keys and their mechanics.” This work also contains playback systems that play “back audio excerpts from the piano repertoire.”

In the lengthy introduction, incidental noises, including scratching and scraping sounds are prominent. Because of the extremely slow rate of change every new sound carries a weighted significance. Processing techniques include the boosting of filtered resonance, similar to the feedback in previous works.

The obvious presence of the piano is disguised or masked until shortly after the 3-minute mark. Here the composer sparsely introduces middle to high register pitches. There is something Feldmanesque in the way Di Scipio utilizes compositional restraint. At times each attack is followed with an avalanche of granular-like, pitchless echoes, sounding like pebbles being poured into a container.

These echoes eventually turn into wavelike utterances that conjure up an aquatic environment, within a slowly building crescendo texture. Like Shepard tones there is a continuous, almost infinite sense to this textural build-up.

After twelve minutes the traditional piano gestural repertoire comes to the surface, which takes on an alien character given all that has happened in the preceding twelve minutes. There is a long fade-out at the end, sufficiently proportional to the 17-minute length of the composition.

Overall, this collection contains fresh uses of sparse textures and dissonance, sustained textural drones, and creative use of various technologies and processing techniques. This is pure electroacoustic music that takes delight in timbres and textures for their own sakes. There is a sense of aliveness and organicity that is easy to appreciate.

Sabina Covarrubias: *Viaje*

Digital download, 2019, sound available from: <https://play.google.com/music/preview/Tgdno52wzzogdfnblktxpswgi2q>. Video available from: <https://vimeo.com/392076266>.

*Reviewed by Seth Rozanoff
Amsterdam, The Netherlands*

Sabina Covarrubias is a Mexican multimedia artist and researcher in music technology, based in Paris, France. Her current creative work demonstrates an approach to merging sound and image sources to make visual music, using the Jitter program. Her creative output can be

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parsed into two types. Covarrubias characterizes the first as “digital algorithmic photography,” and the second as “audioreactive visuals.” Her photographic approach stems from using algorithms to process a given image; algorithms applied are in the spirit of granular synthesis techniques. Audioreactive works attempt to form a cohesive link between sounds and images.

Covarrubias has also recently been organizing Jitter tutorials, which are meant to assist artists and musicians with their own multimedia projects, as well as further clarify the program’s seemingly complex visual design. A definition of visual music based on more recent experience and practice could simply be the combining of nonnarrative visual elements with sound. That pairing often results in a film or a real-time performance that requires projection. The term “visual music” has progressed recently, extending to music videos, installations, and other interactive visual practice. An important aspect of Covarrubias’ audiovisual work is her enhanced approach to music composition, and how it has influenced the structure between her sound and visual elements. As such, her work is not simply an exercise in VJing, or

an attempt to “transcode” sound into image.

A good example of Covarrubias’ compositional approach can be seen in her work *Viaje*. It can be presented as both a live electronics and visuals work, and as music without visuals. Both versions last 45 minutes. *Viaje* was premiered at the 2018 Vision’R festival in Paris, and also has been performed at the 2019 Saturnalia Festival in Milan, and SONICA 2019 in Glasgow.

Viaje contains two main, juxtaposed, sound classes in this work: dense metallic fragments, and a less energetic soundstream. Relating to her use of Jitter, Covarrubias’ real-time images stem from that program’s library of objects, which can be used for making sound, as well as retrieving data. In *Viaje*, the potential role of these objects supports an interaction concept—managing structural interplay between sound and image practices.

Covarrubias develops expressive continuity in *Viaje* from a series of transitions, which seem to mirror shifts in the prominence or dominance of a range of musical motifs. She also manipulates the accompanimental processes, which can be viewed as a type of slowed down improvisation. Much of Covarrubias’ sound material can be characterized as a subtle range of noises, whose layers, at times, “bleed into” the broader sonic image.

