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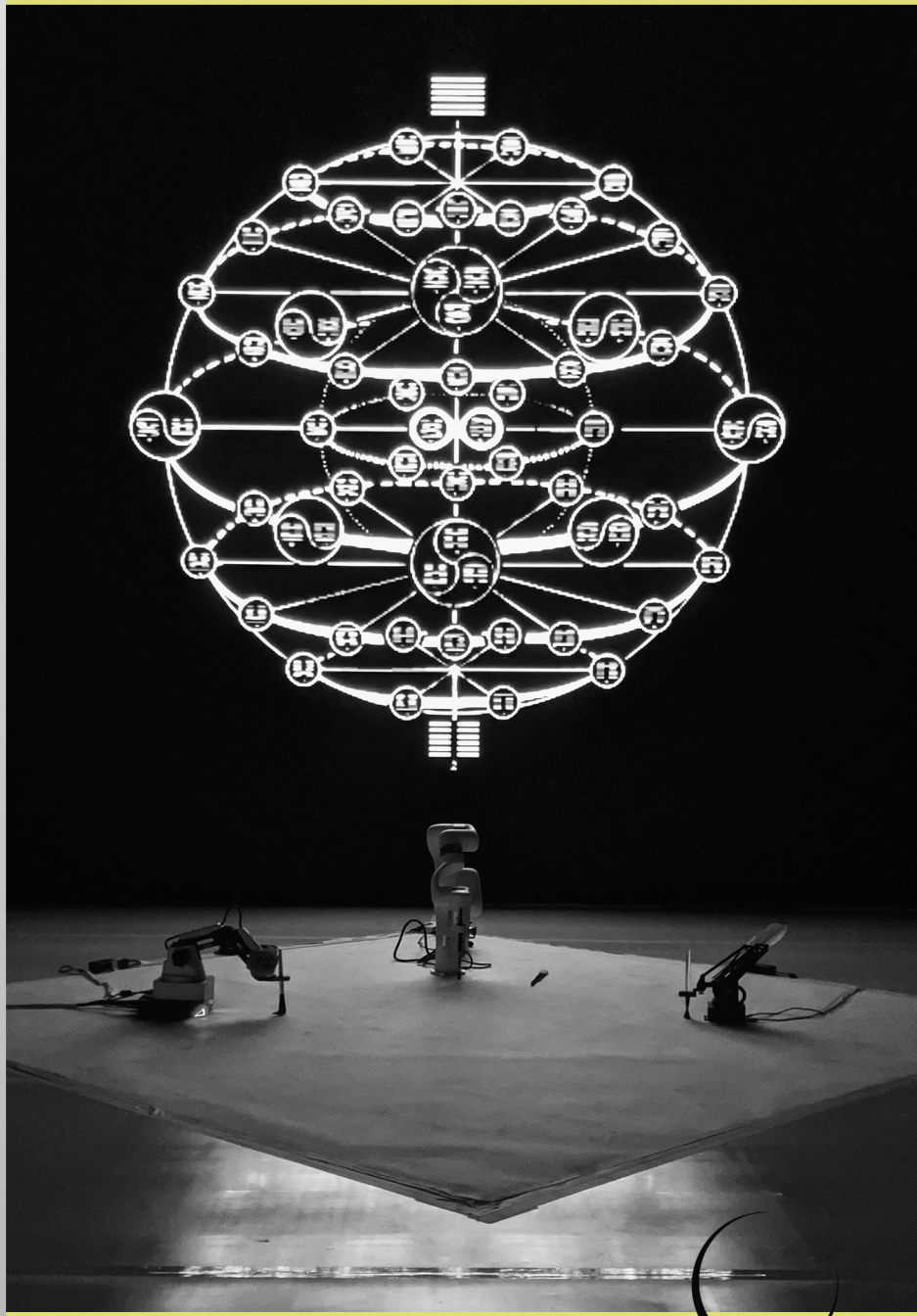

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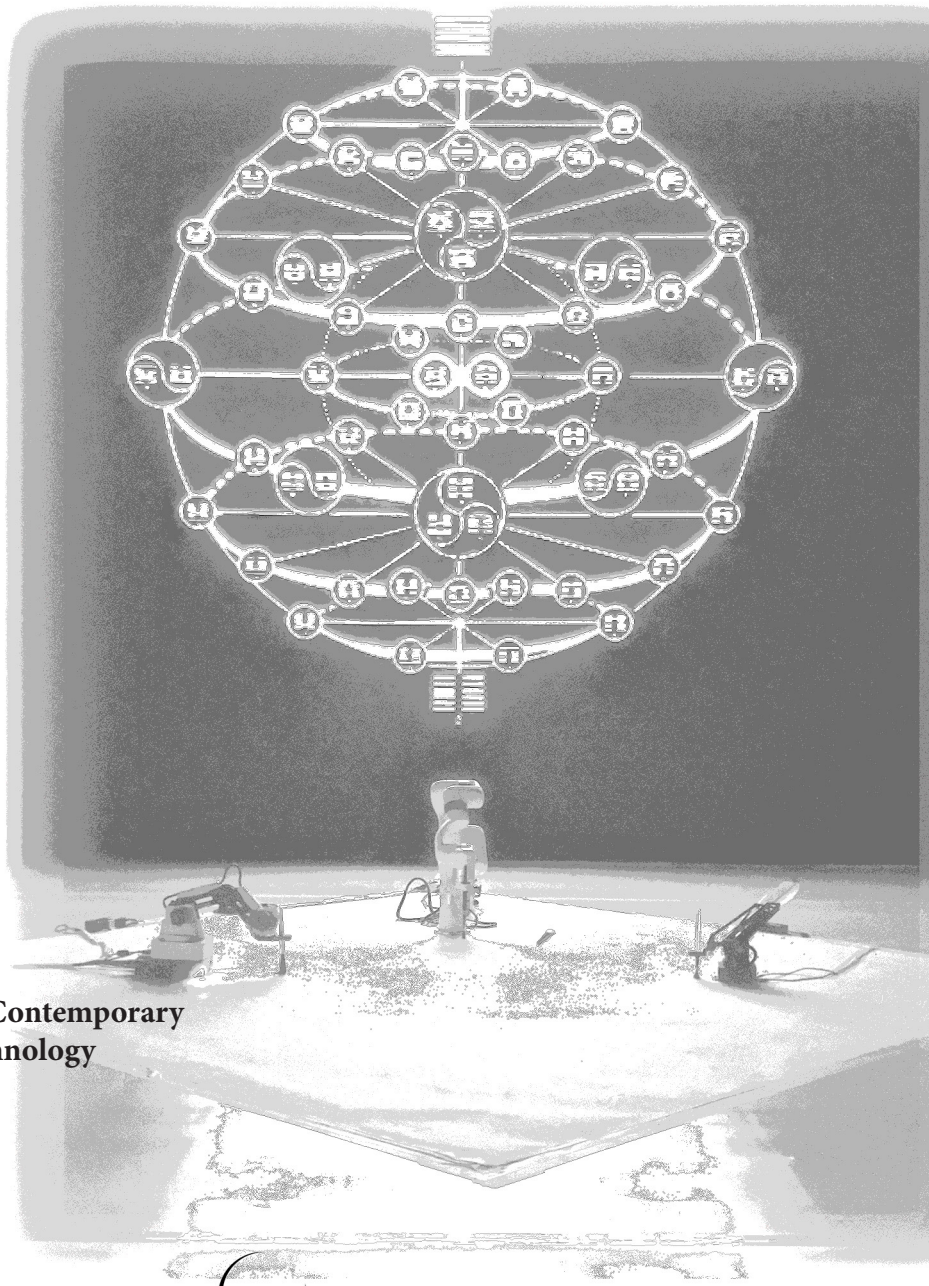

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INSAM Journal of Contemporary Music, Art and Technology is an international peer reviewed journal dealing with topical issues in contemporary art music, visual and performing arts, and technology. The journal encourages interdisciplinary and transdisciplinary approaches and innovative views on these subjects, aiming to create a platform for communicating new ideas and theoretical and artistic impulses.
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VISIONARY PLATFORM

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EDITOR'S FOREWORD

Human-Machine Collaboration in music, arts, and theory, has come to be a particularly challenging, provocative and necessary topic. As we underlined in the Call for Papers, the theme of the issue highlighted our intention to give space to overcoming the deep-rooted dichotomy "human vs. machine" in the arts. In finding and understanding the flaws and strengths of both sides through theoretical, inter- and trans-disciplinary, and critical thinking, we strive towards creating a platform for open discussions on the subject.

In the issue of INSAM Journal in front of us, this conversation is inspired by the propelling artwork of Sougwen Chung, an internationally renowned multi-disciplinary artist, with whom we've had an exciting interview on the topic. Chung's stance that "combining AI and robotics with traditional forms of creativity (…) can help us think a little bit more deeply about what is human and what is the machine" is here explored in depth. In the piece that follows, with the main theme in mind, Marija Maglov interviews Dr Kelly Snook, Professor of Media Art Technology at the University of Brighton, and one of the developers of MI.MU Gloves, that are famous for gestural control of music and visuals.

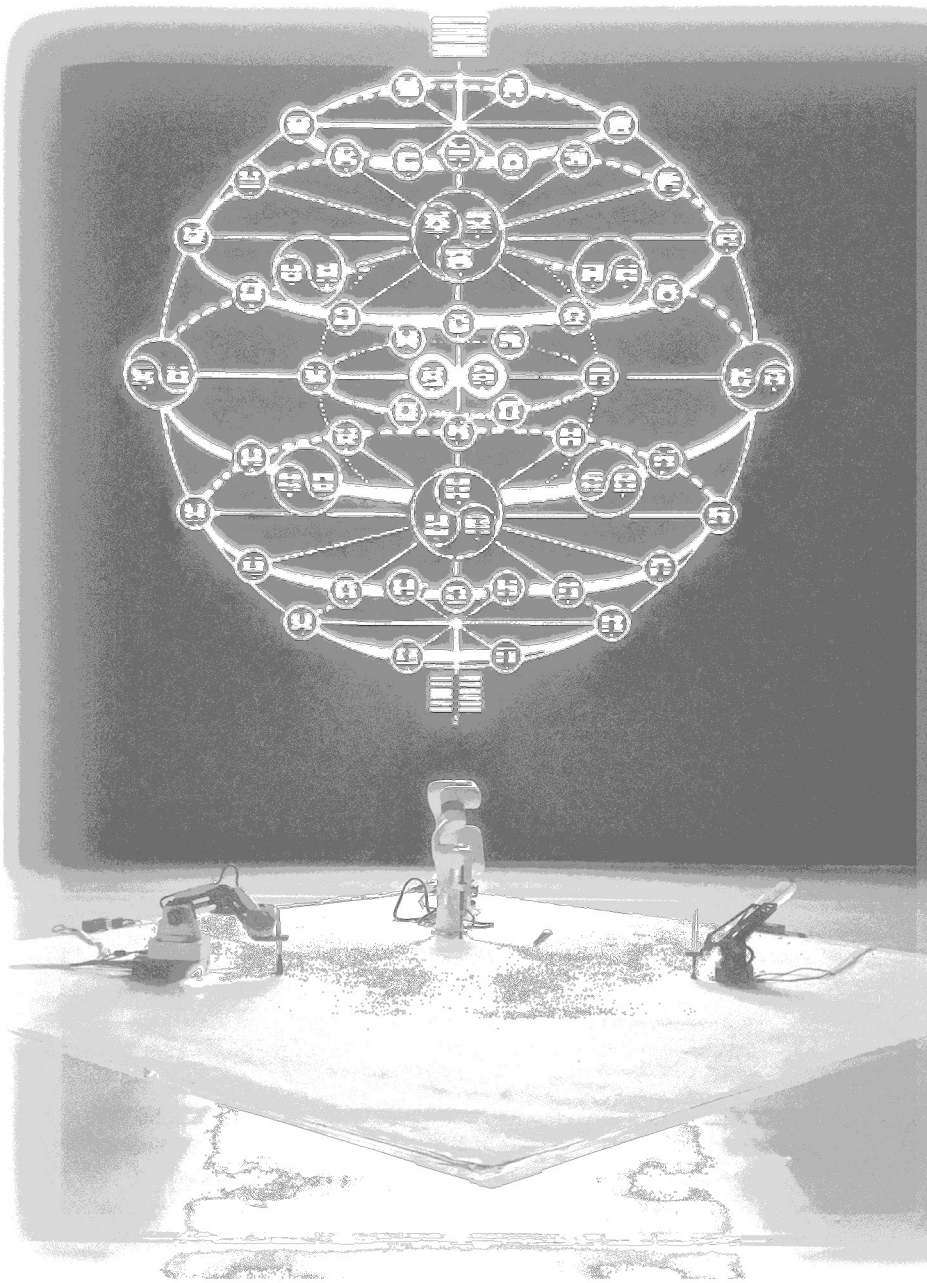
The central section of this issue, consisting of four papers, begins with Mattia Merlini's and Stefano Maria Nicoletti's article on computational creativity and the question of the role of the body in the experience and creation of music. Sandra Bjelan-Guska and Nela Hasanbegović investigated the possibility of using computer software in the teaching of fine arts in Sarajevo Canton by questioning elementary and high school teachers on their current methods and ideas for improvement. In her text, Marija Mitrović looks into the new incidences of *gesamtkunstwerk* in a contemporary, technologically driven context. Mark Dyer writes about musical borrowing in Nicolas Collins' works such as *Still Lives* and *Still (After) Lives*.

In the Beyond the Main Theme section, composer Dino Rešidbegović presents a novel method of notation in electronic music dubbed Approximate Reductionist Graphical Notation (ARGN). Immanuel Mellis, writing for the Students' Papers section, delves into the issue of small intimate venues such as house concerts, secret concerts, and listening rooms. The Reviews section brings us the review of new publication *The Oxford Handbook of Voice Studies* (2019), particularly important for voice scholars, edited by Nina Sun Eidsheim and Katherine Meizel.

On behalf of the Editorial team and myself, I would also like to thank all of our peer-reviewers for their diligence and thoroughness, as well our proofreader, Anthony McLean, for his meticulousness and responsiveness that marked our cooperation. As always, many thanks go to the authors who decided to share their work with us, especially having in mind the heavy and turbulent times in which we were preparing this issue.

In Belgrade, July 7, 2020,
Bojana Radovanović,
Editor-in-Chief

(Inter)Views



Bojana Radovanović*
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Belgrade, Serbia

COLLABORATION, AT ITS HEART, ISN'T ABOUT CONTROL:
Interview with Sougwen Chung[1]

As highlighed in her biography,[2] Sougwen Chung is an internationally renowned multi-disciplinary artist, who uses hand-drawn and technologically-reproduced marks to address the closeness between person-to-person and person-to-machine communication. She is a former researcher at MIT Media Lab and current Artist in Resident at Bell Labs and New Museum of Contemporary Art in New York, working in the fields of installation, sculpture, still image, drawing, and performance.

Chung received Japan Media Art's Excellence Award in 2016 for her project *Drawing Operations*. She has been awarded Artist in Residence positions at Google, Eyebeam, Japan Media Arts, and Pier 9 Autodesk. In 2014, she was selected as one of the Top 20 New Visual Artists by Print Magazine. Her multidisciplinary work has been exhibited internationally, including the Museum of Contemporary Art in Geneva, The New Museum of Contemporary Art in New York, the NTT Intercommunication Center (ICC) in Tokyo, and The Drawing Center in New York. Her work has been featured in The New Yorker, the BBC, The New York Times, Fast Company, Wired, Endgadget and USA Today.

In this interview, the artist speaks about the poetics of her collaboration with robotic systems, as well as the development of D.O.U.G. and her latest projects.

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1 This interview was done within the Institute of Musicology, Serbian Academy of Sciences and Arts, the scientific research organization funded by the Ministry of Education, Science and Technological Development of the Republic of Serbia.
2 Chung's biography is available at: sougwen.com.

Sougwen Chung, Photo by Michael George

Doing this work has taught me a few things. It's taught me how embracing imperfection can actually teach us something about ourselves. It's taught me that exploring art can actually help shape the technology that shapes us. And it's taught me that combining AI and robotics with traditional forms of creativity -- visual arts in my case -- can help us think a little bit more deeply about what is human and what is the machine. And it's led me to the realization that collaboration is the key to creating the space for both as we move forward.

Sougwen Chung, TED, 2019.

I've highlighted this quote of yours from your recent talk at TED. It seemed like an excellent introductory snippet to our conversation about your art, which inspired the main theme of this issue. The relation between humans and technology is something that is continuously challenged and explored in your work. Would you introduce us to the main ideas and inspirations that lead you throughout your career?

First off, I'd like to say that it's an honour to have had the work inspire the main theme of the issue. As we are continuing to contain the COVID-19 pandemic on a global scale through social distancing, initiatives that connect practitioners across sectors are needed now more than ever. I'm excited to explore, be inspired by, and discover the work of like-minds through this issue.

The main ideas and inspirations for my practice to-date began as a response to a provocation. It was a provocation I stumbled upon by following a story about a prodigious Wei-Chi player losing a series of games to an AI system in 2016. Instead of despairing, he experienced a changed awareness about the beauty of his craft. I was incensed by the idea, the provocation of uncovering the potential beauty of a non-human creative gesture.[3] It excited me as an artist, technologist and researcher all-at-once.

Over the years, this interdisciplinary pursuit has brought me to places, ideas, and communities I couldn't have imagined. It's driven a critical practice that reveals the malleability of what we consider human and machine.

We tend to define humans and machines as distinct from each other. Through the work, I've found that definitions of separation, of either-or, are outmoded. To move forward, I develop forms of collaboration that explore processes of becoming-with.[4]

Your project Drawing Operations started in 2015 as an "ongoing collaboration between an artist and a robotic arm." D.O.U.G., the robot you've designed and built, is your collaborator. Can you explain how the process of development of D.O.U.G. and the various stages of the project unfolded?

In 2015, I was interested in creating a robotic unit programmed to draw with me. That could not only evolve alongside my own development as an artist and programmer, but alongside developments within emerging technological fields.

It's taken the form of 4 different generations of robots, spanning multiple

3 Metz, Cade. "The Sadness and Beauty of Watching Google's AI Play Go." *Wired*, Conde Nast, 3 June 2017, www.wired.com/2016/03/sadness-beauty-watching-googles-ai-play-go/.
4 Haraway, Donna Jeanne. *Staying with the Trouble: Making Kin in the Chthulucene*. Duke University Press, 2016.

technologies, design processes and interaction models. Our research topics cover mimicry and spontaneity, memory and data bias, swarm intelligence and surveillance, biometrics and interplanetary feedback, and so on.

Generation 1 explores mimicry and was my first foray into designing custom systems for a robotic unit. It started out as a computer vision system that tracked the color of my pen and then relayed the lines on to the other side of the page. It was rudimentary, like drawing with crayons.

Generation 2 explores memory. I designed a robot that was trained on two decades of my artwork to see what patterns would emerge. I was curious about what it would be like to relay a drawing model from a recurrent neural network with a personal and bespoke data set into a robotic unit that would draw with me. It created a feedback loop of gestures between my line input and what my robotic drawing collaborator outputs, and back again.

Generation three explores swarm robotics linked to the vibrant and remarkable movement of New York City, where I was based at the time. It is the first city in an ongoing series of collaborative landscape paintings and exploratory robotics. The research involved the linking of urban flow extracted through public cameras to a custom-designed kinetic sculpture -- the expanding of the robotic form in the work. It broke out of the binary framing of human and robot arm to pursue a collaboration that explored swarm intelligence. It was the first time I started that co-creative negotiating on such a broad physical and environmental scale.

Generation 4 is currently in development and explores bodies – the invisible systems that govern them. Brainwaves, electromagnetic frequencies, and interplanetary readings.

These generations of robots conceptualize new models of research through critical and embodied investigation. What does it mean to extend the human sensory apparatus through research that replicates synthetic sensing in various technical objects?[5] In my case, collaboration through robotic systems.

By regarding artistic and scientific research as complementary practices throughout my work, I've been developing approaches to how models of knowledge can reinvent themselves through the uncertainty of artistic practice. In a sense, to work towards a form of learning that charts its own path across disciplines, and is not so easily held captive by dominant cultures of evaluation and prediction.[6]

I hope that it offers a view of artistic practice that is beyond individual expression and a view of scientific practice that is inhabited and felt. These complementary views held in creative practice and research are part of the development of a new, collaborative imagination – of radical new intersubjectivities.[7]

5 Hui, Yuk. *On the Existence of Digital Objects*. University of Minnesota Press, 2016.
6 Rogoff, Irit. 2018. Becoming Research. In: Choi Jina and Helen Jungyeon Ku, eds. *The Curatorial in Parallax*. Seoul, Republic of Korea: National Museum of Modern and Contemporary Art, Korea, pp. 39-52.
7 Chung, Sougwen. "Only Human." *Mana Contemporary*, 2018, www.manacontemporary.com/exhibition/onlyhuman/.

What are the postulates of your collaboration with D.O.U.G. as a non-human agent? D.O.U.G. is mimicking the way humans learn (with the decades of your own art as its primary source of information), and that it also has the ability to make mistakes. With that in mind, can you observe, discern, and explain the line between human and non-human in your collaborative art? We can imagine it being more complex given that you are "feeding" the machine parts of yourself – and maybe even more in some of your recent projects we will delve into soon.

We are social animals. As humans we naturally anthropomorphize to facilitate connections with that which is unlike us. It's a continuation of our cognitive evolution as a species. That being said, we should be mindful of words like "ability" when referring to machines, and consider what purpose the agency and intent it ascribes to them might serve.

The "mistakes" my drawing units have "the ability" to make are found in all systems. In my work, the "mistakes" are actually the differences that catalyze creative decisions I wouldn't have arrived at otherwise.

Within the collaboration, the differences between human and non-human are questioned within the space of a canvas. The work asks, "where does my artist's line end and the machine's lines begin?" It becomes a philosophical question that exists simultaneously as a research prompt, I really like when the two coincide.

I have learned through art-making how expansive our engagement with machines can be. Machines as creative catalysts, as speculative objects, as interactive reflections of that which is in us, across the realms of the creative, personal, and political. In that way, the practice feels like it's just scratching the surface of these ideas, and there's so much more to explore.

Did drawing with D.O.U.G. change your perspective on human (and machine) creativity and how?

Drawing with D.O.U.G. as collaborator helped me see that perhaps the future of human creativity isn't in what it makes, but how human and non-human alike can come together to explore new ways of making.

Initially it began with the thinking that though art, we can shape the tools that shape us. With a background in art and engineering I have been acutely aware of how interdisciplinary approches can shape the development of one's own tools and systems-of-making.

By doing so I'm interested in producing methodologies that resonate, with my own practice and with others. For me, it's an exciting part of working with emerging technologies – how they can catalyze new approaches to traditional media and ways of thinking. Technologies like but not limited to computer vision, ai systems, and custom robotics have deepened my own engagement with drawing, image making, sculpture, installation and performance. It's motivated by asking what it means to develop an artistic practice within a technological landscape that impacts so much of our daily life.

Project Exquisite Corpus (2019) stems from various strains of thought on human/non-human collaboration, indeterminacy in the basis of the artistic work with robots, bodies, and ecology/economy. What are the main questions you're trying to answer or, what is it that you want to explore in this ambitious "performance installation"?

Exquisite Corpus came at an interesting time, in 2019, before the pandemic. So, it at once feels like yesterday as well as a long time ago.

Exquisite Corpus was named as a reference to the surrealist drawing game *Exquisite Corpse*, in which two drawers collaborate on the drawing of a single figure without seeing the contributions of the other. It's meant to stimulate the

subconscious through an activity that demonstrates how different perspectives can come together to create something unexpected. *Corpus*, latin for Body, references biological, technological, and ecological bodies in collaboration, an interaction of exquisite unknowing.

What do we know about bodies? The work endeavours to create an immersive sense impression of bodies at a micro and macro scale through synthetic sensing captured through electroencephalogram measuring devices (eeg headset) and satellite data. The micro scale being the cognizing body and the macro scale the interplanetary body.

How can our senses become heightened by an awareness of both, extending the human *umwelt* and mediating it through technical objects like robots?

How do your biological/bodily processes provoke or initiate response from your environment?

The work instrumentalizes the feedback loop of humans-machine-ecology through the layering of my brain-waves while drawing, electro-magnetic field readings from the robotic unit and satellite data from space during the collaborative painting. I wanted to explore the co-creative process and inhabit the multi-sensory backdrop of the data being fed into the drawing.

The work foregrounds the interconnectedness of the biological, the mechanical, the ecological. As humans on the planet, we make and work within this layered nested system. These data points are poeticised and returned to the *Exquisite Corpus* project.

The work extends my research in human and machine collaboration into an exploration of ecologies. It moves …. "beyond the simplifying binaries of real and artificial, human and machine—urges the poetic promise of mechanical and artificial systems to imagine forms of closeness in an increasingly estranged world. A result of the human sensorium through and through, her works double down on the entanglement of all bodies (biological, mechanical, and otherwise), never really disembodied but always becoming."[8]

What is the place of theory and philosophy in your research?

The place of theory and philosophy in my research is complementary. The work stems from the desire for a wide engagement with world-building through a variety of sources (cited in this interview). Philosophy and theory is a component of a broader wealth of engagement across cultural sectors, including current and

8 Voon, Claire. "A Language for Intimacy: On the Work of Sougwen Chung." *Corpus*, Boston Center for the Arts, 2020, alanguageforintimacy.com/projects/sougwen-chung-claire-voon.

historical developments in technology, science, sociology, and the humanities… It all informs the thinking and making of the work.

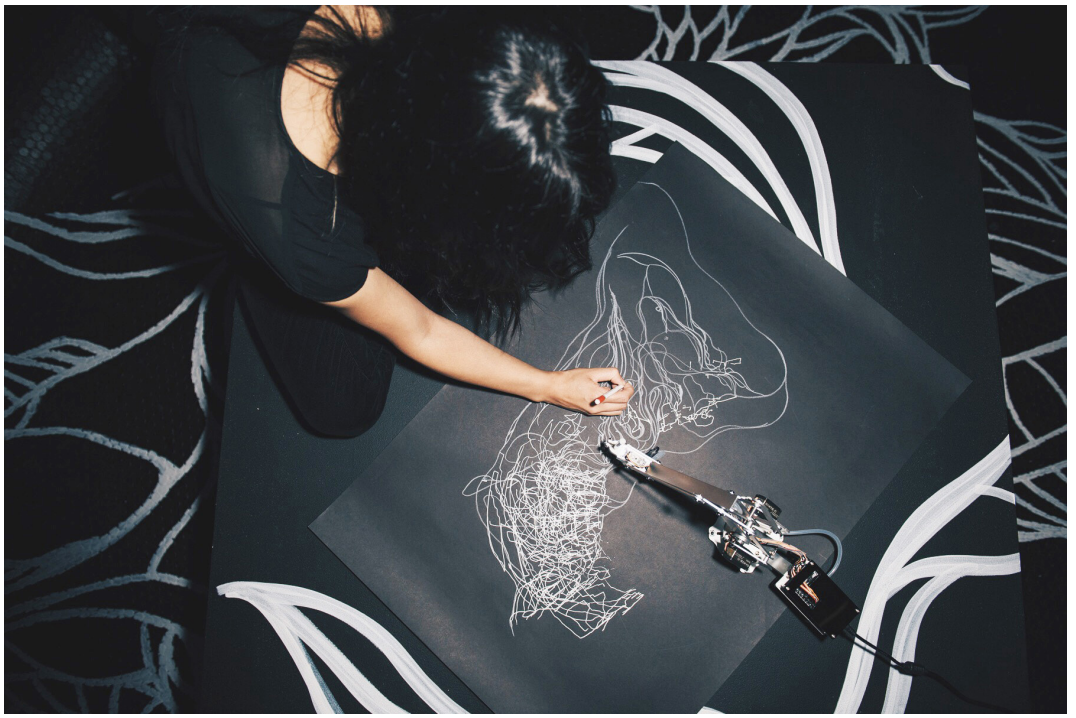
In your opinion, what can D.O.U.G. (or any other robotic units you use) teach us?

In my opinion, I'm less interested in what robotic units can teach us inherently, but what we can learn from an honest interrogation into the values and perspectives that feed into collaborative robotic systems.

Beyond the human-machine dynamic, collaboration is a universal idea. Collaboration, at its heart, isn't about control. And the recognition that what defines the best collaborations are one in which both parties are empowered, and necessarily changed for the better.

How can broad engagement with the evolving nature of collaboration locate us in a renewed sense of our collective humanity? More than ever, we are observing an urgency across all disciplines to recognize and commit to the building of an entangled perspective – to invent quickly, to imagine brazenly, to commit boldly to new approaches for creating connection.

A multiplicity of interests and approaches, which issues concerning collaboration like this issue curates, helps us to remember, to construct meaning from that which is *nameless and formless, about to be birthed, and already felt*.[9]



9 Lorde, Audre, et al. *Your Silence Will Not Protect You*. Silver Press, 2017.

Marija Maglov*
Institute of Musicology
Belgrade, Serbia

"HUMAN VS. MACHINE" DIVIDE IS A FALSE DICHOTOMY
Interview with Dr Kelly Snook[1]

Following this INSAM Journal issue's main theme of human-machine collaboration, I was inspired to start a conversation with **Dr Kelly Snook**, Professor of Media Art Technology, and one of the creators of MI.MU Gloves. Manufactured in the UK and sustainably sourced, this wearable musical instrument truly gives human-machine collaboration another dimension, considering the organic unity performers can achieve with this instrument. This interview is dedicated to discussion on this project, but also touches on topics such as the intersection of art, science and technology and the position of women in the science and technology world. Given that my first introduction to Dr Snook and her work happened at music industry related conferences where she demonstrated her specific outlook on the industry, part of the conversation touches on that topic too.

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1 This interview was done within the scientific research organization the Institute of Musicology SASA, funded by the Ministry of Education, Science and Technological Development of the Republic of Serbia.

Your professional biography is very complex and your professional road seems very exciting: from aeronautics and astronautics to music production and developing MI.MU Gloves; from working as a NASA Research Scientist to teaching Media Art Technology at the University of Brighton, but also collaborating with Imogen Heap as her studio manager and touring with Ariana Grande as her MI.MU Gloves technician. Could you tell us more about those experiences and how one led to another? How are they (if they are) interconnected?