One important aspect of audiovisuality in *Viaje* is the organization of broad sonic layers according to visual behaviors. For example, fine-grained visual particles are coordinated alongside specific musical fragments. Covarrubias seems to be decisive regarding these pairings. As such, these larger-scale gestures stem from a use of a range of modular and digital instruments. Covarrubias uses hardware manufactured by Make

Noise, Moog, Mutable Instruments, and Arturia in her work. Her configuration of these devices results in what can be characterized as a range of metallic sonorities. Those sounds are then pitted against various types of patterning, generated in Jitter. Another aspect of audiovisuality in *Viaje* is the quality of an expanded space. Drone-like soundstreams seem to soften this sense of space.

Covarrubias addresses the issue of form as well, inserting short transitory sections between the larger audiovisual behaviors. For example, sometimes she clears out the orchestration, resulting in the transformation of her accompanimental materials. The listener or viewer might not notice the significance of these adjustments until a new contrast between sound and image is achieved. Another example can be heard around 18'30", where Covarrubias introduces flute-like utterances to denote a new formal section. This new sonic character is then mimicked throughout the succeeding five minutes by a range of motivic variation, all of which could be heard as being derived from an organ or similar keyboard instrument. As this section progresses, Covarrubias again, has set up another compositional structure between the more robust figurations and their accompanying orchestrations.

As related to visual elements in her work, Covarrubias developed a distinctive formal process as well. Two main issues are relevant here: color selection and combination, and movement of particles. In the context of *Viaje*, these visual behaviors seem to have been carefully choreographed to coordinate visual patterns with sound. Her approach to shaping visual behavior in *Viaje* stems from her work in *Turning Point* (2018). At around

4'00" of that work, her particles are programmed to form new circular patterns. These patterns contrast the buildup of weightier musical layers. As this circular arrangement develops, one hears and views a clearer interaction with the music. As the work continues (circular patterns still present), almost unexpectedly, around 5'30", sequential musical figures dominate the landscape, and the circular forms are traded for dense strands of tread-like visual patterns. At times the movement of these "threads" mirrors the past behavior of particles seen in the beginning of the work. This type of repositioning technique is also used in *Viaje*. This often happens later, mirroring development of new sonic trajectories. Meaning that, after a given section, she develops variations of her sonic material, retransforming her fragments. As such, the resulting interplay between sound and image is maintained, stemming from subtle alterations of both elements. Overall, Covarrubias' aesthetic can be summarized in her own statement: "I develop 'visual-motifs' along with the work . . . I create crescendos, diminuendos, accelerandos, development of motifs, I cannot separate my visuals from the music."

As mentioned earlier, Covarrubias has successfully unpacked Jitter's objects for new users—those who are not programmers, in particular. In her tutorials for beginners, she has broken down Jitter's functionality, discussing the software's practical features. Often, Covarrubias suggests a creative project in which a given Jitter object could be used. This trajectory not just assists one's understanding of technical aspects of programming images, but also encourages artistic thinking. At the core of her tutorials is experimentation between sounds and

images – how to effectively manage audiovisual interaction.

Of course, this is an important aspect of her own creative work, but Covarrubias does not necessarily claim that Jitter is the best approach. She states the following: "I believe that excellent results can be achieved regardless of the tool used . . . good quality and originality in a work will depend on the artist's potential and experience and not in the tool he or she is using."

Her additional video footage further encourages new users who may feel overwhelmed by a given patch's design structure. Covarrubias' attitude has been informed by not only her own research activities, but her current multimedia practice as well. She does not overlook a discussion about Jitter's programming theory either. Clarifying this information can potentially further assist one's view of the differences that exist between artistic approaches using technology, and Jitter's technical structure. Ultimately, Covarrubias' educational approach supports, or opens a space for, artistic thinking, compared to a scenario wherein a user may struggle to work around a program's technical limitations. Also, her tutorials encourage others to personalize their visual results. An example can be seen at <https://youtu.be/8QcZ1Qc7qIw>. This video corresponds to her tutorial aimed at using color data that has been extracted from a movie, and used to further modify a given 3-D shape. Covarrubias also tries to speak in relatively nontechnical terms here, assisting the user's understanding of a given tutorial, including those provided by the Max program. Covarrubias' tutorials, as well as her artistic practice, make positive contributions to the ever-developing field of visual music.