As I get older, I see more and more how everything is connected. From an early age, I knew that music was central to my own purpose in life, but it took years of exploring the world outside of music to understand how science, technology, and service fit together with music. The catalyst for the re-integration of music, science, and technology in my work was my re-discovery in 2001 of Johannes Kepler's use of music and harmonic theory in his astronomical and mathematical investigations. While preparing for an invited speaking tour in Japan on the topic of the role of astronomy and space science in the evolution of collective human consciousness, I was intrigued by his use of music, together with arithmetic, geometry, and astronomy, as one of the "Quadrivium" of fields of scientific inquiry. My quest from that point on to develop a way for people to immerse themselves in data or information has led me to the fields of data sonification, media technology, and game design in the creation of Concordia, a musical instrument platform for playing the universe (www.concordia.world). You can read more about it in this recent paper about Concordia in the *Journal of New Music Research* (Vol. 49/1, 2020).

What specifically is there in Kepler's writings that pushed you in the direction of creating these projects at the intersection of music, science and technology?

What first drew me to his work was the exciting idea that he used music to launch modern astronomy. I wondered, why don't we use music in this way today? What could it be like if we did? Then, as I investigated more, I was extremely moved and inspired by his commitment to pursuing truth, sometimes at the expense of his own world view. The first break from prevalent thinking was the idea that planetary orbits were elliptical, not circular, and that they orbited the Sun, not the Earth. It is difficult to overstate the radical nature of this thinking. But his third law was the most challenging for him to accept – so far beyond what he would allow himself to believe that it was three months between when he made the discovery and when he accepted it. Moreover, it rendered his earliest and most cherished work incorrect, so he went back and corrected it. It takes a special kind of soul to be confronted by their own blind spots and to overcome them. Finally, Kepler was a very spiritual man, but not so religious that he would let Christian dogma override scientific observations

or mathematical proofs. His conviction that God's creation was intelligible and could be understood by us, and that God's organizing principle was Harmony, was what drove his scientific inquiry. In our modern era where science, religion, and music have diverged into separate realms of human activity, it was Kepler who convinced me they are not, actually, separate. That is, I don't see this work as an "intersection" of different fields. I actually believe they need to be considered as one.

How was the idea of MI.MU Gloves conceived? Who are main actors and what are their particular roles within the project?

In 2009, Imogen Heap was actively searching for new tools to liberate her from her computer and music tech on stage. I was working for NASA on assignment at the MIT Media lab at the time and invited her to visit, where she encountered all manner of new ideas for musical expression. Ph.D. student Ellie Jessop had created the VAMP glove, which inspired Imogen so much that she returned to the UK and immediately started looking into how to create her own version of gloves for musical performance. She found Dr. Tom Mitchell at the University of the West of England (UWE) and then I joined them soon afterwards in early 2010. The project was spearheaded by, and centrally focused in the early years on, Imogen's desire to write, record, and perform a song entirely with the gloves. We quickly realized we would need to design our own gloves, as what she needed was not available off the shelf, and we gradually assembled a small team for the software, hardware, and textile work. As it was an independent and informal project with Imogen Heap at the center of the design process, we all wore multiple hats and I was the only one on the team working directly for Imogen, and even then, we had many other projects besides the gloves. So the technology evolved as everyone's side passion project, punctuated by high-visibility performances. Tom Mitchell wrote the initial glove software, and worked with Seb Madjwick of x-IO technologies to design custom sensor and networking hardware. Adam Stark and I worked together on the user interface in Max-MSP for Imogen to be able to create her music and performances with the gloves. Eventually the two pieces of software were combined and rewritten by Adam and Tom into what is today called Glover. Textile experts Hannah Perner-Wilson and Rachel Freire were brought in to design robust and beautiful gloves, and I also worked on coordinating the different aspects of the project and maintaining Imogen's glove hardware setup. Dutch artist, Chagall van den Berg (aka Chagall) joined the team in 2014 and worked on Glover's user interface. At the end of 2014, we sold our first round of gloves to about 15 people, including Ariana Grande, and I left to support that tour. Adam and Chagall took over managing the project, and its eventual conversion into a company.

One of the features of MI.MU Gloves, if I understood correctly, is that every performer can make their own set of commands that best serves their own specific creative needs. Thus we have very varied outputs with MI.MU Gloves, differing in sound, but also the visual side of performance, making them immersive live experiences. What kinds of possibilities for artistic expression does your team strive to provide with MI.MU Gloves? Do performers themselves sometimes approach you with ideas, suggestions or requests?

That is correct. One of the more challenging aspects of trying to build the gloves is the almost endless variety of personal expression that people want to achieve with them. We are constantly trying to find the balance between creating a powerful, flexible, customizable tool and limiting complexity so that tool is as accessible as possible. We do get many requests and suggestions, and not only from performers, but from people who want to use the gloves for other things like robotics or communication. Even a single performer may have many different styles of interaction that they would like to explore. We want it to be relatively straightforward to incorporate the gloves and the Glover software into any performer's unique setup in a way that empowers them and lets them work in ways they have customized to their needs. The gloves can be used to control anything that can talk to a computer, so this makes them appealing to musicians, DJs, visual artists, dancers, and roboticists. We hope that the artificial barriers between these different areas of human expression will begin to blur through the use of technologies like the MI.MU Gloves.

Since the topic of this INSAM Journal issue is Human-Machine Collaboration, it would be interesting if you would share your perspective on some of the questions that we seek to address within issue. How are novelties in machine learning and artificial intelligence changing the ways humans create and think about music? Are these kinds of artistic endeavours important to prepare us for more increasing role technology has in our daily lives? Is the deeply rooted dichotomy of humans vs. machines fading after all?

I do think the "human vs. machine" divide is a false dichotomy, and I hope it continues to fade. Music is a realm where partnership between human and machine yields one of the most abundant harvests of creative output of any field. Whether for personal, individual enjoyment and fulfilment, or for thrilling public performances, machines can help us break through barriers in our own physical environment or in our creativity like never before. Machine learning, when used in technologies like the MI.MU Gloves and other gestural interfaces, can enable such intuitive mappings from gesture to sound that the technology itself seems to disappear as you become one with it. In another example, when used in cooperative ways between performer and audience, ML and AI can create new modes of audience participation and co-creation at small or large scales, and in ways never before possible. Machines will never replace humans, but as they get better, they can make us more aware of what makes us important as individuals and collectives.

As a woman in the science and technology world, would you say this world is more open to women than few decades ago, especially with the development of new technologies? Are there more opportunities for women for work in this field or do you feel there are still some specific challenges?

In general, our society is still in the beginning stages of learning how to operate inclusively, fairly, and without discrimination. That said, I consider myself to be just as limited by my own blind spots resulting from my privilege as I am by disadvantages due to gender. Also, as a person on the autism spectrum, I find the challenges stemming from society's immaturity in its attitudes toward neurodiversity to be personally troubling. Before being in the CIS-white-male-dominated world of music technology, I was in the field of Aerospace Engineering, so I have been engaging in these women-in-science or women-in-technology conversations for several decades now. I wish there were no longer need for these discussions, but this issue is tightly coupled with some of the other challenges of this time in history, such as racism, colonialism, economic disparity, political partisanship, nationalism, and a host of other symptoms of society's failure to embrace its oneness. The equality of women and men cannot be solved without addressing this broader failure.

Since we are doing this interview in the midst of Covid-19 pandemic, could we share a few thoughts on the world after this? Do you have some expectations regarding the music industry and its existence in the present form? On the other hand, would

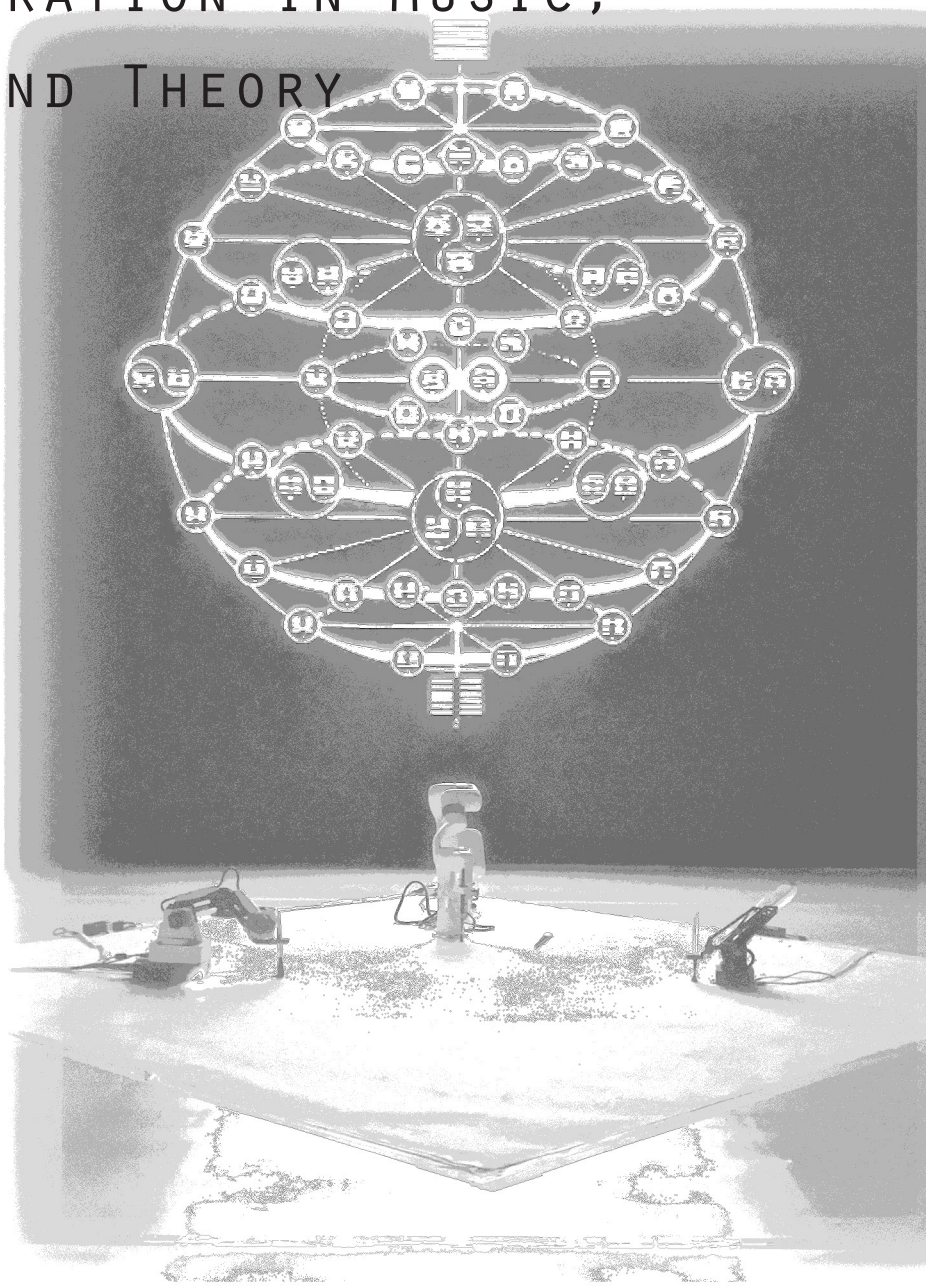
you expect that there is going to be even greater importance given to the projects at the intersection of art, science and technology, bearing in mind the recent renewed emphasis on the importance of trust in scientific efforts?

I am not a fan of the "music industry" in its current form, and I'm always standing up at conferences saying radical things about doing away with it altogether and learning how to create a society that works for everyone, including artists and musicians, by removing the need to commodify our art and music. I dream of a world where everyone's basic needs are met and economic disparity is eased. I suspect we haven't seen the end of the changes that the current pandemic is going to bring about, so it seems premature to try to find any kind of stability in this inflection point. I do hope that through this time, our collective attention will be sufficiently drawn to the deep inadequacy and injustices in our systems, which we called "normal." I very much hope we do not just return to them, as an attempt to do so will be our undoing. You keep asking about the music industry, but I keep zooming out because I think that the music industry often gives us clues about where our weaknesses lie before other systems do. But at this moment in history, when almost no system seems unaffected, my hope is that we will use this opportunity to re-evaluate and redesign from scratch some of our ways of thinking and the infrastructure of daily life using improved metrics.

I was thinking how the conferences where we met were all about the music industry, music innovation and technology, but we do not actually hear so much music there, which is understandable given their focus. But in order not to follow that route, could you tell us what kind of music shaped you, do you have some preferences when working with artists in a studio and what is your soundtrack these days when working on research?

I don't listen to music as a background for other things, so in that sense, there is no "soundtrack". As a child I was most moved by intense and dissonant classical music from the 19th and 20th centuries like Mahler's 10th symphony. When working in the studio, I put most of my energies into composition, production, arranging, and mixing devotional music that is being created for the purpose of elevating spiritual prayers and writings. As a producer who is also a member of the relatively small global Bahá'í community, I most often work with Bahá'í artists. In this way, I am often helping to create music that has a specific purpose, which is a bit like film scoring, but without picture and more conceptual. I am extremely interested in collaboration between artists who are focused on this more lofty goal through processes of consultation and in a spirit of service. Typically, the projects I choose to work on are not traditionally commercial, nor do they have financial profit as a goal. Musically, I love helping people bring what's in their brains and hearts into reality through both traditional instruments and electronics.

Main Theme:
Human-Machine Collaboration in Music, Arts, and Theory



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OF FLESH AND STEEL: COMPUTATIONAL CREATIVITY IN MUSIC AND THE BODY ISSUE

Abstract: Could machines ever take our place in the creation of art, and particularly music? The outstanding results of some well-known AIs (e.g. EMI, Flow Machines) might make us believe that this is the case. However, despite this evidence it seems that machines present some intrinsic limits both in creative and non-creative contexts (already highlighted by John Searle and the debate around mechanism). The arguments of this paper are centred around this very belief: we are convinced that the utopian claims regarding all-round machine intelligence are not plausible and that our attention should be directed towards more relevant issues in the field of computational creativity. In particular, we focus our attention on what we call the "body issue", i.e. the role of the body in the experience and creation of music, that we consider problematic for the idea of a truly creative machine (even if we take into consideration weaker renditions of artificial intelligence). Our argument is based on contemporary findings in neuroscience (especially on embodied cognition) and on the theories of Maurice Merleau-Ponty and Roland Barthes.

Keywords: artificial intelligence, computational creativity, mirror neurons, embodied cognition, embodied simulation, body, creativity, performance

1. Introduction

Technological advancement is – as of today – primarily taken for granted: Smart Assistants help us schedule our appointments in our diaries, algorithms suggest what music we should listen to and what we may want to buy next. Our lives are shared with other people at least as much as they are with computational devices and – as

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philosopher Luciano Floridi puts it – "we are increasingly delegating or outsourcing to artificial agents our memories, decisions, routine tasks, and other activities in ways that will be progressively integrated with us" (Floridi 2016, 94). The very fact that so many tasks – often considered to be exclusively pertaining to humans – are being delegated to artificial agents challenges our intuitions regarding humanity and its core characteristics. We have observed this shift in perception in the past, for example, with the game of chess: while mastering chess was arguably considered a definitive mark of intelligence before the advent of computers, supporting this consideration is not so easy today, where computational devices can challenge each other to establish supremacy (Silver et al. 2018).

On a par with intelligence, creativity is another trait considered to be exclusive and characteristic of human beings. This exclusivity, concerning creativity, seems to be challenged by the advent of computational devices. In this paper, we reflect upon the relationship between human agents and music, both in the realms of music experience and music creation, in light of historical and contemporary findings in the field of computational creativity. More precisely, we are convinced that there is a hiatus between machine-based (so called) creativity and a human-based one and that this gap could be represented by at least four issues: the "body issue", the "social issue", the "experiential issue" and the "consciousness issue". We have previously sketched these issues (Merlini & Nicoletti 2020), under the hypothesis that these problems are among the most meaningful in the debate concerning the differences between human and machine-based creativity. In doing so we have argued that the concerns regarding all-powerful Artificial Intelligences – supposedly destined to dominate us in every context – are not sufficiently plausible and that we should not grant them priority over the aforementioned issues (cf. ibid., the Chinese Room argument in Searle 1980 and the considerations regarding Strong and Weak AIs, as well as mechanism, presented in Aldini, Fano & Graziani 2016, Beccuti 2018 and Gödel 1951).

In this paper we would like to outline a brief introduction to the most widespread techniques in computational music generation (Section 2), followed by a summary of the aforementioned issues (Section 3). We then shift our attention towards the body issue – that is, the importance of having a body in order to experience and create music. In this section (Section 4), we argue in favour of this centrality by primarily taking into account some contemporary findings in neuroscience, introduced by the philosophical positions of Roland Barthes and Maurice Merleau-Ponty. In Sections 5 and 6 we consider some examples and some possible objections as a conclusion.

2. Computational Efforts and Music Generation

The idea of bringing creativity and computation together is, as a matter of fact, older than the invention of modern computers. One of the very first references to this possibility dates back to Charles Babbage and Ada Lovelace, who were

convinced that their Analytical Engine – under certain assumptions – "might compose elaborate and scientific pieces of music of any degree of complexity or extent" (Babbage 1889, 23). The idea of integrating computers and creativity was then taken up by the theorists of the early computer era, such as Alan M. Turing who, around a century after Babbage's ideas:

> was producing (as a joke) programmed love-letters on Manchester's MADM computer; and haikus would soon be generated on Cambridge's EDSAC machine. Even more to the point (or so it might seem), "creativity" was identified as one of the chief goals in the document planning the *Dartmouth Summer School* of 1956. That meeting was where artificial intelligence was officially named (Besold *et al.* 2015, v).

From these early days, the efforts to combine computers and creativity have been manifold and diverse in nature, tackling the fields of visual arts (see Cohen 1995 and Colton 2012), poetry (Colton et al. 2012) and music. The field of music generation – and *Music Generation Systems* (MGS) in particular – has seen the introduction of some of the most notable algorithms developed to combine computation and creativity. The taxonomy described below has been developed by Carnovalini and Rodà (2020, 8-12), a taxonomy which is in turn based on the work of Fernandez and Vico (2013). We briefly present the seven categories in order to capture the most widespread methodologies in the field of computer-generated music, as well as some of the most notable examples from an historical standpoint:

1. *Markov Chains*
2. *Formal Grammars*
3. *Rule/Constraint based systems*
4. *Neural Networks/Deep Learning*
5. *Evolutionary/Genetic Algorithms*
6. *Chaos/Self Similarity*
7. *Agents Based Systems*

The first category addresses *Markov chains*: these are *stochastic processes* – mathematical models that evolve over time in a probabilistic manner – where the outcome of a certain state depends only on the outcome of the previous one (Kemeny & Snell 1976, 1). Suppose we have only three states and the probabilities to transition from one state to the next (from the current generation to the following) are distributed as follows:

		Next generation		
	State	**1**	**2**	**3**
Current generation	**1**	0.65	0.28	007
	2	0.15	0.67	0.18
	3	0.12	0.36	0.52

Table 1

We could then represent this specific process through a *transition diagram* (Kemeny & Snell 1976, 2):

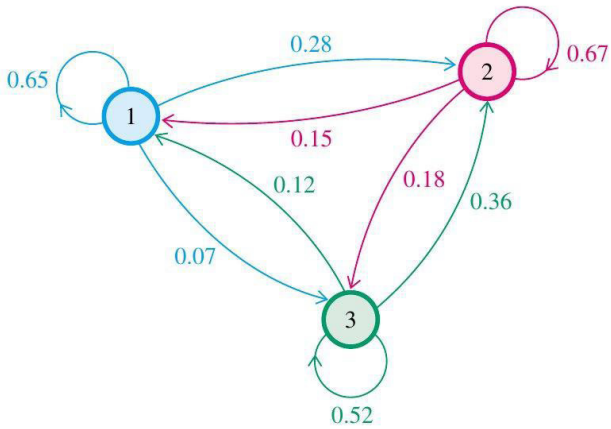

Figure 1. *Transition diagram* (Kemeny & Snell 1976, 2).

Markov chains were chosen by Anderson, Eigenfeldt and Pasquier to propose a generative music system able to compose Electronic Dance Music:

> The Generative Electronic Dance Music Algorithmic System (GEDMAS) is a generative music system that composes full Electronic Dance Music (EDM) compositions. The compositions are based on a corpus of transcribed musical data collected through a process of detailed human transcription. This corpus data is used to analyze genre-specific characteristics associated with EDM styles. GEDMAS uses probabilistic and 1st order Markov chain models to generate song form structures, chord progressions, melodies and rhythms (Anderson et al. 2013, 6).

The second category, *formal grammars*, originates from the work of Noam Chomsky (Chomsky 1957), who introduced the concept of *Generative Grammars:*

> A *Generative Grammar* is composed of two alphabets: terminal symbols and non-terminal symbols (or variables). A set of rewriting rules is given over the union of these two alphabets, that allow to transform variables into other symbols (both variables and terminals). The generated language is the set of all the strings of terminal symbols that can be obtained starting from a special variable chosen as starting point (usually called *S*) and applying any number of rewriting rules in sequence (Carnovalini & Rodà 2020, 9).

One of the most important MGS in computational creativity history is closely related – at its core – to the possibilities granted by formal grammars: David Cope's *EMI*, or *Experiments in Musical Intelligence* (see Cope 1991 and Cope 1992). The combinatorial process that takes place after the analysis of a piece of music is described as:

> The refitting of juxtaposed elements of a work back into logical and musical orders can be enhanced by using *augmented transition networks* (ATNs), a technique developed by researchers in natural-language processing. [...] ATNs can be applied to the recombinant music problem in much the same way as to language: analyze and store musical elements and then reuse them in compositions that vary but have essentially the same musical meaning (variations within a set style) (Cope 1991, 26).

Rule/Constraint based systems, in the third category, differ from generative grammars in being generally unable to produce music out of the blue. They usually rely upon a given input that is subsequently shaped through the application of *rules* and *constraints*: "The inclusion of rules can be implemented in many ways, for example as a final validation step, or to refine intermediate results [...] Constraints can be used to model more abstract features [like tension], rather than explicit music theory rules" (Carnovalini & Rodà 2020, 10). The idea of applying rules and constraints rises pretty early in the history of music generation systems and we can appreciate it in the first two movements of the *Illiac Suite* (cf. Hiller & Isaacson 1958): "The Illiac music was generated from rules defining various styles (including sixteenth-century counterpoint and 12-tone music, and a variety of dynamics and rhythms), sometimes combined with tone-pairs chosen by chance" (Besold et al. 2015, vi).

The complexity of the systems put in place increases within the category of *Neural Networks/Deep Learning*. A notable advantage over the aforementioned methodologies is that the use of deep learning (or generally, machine learning) techniques can create *generality*:

> As opposed to handcrafted models, such as grammar-based or rule-based music generation systems, a machine learning-based generation system can be *agnostic*, as it learns a model from an arbitrary corpus of music. As a result, the same system may be used for various musical genres. Therefore, as more large scale musical datasets are made available, a machine learning-based generation system will be able to automatically learn a musical style from a corpus and to generate new musical content (Briot et al. 2020, 5).

MidiNet, the model proposed in Yang, Chou & Yang (2017), based on a Convolutional Network, is able to "generate melodies either from scratch, by following a chord sequence, or by conditioning on the melody of previous bars (e.g. a priming melody), among other possibilities." (Ibid., 1).

The fifth category is dedicated to *Evolutionary/Genetic algorithms*. As stated by Carnovalini and Rodà (2020, 11), there are three main prerequisites that need to be satisfied to solve a problem via a *genetic algorithm*:

1. *The ability to generate random but suitable solutions to the problem as a starting population*
2. *A way to evaluate the "fitness" of a solution*
3. *The ability to mutate and recombine those solutions*

In doing so, we could operate a continuous selection on the 'fittest' solutions (whose original pool is randomly generated in a suitable manner) to our problem through every iteration of the algorithm itself. One famous example of an algorithm of this kind is *GenJam*, by John Biles. As explained by the author, *GenJam* is:

> a genetic algorithm-based model of a novice jazz musician learning to improvise. GenJam maintains hierarchically related populations of melodic ideas that are mapped to specific notes through scales suggested by the chord progression being played. As GenJam plays its solos over the accompaniment of a standard rhythm section, a human mentor gives real-time feedback, which is used to derive fitness values for the individual measures and phrases. GenJam then applies various genetic operators to the populations to breed improved generations of ideas (Biles 1994, 131).

The sixth category is *Chaos/Self Similarity*. With these methods, musicians and technicians try to generate music that present some degree of self-similarity, either in structures or melodies. In order to accomplish this objective, one possible strategy is to use Cellular Automata: abstract computational systems which are

discrete in nature, being composed of a finite set of simple units, or the *cells* (cf. Berto & Tagliabue 2017). Cellular Automata are particularly powerful computational devices that, given appropriate rules, can emulate a Universal Turing Machine and hence compute anything calculable, if we accept Turing's thesis (see Copeland 2020, Turing 1936, and Church 1936). One of the most famous implementations of Cellular Automata to music generation is *CAMUS*, presented by Eduardo Miranda (Miranda 1993). The first prototype, *CAMUS V1.0*, relied on the combined action of two different automata: the first one, based on John Conway's *game of life* (see Berlekamp, Conway and Guy 1982), was responsible for pitch selection while the second was responsible for orchestration. Despite these efforts, however, the results of the systems based on Cellular Automata are not particularly thrilling, according to Carnovalini and Rodà:

> Cellular Automata tend to generate melodies that are not too pleasing, and often need further human intervention. [...] The usual lack of aesthetic value of the results suggests that this is not a good example of CC but rather a way to explore unusual melodies. For these reasons, these systems are arguably less interesting to AI practitioners (Carnovalini & Rodà 2020, 12).

The seventh and last category is dedicated to the *Agents Based Systems*. A software agent is a somewhat autonomous piece of software which is able to perceive and act towards a certain environment with some specific capabilities (i.e., information gathering, learning abilities or "cooperation (with other agents) in order to perform tasks for their owners", Nwana 1996, 213). This kind of software is of particular interest for music generation especially when we see the presence of multiple agents that are able to interact with each other: such a system is then called a *multiagent system* (Vlassis 2007, 1). An example of multiagent system is *Voyager*, presented by George Lewis:

> [...] the Voyager program is conceived as a set of 64 asynchronously operating single-voice MIDI-controlled 'players', all generating music in real time. Several different (and to some, clashing) sonic behavior groupings, or ensembles, may be active simultaneously, moving in and out of metric synchronicity (Lewis 2000, 34).

Voyager essentially creates a virtual orchestra that is able to improvise in a concordant manner and can play together with a human performer, to whom it can react during the execution. Aside from the specific computational effort, (multi)agent-based systems are also important for their attempt towards "humanising" computational means, an aspect that cannot be overlooked when trying to generate music relatable to humans (Carnovalini & Rodà 2020, 12).

3. The Four Issues

Despite these remarkable achievements in the field of computational creativity, we argue that actual creativity is unlikely to ever be reached by any computational or AI-based entity. As exposed elsewhere (Merlini & Nicoletti 2020), we think there are (at least) four main issues preventing AIs from becoming truly creative. In this paper, we focus on what we call the "body issue", but we will also offer a brief overview of the other three issues to create an input for further research. Such issues arise clearly as we leave reductionist positions behind and stop considering music as an isolated (and primarily written) text. From our perspective, it is clear that music must be understood within a frame including its social and cultural context, but also within its performative and corporeal nature. Such aspects of music are not just interesting add-ons for the experience and creation of music; instead, they add to the very essence of the musical experience itself.

Let us try to delve deeper on the first issue – the social aspect of music. The "human" quality of music does not only concern what is commonly called "emotion". Indeed, some AIs can produce music that creates emotional experiences amongst human listeners – and surely, there is no limitation that prevents us from believing that further developments in this field could lead to convincing results. Yet the meaning of music largely depends on social elements that are more difficult to experience when a listener is not a member of a particular society with its own specific culture and history. Computers might be able to create a song "in the style of The Beatles", but that song will always ignore the social value that an actual Beatles' song contains. Music and its meanings always rise from tangible situations. People gather round certain kinds of music and its perceived quality largely depends on elements that transcend its formal features (Spaziante 2007, 33). Could we ever feel the same with computer-generated music? And will the creator act in a way to actually respond to the social needs of the time? One might agree with David Cope (2001, 335) as he argues that music is an independent entity, since the only tangible thing we have is the final product, but this is a highly debatable claim.

Second, we have the experiential issue, which is to some extent consequent to the above. It is easy to argue that computers can replicate the final product without encountering any relevant obstacle – especially when discussing avant-garde hyper-rationally (or randomly) built music, in which the presence of the author attempts to commit its definitive suicide. Yet what we would miss here is not only the idea and concept behind art, but also the very human process that brings us to that. Iannis Xenakis, for instance, remarks (2003) how much his work was inspired by very personal choices and conditions, such as cultural roots, interests, ideals, and the rejection of much of the avant-garde music of his time. Without these human experiences, there is no adequate nest for music to become fully meaningful. The only experience that a computer can gain – as it lacks intentionality and connections

with the world – is manipulating 0s and 1s. As Jean-Jacques Nattiez (2007) highlights (focusing on the "aesthesic" aspect of creativity, which is different from the aesthetic element and has to do with the way listeners experience music), the human experience sets the conditions for musical creation: the composer's choices spring from situational factors, discourses and personal experiences, such as their opinion of other composers and their music. Such an interaction with the world is not available to AIs.

This leads us directly to the third issue, which focuses on consciousness. This has nothing to do with emotion, intention or self-awareness, which would lead to an unnecessary amount of speculation. What we are writing about here concerns consciousness in a more phenomenological sense (Brentano 1874), as the human ability to intentionate the world and have a trade with it. Although Searle's position is far from the phenomenological tradition, the basic problem behind strong artificial intelligence – as presented in his Chinese room argument (Searle 1980) – is similar to our point here, as it deals with the incapability of machines of having a "qualitative" experience of the world. From such a perspective, weak AIs seem to be the only possibility, and we should not fear to ever be replaced by truly creative artificial agents. However, there is also an additional reason, on which we will focus in the next section.

4. The Body Issue

Consciousness is tightly connected with the body, so the corporeal side of musical experience cannot be put aside when talking about what makes the human relationship with music so special – which is, after all, what we have been doing up to this point. The strong connection between consciousness and body is something that we can already find in the thoughts by Maurice Merleau-Ponty, who took the phenomenological claims to a whole new level by emphasising the role of our body as living flesh in our embodied experience of the world (Merleau-Ponty 1945). His critiques are directed to abstract conceptions of consciousness that do not take into serious account the carnality of our existence – something that can be found as well in the words of another French author: Roland Barthes. In this case, Barthes (1977) highlights the forgotten bodily side of music, in the form of *musica practica*, that is the bodily sensation of actually playing a piece of music. Everyone can relate to this when thinking of Barthes' idea of the "grain of the voice" (Ibid., 49-55), or the physical side of vocal music, the quality of its sound that conveys all the corporality of the emission, the vibration of the vocal cords and the effort of the larynx. The roughness or the frailty of the vocals in a song, the singer's impetus or grace, are all qualities we can easily sense from music, and which mean a lot to us since we all know, to some extent, how it feels like to sing. We do understand such values as meaningful and can later make creative use of them, only because we own (or we are) a body and can relate to what music-making bodies communicate. This is also

valid in the case of instrumental performances. After all, is it not true that popular music (and not necessarily only that) is usually composed by actually playing an instrument (Moore 2001, 56-60), that offers specific affordances (Gibson 1979) and carries a whole set of specific body shapes and physical sensations? In this sense, many creative choices are body-driven and much of the communicative strength of music can spring out of the body knowledge we have of it, using the instrument as a medium for our bodies to imprint their motion in a sonic event.

Of course, what was mainly speculation in the Twentieth Century can now be confronted with scientific findings to add plausibility. Merleau-Ponty and Barthes were lucky in describing such a process so early and many of their intuitions can find fascinating parallels in neuroscientific claims (in Corness 2008, Merleau-Ponty has been related to that context). What we are pointing at is the discovery of mirror neurons and, more specifically, the theorisation of *embodied simulation* (Gallese 2005; Gallese & Sinigaglia 2011; for the relationship with music, see Schiavio et al. 2014). The interest in research on embodied music cognition is growing and there is still much to be understood, but let's try to mention at least some of the major findings that can help us to explain the "body issue" in a more specific way. What we are particularly interested in is the role of embodied simulation when it comes to "understanding music corporally", reconnecting our experience to that of the performer we are listening to – and the meaning that such an experience can have for our comprehension of music and for creativity.

Embodied simulation allows the listeners to feel as if they were actually producing the sound with their own actions, to some extent, by "simulating" via mirror neurons – which activate when passively experiencing a goal-directed action, just as they would when actively producing that action, with no mediation from mental states nor cognitive involvement. Since the action required in performing music "involves the perception of purposeful, intentional and organized sequences of motor acts as the cause of temporally synchronous auditory information" (Overy & Molnar-Szakacs 2006, 236), embodied simulation seems to work with music as well. To further explain this using Overy and Molnar-Szakacs' words: "the expressive dynamics of heard sound gestures can be interpreted in terms of the expressive dynamics of personal vocal and physical gestures" (2009, 492). There is even some evidence of a connection between the experience of music, language and action (sharing the same neural resources), which would then be able to communicate meaning and human affect via embodied simulation (Overy & Molnar-Szakacs 2006), basically putting music (or at least its "motor aspect") at the same level of facial expressions or postures in terms of expressing emotions. New paradigms such as these try to account for the importance of "dealing with music" (Reybrouck 2006, 62) in a concrete way, by focusing on our living bodies and their relationship with musical instruments, which can be conceived as appendices to the body, capable of working as interfaces between us and the world of sound, and as tools for the acquisition of musical body knowledge (Ibid., 66).

Some studies (e.g. Haslinger et al. 2005, Haueisen & Knösche 2001; see Calvo-Merino et al. 2005 for dancing), although not explicitly studying embodied simulation, have demonstrated that a stronger neuronal activity occurs when musicians are listening to music performed with the instrument they are able to play (to the point of stimulating micro-movements of fingers or lips), thus suggesting that a "repertoire of acts" is necessary to fully understand the "physical meaning" of what we are listening to. So, expertise – or at least roughly knowing how it feels to play a certain instrument – seems to be a crucial aspect (Leman 2007, 95-96). Nevertheless, non-musicians can also experience simulation to some extent, not only focusing on the voice, which would seem more obvious as it is the most "human" instrument we have and everyone knows how to sing – this might also explain why vocal music is the most widely appreciated and "understood" by casual listeners. Arnie Cox (2016, 28-29), for instance, explains such phenomenon by recalling the concept of "mimetic subvocalisation" or the rough vocal reproduction of melodic contours not only performed by singers, but also by instrumentalists. Additionally, Cox argues that although one could be in the situation of not knowing how it feels to play an instrument, he/she can always imagine what it would be like to do so (Ibid., 51-52). Although these explanations offer fascinating insights for the resolution of the problem, we argue that more work should be done in this direction. Indeed, since a simulation involving vocalisation is not equal, in terms of sensation, to one involving instrumental playing, the physical feedback might be very different. Moreover, such a conception also prioritises the melodic aspect of music, failing to account for other important aspects. Lastly, the involvement of imagination in the second hypothesis seems to bring into the game those mental states that the very definition of embodied simulation excludes from it. Maybe only a very broad conception of "imagination" (or possibly the "mimetic motion imagery" introduced in ibid., 23 and defined as "not deliberate or conscious"), not involving mental states, can fit this role. The importance of rhythm must also be stressed as a form of musical participation as primordial as vocalisation. If melodic contours can be simulated via mimetic subvocalisation, it is possible to imagine that instrumental parts that are more rhythmically connotated (e.g. drums, rhythm guitar, bass, pizzicato strings etc.) can be roughly simulated by relying on rhythmic abilities (in ibid., 34 we find common manifestations of this: toe-tapping, swaying and dancing to music). Greg Corness acknowledges that there is no actual comprehension of the musical gesture in its physicality, but rather of the intention of the performer – otherwise too many people would not possess sufficient body knowledge to "resonate" with the performer's goal-oriented actions (Corness 2008, 23). Yet we are not convinced by the fact that intention is of primary importance here, as our example will soon explain.

A possible solution to this "expertise issue" is proposed by Overy and Molnar-Szakacs (2009, 493) as they argue that listeners might be able to get to deeper and deeper levels of understanding of musical motion following a precise hierarchy:

1. intention level
2. goal level
3. kinematic level
4. muscle level

Only musicians can truly "resonate" up to the muscle level (with special intensity when listening to music played on the instrument they can play, or at least on instruments from the same family as theirs, see Leman 2007, 97), while a musical novice will not gain access to precise information on any level, but would probably still be able to subvocalise, feel the beat (rhythm and voice) and interpret emotional content according to very basic parameters (e.g. pitch height, speed and intensity).

A computer not only does not have a body (made of flesh and featuring a neural network resembling that of human beings and some animals, thus including mirror neurons), but it also does not own any of the aforementioned (innate?) inclinations towards the production of – say – vocal and rhythmic music. All the communicational strength of such body knowledge is lost, not only because a computer cannot understand music in this way, but also because it is not able to perform music in a way that is meaningful for us. After all, "music is clearly not just a passive, auditory stimulus, it is an engaging, multisensory, social activity" (Overy & Molnar-Szakacs 2009, 489) and, in opposition to a "long tradition of objectivation" within musicology, "music users are biological organisms that have a body equipped with the necessary tools for action, perception and processing at the level of mental operations" (Reybrouck 2006, 60). None of this applies to an AI.

These statements lead us to the final two sections of this paper, in which we will discuss an example and a potential problem, respectively capable of giving a better account of what we are arguing here.

5. An Example: Mono and Tremolo Picking

As music is linked to physicality, it is very difficult to make the reader feel what we are trying to describe in terms of musical experience. Thus, we will briefly analyse a track by the Japanese band Mono – namely 'Cyclone' from The Last Dawn (2014) – to explain the importance of the body issue from a practical point of view, inviting the reader to listen to the song to fully understand what we are talking about. Mono is a post-rock instrumental band best known for their highly melancholic music, described by the guitarist Takaakira Goto as the result of an on-going battle against an overbearing sadness (Chuter 2015, 176-179). This is especially true when it comes to the sibling albums Rays of Darkness and The Last Dawn, both released in 2014 and reflecting witness to one of the toughest moments in Goto's experience (see Chuter 2015). The first represents the dark side (culminating with the highly disturbing 'The Last Rays') while the latter tells the story of a possible redemption.

'Cyclone' is from the second album, yet it is still far from being joyous. We argue that much of the emotional strength and of the meaning of this song owes a debt to the technique Goto uses to play his guitar.

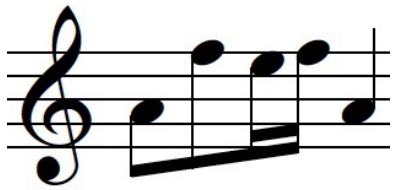

Figure 2. Main melodic contour of the song

The first two minutes of the song present the main chord progression (portrayed by an arpeggiated electric guitar panned to the left) and the main melodic idea that will be carried out for the entire song: a brief and almost circular tune (Figure 2) that perfectly fits with the song's title. From the second minute to the fourth (approximately), the texture becomes more and more dense, as the lead guitar begins to play the same melody in tremolo picking, as typical of much post-rock music (i.e. an alternate picking – up and down – performed non-stop, usually at a very high speed, that confers to the played note a characteristic continuous sound such as experienced in mandolin music). Circularity – which is more likely to be felt as such by a guitarist or an accurate listener, see the "expertise issue" above – takes place at a whole new level, and creates a vivid experience of a cyclone hitting the listener. Yet there is something even more striking happening here: although the average guitarist can perform tremolo picking quite easily, it is still a very "physical" technique and can use high amounts of energy to be performed precisely, especially over a sustained period (as is the case of 'Cyclone'). As Goto plays his part, every guitarist should be able to feel the effort in his/her picking hand, to feel the pain increase alongside the song's dynamics, empathising with the motor act that originally gave birth to the sound he/she is listening to – as the listener is able to decrypt and physically understand its origin thanks to the body knowledge learned from instrumental practice. This is the highest level of simulation: through the sound down to the muscle level (Overy & Molnar-Szakacs 2009, 439), enriching the musical experience with a whole new level of physical and emotive meaning.

This relates negatively with computational creativity if we think of the importance of such an experience when it comes to creating new music, especially in cases in which music is created by directly playing an instrument. The afforded techniques play an important role in musical outcome and, while it is clear that the creator's intention and mood highly influence his/her rendition of the performance, it may also be plausible that composers deliberately or subconsciously choose how to play their music by relying on a "vocabulary of motor acts" which, at least within the same culture, will likely be "felt" in a certain way. Also, staying on a more basic level, it is evident that having a body influences how music is created and how it will be

understood by the listener. Although music speaks through sound, it also says a lot "through the body". While computers can (re)produce sounds, they might have a problem with the body.

6. A Problem: Is Electronic Music Cold?

Amongst some music lovers, there may be a widespread belief about electronic music being "cold" when compared to – say – rock or classical music. From a perspective similar to that we have endorsed in this paper, it is plausible that such a claim could find scientific confirmation, given that electronic music often relies on sounds that are not only synthetic, but also triggered by accurately programmed devices involving no human corporality in this process. Since the production of electronic sounds is disembodied (although this is not always the case), there seems to be no space for any kind of embodied simulation. Scholars, who widely acknowledge this issue (e.g. Overy & Molnar Szakacs 2009, 489n; Corness 2008, passim; Reybrouck 2006, 67; Leman 2007, 98; Cox 2016, 37, 212), have tried to suggest different kinds of answers in order to explain why this might not be the case. We challenge the reader to listen to a track such as 'Emerald Rush' by Jon Hopkins without feeling anything connoted in a (very) physical way.

Reybrouck (2006, 67) and Leman (2007, 98) apparently treat electronic-generated sounds as acousmatic sounds (i.e. sounds of which the origin is unknown to the listener). While the first emphasizes the problematic side of the issue, leaving it widely open (at least from the perspective that is of our interest here), Leman later recalls (Ibid., 112) the theories of Theodor Lipps (1903), which, although not particularly linked to the problem of electronic sounds in Leman's argumentation, can suggest a possible solution. Simply put, Lipps argues that we can empathise with the shape of objects, projecting on them what that shape makes us feel like. For instance, a sharp object could make us project on it an upsetting feeling, a certain melodic contour or a specific timbre could recall corporeal articulations or situations. Empathy is still involved here, but in a different way from what happens with embodied cognition. Nevertheless, such a perspective could give us some insights to explain the corporal value of electronic sounds in this direction. Our perplexity here is about the possibility that analysis could easily shift from a context in which the carnal factor is central, to one in which more abstract conceptions of emotivity could become too important – which is something that we do not think will ultimately be able to answer the initial question.

Greg Corness recalls the electronic issue in his 2008 paper, and one of his main questions deals with the problem of gaining different feedback from one person using the computer to write an email in his office and another one using it to perform a set on the stage. Although disembodiment is explicitly addressed (Ibid., 21) as one of the main (if not the main) aspects of the issue, the solution focuses on the context, namely addressing the ability of mirror neurons to "deduct" the

agent's intention from the context itself (Ibid., 23). Again, this does not deal with the original problem, and we wonder if that is possible at all. Arnie Cox (2016, 37) describes a hierarchy of sounds from the ones that are the easiest to feel a relation with, to the ones that are less immediate:

1. sounds produced by instruments in which our hands and mouths are directly involved (e.g. voice, hand drums, guitar)
2. sounds produced with the mediation of sticks, keys, bows and such (e.g. drums, piano, violin)
3. electronic sounds created via hand controllers (e.g. keyboard synth)
4. electronic sounds produced and modified via real-time controllers (e.g. knobs and sliders in synthesisers)
5. sounds produced by the playback of recorded music (e.g. musique concrète)
6. incidental human sounds (e.g. Cage's '4'33"')
7. sounds not made by humans (e.g. birdsongs).

The general claim that we can understand from this is that the human touch (and body) can be more or less responsible for the produced sounds. Some of the sounds in which such a responsibility is not evident may sound "enjoyable for some listeners, and disconcerting and unenjoyable for other listeners" (Ibid., 212). That being said, Cox's experience suggests that, while some sounds may "resist" to what he calls "mimetic participation" – and it does not have to be electronic music, since Cox mentions 'Atmosphères' by Ligeti as an example – there is never an occasion in which it comes to zero (Ibid., 48). Electronic sounds may be less "corporal", but somehow still possible to embody. Although this may be proved true by further research and experiments, we cannot avoid asking ourselves if it is true that we get less physical feedback from electronic music.

As is, this issue remains open to this day, and its resolution could lead to interesting developments from the perspective presented here. Understanding how we experience an embodied feedback from electronic sounds may explain why electronic music does not sound as "alien" and "cold" to us, but may also open the way to a reconsideration of the capabilities of AIs. Nothing destructive, because the absence of a body like ours will still prevent computers from physically understanding music and the ability to create something meaningful as a consequence.

The theoretical overview presented in this paper – although not free from problems that have to remain unsolved, for now – argues in favour of a perspective in which the role of the perceiving body is paramount in the process of not only experiencing music, but also creating it, despite the great achievements obtained in the field of computational creativity. This is why we argue that the "body issue" (and the other aforementioned ones) represents an intrinsic limit to computational creativity.

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OF FLESH AND STEEL: COMPUTATIONAL CREATIVITY IN MUSIC AND THE BODY ISSUE (summary)

Artificial agents are increasingly present in our everyday lives, helping us with our tasks and setting the bar for their "intelligence" higher and higher. Computational creativity is of course one of the main fields in the developments of artificial intelligence, and has been since the very creation of AI. Nowadays, several models for computational creativity are available, and offer very interesting results. For instance, *Markov chains* are used to create Electronic Dance Music, *formal grammars* are featured in AIs capable of creating music recombining chunks from a database, *rule/constraint based systems* are able to generate music applying a given set of rules on pre-existing material, *neural networks* use deep learning to develop music from basic elements, and *genetic algorithms* create suitable solutions for a given context, also being able to mutate and recombine them. Despite such admirable achievements, we argue that the creativity of artificial agents is bound to be limited by a set of (at least) four issues: the "social issue" addresses the importance of the social context in the meaning and value of music; the "experiential issue" focuses on the role that personal experiences and background culture have in the conception of musical ideas; the "consciousness issue" highlights the lack of consciousness as the main limit of creative artificial agents, incapable of having a direct contact with the world. The fourth issue (the "body issue") is linked to the previous one, but focuses on the bodily side of the problem, emphasising the role of the embodied experience of music in the creative process. The discovery of mirror neurons and embodied simulation gives additional persuasion power to the theories of Maurice Merleau-Ponty and Roland Barthes, highlighting the role of the body in the physical and carnal trade with the world. Our body knowledge of music helps us understand music to a deeper extent, without any mediation being required, and the lack of a body made of neurons and flesh seems to constitute a huge limit for computational creativity. Such a comprehension seems to require a "vocabulary of acts", i.e. an expertise in playing an instrument, to fully take place, so we must better understand to what extent novices can understand music physically, and if there are instruments (e.g. drums, voice) that are more likely to resonate with everyone's competences. Another important problem concerns electronic sounds that are often created without the implication of direct bodily involvement by the musicians. More work needs to be done to explain why electronic music is apparently no less corporal and vivid as – say – rock or classical music. Since a computer does not own a body, we argue that it is not possible for it to understand music as we do, resonating with the physical motion behind the creation of sounds, but also to use that body knowledge to create fully meaningful music – given that compositional choices often take much of their connotations from the physical action behind their production, as our case study of tremolo picking should demonstrate.

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APPLICATION POSSIBILITIES OF COMPUTER SOFTWARE IN THE CONTEXT OF THE ART TEACHING

Abstract: The development of technology has significant implications for human creativity. The nature of creative processes is being redefined, and technology is playing an increasingly important role in creative activities, becoming a tool or an extension of the creator's hand helping to integrate a new idea. Implications are also evident in the teaching of fine arts, enhancing the possibilities of stimulating students' creativity using computer software. This assisted creation system is empowering for the student, as it enables him / her to acquire new abilities and a wide range of creative skills, as well as facilitating the formation of personal semantics. In order to determine the possibility of using computer software in the teaching of fine arts, research has been conducted among subject teachers. The aim is to determine the extent to which teachers of fine arts are familiar with software suitable for visual design, to establish whether they use it in their educational work, and to examine the methodical specifics of the realization such teaching. The results of the research are significant for the processes of designing initial university education programs, as well as in programs for lifelong professional teacher training, both for the purpose of educating teachers about the possibilities of using computer software and their impact on enhancing students' creativity. The results can be a real boost for teachers who want to complement and strengthen their educational practice.

Keywords: creativity, design, computer software, divergent thinking, visual arts

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I. Introduction

The priorities of a contemporary education policy are to improve the quality of education and are focused on studying and applying creativity in the teaching process. This is so due to the fact that formal education constitutes a fundamental pre-requisite for the development of an individual's creative skills. Education is one of the key factors of the quality of intellectual capital, which is crucial for international competitiveness of a national economy and in sustainable development (Education Policy Analysis 2002). The attributes of education systems should strive towards the production of new knowledge while successfully applying existing techniques, which represents a strategic resource for products and services. Such knowledge should be networked, decentralized, interdisciplinary, efficient, and competitive. As such, it constitutes a market good.

To enhance development and form a well-rounded personality, as well as to encourage students' creativeness, the teaching process applied in the fine arts should be based on the tendencies of the new age, bearing in mind that the development of technology has major implications on human creativity. In general, teachers of fine arts assume a rather important role in the development and cultivation of student creativity, because, as claimed by Torrance (as cited in Martić 2009), teachers who act creatively on their own and who are aware of what creativeness is are able to identify and understand students' creative needs and encourage divergent thinking. The quality of an education system such as this will lead to proliferation of creative potential, and the professional development of educators should be of paramount importance. We argue that a focus should be made on the development of competencies to encourage creativity among students using suitable fine arts and visual design computer software at all levels of education. The nature of creative processes could be redefined, and technology assumes an increasingly important role in creative activities while becoming a suitable tool or an extension of a creator's hand and an aid in the integration of new ideas.

2. Encouraging the development of creativity among students using software in teaching fine arts

If creativity is viewed as a general human trait and quality – being universal, yet possessed by individuals to a different degree and with different intensity – and as a foundation for the development of any society, we are responsible as a society to enable and encourage its development in the education system (Gajder and Mlinarević 2010). Creativity, as a human trait, needs to be cultivated and the use of new technologies to facilitate this should be encouraged, arguably leading to a higher quality teaching process while addressing of the needs of individuals and society as a whole. A creative teaching process will be difficult if there is a lack of motivation, explana-

tion, and encouragement; if there are no signposts to possible alternative methods, the facilitation of the flow of ideas and encouragement of project-based problem solving work with be difficult to achieve, both inside and outside school. All of this indicates that teacher creativity and the democracy of the school environment are fundamental prerequisites for the development of creative students.

Abraham H. Maslow believes that the teaching of all school subjects should look up to and follow the model of arts subjects, which encourage the creativity of students to a significant extent. It is a historical coincidence that teachers of arts were the first to go in that direction. The same might be implemented in teaching mathematics, which I hope will happen one day. It is certain that mathematics or history or literature are still taught nowadays in an authoritative manner focused on memorizing... The issue is how to teach children to face here and now, how to help them become creative people who are able to take a creative orientation (Bognar 2012).

Fine arts teaching can encourage creativity in a modern student if it is focused more on the use of new tools, software and applications, and on promoting the features of developed education systems founded on the production of new, and application of the existing, knowledge, or an education:

> „ ...striving to the empowerment of a new type of human being which we need, a person of process, a creative person, a person who knows how to improvise, a self-confident and brave person, and autonomous person." (1976, 95-96, as cited in Bognar 2012).

It was Komensky who pointed out that it is necessary to respect the individuality and distinctiveness of every child and to adapt the teaching content to the child's individual development abilities and needs. Additionally, Komensky indicates that a child's thought develops from the concrete to the abstract. Ever since the discovery of "prescientific developmental psychology", this has become one of the fundamental teaching principles – the principle of vividness and abstractness. In the modern era, this principle has become the backbone of lesson planning and organization, and has become the subject of study by many contemporary authors, such as Arnheim. In his essay, The Perceptual Challenges in Arts Instruction, Arnheim argues:

> "Every object or event in this world is capable of profoundly arousing the human spirit if the conditions are favorable" (Arnheim 2003, 244).

Arnheim's analysis of artistic form and an attempt to make the visual categories "intelligible" in regular arts instruction may and does serve as a means with which we can make some arts issues understandable to students. However, as Arnheim himself cautions, we must not fall into a trap, as his analyses are not and should not be a "recipe" either for artistic production or for perception or an aesthetic experi-

ence of a work of art (Arnheim 1987, 15). As a Gestaltist, in his essay The Perceptual Challenges in Arts Instruction, Arnheim addresses directly educators, emphasizing that it is necessary to differentiate between sensory stimulation and perceptual challenge, and that in regular instruction children do not have sufficient perceptual challenges, whereas in everyday life they have too much sensory stimulation, developing as a result the mechanism of "sensory numbness". To create a perceptual challenge in instruction, the materials used must possess internal order, and allow for the creation or order understandable to students. Those scenes of order must visually be associated with something students can relate to and that is present in their daily lives, such as new applications, software, games, that is, everything which takes part in building the visual identity of their reality. What is affirmed as crucial is that children understand what they see, because that is the only way they can use the sense of sight as a path to knowledge, and not only as a mere "entertainment with minute spectacles" (Arnheim 2003, 249-250). Stanley Greenspan (2013) maintains that developing the ability of visual-spatial processing is the first step to developing reflexive thinking and understanding of the world. He adds that a teacher's task is to help students engage all segments of their visual-spatial world, and to encourage them to analyze it using their emotions. Further, teachers should familiarize their students with different spatial dimensions, encourage them to use space creatively and to view logical relationships between space entities. This is followed by the development of higher-orders thinking skills, such as multi-causal thinking, thinking in the gray zone and reflexive thinking. Greenspan concludes:

> "The ability to comprehend the world lies not only in the verbal understanding but in the visual and spatial understanding too" (Greenspan, 2013, 161).

According to Piaget, a child's symbolic thought which occurs at pre-school age is the most important; phantasy and language open new possibilities for thinking. Each symbol contains new feelings and ideas and packages thoughts so that they can be quickly analyzed (as cited in Handukić 2008, 112). The stage of full expression is marked by the visual expression which can be identified by the following features: objectivity of perception, particularly that of space, which is determined by three-dimensional recognition and mastering perspective; to a certain extent cultivated creative nature of imagination becomes used for the purpose of creation in different branches of art; expression at significantly higher expressive visual level, aspiring to express through works of fine arts both mood and internal life. This indicates that it is preferable at this age to introduce students to the use of software and applications when creating fine arts and visual works, as the system of supported creation will be rather empowering for a student. In the adolescence period, the fine arts work of young people reflect their susceptibility to perception and a wish to experiment. Panić (1989) defines this phase as a reawakening of creativity, when the

independent artistic has a need for originality. A convincing visual representation reflects a student's focus and interest in the performance and creation of fine art, and facilitates a potent shaping of personal semantics with the use of computer software.

For the creativity, expressive, and receptive abilities to develop, teachers have to not only be well acquainted with the findings of contemporary pedagogy, developmental psychology, didactics, psychology of art, new technologies and multimedia, but they themselves, being creative individuals, must find ways to implement the conclusions into their own educational work:

> "The data about the nature of a child's talent offers a possibility for a focused intervention to develop preferred dispositions. Such a system must also include extremely talented teachers inclined to creativity. Otherwise, as claimed by Goethe, what happens is that a teachers becomes afraid of a student, in which case the teacher inhibits and delays the child's development" (Panić 1989, 44).

3. Didactics of fine arts instruction faced with contemporary challenges

Due to its complexity and multifactor determination, instruction is defined in multiple ways in didactic reference books; however, the majority of authors define it as the most organized activity of teaching and learning. Muminović (1998) maintains that instruction is a dialectic blend of the past, present and future, and in it he sees its contradiction. According to its basic function, instruction has to be oriented towards the future, otherwise it does not justify its existence. While preparing young people for the future, instruction is implemented in the present and draws on the past for its content; however, it must not linger there. Its ultimate purpose is to prepare young people for life in an uncertain future. Implementation of such instruction requires competent teachers engaged in permanent and life-long professional and expert development, listening to the needs of their students, and appropriately responding to them in a creative artistic process such as teaching.

In the implementation of the teaching process, all of the teaching competences come under the spotlight, particularly the didactical-methodological competencies and the sense of creating optimum conditions for teaching and learning. Writing about what good instruction is, Meyer (2005) lists ten of its features: clear structuring of instruction; large portion of actual learning time; a stimulating learning environment; clarity of content; establishing sense through communication; diverse methods; individual encouragement; intelligent practicing; clarity of expected achievement; and a prepared environment. Implementing in practice a quality instruction with all of the above (alongside many other features) has always been the top creative and artistic skill, however there are new challenges if we bear in mind the digital world being implemented, and even imposed, in teaching environments.

Digital competencies enable a teacher to meet the requirements of modern society by way of didactically and methodologically designed models of both traditional and modern instruction.

Traditional models of teaching, most commonly implying the didactic model of school functioning in which students are grouped in classes, taught by subjects for periods of 45 minutes, and in which the dominant method is frontal teaching and an expressed verbal method or lecturing by the teacher, have been criticized ever since the reform of pedagogy to date (Bjelan-Guska 2017). On the other hand, the modern paradigm of teaching is founded on the scientific knowledge of how the brain learns best and implies that teaching and learning processes are complex; that they include social interaction, group work, individual research assignments, and methods such as reflection and role-play, etc. Instruction based on the characteristics of the one primarily being taught (the student) is organized in a thematic, integrative, cooperative problem-based and exploratory manner. The teacher is no longer the only source of knowledge in the classroom and an unquestionable authority the students are afraid of, but the one who leads and steers the process, motivates, encourages, discusses, questions, doubts, explores, learns and creates a pleasant and warm classroom environment in which the students feel safe and in which learning takes place. Such instruction is based on learning outcomes oriented on competences, implying reorganization of information in unique, creative ways, with foreseen and unforeseen solutions, encouraging divergent, creative, critical and reflexive thinking with the use of the acquired skills in variable every day contexts.

By applying elements of multimedia, appropriate software, and online communication in classroom instruction, schools can increase their efficiency and effectiveness. The most basic application of Information and Communication Technologies (ICT) is reflected in the instruction carried out in interpersonal relations (f2f) with the use of appropriately created digital instruction materials. The instruction carried out with the application of ICT and certain digital materials (such as digital books, collections and catalogues, presentations, virtual tours, simulations, etc.) is referred to as hybrid instruction (Recommendations for E-Learning Education Materials Design, 2009). Such instruction inevitably uses different database search engines and online support which enables the information and experience sharing amongst students in forums, via electronic mail, chat rooms, etc. A well-balanced direct contact and hybrid instruction, with appropriate facilitation and well-designed methodological instructions, with the use of modified material resources, i.e. technological-didactic and fine arts materials can neither harm nor contribute to the stagnation of teaching process. Tokuhama-Espinoza (2014) argues that, despite 125 years of progress in formal education, we have still failed to find the right answers to meet the needs of all the learners. Hence, the best time to seek methodological answers to our questions is always the present – the only time we have - and the most suitable field of school teaching can be argued to be the artistic field, since this is the "cultural core". This is defined by Julian Steward as the aspects

of culture directly associated with a community's survival and economy. We will now provide a brief overview of specific software solutions the students should be or already use in the teaching process, which will facilitate their integration into mainstream society and labor market.

The computer software most successfully used in fine arts instruction is Microsoft Paint. Its widespread usage is probably due to its availability to nearly all schools and students by being an integral component of the Windows operating system. It is suitable for graphic design, illustrations and logotypes, as well as blending images and texts or creating comic books or larger portfolios. Its presence in fine arts instruction provides a higher quality relationship in teaching classes based on visual-problem-solving units involving dots and lines, planes, surfaces and living environments. For dynamic comic book designing, the CLIP Studio software can be used to stir the students' imagination and their visual expression skills, offering high-color designs and excellent visual communication tools. The Adobe package, meanwhile, represents a collection of software programs and tools suitable for teaching certain fine arts problem-based units. However, it is important to single out Adobe Photoshop as one of the most suitable computer software for the manipulation of photographs, the creation of strip boards, and posters, while the Adobe Flash and Animation software enables the creating of computer animations that may reflect the visual identity of the student's reality. Elsewhere the stop-motion technique is suitable for the completion of assignments related to mass and space, as these techniques can build bridges between the direct clay shaping (claymation), digital photography, and computer manipulation software to create video montages. Each movement of a sculpture is recorded with the help of a camera and a tripod, followed by the creation of an animated movie composed of a series of sequences using the computer software ShotClip. Finally, learning in fine arts classes may also be assisted by using video games created on the H5P Games platform and Appsgeyser.com application, which can be used to develop a personalized game or a quiz.

The more that students enjoy these experiences in the classroom, the more schools can become the space for life itself, rather than simply for the preparation for life, as the students will be able to experience in real-time the tools and techniques they will later move on to use. The key issue is whether we prepare the teachers for such an instruction in the classrooms, for the life at schools and the school which is life itself.

4. Methodology of empirical research

4.1. Research aim and questions

The aim of this research was to establish the possibilities for the application of computer software in fine arts instruction amongst subject teachers. The research questions were focused on the following: the extent to which fine arts teachers are

introduced to the software appropriate for fine arts design; whether they use this software in their own teaching; and the discovery of specific methodological features needed to teach fine arts classes using computer software. Additionally, differences have been investigated in respect to the socio-demographic features of subjects.

4.2. Research instrument and data processing

A questionnaire designed and created for the purpose of this research consisted of 14 questions sent out to fine arts teachers, which was divided into three sections. The first section asked questions relating to the socio-demographic features of subjects, such as age, sex, length of teaching, the education level of employment and the weekly workload. The second section consisted of four questions relating to the pedagogical strategies and different aspects of teaching and learning, and the materials/resources used. The third section focused on the questions surrounding the possibilities to use computer software in fine arts teaching, the specific methodological features of teaching while using the software, and the perceived advantages and challenges. The data was collated in Google Forms and was then analyzed.

4.3. Research sample and procedure

The empirical research was conducted in April 2020 by means of an anonymous survey on a voluntary basis. The link was sent to 80 fine arts teachers employed with elementary schools and high schools in the Sarajevo Canton but only 17 teachers completed the questionnaire. The breakdown of subject sample according to their age, sex, length of work experience and education level is shown in Table 1. Although the intention of the research was to include the total population of the fine arts teachers in the Sarajevo Canton, the results obtained cannot be considered representative; however, they are illustrative for some pedagogical-methodological phenomena and contribute to creating recommendations for improving teaching in fine arts.

Table 1. Structure of the subject sample

	Age				**Sex**		**Years of teaching experience**				**Education level of employment**	
	<30	31-35	36-45	46-55	M	F	1-3	4-10	11-20	21-30	Elementary School	High School
f	1	3	8	5	5	12	2	3	8	4	8	9
Σ	17											

As the results indicate, the majority of the teachers who participated in the research are females aged between 36 and 45. Almost one half of the subjects is employed with the elementary schools, with the other half in high schools in the Sarajevo Canton. In terms of the years of experience working as a teacher, the majority (8), have between 11 and 20 years of experience. If this information is compared to Huberman's roadmap of the professional teaching career development stages (as cited in Ajanović and Stevanović, 1998:207), those 8 subjects belong to the stage of turbulent period of activism and experimentation; therefore, it is rather illustrative, but not unusual, that they are the majority in our sample.

4.4. Results and discussion

4.4.1. Pedagogical strategies of teaching and learning in fine arts instruction

The second section of the questionnaire related to the application of the pedagogical strategies and the different aspects of teaching and learning that are adopted, as well as the extent to which they are present in the respondents' teaching. The results are presented below.

The results of the research indicate that 10 fine arts teachers sometimes and often use traditional teaching methods, while seven do so seldom. The majority of the subjects often use teaching with demonstration and exploratory learning, while the majority sometimes use collaborative learning, peer teaching, personalized learning, integrated learning, differentiated learning and problem-based learning. It is not insignificant that three teachers never use peer teaching, integrated teaching or problem-based learning.

Table 2. Aspects of teaching and learning

How much do you use the following aspects of teaching and learning in the classroom? (N=17)	Never	Seldom	Sometimes	Often
	f	*f*	*f*	*f*
I present and explain a fine arts problem or a movement to the whole class	0	0	3	**14**
I provide additional explanations and support each student's ideas	0	0	3	**14**
Students work on their own and at their own pace	0	1	6	**10**
Students do an exercise or assignment individually at the same time	0	2	7	**8**
Students are encouraged to experiment	0	1	4	**12**
Students discuss ideas with other students and teacher	0	2	4	**11**
Students decide how and at what pace they will learn	0	**7**	**7**	2
Students conduct their own artistic research and fine arts activities	0	3	4	**10**
Students work in groups on clearly defined fine arts problems	0	1	**14**	2
Students collaborate on finding solutions for fine arts problems	0	4	6	**7**
I use different types of material (visual, audio, written) in my classes	0	0	5	**12**
I use content from different subjects to explain fine arts phenomena and concepts	0	0	8	**9**
I encourage other teachers teaching different subjects to coordinate teaching on certain common topics	2	**6**	**6**	3
I organize field classes / visits to museums and galleries	1	5	**9**	2
I provide feedback to students during a learning activity	0	0	3	**14**
Students write tests and pass the assessment	4	**6**	5	2
Students take part in evaluating their own work and the work of their peers	0	1	**10**	6

The results indicate that the majority of subjects **often** use strategies for active teaching and learning, including aspects such as: I present and explain a fine arts problem or a movement to the whole class; I provide additional explanations and support each student's ideas; Students work on their own and at their own pace; Students do an exercise or assignment individually at the same time; Students are encouraged to experiment; Students discuss ideas with other students and teacher; Students conduct their own artistic research and fine arts activities; Students

collaborate on finding solutions for fine arts problems; I use different types of material (visual, audio, written) in my classes; I use content from different subjects to explain fine arts phenomena and concepts; I provide feedback to students during a learning activity. The research results indicate that the majority of subjects **sometimes** uses strategies for active teaching and learning, including aspects, such as: Students work in groups on clearly defined fine arts problems; and I organize field classes / visits to museums and galleries. The results which draw our attention in particular are those in which the majority of subjects state that the students **seldom** and **sometimes** decide how and at what pace they will learn; further that there is an almost equal number of those subjects who **never** and **seldom**, and **sometimes** and **often** encourage other teachers teaching different courses to coordinate teaching on certain common topics. The majority of subjects **never** and **seldom** ask their students to take written tests and assessments.

The results obtained indicate that teachers are introduced to the appropriate pedagogical strategies in the process of teaching and learning; however, not entirely to how these strategies can be applied. Namely, considering the potential of differentiated teaching and problem-based learning, it would certainly be recommended that a significantly higher percentage of teachers should use it in their own teaching processes to raise the quality of their teaching and to make lessons more challenging, while also increasing the level of engagement from students. The reasons for such results are probably multiple. One is the fact that for many years now, a number of fine arts teachers in the Sarajevo Canton have not attended any professional development programs held by renowned pedagogues. This information could definitely be used as a basis for a more intensive introduction of current and future teachers to all pedagogical strategies and potentials in the teaching process, intended to improving and raising the quality of education process in fine arts instruction in the Sarajevo Canton.

4.4.2. Teaching materials/resources

In the remaining part of section two, the subjects were asked about the learning materials/resources they preferred to use in their teaching and about those they would like to use but which were unavailable to. The majority of subjects **often** use video/audio materials in their daily teaching practice. The majority of subjects often use materials/resources for children with special needs/disability; however, there are those who never do so. In their fine arts instruction 12 teachers often use Power Point presentations. The majority of teachers, (8) seldom use reproductions on paper in their teaching. Fine arts materials are used often in the teaching process by the majority of subjects, while some only use these sometimes, when required to by the teaching unit. Internet collaboration tools are sometimes used by the majority of teachers either as internet or computer simulations. 10 subjects never or sometimes

used special software for fine arts design, and 7 subjects never used any tools for extended / virtual reality. Table 3 presents the results regarding the teachers' views about the learning materials/resources they would like to use but cannot.

Table 3. Learning materials/resources

INDICATORS	KEY FINDINGS FROM OF THE RESPONSE ANALYSIS
Learning materials/resources teachers would like to use but are not available to them	The majority of subjects state that they need an appropriately equipped classroom for fine arts instructions, with the equipment primarily enabling the fulfillment of the traditional fine arts-practical assignments (different materials for sculpture, graphics and painting) and fine-arts-digital works. The learning materials/resources they need to support their teaching practice are the following: computers, tablets, projector, smart boards, digital boards for visual expression, Wacom, iPad Pro with pencil, software for visual design, 3D and video applications, VR (glasses).

It is clear from the above responses that the subjects sometimes need basic materials, didactic and fine arts realia to teach, but that there are also those who clearly anticipate and verbalize their desire for additional teaching and learning materials/resources.

4.4.3. The potential for application of computer software in the fine arts instruction

To get a detailed insight into all individual features relevant for the application of software in fine arts instruction, we asked questions relating to teachers' professional development in the field of information and digital technology. Some 12 subjects did not attend training programs for software and applications for virtual design and virtual environment in the past two school years, while only five subjects did attend such programs. In the past two school years 14 subjects did not attend training in the use of applications and simulations, while only three did attend. Only two subjects attended training program relating to the use of multimedia and equipment for audio and video recording, while 15 subjects did not attend a similar training program. When asked how often they used a computer, tablet or a smart phone to prepare for class (before the changes to online teaching applied due to Covid-19 pandemic) 12 subjects said they used those devices on a daily basis, while 4 said they used them every week, and 1 subject said that he/she used them almost every month. Additionally, questions were asked as to the extent to which the subjects agreed with the claims about the use of software in fine arts instruction, and the results are presented in Table 4.

Table 4. Use of software in the fine arts instruction

To what extent do you agree with each of the following statements about the use of software in fine arts instruction? (N=17)	I strongly disagree	I disagree	I agree	I strongly agree
	f	*f*	*f*	*f*
Software should be used for students to complete assignments and practice	0	1	**11**	5
Software should be used to improve the classroom environment and collaborative relations	1	1	**9**	6
Software should be used for the students to learn independently and remember the units more easily	1	5	**7**	4
The use of software in teaching and learning has a positive effect on student motivation and development of critical thinking	2	2	**8**	5
The use of software in teaching and learning has a positive effect on student success	1	5	**8**	3
The use of software in teaching and learning has a positive effect on students' higher order thinking skills	1	4	**7**	5
The use of software in teaching and learning has a positive effect on students' competences for multiple skills	0	2	**9**	6
The use of software in teaching and learning is necessary for the preparation of students for life and work	1	2	6	**8**

Of the total number of subjects, 11 agree that software should be used for the students to complete assignments and practice, while five strongly agreed and one disagreed. Some nine respondents agreed that software should be used to improve the classroom environment and collaborative relations while six subjects strongly agreed. The majority of subjects agree and strongly agree with the statement that software should be used for students to learn independently, while six subjects disagree and strongly disagree. It is interesting that four subject disagree and strongly disagree with the statement that the use of software has a positive effect on student motivation and the development of critical thinking. Some six respondents disagree or strongly disagree that software and its usage has a positive effect on student success, while 11 subjects agree or strongly agrees. Most subjects to a greater extent agree or strongly agree that the use of software in teaching and learning will have a positive effect on students' higher order thinking skills, that the use of software will have a positive effect on students' competences for multiple skills, and that the use of software in teaching and learning is necessary for the preparation of students for life and work. The results obtained are positive in the context of implementation of a quality teaching process in fine arts instruction, and in respect to the expressed awareness that the use of software can only improve educational practice and bring it closer to addressing the life challenges students face on a daily basis. Additionally, it is significant that teachers are aware of the benefits and importance of the appropriate application of software in shaping their classroom.

Although teachers acknowledge the possibility to use software in fine arts teaching, Table 5 presents in detail the indicators that hinder or completely disable

the teaching of classes with the use of software for fine arts and visual activities.

Table 5. Challenges for teaching the classes using software

Does anything listed below affect your teaching with the use of software suitable for visual design? (N=17)	Not at all	Very little	Somewhat	A great deal
	f	*f*	*f*	*f*
Lack of computer equipment	**8**	2	2	5
Lack of the Internet or Internet speed	4	2	5	**6**
Insufficient number of portable computers	4	1	3	**9**
Lack of the teacher's appropriate training	**9**	1	4	3
Insufficient technical support by IT coordinator	2	3	**9**	3
Insufficient pedagogical support for teachers	4	**6**	5	2
Management of school timetable	3	3	**8**	3
Management of teaching space	2	2	**7**	6
Insufficient interdisciplinary support by colleagues from school	4	3	**7**	3
Lack of content in the native language	5	2	**9**	1
Lack of teacher motivation	**6**	**6**	5	0
Lack of student motivation	3	6	**7**	1

When the subjects respond to statements relating to the challenges they face in teaching classes using software for fine arts and visual activities, the majority acknowledge the lack of Internet or its low speed, as well as an insufficient number of portable computers. Interestingly, the majority of subjects see few challenges in insufficient pedagogical support to teachers and no challenges at all or very few challenges in the lack of computer equipment, lack of appropriate training of teachers, and lack of teacher motivation. These are somewhat contradictory results in reference to appropriate training of teachers, while in the previous sections many teachers report about the lack of professional development training in the field which could offer them such competences. This could be an interesting area for further research, to ask why teachers do not spend more time the practical instruction of software to teach fine arts if there are no or few challenges in the lack of equipment, teacher training or teacher motivation.

In the last section of the questionnaire, teachers showed interest in attending a professional development program on the use of various suitable software, applications, and tools for visual manipulation and design, which is extremely motivating and encouraging. In the last open-type question, respondents were

asked to share their observations and thoughts and list the software applications they already use in their daily teaching practice, with a particular focus on the methodological features related to their use, as well as on the advantages and challenges they see in such a teaching process (Table 6).

Table 6. Software for visual design, advantages and challenges

INDICATORS	KEY FINDINGS OF THE RESPONSE ANALYSIS
Which software suitable for visual design do you use in your teaching? List the methodological features of conducting the instruction when using them.	The majority of subjects state that they use in their teaching process in fine arts the following software suitable for visual design: Adobe Photoshop, Adobe Illustrator, Corel Draw, Paint, Photo Editor, CAD, Power Point, Sketchbook, Procreate ios, Microsoft Word, software for the video and audio material montage, Google Forms (written tests), and Office 365 platform, virtual interactive museum exhibitions, online games, quizzes, audio-video recording on YouTube.
What are the advantages, what are the challenges?	Teachers state that the **advantages** of the use of software for instruction are clearer identification of a fine arts problem, blending creativity and technical skills, the ability to visualize tasks, because each software has a wide range of tools for teaching most of the fine arts content. Additionally, they believe that those are the tools necessary in the daily teaching and to encourage creativity and motivation among students; the combination of practical work and work on a computer can have a positive learning outcome; the illustration of other forms of work will result in better understanding of a fine arts problem and expressing a visual identity in a different way. According to the subjects, the **challenges** are primarily related to the equipment in the classrooms, because they do not have the appropriate multimedia equipment and software, which are provided by the teachers themselves from their own pocket. They also state that another challenge is the possibility for the technology to transform their teaching.

5. Conclusion

The application of computer software in fine arts instruction in a developed educational system has shown to be truly important in education and upbringing. It has made a special contribution and proved to have extensive didactic value in higher grades of elementary school children as well as in high school education. The aforementioned system of supported creation is empowering for students, enabling them to acquire new abilities and a broad spectrum of creative skills, as well as a facilitated forming of personal semantics. The question is raised as to what extent today's fine arts teachers in the Sarajevo Canton are introduced to the application of computer software and how much they use them in their instruction to focus their teaching towards students and to encourage active learning, which is the foundation of a modern teaching process.

The aim of the research presented her was to establish the possibility for the application of computer software in fine arts instruction by fine arts teachers. The aim was fulfilled by asking research questions to establish the extent to which fine arts teachers are introduced to software suitable for visual design, whether they use

this software in their own direct instruction work, and to identify the methodological features of conducting the instruction using computer software.

The research results have indicated that fine arts teachers are mostly familiar with the possibilities for the application of computer software in visual design, as well as with the fact that the usage of different software will encourage creativity among students. This is an excellent indicator of intrinsic motivation, a pre-requisite for quality instruction. The research has also shown that teachers use software suitable for visual design to an extent that is not yet sufficient. The analysis of the socio-demographic characteristics of subjects has produced interesting results showing that there are no significant differences between the older and the younger subjects, although the initial research expectations were to find that younger subjects would be more familiar with the use of computer software in fine arts instruction, and its application would be more frequent among the younger than the older teachers. However, the results show that age, as a socio-demographic feature of the subjects, is not a crucial factor for the application of software suitable for fine arts and visual design in the education process.

The research results and the teachers' interest indicate that it is necessary to put effort in further professional development and training of teachers in the application of computer software, especially those suitable for fine arts and visual design. The acquisition of new competences will promote the existing education process and contribute to better learning outcomes. Additionally, the results of this research are important for designing programs of initial university education, but also of life-long professional education of teachers, aimed at introducing teachers to the possibilities for the use of computer software and their effect on increased creativity among students.

The challenges of educational work in the 21st century certainly demands permanent professional development and training. This is the only way for teachers to work continuously on the development and improvement of their skills, and to improve the quality and creativity of their teaching activity. The way in which professional development and training is organized, prepared and implemented in practice is defined greatly by the changes in the classroom itself, that is, it affects how and to what extent the acquired knowledge in the field of creativity and multimedia will be applied in work with children and youth. Within the reforms in our education system, it is important to acknowledge that the basic link of quality of the teaching process in which full potential and creativity of each student would be developed and encouraged is a quality teacher.

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TRANSMEDIAL (R)EVOLUTION: {SinOsc.ar(400, 800, 0, 0.1) multisensory.experience}.play;

Abstract: The digital revolution and technology has led us towards a more intimate understanding of the acoustic instrument and its sound. What was the modern piano for Chopin was a tape recorder for Schaeffer. Today, there is little distinction between the sounds of acoustic, natural or electronic. In this paper I describe the shift of musical perception throughout recent technological developments. My starting point of exploration is the spectral attitude of 1979, which inspired further sonic evolution and changed our perception of the sound, performance and instrumental body or instruments, as well as introducing the computer as an essential instrument for composing. Further, I highlight the importance of software and discuss the ways in which software-generated musical ideas can incite human creativity and influence a post-digital vision of *gesamtkunstwerk*. The evolution of hybrid instruments and real-time audio-visual interactive software has led to changes in temporal freedom and created a multisensory experience. I explore how this transmission breaks down the barriers and limitations of the human creative mind and discuss how this can potentially lead to the new musical era. Finally, I reveal some art experiments within the concept of transmedial composition in recent times.

Keywords: sound spectrum, musical language, transmedial, gesamtkunstwerk, composition, software, creativity, multisensory, perception, human-machine collaboration

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The technology evolution has gone hand in hand with human creations; better yet it creates a hybrid process that does not imply an exclusion of tradition, but instead evokes its extension and includes an expansion of creative possibilities. In the domain of musical sounds, the refinement of digital synthesis and real-time processing, alongside the creation of interactive software and hybrid instruments,

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has opened up wide new territories, offering different points of view. As Douglas Kahn stated "both sound and listening have been and continue to be transformed through the cultural elaboration of technology" (Kahn, 2001, 15). The traditional use of instruments and the understanding of acoustic sound needed liberation, and in this context, that classical instrument of the new age – the computer – became the point of liberation and personalization.

The creation of spectral sound analyzers was followed by newly developed technologies which inspired composers in the last hundred years, ever since they gained the ability to directly manipulate every characteristic of sound. The task of a composer became not only to compose music for instruments, but to create and generate the very sounds themselves. This change in perception of both sound and creation announced the era of a diverse collaboration between composer, the acoustic instrument, and computer software (OpenMusic, AudioSculpt, Max/MSP, SuperCollider, Processing etc.) (Holmes 2002). Furthermore, the power and possibilities of software language emphasized the importance of sound as a part of various artistic practices, alongside other media and cultures that cut across genres of music, rather than allowing it to become its own sui generis field. Throughout the modern period, sound has wanted to break free from the historical constraints of music and become accepted amongst other creative media. Musicians' deep engagement with technology, far from being merely a search for "new sounds," constitutes one of the primary vectors through which music in the 20th Century opens out into other fields of thought and action, from aesthetics to politics, science, and philosophy. Therefore, developments of the digital era influenced the natural need for multisensory experience:

> Just as the new sound technologies brought together artists of opposing aesthetic positions, so too did they throw open the gates separating the various forms of art. One of the most remarkable effects of the technologization of sound was to draw music into the synesthetic gyre of the early 20th Century. This multi- (or inter-)media impulse, too, belonged to the spirit of the age. (Patteson 2016, 7)

The hybrid or multimedial character of the artwork is not the invention of our contemporary culture. Instead, increased awareness of the multimedia form could be already found in the works of many 19th Century writers and artists such as the visual poems of Mallarmé or the musical dramas of Richard Wagner. In his 1849 essays *Art* and *Revolution and The Artwork of the Future*, Wagner used the term *gesamtkunstwerk* to describe the concept of total work of art or all-embracing art form. He applied this concept for creating the ideal artwork throughout the use of different media as a unity in his musical drama.

> Wagner thought that the separate artistic media – music, text, dance, painting, architecture – which represent the different human senses – auditive, visual and kinesthetic – could only fulfil their original function if they interact in perfect harmony with each other. (Lajosi 2010, 44)

Besides the multisensory experience, the concept of the *gesamtkunstwerk* affects the traditional roles of creator, performer, and receiver, and considers composing process as a complex, social, and intermedial act. He thought of it as an artwork of the future and it seems that today artwork is, in some way, a reflection of his giant vision.

I Composing *into* the sound

After the new tonality and the new simplicity (alongside neo – romanticism/impressionism/serialism) it seemed like composers remained stuck in the *isms* and reproductive applications (duplication, dissemination) instead of invention and generative or productive uses (Moholy-Nagy 1985). Cage came up with a similar conclusion about the habitual practice of music and composers whose approaches to creating music mostly began with existent figures – melodies snatched from the great fragments of musical memory and finished by giving these figurative patterns personalized time frameworks. These automatic thought processes could only be transformed by the creation of new or different methods of listening to the sound, rethinking and exploring the unformulated.

The 1970s was a decade of radical shift in perception of sound, mainly concerning the idea and possibility of *observing* the sound regarding to technological developments within composing processes. This was the process of liberating sound, an intuitive transition from relations of pitch between tones to the microcosmic world of frequency ratios within a single musical sound. Since Helmholtz, it has been understood just how sound comes into being, that it owes its existence to the simultaneous sounding of many tones, and there has been knowledge as to which elements affect its transformation in time. Before the application of technology in music, one could not apply these theories and turn them into creation or, hopefully, a new language. In that vein, Wittgenstein's remark bears an important perspective:

> What a Copernicus or a Darwin really achieved was not the discovery of a true theory but of a fertile new point of view (Wittgenstein 1984, 18).

This could also apply to the impact of technology on Helmholtz's theory. About 75 years after Helmholtz published *On the Sensations of Tone*, Cage foresaw the potential evolution of musical thought and recognized the very beginnings of a sonic expansion to be achieved with electronic technologies. Apart from predicting the availability of the "total field of sound," including noise, Cage also imagined the precise modification of the harmonics, frequency, and intensity of this sonic spectrum, years before digital technologies were developed (Cage 1961).

Spectral attitude and musical material

In the time of technological growth, beside electronic music, the force that evoked a re-birth in perception of sound was the spectral approach to music and composing. Features of spectral composing include process preferred over development, frequency and temporal space, continuum of timbre and harmony, a global approach to form, the use of approximations, and perceptual and psychoacoustic aspects of sound. Murail introduced the subject of the spectral attitude to the music,

> Our conception of music is held prisoner by tradition and by our education. All has been cut into slices, put into categories, classified, limited. There is a conceptual error from the very beginning: a composer does not work with 12 notes, x rhythmic figures, x dynamic markings, all infinitely permutable; he works with sound and time. So why do we always have to speak of music in terms of notes? (Murail 2005, 137).

When Pierre Boulez came back to Paris in the mid-1970s to open or 'establish' IRCAM (*L'Institut de Recherche et Coordination Acoustique/Musique*), spectralists saw themselves as an anti-institutional group within the field of contemporary music led by serialism (Smith 2000, Murail 2004). This is important in the context of the perception of musical material. While serialists composed within the processes of fragmentation of existing musical language, spectralists went one step back to the question of what the essence of existing language is. Spectralists questioned some elements of serial music, such as the idea of the parameter, and claimed that there is theoretically no difference between diverse musical parameters because they perceived sounds as correlated ensembles of energies. They have returned to the origins or to the pure nature of sound, which Grisey named as the 'ecology of sound' (Heile 2009).

Spectral attitude and technologies

The relationship between spectralism and the rising post-industrial Zeitgeist was clearly seen in the spectralists' commentary concerning technological impact on musical practice and perception. Grisey, Dufourt and Murail claimed that more than anything else, new technologies (mainly the spectrograph and computer) revealed the unseen dynamism of sound. Murail, for instance, underlined how the spectrograph (which made possible to visualize and manipulate complex sounds) opposes the illusion, presented throughout musical notation, that sounds are detached, fixed objects:

> With new methods of sonic analysis, one immediately discovers that a sound isn't a stable entity and doesn't remain identical to itself, as

> the abstract notes in a score might lead one to believe. All of our musical tradition is based on this assimilation of the real object by its symbol, while it is actually the case that every sound is essentially variable, not only from one iteration to another, but also within its own duration (Murail 2004, 12).

Technology has always played an important role in the development of spectral music and models derived from electronic processes such as frequency shifting, ring modulation, frequency modulation, or tape delay, can be found in any number of spectral pieces:

> Spectral analysis means an approach to sound materials and musical structures which concentrates on the spectrum of available pitches and their shaping in time. In embracing the total framework of pitch and time it implies that the vernacular language is confined to a small area of the musical universe (…), it is sound recording, electronic technology, and most recently the computer, which have opened up a musical exploration not previously possible' (Smalley 1986, 61).

The desire for mastery of the sonic continuum led naturally to the use of the digital computer. Because of tradition and manual habits, a composer's or a performer's relationship to the computer was opposed to the traditional acoustic instrument, although both are artifacts made by human beings. As a matter of fact, the spectral analysis of the sound and further technological developments in terms of music brought an even more intimate understanding of the acoustic instrument:

> As the development of techniques for spectral analysis and synthesis techniques led to new ideas of how to write for the piano in the 20th Century, the 21st Century has seen the creation of interactive software and hybrid instruments designed to explore further the unique inner metaphors of the original acoustic instrument (Nonken 2014, 141).

A good example of the transition from traditional to contemporary perception of sound and the use of electronic resources to expand natural instrument's capacities is the piece *Tombeau de Messiaen* for piano and electric tape (1994) by Jonathan Harvey. With piano part inspired by Messiaen's leitmotifs and the electric tape created according to new technological approaches, this piece could be perceived as Janus-faced. In *Tombeau de Messiaen*, the pre-recorded tape consists of 12 pianos all tuned in harmonic series, each on one of the twelve pitch-classes. It adds resonance to the piano chords which evoke the tape's 'reaction,' articulating the "same" sound. In an ideal performance, for both the pianist and the listener, both parts should perceptually fuse. In this way, Harvey created "an inner life" of a sound and an effect of meta-piano since it is not clear to the listener what is a sound of piano and what

is part of an electric tape. He wanted to make a musical material which could be perceived and heard on many sensory levels. Harvey has shown that technology has come to classical music not to replace old instruments but to free them (Harvey 1999).

Spectral attitude and instrumentarium

> Suddenly, one day, it seemed clear to me that the full flowering of music is frustrated by our instruments. In their range, their tone, what they can render, our instruments are chained fast, and their hundred chains must also bind the creative composer. […] It may be that all the possibilities of traditional instruments have not yet been exploited, but we are certainly well along the way of the path toward exhaustion. Where then do we turn our gaze, where does the next step lead? The answer, I believe, is abstract sound, unbounded techniques and technologies, tonal limitlessness. All efforts must push in this direction, in order to bring about a new, virginal beginning" (Busoni 1907)

More than any other figure, Busoni, with his treatise Sketch of a New Aesthetic of Music (*Entwurf einer neuen Ästhetik der Tonkunst*, 1907), influenced the intellectual foundation for the technological experiments of the 1920s and 1930s. Further, while Luigi Russolo denounced the symphony orchestra as "a hospital for anemic sounds" (Russolo 1967, 6), Edgard Varèse already in 1916 wrote about "the great need for new instruments, new technical means which can allow and sustain any kind of expression of thought." (Varèse 1983, 23) It was clear that the exhaustion of the symphonic instrumentarium was at hand and an opportunity for radical renewal raised. The time had come when music and technology entered into a mutually catalytic relationship, impelling each other toward a sea of new possibilities. This shift of instrumentarium began in the early part of the century and, as Elena Ungeheuer argues, was complicated as instrument builders did not wish to change the course of music history with new sounds and means of sonic manipulation, but rather to use electricity to imitate what was already familiar. She emphasized a distinction between the "imitative" instruments of the early 20th Century and the "innovative" sound machines of the post-1950 period. (Patteson 2016) If electric instruments serve as an imitation of acoustic instruments, it is still a large fail in a technological use. The purpose of this instrumentarium expansion or shift should be a call for creative artists to conceive a different compositional style, so that these instruments can become what they ultimately strive to be: instruments for a new music of a new age:

> The deepening engagement with technology in 20th Century music, born of a desire for control, has brought about a centrifugal expansion of the art (and indeed of all art), unleashing an almost incomprehensible multiplicity of sounds, techniques, politics, and practic-

> es. In place of the monolithic modernist vision of a technological promised land, a destination in history where the development of instruments would attain a state of perfection or at least provisional equilibrium, we are now faced with a state of chaotic oscillation or perennial flux, leading nowhere. Accordingly, the challenge for contemporary musicians is by no means a simple matter of remaining technologically "up to date"; instead, it is a question of navigating, at the deepest, cellular level of artistic practice, the unstable force fields spanning the gap between instruments and aesthetics, technology and technique (Patteson 2016, 167).

II Coding the visual sound

The narrative in this section is related to the new musical language born in the digital age. The application of the computer influenced expanding the practical range of sonic possibilities, while also enabling the detailed and empirical study of timbre. It was in fact the appearance of digital sound synthesis that made that new sound vision possible. Max V. Matthews, the computer music pioneer, understood the power and generality of digital synthesis which he described in his 1963 article in Science:

> With the aid of suitable output equipment, the numbers which a modern digital computer generates can be directly converted to sound waves. The process is completely general, any perceivable sound can be so produced (Matthews 1963, 553).

In the 1960s, Bell Labs started to develop and expand the technological tools in an unexpected direction. The essential instrument – digital computer - became more complex and a number of, what were called, unit generators had been added to the set of new possibilities. The user would compose a piece coming up with a series of numbers that became input specifications for the instrument. According to the numbers one gave, the series went into the computer, and the sounds that were generated had characteristics determined by these numbers. With the rapid development of technology, the musical 'system' of the new age became *software*. Software was used to designate the pitch, timbre, amplitude and duration of sounds being played on instruments connected to the computer. Herbert Eimert, one of the founders of the *Studio für Elektronische Musik* in Cologne, described this creating shift from manual to technological:

> The composer, in view of the fact that he is no longer operating within a strictly ordained tonal system, finds himself confronting a completely new situation. He sees himself commanding a realm of sound in which the musical material appears for the first time as a malleable continuum of every known and unknown, every conceivable and possible sound. This demands a way of thinking in new dimensions,

> a kind of mental adjustment to the thinking proper to the materials of electronic sound (Wörner 1973, 122-124).

Besides the concept of computer memory as an adjunct to human memory, one could bring in his/her own sounds, stored as digital information, and control them using patterns and sequences and free-form patch control that is unique to one person's computer. So, with electronic and electro-acoustic music came just about every method of composing imaginable: graphical scores on paper or transparent sheets of plastic; computer-generated algorithms; oral commands; written instructions; audible performance cues; and so on. There were no standards other than those for traditional musical notation but in this case, the composer usually did not have to work with pre-existing material. Instead the composer created and shaped the sound that he/she wanted to hear.

It is important to acknowledge Reas' and Fry's argument that:

> Software holds a unique position among artistic media because of its ability to produce dynamic form, process gestures, define behavior, simulate natural systems, and integrate various media including sound, image, and text (Fry and Reas 2007, 1).

Hence, I would argue that today software represents an essential contemporary digital language. However, it still requires its own terminology and methodological approach.

Since many software environments are programming-based, it is important to understand that programming languages are not just for engineers, but for anyone interested in adapting to contemporary digital language especially connected to innovative creating processes. The computer arose as a tool for fast calculations and has evolved into a medium for expression. To entirely explore the computer as an artistic material, it is important to understand the art of computer programming. As Nelson stated:

> The more one knows about computers, the better his/her imagination can flow between the technicalities, can slide the parts together, can discern the shapes of what one would have these things do (Nelson 1984).

Programming is not the only way, **Max/MSP** for example, a powerful program used for algorithmic composition offering controls over the parameters and performance of digital synthesis and real-time audio processing, is mostly used by many musicians and visual artists as a base for audio-visual creating and is different from typical software languages – its programs are created by connecting boxes that represent the program code, rather than lines of text. Beside Max, there are other important software tools that deserve mention:

- **SPEAR** (Sinusoidal Partial Editing Analysis and Resynthesis), first time demonstrated at the Columbia University Computer Music Center on February 2004, is an application for audio analysis, real-time editing and synthesis (Klingbeil 2009);

- **OpenMusic** (OM) is a computer-aided composition program created at IRCAM which became popular among a wide variety of composers, such as Brian Ferneyhough or Kaija Saariaho. It is a visual programming environment based on patching pre-defined or user-defined objects, however it is does not operate in real-time;

- **PureData** is the open source sibling of Max/MSP;

- **Orchids** is program created at IRCAM, particularly for supporting instrumental and orchestral synthesis. Orchids has access to a huge database of instrumental samples from orchestral instruments to traditional instruments from all over the world;

- **SuperCollider** is a free and open source software tool for audio synthesis and algorithmic composition, used by musicians and researchers working with sound. With different use of its major two components - *scsynth* (a real-time audio server) and *sclang* (a client, an interpreted programming language), the user can constantly explore new sound synthesis methods or connect with other software or controllers;

- **Processing** considers the ideas of computer programming (Java language) within the context of the visual arts. It creates interactive and visual work, building real-time processes to generate form. Processing was created as free and open-source software (FOSS) to be accessible (can be downloaded without cost) and flexible (could be understood by a general audience) (Fry and Reas 2007).

What makes these separated programs more powerful is the point of their synthesis as a cross-program. While, for instance, SPEAR's support for text-based file formats makes cross program data exchange relatively simple; OpenMusic, Common Music, Max/MSP and SuperCollider, can be used to import, manipulate, export, and/or synthesize SPEAR analysis data. OSC (Open Sound Control) is the element that lets different programs run on the same or on different computers while communicating. In this way both audio and visual software can work on the same artistic process. Finally, playing with different algorithms in relation to amplified acoustic instruments and diverse visual presentation of the sound encourages future exploration and a multisensorial approach to musical composition.

III Sounding the transmediality

The new conception of artistic creation was anticipated by both Cage's approach to music as the organization of sounds and events and his chance compositions, and the Fluxus movement as "borderline art" in which the genres are retained. (Kotz 2010) Further, the rapid growth of technology resulted with overwhelming hybridization:

> Each day provides an example of chaos. Either in the form of telephone calls or in the mail coming. We never know what's going to happen. The kind of trouble that people have with the weather, we now have with every aspect of our lives. Everything as a result is interesting. And we're living now more and more not only in a world full of noise, but in one full of all kinds of things that we can perceive through our senses and also a world of more people than ever before (Cage 1961; Bernstein and Hatch 2001, 271).

Composers today live in a moment of extraordinary transition. Omnipresent digital discoveries including media and VR (virtual reality) platforms, as well as the all-embracing habitation of the Internet, will profoundly affect the multisensorial arts. In the second half of the 20th Century, places such as frontal concert stages built for presenting 19th Century music, do not satisfy for the needs of electronic media, multi-loudspeakers, and interactive media. Instead of being staged frontally with the audience seated, immersive aural constructions are usually best experienced interactively, as the audience explores the sonic world by listening at different locations in the space. In the process of composing, artists can explore different ways of hearing, "whether sound is very far away, very close up, vibrating an elbow, appearing on top of their head, or 'inside' their head and streaming out of their ears into space in front of their eyes" (Cage, Bernstein, Hatch 2001, 188). In this way, the composer creates an interactive world within his/her piece. There is a critical need for buildings that are dedicated completely to these new musical and sonic worlds, but the problem with finding suitable space is just one of many. There is also an issue of the performer: who is the performer in the multisensorial artwork? Is it a musician, a listener or the software itself? Since there are no longer limitations to writing notes on paper, neither to writing notes at all, with current sound technologies composers are not working with notes but with numbers, algorithms, MIDI cables, space, microphones and loudspeakers to access real-time auditory experiences. The composer is not operating with material but expanding the perception capacity. A listener has the possibility to individually interact with a piece while changing perceptual viewpoints, expanding visual, auditory, tactile, and motion-based experiences.

This active listener's participation in the creation of the artwork, instead of taking part in a hermetically closed artistic space and passive aesthetic experience, is already revealed in Wagner's oeuvre and Theatre in Bayreuth.

> The theatre – that is the totality of the building, the play, the performance, the actors and the audience – is a medium through which artistic and social perfection could be achieved. In Opera and Drama Wagner also accentuates the dynamic nature of the *Gesamtkunstwerk*, which is not seen as a static art form, but rather as an aesthetic (almost physically experienced) action. It is production and re-production at the same time (Lajosi 2010, 51).

For Wagner, music is specified with the active role of intermediation that binds together the different arts. But all kinds of art forms and mediums have equal rights on the stage and everyone is the creator of the artwork. In that sense, *gesamtkunstwerk* embraces the spirit of free mankind and opens new wide territory for creation. While in the Wagnerian sense it considers the individual arts subordinated to a common purpose within opera and theatre, in a post- digital era *gesamtkunstwerk* takes an even broader meaning, including a synthesis of any discipline, space, and time, and including digital tools manipulated by the creative human mind. What is in common for both meanings is the shift of thinking and vision of new socio-cultural reality.

A cross-disciplinary practice merging the roles of composer, sound engineer, performer, filmmaker, programmer, visual and conceptual artist, results in the concept of a transmedial composition. A transmedial work goes beyond the meaning considering the interfaces between media, their transmissions, interdisciplinary exchange, interaction of wide topics, media forms and schools of thought. The composer of transmedial composition considers the most recent areas in research in music, the arts, science and society.

> Because art serves the function of training man's sensory and other apparatuses for the reception of the new, then creative activities that hope to do justice to the imperatives of their time must explore the unknown rather than simply re-produce the familiar (Mogoly-Nagy 1985, 289-290).

Due to technological developments, the human perception of composing and perceiving music became productive instead of reproductive, broad and synesthetic instead of narrow and unidirectional. It is likely that audio and video processing are not independent in human perception and this is now considered even in wider disciplines. If, as listeners, we are able to describe or visualize what we hear, software fusion would prove to be able to realize that multisensorial vision and, in that way, to inform our own compositional intentions.

Instead of being creative laboratories, art institutions such as music conservatories must follow the rules and limitations of the old educational system that considers music up to the beginning of the 20th century concluding with Schoenberg. To get out of this comfort zone means to try new approaches and ways and to follow global changes. Music academies and conservatories mostly do not consider the computer a real instrument of our age, which is why future generations are probably going to be more interpreters or reproducers instead of creators. This institutional problem affects the transmedial sphere too, since sound is one of its fundamental constituent elements. A good example of the art institution that meets contemporary needs is the Institute for Music and Media at the Robert Schumann University of Music and Media based in Düsseldorf (Germany). It provides an environment

that combines artistic, scientific, and technical interests and offers a diverse range of studies (classical music courses, classical music recording and production, media composition, music and audiovisual media, visual music, music informatics (algorithmic acoustics, hybrid sound computing and expanded systems), music and text, sound and reality etc.). This is an institution that opens up the new space for innovation and experimentation and that allows students to follow their unique professional development as artists and creators.

//quit the server{s.quit};

> As immersive technologies expand and grow to mirror the sensitivity of our responsive energies, will the auditory arts delve consciously into these expansive sensory worlds? And in what ways? (Bernstein and Hatch 2001, 185)

To conclude, I would agree with Winner that "we do not use technologies so much as live them" (Winner 1977, 202). As I have illustrated, the concept of musical creation and performance has become reconstituted regarding to technology, since technology could analyze each of the components of a given activity and reshape it. New technologies are transforming the live experience of music:

> Because we are born into chains in nature, thus there awakes with the spark of spirit the idea of freedom over nature: the idea of technology. Every new invention is a new stage in the freedom attained by humanity through the progress of technology (Zschimmer 1917, 18).

The concept of a concert/exhibition became a one-time event, and every perceiver of modern artworks searches for the maximum of sensual experience. A spectral approach to sound has meant a broader perception of sound and music performance, which has led to the use of software enabling the further evolution of musical language. The use of the sound, space, light, images, chairs, words, movements, lamps, or neuroscientific invention as unified parameters for musical composition or as one common medium would not be possible without the synthesis of software and the human creative mind. This is an important matrix for the future artistic environment.

The interplay between roots and globalization, high tech and high touch experiences, the fusion of auditory, visual, haptic, and kinesthetic media, as well as artworks created with other media through interaction, participation, and collaboration in which the role of the artist is redefined; all leads to the postdigital artwork of the *Future* which is *Now*. It is clear that with the development of technology humankind is changing, and this global cultural change must result with a revolution in the humanization of digital technologies within the new creative processes.

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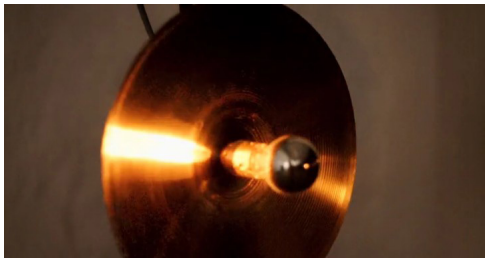
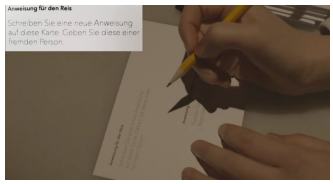
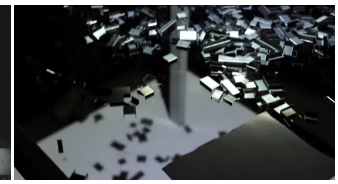
Appendix. Examples of experimental artworks

1. *Ich war die Wellen, doch dann sah ich sie an*. [I was the waves, but then I looked at her.] by Lambert Windges is the sound - light installation that takes the emergence, presence and disappearance of varying circumstances in a polyrhythmic structure as its theme. Lambert was inspired by the dualistic interpretation of various phenomena in our lives and in his work he describes a perspective that seeks to observe these phenomena and at the same time to uncouple them from their dualism through the neutral standpoint of observation.

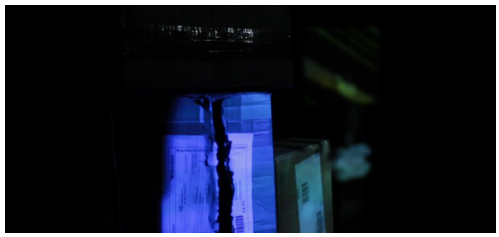
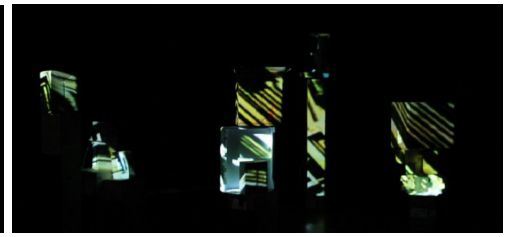


2. Eins and Viel (One and Much) is an interactive installation by Suhyun Park which she describes as "a granular playground consisting of rice, staples, instruction cards and algorithm." These materials, as well as two microphones and four speakers, encourage the audience to interact with the setup while each time the sonic and visual experience is different. The sounds recorded with the microphones are processed by an algorithm in SuperCollider and played over the speakers in real time.



3. *Paketzentrum 47* is the multi-channel sound sculpture with projection mapping by Lukas Truniger. It is inspired by investigations into the origin, manufacture and material composition of a laptop. In this process the starting elements of the work were: packaging material of entertainment electronics, images of the raw materials that are required to manufacture a laptop, and the recordings made by a mini-recorder that was forwarded in continuous operation. The sculptures were developed together with Katharine Hauke, student of the Düsseldorf University of Applied Sciences. For the technical implementation of the projection mapping and the multi-channel sound, a specialist system in the programming environments SuperCollider and Max/MSP was developed.

4. *av@ar* by Manfred Borsch is the interactive and audiovisual installation which focuses of the experience in the relationship between the individual person and their medial reflection. In a monitored closed circuit, dependencies and aesthetic planes of reference can be interactively experienced and controlled with the entire body. A catalogue of emotions is used as audiovisual communication material and initiates reflection by means of the systematic use of feelings. The dance with the medial mirror therefore opens a realm of experience in the field between the non-digital and the digital self – your own avatar.

5. The installation *Transformation in Sync* by Vincent Stange reflects the connection and separation of rooms. Both, the sound and the lighting play a crucial part in this installation. On February 14, 2018 Vincent Stange presented his sound and light composition in two floors of Filmwerkstatt Düsseldorf. The audience was exposed to equally strong auditory and visual stimuli. What they heard was converted to light and back again to sound. The central question in this study is whether a light composition can replace musical elements or whether it remains only a visual event.

6. *Spielraum* is the interactive installation with the aid of motion capture technology made by Sebastian Fecke Diaz, who investigates (im)moral texts and deconstructs them using granular synthesis. The title of the work refers to the process of playful discovery by visitors, in which their own body and its movements serve as the interface for sound control. The Kinect v2 depth-sensing camera transmits images to a large screen that make it possible to look at yourself in a new way from an unusual perspective. The installation deals with (im)moral texts at the audio level and encourages visitors to deal with their own individual, moral margin of freedom.

7. *HomocordiaDisapiens* is a transmedial performance, a future-oriented manifesto about human-technology collaboration resulting with improved social dis/order. This project should not be consumed as an absolute and passive art performance and it includes social dimension of participation by initiating an interaction between audience/performers, creators and

installations. The main idea was an artwork as a result of collaborative creating processes so beside myself, authorship belongs to Yannick Benavides, (project manager and movie director), Suhyun Park (audio installation), Sebastian Fecke (kinect installation), Paul M. Reyes (face morph installation), Leon Eckard (VR installation), Lambert Windges (audioreactive light installation), and Yuni Hwang (stage design).

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THE HUMAN *STILL LIVES*? TECHNOLOGY, BORROWING AND AGENCY IN THE MUSIC OF NICOLAS COLLINS

Abstract: This paper considers aspects of late 20th century experimental music in a post-digital era, where DIY approaches of hacking now outdated digital technology have enabled new forms of artistic expression – namely, glitch and aesthetics of failure. More specifically, it will examine American composer Nicolas Collins' approach to hacking portable CD players as a means to imitate sound production methods of turntable artists from the 1980s, in such works as *Still Lives* (1992). The paper will then explore Collins' attempt to orchestrate this work for acoustic instruments using open musical notation in *Still (After) Lives* (1997). This discussion is viewed through the lens of musical borrowing, tracing Collins' material – a canzone by Giuseppe Guami – through its varying mediums and guises, highlighting the limitations of technology and notation as a means to rearticulate a musical fragment and the fruitful artistic avenues this opens. Through the examination of a musical material, the paper goes on to scrutinize the entanglement between human, material and machine agents. I propose that understandings of such practices might be extended from the post-digital to the post-human: a collaborative network of agentic 'things'.

Keywords: Nicolas Collins, post-digital, musical borrowing, new materialism, posthumanism, transhumanism, ruin

The following article is a revised version of a paper written at the Darmstadt New Music Summer School, July 2018. It was commissioned through the 'Technology in Music Book Sprint'[1], led by Dr Camille Baker, as part of the Defragmentation project on curating contemporary music. I entered this workshop with the aim of discussing the role of technology in a series of pieces by American experimental composer

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1 A summary of this residency, and the original manuscript, has been self-published by C. Baker < https://books.apple.com/us/book/id1461493311>.

Nicolas Collins. As the project developed, with discussions between interdisciplinary practitioners and thinkers, we as a group found overlapping interests in areas of New Materialism, Posthumanism and Transhumanism in relation to technology. Our overarching question became: "Where lies human agency?". I therefore wanted to further probe Collins' music with this query in mind. Furthermore, considering the aspects of musical borrowing in these pieces, this paper asks what light New Materialist theory might shed on the borrowed 'material': What is its *thingness*? What role does it play in the creative process? What are the limits and hierarchies of agency within material entanglements of artists and things, when engaged in borrowing? This article represents a provisional and experimental effort to reflect upon such questions.

Still Lives

In the early 1990s, Nicolas Collins began his DIY practice of hacking portable CD players in an attempt to imitate the virtuosic turntable techniques of '80s DJs (Collins 2009, 1). In *Still Lives*[2] (1993) such a device "suspends, re-articulates and draws out short 'skipping loops'" (Gottschalk 2016, 260) of a recorded source material, namely, the first nine measures of 16th/17th century composer and organist Giuseppe Guami's *Canzon La Accorta a Quatro*. Unlike similar artists' endeavours at the time, Collins tampers with the player mechanism itself rather than the CD and, consequently, we hear the resultant errors (Stuart 2003, 49). At the same time, a "single trumpet anticipates and suspends pitch material" (Collins 2009, 5) from the Guami source. The piece culminates with an extract from Vladimir Nabokov's autobiographical memoire *Speak, Memory* (1951), read by Collins.

Much has been written about the exploration by Collins and other artists of skipping CDs through the post-digital lens where glitch is not only a symptom of malfunction, but a mode of expression. Kim Cascone (2000, 12–13) understands such practice as "working beneath the… veil of the digital medium" and a shift in focus towards the detrital sounds. Cascone (2000, 12) argues that in such instances, the medium is no longer the message but rather the "tools themselves have become the message". The equipment we use to create and listen to music – whether digital or analogue, software or hardware – has become inseparably ingrained into the music itself. Ian Andrews (2002, 5) highlights the complexities of Cascone's argument and proposes that such practice might be understood paradoxically as both a rejection and perpetuation of the digital media hype, and as a technological movement towards transparency whilst entrenching a more powerful illusion of control. Whilst I sympathise with Andrew's survey of contradictions inherent to the post-digital, I am less convinced that, in the instance of *Still Lives*, the "glitch becomes the whole aesthetic at the expense of other content" (Andrews 2002, 5). Here, Collins'

2 Released on *Sounds without Pictures*, Periplum, P0060, 1999, compact disc. A recording can be found on the composer's website <http://www.nicolascollins.com/soundwithoutpicturetracks.htm>

borrowing of an existing music, and more specifically of a recording of a particular musical interpretation, adds another dimension to Andrew's argument.

This feature has implications on my reception as a listener. We might equate the Guami recording (a preservation or trace of a performance) to a photograph of an object. In *Still Lives*, we as listeners are invited to magnify and incessantly scrutinise the 'errors' and detritus – the digital failures – as if slowly and methodically perusing a small section of this photo through a cracked glass frame. This neither fully obscures nor detracts from our viewing of the photo, but allows us to focus more on the fractured qualities of the image itself and to look at the frame all the more – its material limitations, its fragility, its role in, and transformation of, our viewing. To address Andrew's notion of content, we'd have to ask whether the glitches obstruct the 'real' music, or whether the intact Guami extracts obscure the scratches. Or, whether a compromise might be achieved: placing significance not in abstract and aestheticized scratches, but in etchings made upon a *thing*.

Still (After) Lives

In *Still (After) Lives*[3] (1997) Collins orchestrates the aforementioned piece "with a chamber ensemble imitating all the CD artifacts – from looping to glitching – purely acoustically" (Collins 2009, 5). Set for an open configuration of string and wind instruments as well as vibraphone and narrator, players are presented with the pitch content from the first nine measures of the Guami *Canzone*. The score[4] functions "like a jazz lead sheet" (Duguid 1995) where the conditions with which the performers are to interpret these in terms of rhythm and timbre are underdetermined in the notation itself. Whilst Collins' written instructions for instrumental techniques, pitch detuning and rhythmic divergence might not achieve the direct sonic imitation of the digital failure as explored in *Broken Light* (1992), we're reminded that players cannot "'be' a skipping CD player" (Duguid 1995). Instead, Collins' instructions hint towards a mode of performance that invites a human and new articulation of the same process that occurs in the earlier instalment. The Nabokov text is once again presented at the end of *Still (After) Lives*.

In his re-purposing through notation for acoustic instruments, Collins pursues an increase in risk and the potential for glitch in the human performance. As Tim Rutherford-Johnson suggests, the aesthetic of glitch is not confined to electroacoustic music, but also manifests in the realm of the acoustic, in earlier practices such as Helmut Lachenmann's *musique concrète instrumentale* and the "negative space" that exists in the periphery of "'good' sound production" (Rutherford-Johnson 2017, 203–204). Whilst Collins clearly inhabits a very different sonic and aesthetic world to Lachenmann, there is a comparable attempt here to achieve a form of failure in how

3 Released on *Sounds without Pictures*, Periplum Records CD (1999). A recording can be found on the composer's website <http://www.nicolascollins.com/soundwithoutpicturetracks.htm>

4 The score can be found on the composer's website <http://www.nicolascollins.com/texts/stillafterlivesscore.pdf>

the ensemble interacts and combines. Such attempts also characterize the practice of Austrian composer Bernhard Lang, whose extreme employment of repetition in the *Differenz/Wiederholung* series (1998–2013) coincidently also references DJ culture. Collins' performance instructions encourage improvised variations in rhythm, rests and beating dissonances, leading to a desynchronised and dense hocketing texture. Collins admits a desire to "pull [him]self back" (Duguid 1995) and explore the "break point" (Collins 2011, 4) of an instrument. We might understand this latter point in terms of Lachenmann's 'bad' sounds, or how a Baroque instrumental texture is 'wrongly' re-assembled. Collins goes further to say that "hardware does a better job of giving voice to the irrational, chaotic and unstable" (Collins 2011, 6). Of course, this is the case with the tinkered CD player, but we might also understand Collins' reference in terms of acoustic instruments and human performers. We might therefore recognise this second instalment as a continued pursuit of this endeavour.

Moreover, I am interested in relating *Still (After) Lives* to Cascone's conception of the post-digital, not only in terms of glitch as a mode of expression, but also with regards to the limitations of a piece of technology. I would argue that we should not understand Collins' transcription of the digital sonic expression into musical notation as a championing of the latter in favour of the limited and failing former. Rather, if we view notation (or writing more generally) as a technology in itself, as proposed by varying anthropologists and discussed by Tim Ingold (2007, 127–142), we might understand *Still (After) Lives* as a fruitful exploitation of the failures and limitations inherent to notation as a medium. Or, to put it another way, a delighting in the dysfunctionality within the "functionality of code" (Collins 2011, 4).

Furthermore, Collins expands upon the definitions and properties of hardware and software and their respective correlations to acoustic instruments and a musical score. He proposes that:

> acoustic instruments are three-dimensional objects, radiating sound in every direction, filling the volume of architectural space… Electronic circuits are much flatter, essentially two-dimensional. Software is inherently linear, every programme a one-dimensional string of code (Collins 2011, 3).

Although Collins is clearly referring to each medium's physical dimension, he goes on to relate this to Alvin Lucier's association between these dimensions and the resulting "sound's behaviour in acoustic space" (Collins 2011, 3). Whilst this point may be contested by those working in the domain of software-based music, I am less interested in whether this is strictly the case, and more that this was a motivating perspective for this project. Following such logic, we might therefore trace Collins' progression in the *Still Lives* series from the two-dimensional circuitry of the CD player, to a very different two-dimensional system in the form of music notation (the encoding of binary axes via harmony and counterpoint), to the three-dimensional realisation of this circuitry using acoustic instruments. Mindful of my own practice

as a composer, of correlating degenerated borrowed material to architectural ruins, I am compelled to understand this progression through sonic dimensional spaces to social-geographer Tim Edensor's description of sensual experience in urban environments. Edensor distinguishes between the smooth and sterile state of the modern city (either through an overloading or numbing of sensual experience) on the one hand, and the stimulating, multi-textural and delightfully chaotic experience of ruinous spaces on the other (Edensor 2007, 218). Whilst such a bifurcation does not account for more ambiguous liminal environments that exist between these two extremes, I find this metaphor useful. The *Still Lives* project sees Collins attempting to move away from the smooth realm of the functioning digital compact disc and instead inhabit a sonic space that is irrational and unstable, an entanglement of in-between territories: a musical ruin.

I now return to the photograph analogy. I wonder if in the case of *Still (After) Lives* and the production of a score, Collins has drawn a crude outline based on the fragmented perspective gained from the earlier instalment. The performers, like Cageian colourists (Cage 1973, 35), are then asked to fill in these blueprints and illuminate the captured object using broadly prescribed but underdetermined tools: swatches of each shade upon the palette. We as listeners then bear witness to this haphazard process of pigmentation and peruse the wonderfully fractured and fractal canvas that is unveiled.

Musical Borrowing

But what is the subject of this illustration? What are its composite layers? Certainly, as Andrews suggests, the glitch aesthetic forms part of its content, but Collins' engagement in musical borrowing adds a problematic factor. The Guami source is an equally important component of the *Still Lives* series. So, the 'photo' also depicts referenced musical material. But then we ask, what is the nature of this material, its thingness? Here, I find composer Richard Beaudoin's discussion of iterative musical borrowing useful. In discussing his own *Études d'un prelude* in which he manipulates a specific recording of Chopin (coincidentally, also through translations between digital and notational media) by pianist Martha Argerich, Beaudoin (2010, 102) describes the borrowing of a musical recording as "hearing triple". Beaudoin proposes that a performance of his *Études* reiterates the accumulated creative acts, interpretations and commentaries – or, 'hearings' – of the original composer, the recorded performer and Beaudoin's own. In the case of *Still Lives*, a particular performance of the Guami *Canzone* is borrowed, the traces of which are pinned down in reproducible permanence through the use of technology. We might therefore understand Collins' manipulation of this distinct material in *Still Lives* as similarly hearing triple, and his repurposing in *Still (After) Lives* as hearing quadruple i.e. the notated Guami, the original performance and recording of this, Collins' first interpretation in *Still Lives*, and his ensuing reading of this in *Still (After)*

Lives. Alternatively, we might understand the latter instalment as an alternative third hearing, running in parallel to, rather than in succession from, the former. What we are dealing with then is a composite material, whose individual elements consist of the iterative and divergent interpretations of traces of performances that once occurred. The anonymous recording and its quirks are passed like delicate artefacts between the various renditions and media, demonstrating the "fluid nature of the digital environment" (Rutherford-Johnson 2017, 96): a function composition.

What is the reach of such fluidity and the boundaries of the environment it inhabits? What are the limitations of any piece of technology, be it a CD or scored notation, in rearticulating traces of a musical fragment? José A. Bowen (1993, 141) understands such reconstitutions as "merely spatial representations" and "not the temporal musical work". Such a reading would prioritise the Guami work – the source 'material' – over its translations. I would argue that the work aspect of the *Still Lives* series resides precisely within the mode of translation as material in itself and shifts the emphasis to the relations between material configurations. Whilst Collins admits a desire to de-base discussions around representation in the art world (Conrads 1997), he demonstrates an awareness of (and perhaps a concern with) the anxieties around borrowing and reproduction in the libretto to *It Was a Dark and Stormy Night* (1990) for chamber ensemble, electronics and voice. Collins asks (using texts by art historian Susan Tallman and author Peter Dickinson), in the instance of photo-reproduction where there is "no difference in substance" to the original, "How do you even know what is true and what is not? How do you distinguish between real memory and invention masquerading as memory?" (Collins 1990, 5). Perhaps now the following Nabokov extract included in both *Still Live* and *Still (After) Lives* begins to assume greater poignancy:

> I see again my schoolroom in Vyra, the blue roses of the wallpaper, the open window. Its reflection fills the oval mirror above the leathern couch where my uncle sits, gloating over a tattered book. A sense of security, of well-being, of summer warmth pervades my memory. That robust reality makes a ghost of the present. The mirror brims with brightness; a bumble bee has entered the room and bumps against the ceiling. Everything is as it should be, nothing will ever change, nobody will ever die (Nabokov 1999, 56).

Whilst Nabokov invokes a Proustian involuntary memory by appealing "to the reader's [or, in this instance, the listener's] memory through… evoking a multisensory tableau" (Rodgers 2018, 40–41), Collins (2011, 6) specifies that an engagement with "'outmoded' hardware is not always a question of nostalgia" but a renewed interest in its fallible qualities. Such practices needn't seek to return to the irrecoverable days of the device but might creatively engage with the sonic imperfections that led to its decline. We might therefore agree with Phyllis A. Roth's suggestion (2014, 53) that, in the instance of the above extract, "Art… redeems from time what would

otherwise be lost. Everything is as it *should* be". Collins' employment of the Nabokov text in both instalments of the *Still Lives* series suggests a wry smile in the face of the failing hardware and ambiguities of music notation, as well as the new 'mis-hearings' of the original Guami recording they allow. In this sense, as with Roth's (2014, 53) description of Nabokov, Collins' "complicity in the temporal – indeed… his complicity with death – is, on one level, absolved". Perhaps we not only have to accept that the employment of *any* technology to rearticulate the trace of a musical fragment is inevitably insufficient and perhaps work-destroying, but, exactly because of this, it is the only means of doing so.

Where is the 'Human'?

However, should we grant absolution solely upon Collins? Much of my discussion so far has focused upon materials – both in a musical sense, and objects such as the CD player. Do such matter also play a role here? Where is the 'human' and how does this correlate to machine (non-human), human (both composer and interpretative performer), posthuman and transhuman notions of agency? I will now couch the *Still Lives* project within the discussion of New Materialism in order to further probe the identity of the 'material' and the role of 'technology'.

In the first instance, we might look at Collins' choice of the Guami 'material' through the varying perspectives on what role matter itself can play. Whilst I sympathise with Andreas Malm's (2018, 83) scepticism towards a scenario where "the humans in question had no agency *qualitatively different* from… all the other materials present", I am also attracted to Jane Bennett's conception of vibrant matter. Bennett (2010, viii) proposes that materials "act as quasi agents or forces with trajectories, propensities, or tendencies of their own". This opening up of hazy definitions may perhaps resonate more with those who work with seemingly inanimate matter in their practice where the material has its own disposition, and leads as much as it is moulded. Whereas one might say that Collins chose the Guami recording to work with, we might also acknowledge that Collins, similarly to Beaudoin (2010, 103), was "accosted by the sounds", and that the original recording – its particular traits and its behaviour within the hacked player, i.e. its thingness – suggested itself for borrowing. Suddenly, the capacity for influence beyond that of the human's is extended.

In the second instance, we turn to the hacked CD player as an agentic object. Collins (2011, 5) describes such hardware as being "constrained in its 'thingness'", and the process of hacking, tinkering and meddling as a means to explore the "implications present in a piece of technology" (Conrads 1997). So, it is not merely a case of Collins utilising the sounds of glitch, but unmuting the CD player's capacity to articulate its *own* idiosyncrasies through sound. Collins (2009, 2) further supports this proposition by suggesting that the machine explores "its own automatic variations of the CD" – its own re-articulation of a musical utterance –

and "chose that time to get stuck" (Walters 1995). The CD player, then, becomes an object capable of its own mode of expression and plays an active role in our 'hearing triple' of the borrowed Guami.

Before we applaud our singing CD player, let us now reintroduce our human actants to the scenario and consider *Still (After) Lives* through such a lens. In *Still Lives* Collins begins a dialogue with the non-human and is receptive to what it has to say. He then intervenes and translates this information into notation, itself a form of technology: another object with its own system of code, its own suggestions, and its own disposition. Following Micheal Sean Bolton (2014, 19), we might understand Collins, through such actions, as a "decentered posthuman subject: a subject created and re-created through interactions and interfaces with and within systems of information flow"; Collins occupies multiple nodes in his own network, each with their own role and varying hierarchy. Later, sentient beings in the form of instrumental performers are asked to interpret the notation of *Still (After) Lives* and engage in this flow of information. Such nodal hierarchy surely complicates any notion of performance practice that might be established or called upon within this series. For instance, it would be interesting to know what voice (if any) Collins might have in a rehearsal process, in which case another node of influence and shift in hierarchy would be established. Finally, the human subject can reclaim its own agency, its own means of expression, and have the final say in our 'hearing quadruple'. However, this triumph is complicated not only by Bennett's (2010, 4) suggestion that "we are also nonhuman", but also by N. Katherine Hayles' (2005, 175) conclusion, following Guattari, that "the human has been mechanical all along". Our performer, then, is but another piece of technology, an example of Cary Wolfe's "prosthetic creature that has coevolved with various forms of technicity and materiality" (2007, xxv). Its (rather than *their*) capacity to freely express its own artistic will is but a back and forth signalling of information in a chain of vibrant things.

However, I am reluctant to completely let go of our artistic 'human' agent. I cannot fully relinquish my listening of the *Still Lives* series to a circuitry of information processing. I still find the photographed object, in all its fragmented guises, beautiful to behold. Rather, I would like to reassess Collins' role as the composer. For, following Andreas Malm (2018, 93), we might reconsider that "the agent is the person who instigates the sequence" and that Collins' decision to hack the CD player and insert the Guami recording in the first place gives him agentic seniority. That is not to say that any performance of *Still (After) Lives* will fit neatly with what Collins had initially intended when he picked up the soldering iron. Rather, we might remember that Collins "is a material being situated in a fully material world" (Malm 2018, 95), and with the *Still Lives* project, "unleashes a chain of events that are [his] doing, although not one with [his] initial goal" (Malm 2018, 94). Indeed, if we can broaden our scope of this chain of events, we might even recognise the agency of Giuseppe Guami and the initial dictation of the *canzone*, with which he "has done something [he] had never dreamed of" (Malm 2018, 95).

The *Still Lives* series provides a case study through which to broaden the definitions of what we consider technology and human, and perhaps for these categories to overlap and blur. For myself as a composer, listening to and thinking about this music has allowed me to reflect upon my own and other practices of musical borrowing. I admit that the need to designate agentic seniority is a personal endeavour that perhaps demonstrates a bias towards the composer, though I would prefer to reword this as a sincere interest in the process undertaken by an individual in conjunction with an appreciation of the resulting product. I see Collins' process and the *Still Lives* series as an invitation to practitioners engaged in borrowing to further scrutinise the 'material' that is appropriated, and to be receptive to the ways that it works upon us in return.

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THE HUMAN *STILL LIVES*? TECHNOLOGY, BORROWING AND AGENCY IN THE MUSIC OF NICOLAS COLLINS
(summary)

This article considers aspects of late twentieth-century experimental and postdigital music, where Do It Yourself (DIY) approaches of hacking digital technology enabled new forms of artistic expression – namely, glitch and aesthetics of failure (Cascone 2000). More specifically, the paper will examine American composer Nicolas Collins' creative practice of circuit bending the portable CD player in *Still Lives* (1992). It will be shown that Collins' borrowing of an existing music – nine measures of a canzone by composer Giuseppe Guami – complicates prevailing discussions of such music solely through the lens of the postdigital. The article will then explore Collins' orchestration of this work for acoustic instruments using open notation in *Still (After) Lives* (1997), going on to show that such work demonstrates the pursuit of glitch as a potential in the human performance, as well as the exploitation of the limitations inherent to notation as a medium. In doing so, the article explores Collins' conception of each medium's physical dimension and goes on to relate the transition between sonic 'spaces' to social-geographer Tim Edensor's (2007) description of sensual experience in urban environments.

The paper will then further scrutinize Collins' practice of musical borrowing – more specifically the borrowing of a recorded performance – and relate this to composer Richard

Beaudoin's (2010, 102) conception of "hearing triple". By exploring issues of re-articulation, representation and memory, the article will then analyse Collins' quotation of Vladimir Nabokov's autobiographical memoire *Speak, Memory* (1951) in the *Still Lives* series. It will show that the employment of any technology to rearticulate the trace of a musical fragment is insufficient and even work-destroying but, as a result, it is the sole means of doing so.

Through the examination of a borrowed musical *material*, the article will then explore the Still Lives series in relation to theories of New Materialism, Posthumanism and Transhumanism, scrutinizing the entanglement between human and non-human agents. The paper will firstly explore Collins' decision to borrow the Guami canzone, before framing the composer, the hacked CD player and the instrumental performers as agents within a nodal and collaborative yet hierarchical network.

The paper concludes with a personal reflection on the *Still Lives* series in relation to my own creative practice. I suggest the series is an invitation to artists engaged in borrowing to further scrutinise the 'material' that is borrowed, and to be receptive to the ways that it works upon us in return.

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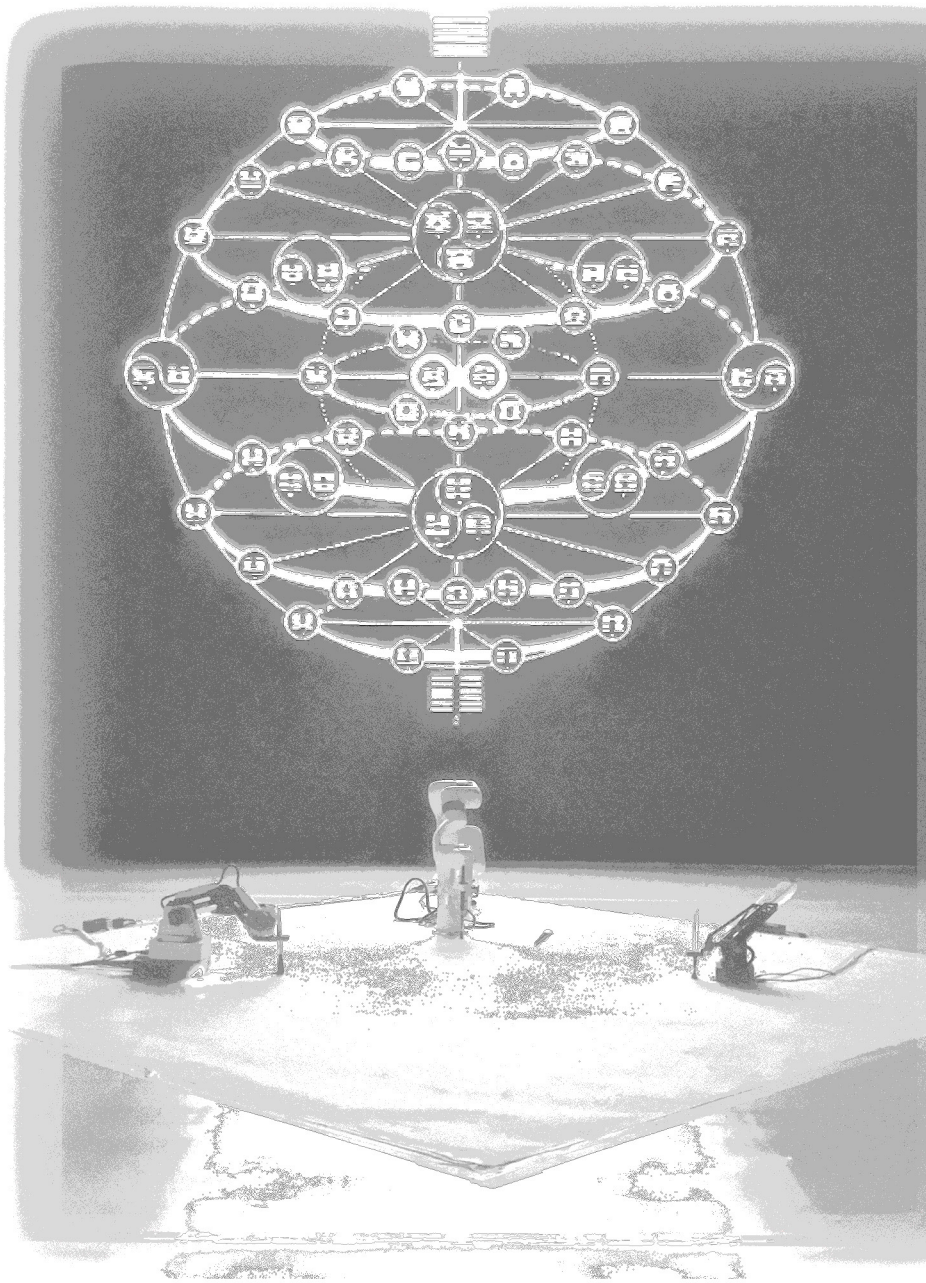
Beyond the Main Theme



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COMPOSITION AND NOTATION OF PARAMETERS IN ELECTRONIC MUSIC: APPROXIMATE REDUCTIONIST GRAPHICAL NOTATION

Abstract: Music composition today present a challenge for every composer, student and professor. In addition to the huge amount of information and technology that are part of modern composition, there are different approaches to the usage of notation within various forms of information and technology. This paper is based on the definition, role and application of notation in compositions. It attempts to define and explain a different, specific approach, which helps in understanding the technology, its applications and features to meet the problems of present compositions by using specific notation for electronic instruments or computers. The paper contains three sections with additional information on the problems, the different types of notations, and the possible solutions. The final result is the description of a connection between the electronic parameters of different instruments and the composition through the ARGN approach (Approximate Reductionist Graphical Notation), which is achieved by means of notation and composition of the parameters of electronic instruments. The ARGN approach contains elements of artistic and theoretical practices based on an interdisciplinary perspective; of the composer, engraver, performer, and improviser, which today represents a profile of a contemporary composer.

Keywords: composition, parameters notation, electronic music, sound synthesizer, sound modulation[1]

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1. PROBLEMS AND PROCESSES PRESENT IN NOTATION OF PARAMETERS OF ELECTRONIC INSTRUMENTS

Parameter notation is a serious challenge due to the connection between notation and parameters, which leads to the complexity of the notation itself. It is almost impossible to find a universal and unified solution that would eliminate the problem present within notation for electronic instruments. However, by researching musical texts of relevant compositions that contain similar content, it is possible to identify some individual solutions of the authors themselves. The solutions offered by various composers of contemporary art music for acoustic, electro-acoustic, and electronic instruments in their works should be landmarks for creating an individual system of musical notation. By researching different compositions related to electro-acoustic music, computer music and live electronics, it is possible to come up with some favorable solutions for creating individual notation models. Individually, each work has its own peculiarities in the structural sense, as well as in the arrangement of instruments, and even in the connection of these factors. If we are discussing analog modular instruments, then the approach is completely different from that of performing electronic instruments. The parametric network itself among the components or modules can be pre-determined in the legend, which is a good starting point for the practical performance of operating objects that represent the parameters of the parametric grid. More precisely, we can use objects, in terms of related parameters-driven modules, that can be graphically represented in a musical text.

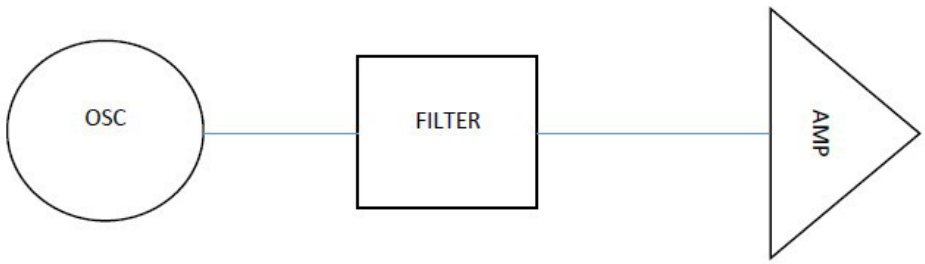

Figure 1. Graphic presentation of the basic elements of electronic music.

Graphic visual presentation is necessary for clarity, which is important for the quick reaction of musicians. Simplified: a circle represents an oscillator, a square a filter and a triangle an amplifier. This approach, through different geometric shapes, allows direct connection to controllers. However, the problem with this type of notation is the inability to change the connectivity of fixed component arrangements. The reason for that is the previous arrangement of the modular grid in the legend of the composition. Simple software that can edit parameter values can help in the further process of finding the most efficient solution.

Positronic Rhythm

Oscillator 1 Wave: Sawtooth Tune: -2 oct Mix: 0dB 100% Oscillator 2 Wave: Square Tune: -1 oct Mix: 0dB 100% Osc 2 Track: on Osc 2 Sync: off	LFO Routing: LFO routing and depth – Pich osc1, osc2 = 7 semitones; PW osc2 = 100%	Low-pass filter Cutoff $\frac{24\ dB}{165\ hz\ 30\%}$ $\frac{12\ dB}{165 hz\ 30\%}$ Resonance: 45% Envelope: 100% A 3.30s D 4.00s S 0% R 2.90s
Noise: off Mix: -	Glide: off Time: - Unison: off Voices: multi	Amplifier A 0s D max S 100% R 0.80s

Figure 2. Representation of the written sound program of the sound *Positronic rhythm* (Welsh 2006, 109).

As shown in Figure 2, the elements of sound synthesis are separated by fields of squares. Between them are modulators. The controllers are in the element and modulator sections. The parameter used by Welsh contains a unique scale in percentages, combined with time and quantity designations. This system is taken from the old system of sound programs (patch) for subtractive synthesizers (Pinch & Trocco 2004, 192). Observing the simplicity of interface programming, this system of parameter notation meets the requirements related to simplified modulations that do not contain too many modulators and modules. A problem arises, however, with complex modulations and complex connected systems which require more efficient notation. Combining the recording of live electronic and acoustic instruments creates even further problems with notation.

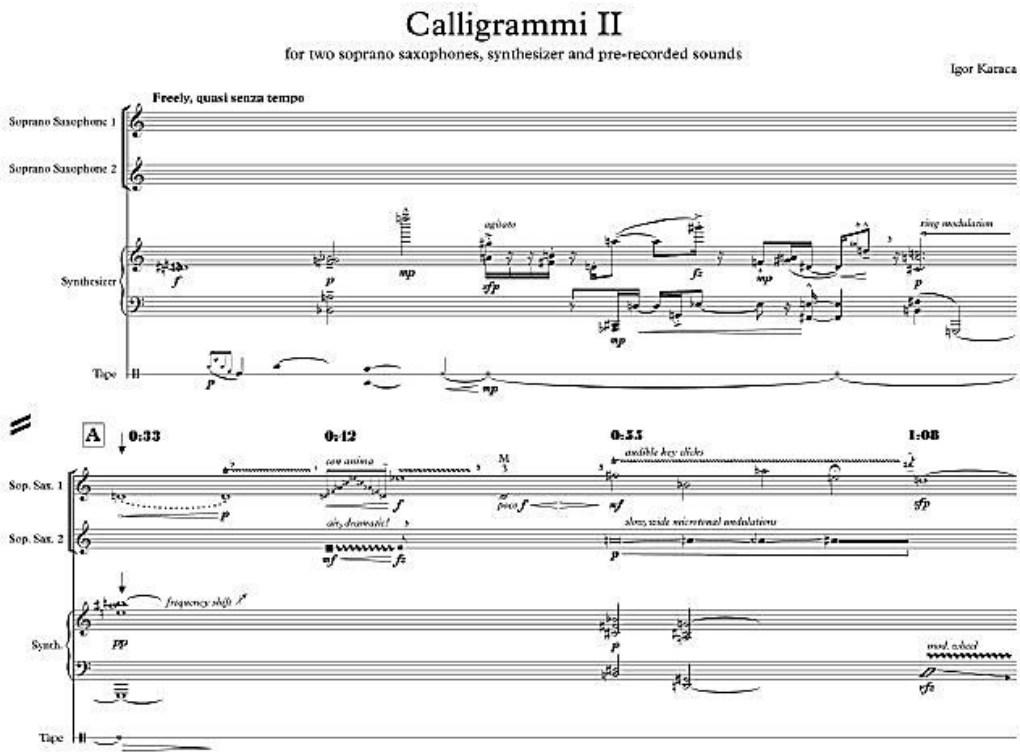

Figure 3. *Calligrammi II* by I. Karača (Karača 2012, 1).

One solution is shown in Figure 3, which could solve the problem of regulation of recorded electronics (tape) and acoustic instruments in a musical score. Karača solves the problem of notation by marking the most important elements of the electronic recording, reducing these only to time regulations in relation to the performances of musical gestures. Through certain time intervals, the intrusions of acoustic instruments are defined precisely, enabling a consistent performance. Karača's time code is a simple and functional solution that can be applied to the notation of electronic musical parameters for live performances. This notation of time through a reductionist approach to the dynamics of parametric changes can serve as a model for the musical notation of musical syntheses in electronic music. The notation of the synthesizer is concrete and refers to the clear requirements of the composer. The notation of complex modulations for a synthesizer, however, requires the principle of combining several notation examples, where the mentioned composition helps to find a solution with a reductionist model of electronic recording notation. Complexity and efficiency are the greatest torments for composers because they are the natural enemies of musical notation. It is almost impossible to find an appropriate solution in terms of a universal approach to this problem. The only possibility is to find different models that would correspond to the conceptual solution of notation parameters.

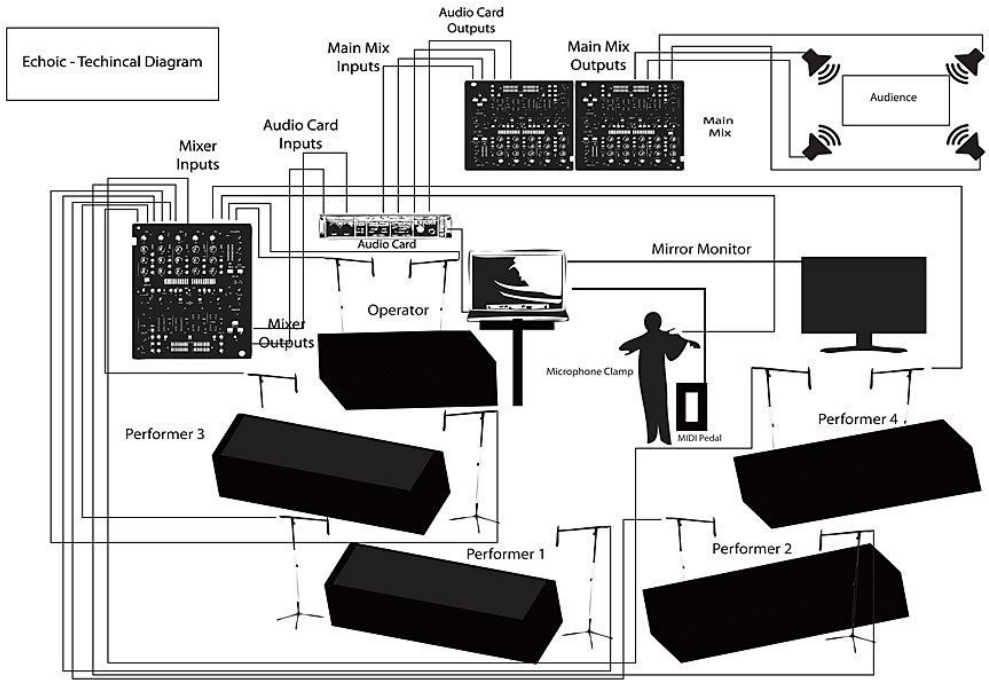

Figure 4. Technical diagram and disposition of performers, instruments and musical equipment for composition ECHOIC by E. Barroso (Barroso 2012, 4).

An example is the pictographically marked arrangement of instruments and electronics on stage. This way of marking is to determine the elements of the system in the legend of the musical text. Electronics (all electronic instruments and their means) require a specific disposition, as otherwise, the composition may be misinterpreted. Barroso solves this problem with the traditional approach found in K.H. Stockhausen in the composition Mixtur back in 1965. In this composition, in addition to acoustic instruments, Stockhausen also uses oscillators, amplifiers, and ring modulators that are connected into a single system with instruments via a microphone (Read 1998, 237). Thus, notation refers not only to musical parameters, but also to all descriptive elements that represent an important factor for the realization of the work. A disposition on the connection of sound synthesizers with other instruments or electronic modules is necessary information. This information provides a clear picture of the relationships and positions of the instruments, which can serve in shaping the musical score of the parameters of electronic instruments. Notation of parameter, for live performances, is another problem in the mosaic of information for notation, which requires careful planning and clear descriptions. The instructions necessary for performance should be concise and clear. In addition to all the complex relationships, modulations, and parameters, it is necessary to take into account the clarity of the musical score.

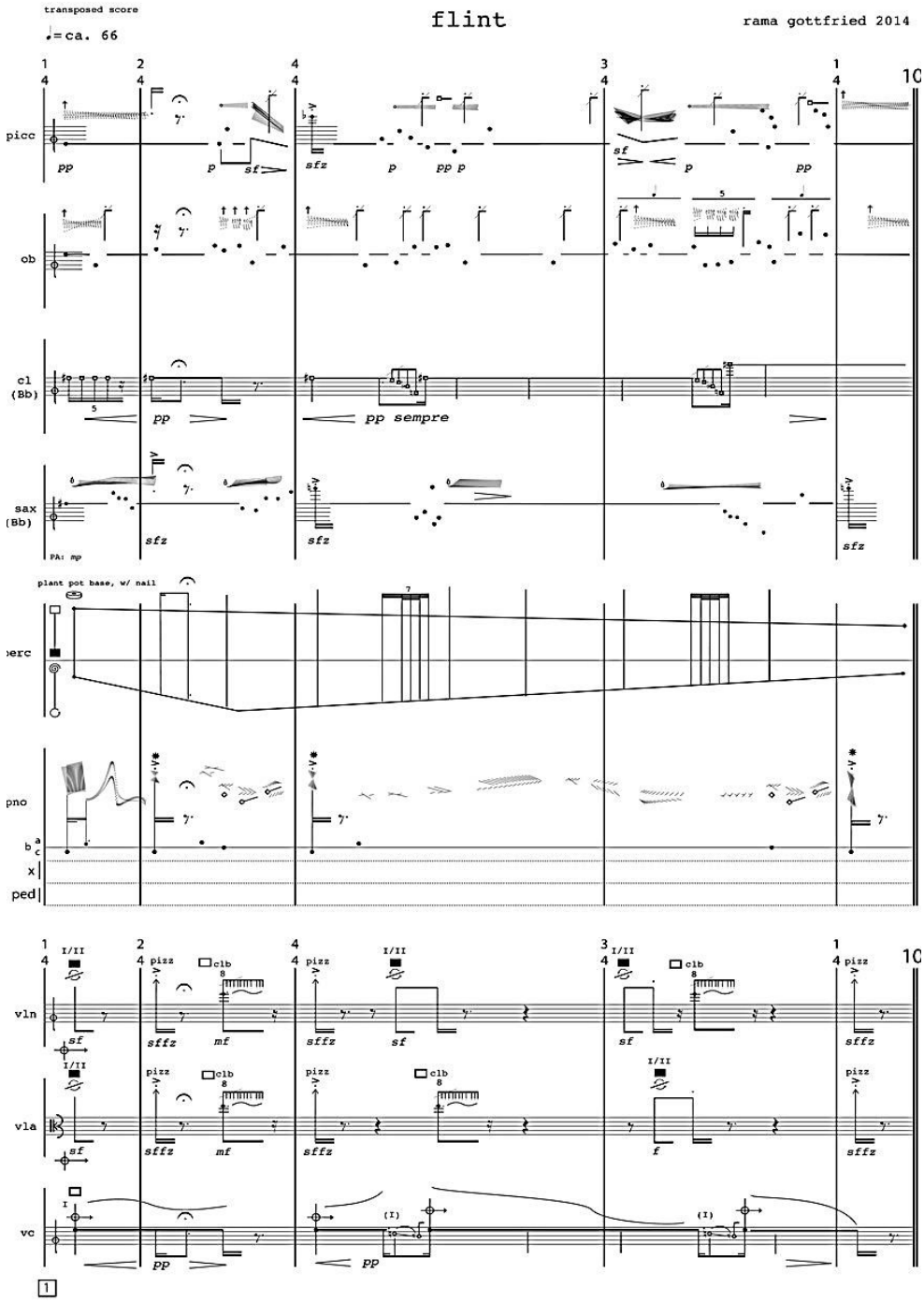

Figure 5. *Flint* by R. Gottfried (Gottfried 2014, 1).

This example of a composition Flint by R. Gottfried (Figure 5) is a simple, clear and graphically arranged musical score. In essence, in the legend of this work, all the relations and parameters of music are strictly determined and it is impossible to perform a work without its diligent and thorough understanding. Such a solution is not a simplification of musical parameters, but shows a possibility of a systematic approach to overcoming the problems associated with the complexity of artistic contemporary music. Although the above composition does not contain the instruments or parameters of electronic music, it nevertheless explains possible solutions to problems related to the logic of writing music in the 21st century. An important segment of the musical text of the composition Flint is the idea of musical manners, which are spatially arranged and determined. However, the control of electronic music parameters again requires other solutions.

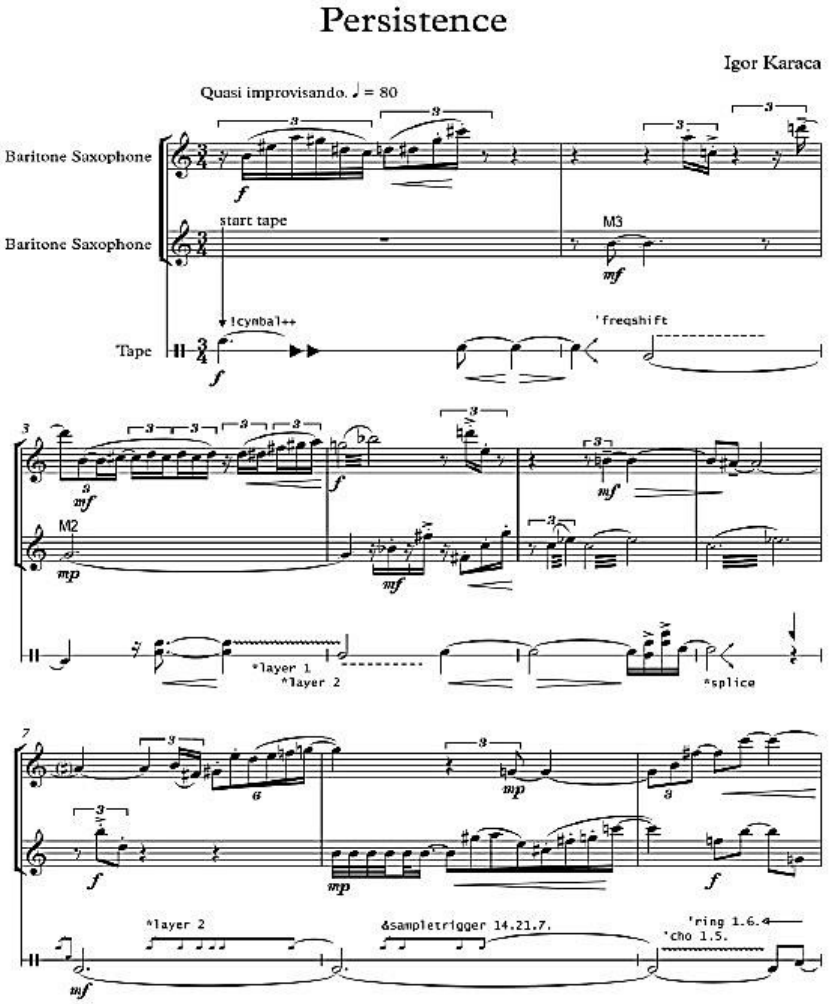

Figure 6. *Persistence* by I. Karača (Karača 2014, 1).

Karača's composition (Figure 6) was written for two baritone saxophones and a tape on which electronic music was recorded, but it contains an important segment that can offer a solution for notation of parameter. As can be seen from the music text, the operations contained in the tape are marked. These operations are also precisely rhythmically and manneredly notated to enable easy reading. This approach marks an important segment in solving the problem of notation of parameter. It is necessary to observe the notation of live electronics in order to apply changes related to parametric controls and their regulation in real time.

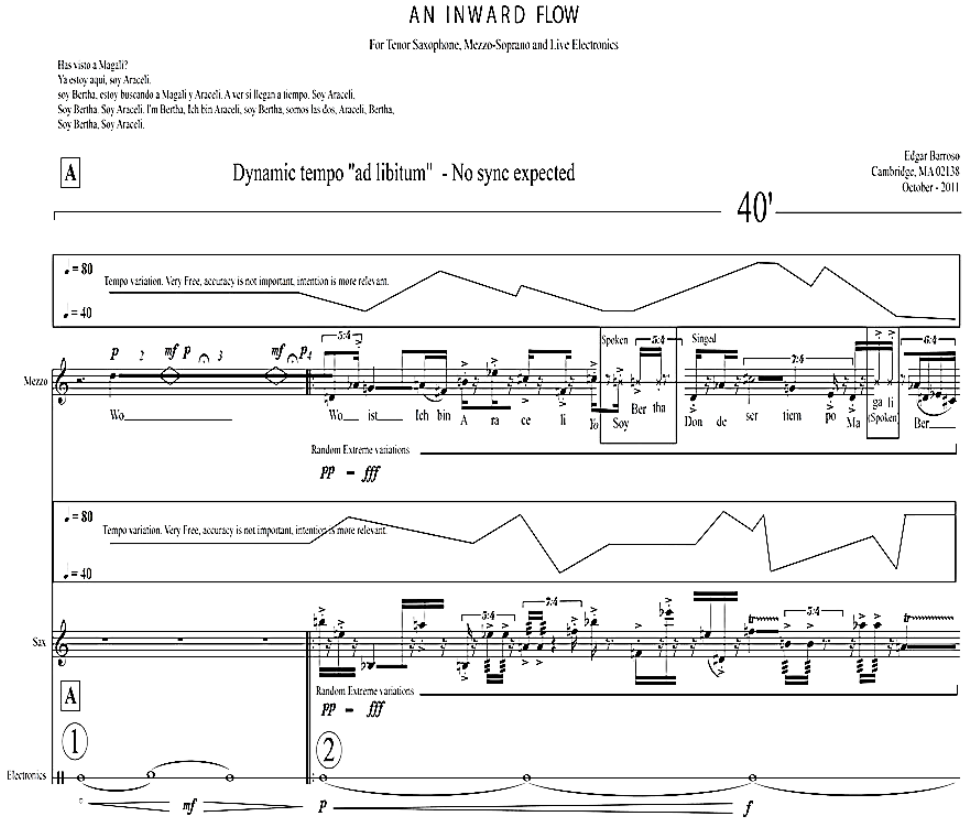

Figure 7. *An Inward Flow* by E. Barroso (Barroso 2012, 1).

It is possible to notice that Barroso's composition (Figure 7) shows electronics reduced to a minimum amount of rhythmic values and activities. One important parametric regulation is that of dynamics and temporal fluctuation. By regulating these parameters, it is possible to generate a feeling of an increasing or decreasing pulse through rhythmic changes occuring in proportion to the tempo. Thus, with the shown examples, it is possible to construct a notation system depending on the requirements of the composer. The similarity in all the examples discussed above allows for a simplification in the musical notation of the parameters. The basic reductionist principle requires previous explanations in the legend of the work, as

well as a clear disposition of all instruments, gestures, equipment and other factors present in the musical composition. A general system however is not possible, due to parameters of the different instruments and the systems or way by which they are connected, the acoustics, and many other important factors. Electronic instrument components may be separately represented in the notation. An example of this can be found in I. Karača's *Persistence* (Figure 6). If it is actually a modular system, then the connection of all modules should be explained in the legend, however problems arise due to direct changes in the connectivity of the components in real time. This problem can be solved with graphically represented components shown in the Welsh table. Each component should contain a geometric shape and a label, yet a table of related components in live electronics, or examples with recorded electronics, should not be present in the performance score. This is due to transparency, and a spreadsheet system would only serve the purposes of pre-programmed sound textures.

Electronic music and notation

The basis and history of musical notation can be presented through gradual steps from acoustic to electronic music. Regardless of the medium, outcome, and manner, the notation of music contains similarities in their presentation and interpretation. While most modern compositions have been written under the influence of new technologies, there are similarities in the compositions for acoustic and electronic instruments. The most common applications that form the basis of modern notation are reductionist musical images shown graphically. Similarities can also be indicated through legends, a necessary feature in today's notation. The project is described through legends. The composition as well as architecture, or electrical engineering, requires a concrete translation of units and a clear standardization of their values. Parameter units are defined in four groups. First, is the percentage scale of values as by Fred Welsh. Second, is another scale of values presented by the same author, which is a parametric scale of individual parameter values. Third, is a value scale present in the MIDI protocol with its scale based on digital technology. This group defines all

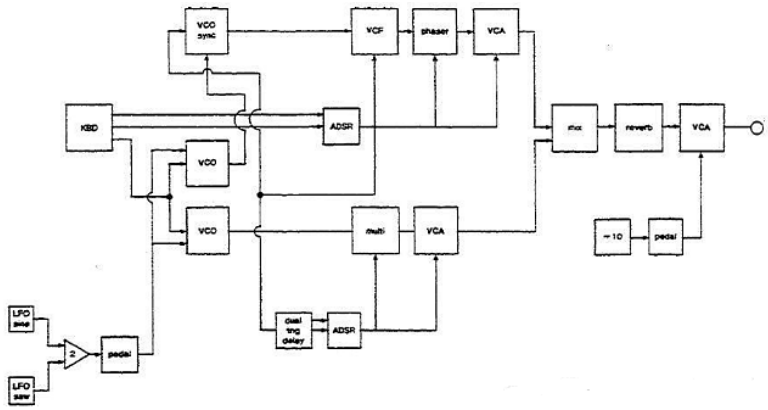

Figure 8. *Orion Rising* by M. Styls (Strange 1972, 252).

values in the range 0-127. The fourth group consists of parametric values expressed in the hexadecimal system, which is suitable for real-time implementation as this system corresponds to the potentiometers of the controllers. This can therefore form a concrete tool to act as the basis of the composition of parameters, which will be discussed in the next section.

The Aries 300 Music System is used in the composition shown in Figure 8. The diagram is constructed for a unique sound texture, in which the composer requires the prior use of an echo as a trigger and two control pedals. This graph, as pictographic information, has a precise function in the composition. The relationships of all the components and their connections make the interpretation of this composition possible. The whole work consists of several different diagrams, which represent its different phases. Thus, diagrams as a tool to composing parameters can be applied to larger parts of the composition of parameters through this example. However, it is necessary to define the required time, which is a key factor for the possible realization of the composition of parameters. Without such precise technical diagrams the realization of the composition within electronic media would not be possible. Thus, the diagram of connections, or connections of components, as well as the direction of signal flow is imperative for composing parameters. By describing the connections between the components and their orientations, it is possible for the composition of the parameters to follow. In the next section I will present a newer composition that applies the previous diagrams and, finally, a specific composition of parameters.

Rawlinson (Figure 9) composes parameters which are like instruments and are nomenclaturally organized into the score. In addition to this parametric organization, the composer uses time patterns marked at the top of the score. The composition is performed by one performer who has precise markings or notated gestures. With simple and sparse notation, it is possible to regulate all parameters. This composition is performed via tablets and, in addition to the explanations in the legend, the composer can add pictographic marks and their descriptions. The systematic approach to the compositional material allows the musical notation to be simple and noticeable, enabling the quick reactions of the performer. For any parameters that need explanation it is possible to apply this systematization directly to the legend. The legend must contain primarily a clear picture of the system being operated, the modules of the individual systems, and the notation of the parameters contained in the specific musical synthesis of the sound operated by the musical composition. The musical composition should control the system of electronic musical syntheses (unless for the purposes of experimentation) If there are several synthesizers present then it is necessary to emphasize their connections.

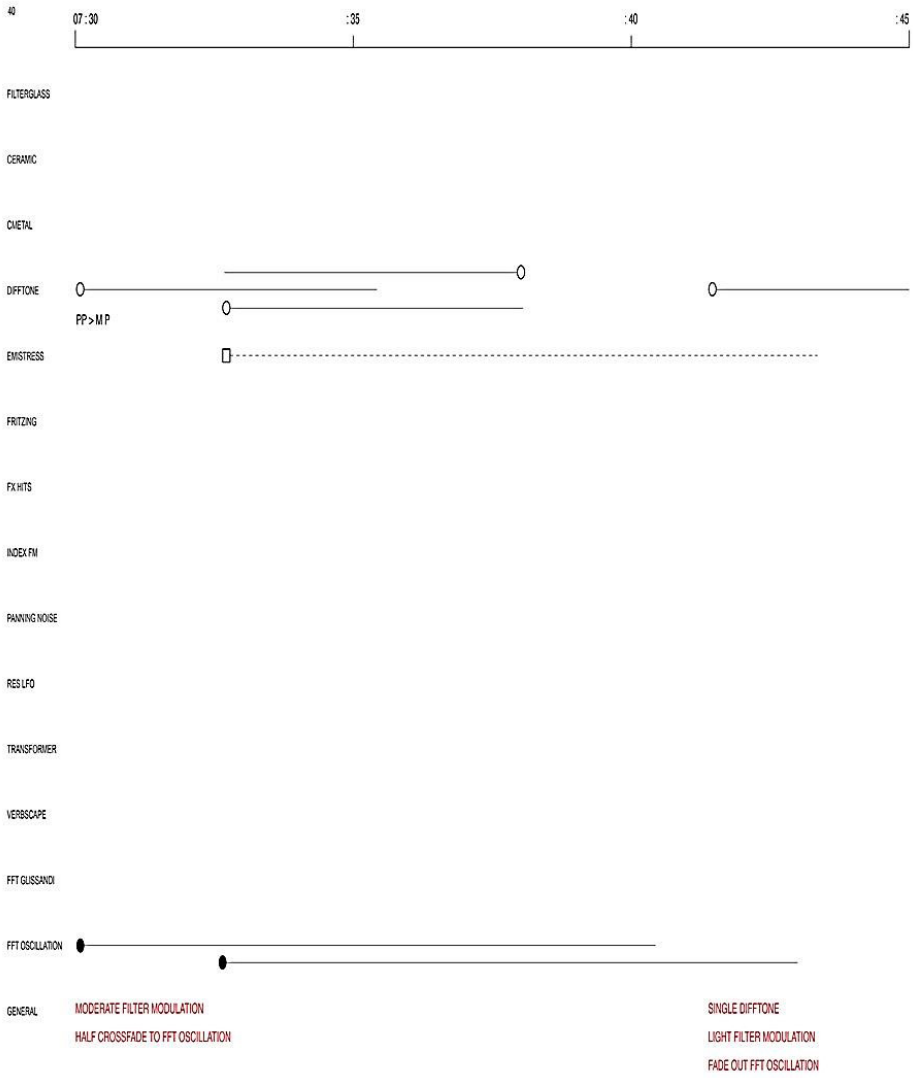

Figure 9. *Short Circuit* by J. Rawlinson (Rawlinson 2011, 40).

2. ARGN, POSSIBLE COMPOSITION OF PARAMETERS FOR ELECTRONIC MUSIC

Approximate Reductionist Graphic Notation, (ARGN) is a flexible deterministic music notation system that allows for applications of all determined procedures of sketching, designing, creating, and realizing both sound and composition with musical text. To understand this concept, it is useful to explain and connect the four words of the acronym. 'Approximate' as it enables the simplicity of the information space which is limited to the basic boundary points. This space is ruled by the performer and only the performer determines in the approximate description of

the score which value he or she takes, allowing for fast interactions with the flow of information. At the same time, performers are given space to perform better in the barriers of interpretive art rather than being presented with burdening information. This approach is imprecise, but it refers to the individual as a composer and thus achieves a more direct relationship to the work, or rather to the score, which is no longer just a set of rules but a source of possibilities and probabilities. The notion of inaccuracy should be better defined as a space of individual versus collective precision. So one can go a step further and realize that precision is a collective and unified virtue. This system offers unified imprecise precision because precision itself is only a quantization of time patterns.

'Reductionism', as another factor necessary for approximation, can be defined as a way of accessing written information. So the information is not only approximate but at the same time reduced to a minimum. This approach offers only reference points as a landmark in some unknown space, as coordinates. If you take a basic course that contains two known points (the start point and the end point), then it is easy to get to the destination. Everything that happens within these parameters or between them is a determination that belongs to the domain of time determinations, and the system of notation or written text itself has no purpose. The reason for this is the huge number of time variables that do not need to be managed, because things in that amount of possibilities and probabilities must be allowed and tolerated. Only in the way of defining waypoints with minimal time determinations can a music flow be realized in all situations more easily than with precise time instructions, as is the case in most musical scores. Reductionism does not refer to the denial of information but to the freedom of movement in the information network. Thanks to this approach, the interpreter can solve any situation present in the variables of time determinants, because the reduction actually forces them to carefully adjust to the time. Thus, reduction is related to the parameter of time and deals with its performances, which it does not overcome, does not anticipate, does not annul, but consonants with.

The 'Graphic' approach to notation has been known for a very long time. This third factor of ARGN achieves the unification of approximation and reduction. Thanks to the approximation, the graphic data is parametrically determined with the basic space, placed by reduction as an object in time space and not as an object with time determinants of size or duration, and the shape itself is reduced to a recognizable model in the score. This recognizability of the model is a graphical approach to notation which identifies the intention of the composer in real time.

Ultimately, the purpose that unites all three of these aspects is 'Notation'. Notation is a determinant of function and not purpose, so it itself acts as an equal with approximation, reduction, and a graphical approach. Therefore, this word is not at the beginning of the acronym but at the end, so that it would not have a primary function but a proportional value with ARG in the ARGN system.

Purpose of ARGN

All four approaches allow for much more than a quick reaction of the performer to the music text or for the ease of recognizing a music model or even the duration of information in time, which is visually clear but not limited to values, and thus creates security and willingness to react in time. Yes, essentially this notation platform makes a musician an artist and a composer, not merely an operator or technician. This idea actually has its roots in the author's RMC (Reductional Music Complexity) system which is designed for this purpose, but is more complex for performers than ARGN, as the time frame is more precise as well as the precision and complexity of rhythmic processes, which leads the performer to research before confronting composition. Why is it that this notation asks the interpreter for something more? Because the performer does not change the text in relation to unpredictable weather determinants such as the atmosphere of the audience, the temperature in the hall, the size and type of space where the concert takes place and the like. Another reason for this is the adaptation of the musical text to the person or the performer, this idea is not actually present in other deterministic notation systems. This factor makes a musician a researcher and a discoverer, but in real time. This is what actually makes freedom, that is, one's own relationship with time through artistic realization. Finally, this approach leads to a "pure" individual mimetic transfer of human imagination and energy to music. Pure, because few factors, parameters, or elements are represented in the mediator, or musical score (ARGN), between the artist and the performance. Yes, ARGN like any other notation system is an intermediary between artists (composers and performers) and performance. Finally, this notation basis is for electronic instruments because they contain a huge potential that also carries a large amount of information, so the necessity of such a system has emerged. Big information is not practical for performers. Information that programs and performs something is difficult to combine because it is not inherent in music. In contemporary artistic music practice, performers are expected to have a practical readiness and knowledge of the use of extended techniques of playing instruments. It would be very difficult to ask the same performer to tune, change, and compose instruments in real time while performing the work. In electronic music there is much more than the above due to the potential of modulation and parametrics, and it is not possible to ask the performer to alter their precision in the performance of works that contain these great possibilities in making and shaping sound.

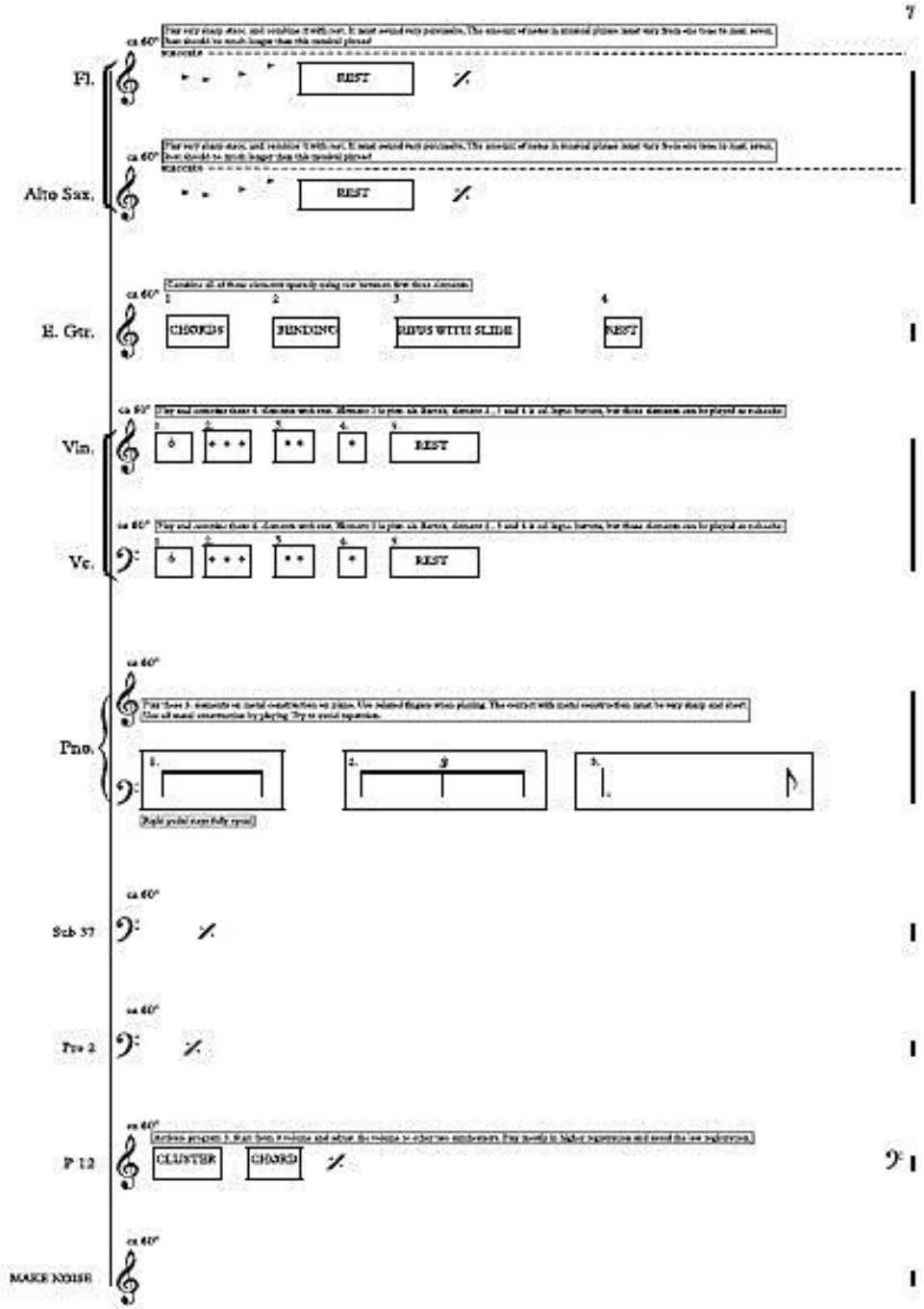

Figure 10. *Subtractive study for sound synthesizers and ensemble* by D. Rešidbegović (Rešidbegović 2016, 7).

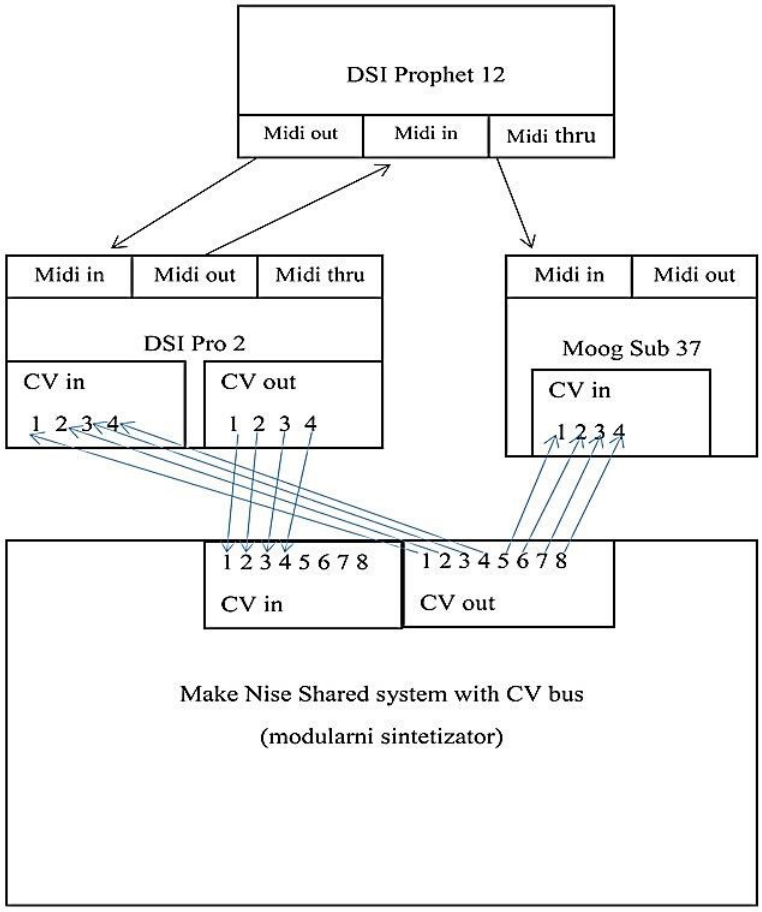

Figure 11. Hybrid system. An example of a composition legend for subtractive sound synthesizers.

Practical approach to composition and notation through ARGN

Figure 11 shows a system consisting of digital connections connected via MIDIA and analog via voltage control (CV). The system consists of hybrid synthesizers DSI Prophet 12 and Pro 2, and analog Moog sub 37 and Make Noise Shares system with CV bus. Of these synthesizers, Make Noise is an analog modular system, which is controlled by voltage control. It is necessary to point out here the connections with external components and audio signal outputs.

Figure 12, in addition to a clear picture of the output channels, also gives the disposition of the synthesizer ratio. As can be assumed, everything is adapted to one interpreter who is centrally positioned in relation to the instrumentation. Similar dispositions can be found in different works written for percussion instruments or Multi percussion, which implies that one performer operates with multiple instruments.

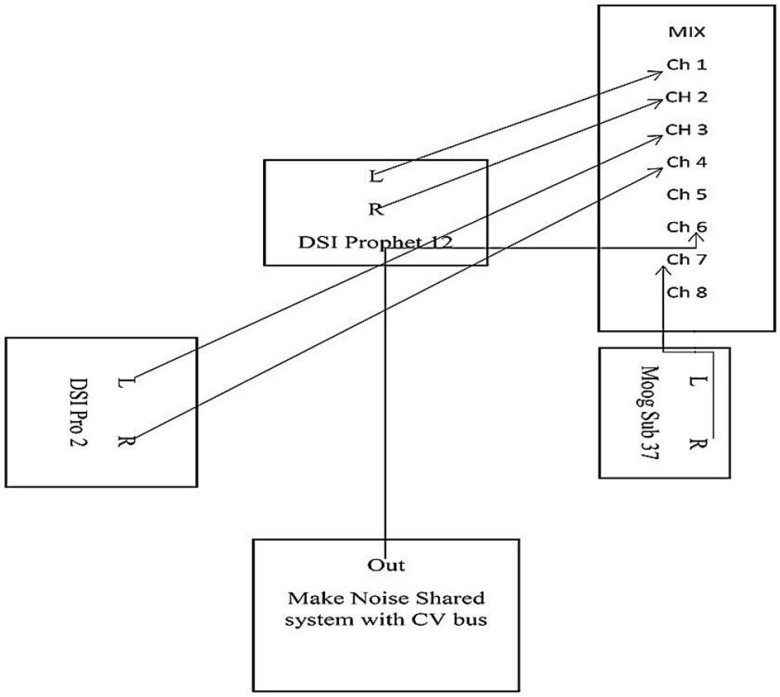

Figure 12. Output channel layout diagram.

Figure 13 represents an external component in the aforementioned system. This system uses only one external controller which, as can be seen in the graph, is a sound amplitude control pedal. After clearly defining the relationships, dispositions, external controllers, it is necessary to define the initial settings of the internal connections of the components of individual synthesizers.

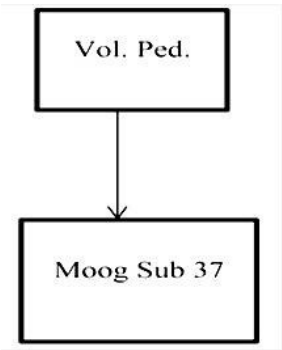

Figure 13. Volume Pedal is an external controller for Moog Sub 37.

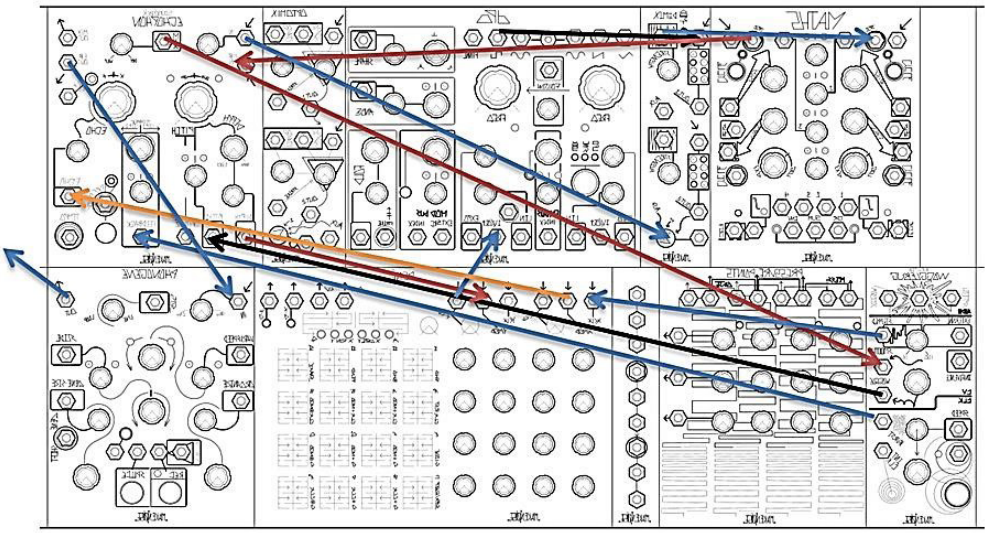

Figure 14. Make Noise diagram. Diagram for modular synthesizer patch.

Figure 14 shows the initial composed sound. The parameter values are set to 12h, which indicates the possibility of changes in the musical score, while the initial sound remains open for future transformations. The parameter based on the hexadecimal system corresponds to the synthesis of the previously mentioned scales values. This system corresponds to the synthesis of MIDI and percentage values. The author of this article classified and included the hexadecimal system as a possibility of musical notation of parameters in order to achieve fast visual stimulation in the case of live performances. This system may not be the most accurate, but the advantages it offers are efficiency in reaction during the performance, due to its reliance on approximate values. Approximate values can be read and realized instantly, while precise values take time to identify and realize which creates a problem with live performances. The graphic representation in Figure 13 demonstrates the setting of conditions for the production and initial realization of the composed sound. The initial position of the parameters can also be determined in the score for other instruments, but since these are non-modular synthesizers, it is possible to mark the beginning with the initial patch, which actually indicates the basic connection on the sound synthesizer. It is the basic connection of an oscillator with an open low-pass filter and an amplifier. Another way to achieve the initial patch is to indicate the wave, letters or mark, the openness of the low-pass or high-pass filter and the parameter of the sustain in the amplifier modulator, i.e. the amplitude envelope generator. The sound envelope amplitude generator must be activated to produce sound, unlike other modulators that are deactivated (their activation is not critical in the sound production itself). The magnitude of the value of the mentioned parameter (sustain) determines the strength of the amplifier. In a musical score, it is possible to note these elementary parameters for all sound synthesizers via this simple system because of the compatibility due to the function of the basic parameters of musical sound

syntheses. Therefore, the elementary parameters can be represented regardless of the instrument or program through which the work is performed.

Prophet 12 initial patch,

Pro 2 initial patch + seq mod. cut-off low-pass filter 16T,

Moog sub 37 user patch panel -6 dB filter (1 pole filter) + resonance 12h, vol. ped. control decay ADSR (Amp EG) AMP.

These designations, which are standardized abbreviations in English, mean that the Prophet 12 uses a factory-programmed initial sound as well as the Pro 2 which still uses a step sequencer in sixteenth note triplets (semiquaver triplets) values to modulate the LP filter cut-off. This sequencer modulates the opening and closing of the low-pass filter cut-off. Finally, the Moog sub 37 uses the initial factory sound located on this instrument under the user group, and is based on a type of single-pole low-pass filter that has a drop of -6 dB per octave. In addition to this setting, the Moog Sub 37 is controlled by a CV (Voltage Control) pedal that is set to control the decay function of Amp EG in this synthesizer. In this way the Moog synthesizer can later use modulations using an internal step sequencer, which can be defined as modulations of articulations in music, as it would modulate the decay of Amp EG. A special graph can highlight all the described functions.

As can be seen in Figure 15, it is possible to use deterministic bonds that have zero values of modulation quantities (Amount). These quantities are provided for performance, so that the real-time modulation operation can be performed. After the highlighted connections, it is necessary to mark another important parameter in the score, which synchronizes the metronomic values of this connected system via MIDI. It is enough to indicate this with the text: Master clock 120 bpm, MIDI clock synchronization Prophet 12, Pro 2 and Moog sub 37, which defines clear synchronization via MIDI. The composer can later write in the musical score all the modulations that are not marked in the legend. Such modulations require sufficient time for implementation. Therefore, it is necessary to leave enough time for the interpreter, so that the interpreter sets all the necessary parametric values in time. This type of modulation represents a development from the initial or determined modulations that are in the legend of the musical score. The notation of such modulations needs a clear graphical representation which, again, would not harm the clarity of a simple musical text. The system of such marking must be equal to the previous deterministic table system, which is shown in Figure 14. Of course, if it is a much simpler operational setup, then it is enough to indicate the source, target, and amount of modulation in the text. The source, destination, and amount of modulation is the basis of any modulation. Therefore, the basis can be displayed in any musical score because it contains a universal principle that does not require the translation of values or names of controllers or parameters. These values can be used to explain the intent for realization required to shape the modulation.

Pophet 12 Initial Pitch			
Osc1 saw Tune 0 Freq c1	Osc 2 saw Tune -3 Freq c1	Osc 3 saw Tune -5 Freq c1	Osc 4 saw Tune +2 Freq c1
LFO 1 S&H AMT 0 dest Osc 1 freq LFO Rate 0	LFO 2 S&H AMT 0 dest Osc 2 freq LFO Rate 0	LFO 3 S&H AMT 0 dest Osc 3 freq LFO Rate 0	LFO 4 S&H AMT 0 dest Osc 4 freq LFO Rate 0
Low-pass -24 db cut-off 100%	Hi-pass -12 db Cut-off 0%	Filter ADSR KB Cont 0 A0 D0 S0 R0	AMP ADSR A0 D0 S70% R0

Pro 2 Initial Pitch			
Osc1 sqr Tune 0 Freq c0	Osc 2 sqr Tune 0 Freq c0	Osc 3 sqr Tune 0 Freq c0	Osc 4 sqr Tune 0 Freq c0
LFO 1 sin AMT 0 dest puls width osc1 LFO Rate 0	LFO 2 1 sin AMT 0 dest puls width osc1 LFO Rate 0	LFO 3 1 sin AMT 0 dest puls width osc1 LFO Rate 0	LFO 4 1 sin AMT 0 dest puls width osc1 LFO Rate 0
Low-pass -24 db cut-off 100%	Filter 2 State Variable Notch cut-off 40%	Filter1/2 ADSR KB Cont 0 A0 D0 S0 R0	AMP ADSR A0 D0 S70% R0
Seq 16 step dest low-pass filter ch 2 clock dev 16T cut-off AMT 0	-	-	-
1CV in Make Noise CV to Feedback tune AMT 0	2CV in Make Noise CV to Feedback time AMT 0	3CV in Make Noise CV to Dist AMT 0	4CV in Make Noise CV to All Amp ADSR Release AMT 0
1CV out in Make Noise Math Trg AMT 0	2CV out in Make Noise Phonogene Vari-speed AMT 0	3CV out in Make Noise Rene Y mod AMT 0	4CV out in Make Noise Echophone Pitch 2 AMT 0

Moog sub 37 User Pitch (Initial Pitch) Panel			
Osc 1 saw/sqr Tune -2 Freq c2	Osc 2 saw/sqr Tune +1 Freq c2	-	-
LFO 1 tri AMT 0 dest wave shape osc1 LFO Rate 0	LFO 2 S&H AMT 0 dest wave shape osc2 LFO Rate 0	-	-
Low-pass -6 db cut-off 100% resonance 12h	Filter1/2 ADSR KB Cont 0 A0 D0 S0 R0	AMP ADSR A0 D0 S70% R0	
1CV in Make Noise CV Cont. Glide AMT 0	2CV in Make Noise CV Cont. Filter resonance AMT 0	3CV in Make Noise CV Cont. LFO 1 Rate	4CV in Make Noise CV Cont. LFO 2 Shape

Figure 15. Table of basic parameter settings.

As Figure 16 demonstrates, the composition of the parameters requires previously written concise instructions. Without previous explanations, this musical image would not be possible. Marked time windows accommodate the actions required to implement parameter changes in the score The specific notation for electronic instruments or for computers, the ARGN, is defined by the author of this text. This type of notation is related to the author's previous work based on the realization of compositions using the basic musical parameter or rhythm without pitch. The very principle of rhythmic musical composition is based on the idea of reductionist complexity present in computer science, which is part of the mathematical probability

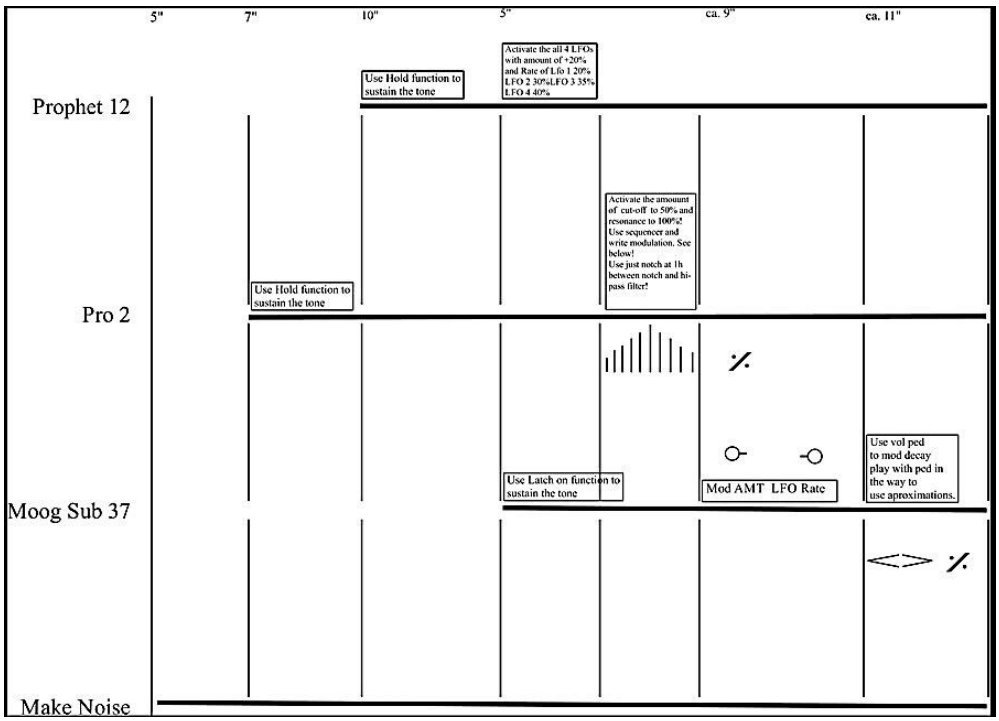

Figure 16. Demonstration of the author 's composition based on the parameters of subtractive musical synthesis.

theory. Thus, the author's basic basis arises from his RMC theory, which is actually a control deterministic model of musical flows in a composition. Tone pitches are left to the performer's choice. If the composer wants to explain the registration, it is possible to define it with a key. The author connects to the RMC system an approach to approximate value in order to achieve a better musical image in the musical score. The idea is to unify the text itself by something that can be universally translated, whether into acoustic, electroacoustic or electronic instruments, including a computer. The unification that is present in the ARGN system refers to the most important link that unites all systems and in a way merges them into one meta system of understanding music information. As mentioned earlier, the basis is taken from the RMC system by which a musical or instrumental gesture can be established, but the most important thing is actually an interpretive gesture. This gesture always depends on the stimulus of the text itself and that is why the author takes ARGN as a universal system of stimuli of performers who act more on the image than on the symbols and therefore the approximation itself is of great importance. The whole value system is approximate, which is also the basis for modulations, so the performer becomes both a sound architect and a composer of interpretation, which is also the author's starting point in his RMC system. The role of the composer himself is a meta-construct of the work that has unlimited potential because it has an approximate basis and at the same time enables endless interpretations of

one composition, as well as a basis for interpretive research by performers and scientists. In this meta system, everyone involved in a work must approach it as a composer in order to enter analytics or performance. Approximation is necessary, because different instruments and synthesizers react differently to the parameter due to the individual architecture of the sound signal and the arrangement of the components. The second argument to the approximate approach is the meaning of modulation. The modulations themselves represent constant changes. These changes, as variable values, are approximate rather than fixed. In some modulations there are fixed values which need to be defined by specific parameter units. These modulations belong to a smaller group compared to the previously mentioned ones. This second group is related to simple modulations, which with their sources, destinations, and the amount of modulators form a much smaller group compared to complex modulations. An example of a necessarily defined parameter value is beat frequency modulation. In this modulation, it is necessary to denote the precise parametric values of the oscillator, whose frequency deviates from the frequency of the adjacent oscillator, and thus makes the mentioned effect. In addition to this example, it is possible to cite a number of other examples of simple modulations such as a thriller simulation, which must be clearly defined beforehand. Therefore, it should be borne in mind that these types of modulation should be clearly marked in relation to their values. Every conceptually conceived modulation requires an experimental method (Čavlović 2012, 132). The modulation is previously sketched so its realization is approached with a computer or a sound synthesizer, which proves an experiment on the basis of some of the musical syntheses. This approach is the basis for composing parameters in different or combined sound syntheses suitable for musical composition. What defines this method is a controlled, assumption-constructed, laboratory experiment. Thus, computers and sound synthesizers are a laboratory, that is, a music laboratory, which enables laboratory observations of the behavior of sound in relation to its, presumably constructed, composition of parameters. Musical composition has always contained this method, because the composer who composes assumes, or sets up a theory, which he realizes with the help of instruments to make an experiment. This old approach to the compositional profession and practice has not changed and remains the same today. In the past, there have been revisions of scores, proving the method of experimentation. Different publishing houses make reissues of notes by composers who have not been alive for a long time, outlining the dynamics of this method. Clear revisions of compositions for keyboard instruments by J. S. Bach during his lifetime and to the present day, explain and argue this thesis (see Schulenberg 2006, VI, 4, 7, 38, 73-74, 98-99, 118, 146, 148, 164).

Summary

Essentially, ARGN represents the composition of parameters. The composition of the parameters of musical sound syntheses is present in the content of the legend, which contains tables of all parameter values necessary for the realization of the composition. This approach provides the basis for the composed sound that occurs throughout the work. Each composed sound is created through the systematization of the parameters of musical sound syntheses, which consists of all their components and parameters. The experimental method makes it possible to compose sound because it uses a computer or a sound synthesizer as a laboratory for controlled experiments that have been previously sketched or designed. Composition by electronic means offers simple and practical notation examples with dynamic and original changes of sound colors through composed parameters.

The big problem of notation today is its purpose. Nowadays, notation is no longer the only information, because the recording itself gives even more precise information than written notes as it contains a live recording in which there is not only musical information but also interpretation. Thus, the very need for a notation system is not directed towards information that remains for future times, but is related to the art of interpretation and musical composition. Due to these reasons, notation in the domains of more complex systems in electroacoustic and electronic music has not been partially or completely notated recently as its realization is almost impossible. However, what is lost is a legacy for performers and performances, because the performance still exists, just not all from a recording. That is why the ARGN system is intended for live electronics, which can be with or without acoustic or electro-acoustic instruments. It is also a human legacy of written and performed music of the past, but only with intention and not with means and functionality. This notation system makes a musical composition an artistic and scientific field with the ability to create artifacts, through sounds without any instruments, which can be (in the field of a musical composition) a musical text, musical content, or a musical score.

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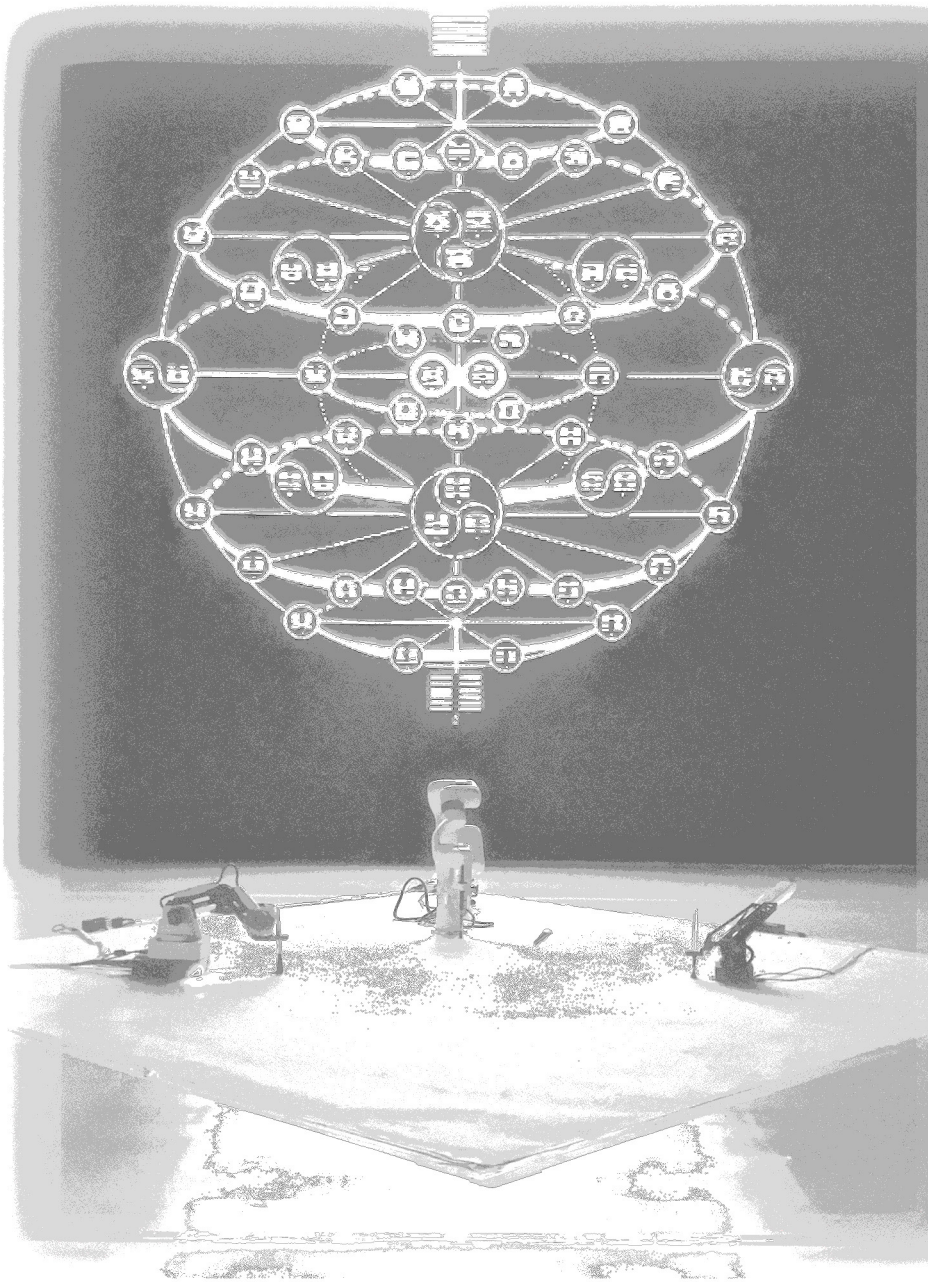

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ARE INTIMATE SMALL CONCERTS WORTH IT?[1]

Abstract: Developing multiple streams of income is an essential method for surviving as an artist, but what streams should an artist pull from? The awareness of one's resources and knowledge of how to use them is what makes or breaks a musician. Many musicians may have overlooked three key resources: House Concerts, Secret Concerts, and Listening Rooms – small intimate venues commonly overlooked. Are these venues worth performing at? Based on one's character, financial needs, and current connections, each of the three venues may or may not be resourceful. This article provides the insight needed to make a decision as to which small intimate concerts (if any) are financially good for you.

Keywords: awareness, concert, small, intimate, house, listening-room, secret

House Concerts

It is not always common knowledge that artists can throw a house concert or perform in another homeowner's house (Timberg 2016). Some artists learn this fact the hard way, spending a significant amount of time performing at bars and cafés just to lose money with each performance (Timberg 2016). But if an artist is sociable, has good merchandise, is willing to do some ground work, and isn't performing on any loud instruments (Concerts in Your Home 2020b), house concerts are the perfect place to put oneself on the map.

House concerts are some of the easiest small, intimate, concerts to profit from.

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In fact Fran Synder, the founder of the first online house concert networking website and the *Listening Room Festival*, says that house concerts are "the lifeboats of the music industry" (Synder 2010). Through his company *Concerts in Your Home*, "in the past 11 years, [he] has secured over 10,000 house concerts for about 1,000 artists" (Herstand 2017). A homegrown artist such as Michelle Malone is a great example of the success that can follow a house concert. Malone asks for a fixed fee of $1,500 or $20-$25 per attendance fee per concert and makes bank (Guthrie 2020). Another successful artist, Jennifer Daniels, makes $100 to $300 per house concert in merchandise sales alone, however, she only makes an overall average of $500 per house concert (Guthrie 2020). The reason for the price discrepancy between these artists is production. Michelle produced her music through the independent label *Aluminum Jane*, then created her own label SBS, or *Strange Bird Songs* (Demings, n.d.). By publishing herself under an entity larger than just a sole proprietorship Malone has been able to secure wide respect and popularity, especially in Southern America (Demings, n.d.). Her music has been featured on a TV commercial, giving her the connections to stage a performance with Elton John. This all started with her decision to produce her music under a label. Jennifer Daniels, meanwhile, is independently produced (Daniels, n.d. b)). Her career entails house concert touring and teaching (Daniels, n.d. a). By taking on all the roles of a label, she is arguably unable to have as great of outreach as Demings, in my opinion. Nonetheless, these two artists are making significant figures through house touring, a pursuit as made possible through sites such as *Concerts In Your Home*, *Russ and Julie's House Concert Resources*, *Home Ditty*, and various Facebook related groups (Concerts in… 2006; Russ and …, n.d. 2020; HomeDitty 2020; House Concert Search via Facebook, n.d. 2020).

House concerts, however, can be a cumbersome experience for hosts. One thing that may seem annoying to hosts is that there are no payments for their services, with all proceeds going to the artist. One way homeowners could gain funding is by passing around a hat for spare cash, but this is not a popular way of paying for events. Many homeowners instead hold potlucks (The Music Playground 2009), but if they live in the State of Arizona they better make it a secret or hold it through an official organization as potlucks are currently illegal (Moye 2016). If the host does not reside in Arizona, their only costs would be preparation and cleaning. With little chance of a large PA system (Concerts in Your Home, n.d. b) there is unlikely to be any heavy metal moshing (or "a form of aggressive [...] dancing" (Galanek, n.d. 2020)), leading to fewer broken household objects and little replacement cost for homeowners. Thus, the homeowner may practically receive free concerts from artists, and with organizations working nationally or internationally, one can be exposed to a vast number of different people, styles, and genres. The situation is a win win for the artist and homeowner.

After enjoying the experience of hosting concerts, a homeowner might be interested in receiving more financial reward for their time in preparing and cleaning

for events. This can be done through sales and attendance fees. However, the moment a host decides to start selling anything from their home – from attendance to food, the home becomes a place of business and the owner will become responsible to adhere to the required laws. Selling liquor such as wine or beer requires a license; provided by a State's *Liquor Control Commission* (Eastman 2019). In New York (NY), a liquor license costs between a "range anywhere from $300 to $14,000" (Brophy 2019). Selling food in NY requires a *Food Service Establishment* permit from a local health department. A host's home kitchen cannot be used to prepare the food, but must be prepared in a separate space not identified as the host's home's kitchen (The Bureau of Community Environmental Health and Food Protection 2019). Lastly, the host's house will need a permit for "general liability insurance" falling under the demands of "Special Events and Short Term Rentals" (Alliant 2019). If a homeowning artist is willing to face these complexities and comply with the law in a way that allows them to profit from providing a house for artists, the success can be exuberant. Because the presence of house concerts is still up and coming with its online presence, having a foothold in the business before it explodes can be life changing. If an artist starts renting out real estate, they could have a very lucrative side hustle owning homes for bands and artists to perform at while also collecting rent from those living in the houses. There is a question of how open non-musician home renters will be to put their location on the map for artists to tour at. However, if one can find a group of other people interested in being hosts and renting a house, it could be a very profitable expansion of the already lucrative housing market. If the artist doesn't want to face these legal complexities, there is an incentive for artists not to be real estate owners, nor perform at their own home altogether. The safer, easier path is to perform on tour. This is a great way to grow one's audience body. It is up to the artist and how they best see themselves surviving the industry.

For an artist focused on their craft, house touring is a lucrative source of income. It gives "many artists [...] added financial support" for when they are not doing traditional commercial touring (Synder 2010). House concerts typically offer artists complete ownership of all collected funds from the event (Synder 2010). This typically means donations and merchandise sales can go directly into the performer's pockets. Often, new artists typically do not get paid and can even lose money, such as in the 212 US Coffee Houses listed as trusted for live performances, and in the 870 food venues that offer live performances (Undiscovered Music LLC, n.d.; Petri 2020). Artists have an avenue of income they cannot resist! When it comes to advertising and building their following, house concerts provide the close, personal interactions artists need to create a strong fan base (Concerts in Your Home n.d. b). As many events involve guests gathering at their friend's house (Synder 2010), there is an instinctual amount of trust that the audience has about the artist even before an initial meeting. Trust can translate into value if the artist meets their expectations, leading the possibility to create lifelong fans and to sell their own merchandise. This is how an artist can make a small intimate concert at someone's home a worthwhile

performing event.

Secret Concerts

Aside from home concerts, another underrepresented form of concert venue is the secret concert, such as those offered by Sofar Sounds. Sofar Sounds started in London as a "music start-up" and now operates in "411 cities across the world, on every continent except Antarctica" (Dickinson 2018). *The Philadelphia Inquirer* calls Sofar Sounds a "secret concert series [that] is growing too big for the living room" (Dickinson 2018). Similar to the macro-effects the internet has had on house concert touring, Sofar's private events have grown significantly due to internet communications and networking. Sofar houses their events in office buildings such as "One Liberty Place" or even a "Distillery in Dufftown" (Dickinson 2018; Abir 2019). Sofar, unlike some house concerts, operates as a commercial organization. Sofar began selling tickets for their events around two years ago as an alternative for passing round a hat for donations (although the hat is still passed around) (Dickenson 2018). This not only presents the event as a serious market event, but also "gaurantee[s] the artists a $100 paycheck each in addition to a video recording of a song of their choosing" (Dickenson 2018).

So as an artist, how does one get into Sofar? The application process has two steps (Sofar Sounds n.d. a). First, an artist needs to fill in their name, contact information, home city and social media links. Second, there is a live video submission. This does not have to be on a stage or in a recording studio – it can be in a home venue. Sofar Sounds encourages the submission of a recent unplugged (non-amped) performance, with no technological enhancements made to the instruments or voices in post-production. Local Sofar team members will review the application, however they will not give feedback if an artist is rejected. They do, however, encourage further applications in the future.

The benefits of Sofar differ slightly to house concerts. The most significant difference is the expanded market and connection with other creatives (Sofar Sounds n.d. b). By utilizing this organization an artist is able to go on tour with some degree of financial support, alongside attendance at commercial events, unlike with many under-the-radar house concerts. The expanded market also allows for easier ways to "fill in []" empty time on a long "international tour" (Sofar Sounds n.d. b)). For example, if an artist is traveling from Germany to the UK, they can stop at the Netherlands and Belgium on the way before taking a boat over to the UK. One artist that did exactly this received an extra $200 on their tour. Assuming merchandise sales to be similar to that of Jennifer Daniels (as discussed above), the artist may also make an additional $100 minimum for each Sofar concert, bringing the artist up to an additional $400 on their tour. This is, financially speaking, very efficient.

On the topic of Sofar's competition, currently the organization has no direct

competition, as popularizing secret concert networks is actually quite difficult (because they are...secret).Indirectly, there are very similar venues that categorize themselves as 'listening rooms', the final small intimate concert venue that will be discussed here.

Listening Rooms

There are 606 listening room venues listed on *Undiscovered Musician* alone, against 1,082 listed restaurants and cafés, making available an immense number of listening rooms. A listening room is a location found usually in a restaurant or a bar, where small gatherings of people can go to eat and listen to live music. Some listening rooms are also designed for listening to recorded music on high quality audio equipment (Bernas, n.d.). As nice as listening to recorded music is, it is not efficient when helping artists pay their bills. For that reason, this overview will focus on live music listening rooms.

The main difference between listening rooms and the other two venues mentioned in this paper is quality. For places such as the 12th Floor Porter, private concerts are held, catering is available, and a beautiful stage is presented for performers ("12th & Porter", n.d.). Sofar Sounds does have quality locations, but not at every location. Listening rooms have a restaurant that can financially support the rooms, offering a higher quality of venue. The difference between listening rooms and home concerts lies more in formality than in quality. It is common to find people sitting on the ground at house events, while listening rooms have tables and chairs for guests to sit. This, as well as an actual stage, can create a more formal concert atmosphere. In terms of size, listening rooms are small, lying somewhere between an average house living room and an average Sofar Sounds concert space. The larger the size, the higher the number of guests, making listening rooms such as The Saint, located in Asbury Park, New Jersey (which holds 150 people with a 14 foot x 14 foot stage) less efficient than Sofar's venues (Impression Technologies, n.d.). These rooms also have a very consistent crowd base as each listening room operates independently. This reduces the benefits that can be obtained by performing here when compared to the other two options. A positive, however, is that listening rooms are harder to get into, leading to a higher quality of performance and higher audience ticket prices. This increases the amount of funds available to an artist, but do remember that the restaurant will take a cut of the profits. Therefore, if an artist is currently climbing the ladder from house concerts to Sofar concerts and are ready for something more financially lucrative, listening rooms are a good source of income.

The qualities and characteristics of listening rooms can make them appear to be a half house concert and a half restaurant gig. It is a great transitional venue for artists at such a popularity that they would be paid for food and beverage location performances. In determining which level of entry one should take in terms of performances, think of each of the three venues discussed above as different levels

of experience. A new artist should be doing house concerts, while those with intermediate experience can make themselves available for Sofar gigs and listening rooms. Experts meanwhile should be performing for commercial businesses such as restaurants, TV stations, and large public centers.

Final Notes

There is a lot of overlap between all tiers, but one thing is certain: there is a clear divide in the expertise needed between small intimate concerts and larger, more commercially bred concerts. There is also a difference in respect between venue owners and musicians. Generally, venue owners of small intimate concerts tend to be more respectable and compassionate than the often-exploitative bar owners. In addition, the relationship between the audience and artist is a totally different experience in each form of venue. Currently, artists have more financial incentive to move towards small intimate concerts. Seeing restaurant performances as the bridge to large outdoor concerts with 60 million fans is illogical. However, by building a global fan base by touring house concerts and utilizing listening rooms, it is possible to develop a large and growing fan base.

One may even argue that livestreams deserve a mention as a form of intimate concert venues. Sites such as Facebook, YouTube and Periscope have been very successful in promoting the use of livestreaming, and musicians have taken it upon themselves to spread their sound across this medium. Livestreams are however, oversaturated. Success using these mediums may be difficult unless a musician already has an already existing following developed in the physical world. Success can also come by being one of the first users of the new medium, by being sponsored or receiving shout outs from other successful artists, or by posting livestreams in specific groups or with specific hashtags that represent the corrent target audience. Livestreams also allow artists to connect with their fans on a one-to-one basis. Periscope recently upgraded its service to allow call-ins from viewers to talk directly with the talent (Bernas, n.d.). Additionally, fans can donate funds directly on a livestream to support their chosen artists, while offering themselves as 'supporters' . There are also exclusive livestream performances that can be held on certain mediums, however on YouTube (for example) this will require an artist to be a content creator with a minimum of 1,000 followers, which may be out of the reach of many new artists (Karim, n.d.). Livestreams, however, may offer a gateway to a new wave of small intimate concerts that exist solely in the digital world.

At this point, the only thing stopping an artist from making their talent a career is knowing how to finance themselves, as musicians no longer have to begin their careers fighting for popularity without pay. Musicians are being valued for what they are worth on a grand scale. Today, it is more about how artists use their own resources and think creatively than finding themselves locked to external management that may restrict their creativity to please their financial backers. Labels, restaurants, and

large concert halls no longer have the upper hand when it comes to controlling what music is produced and how much money artists are making. The responsibility is now in the hands of each individual performer, and the only limit to their value is the price-tag they place on their own creations.

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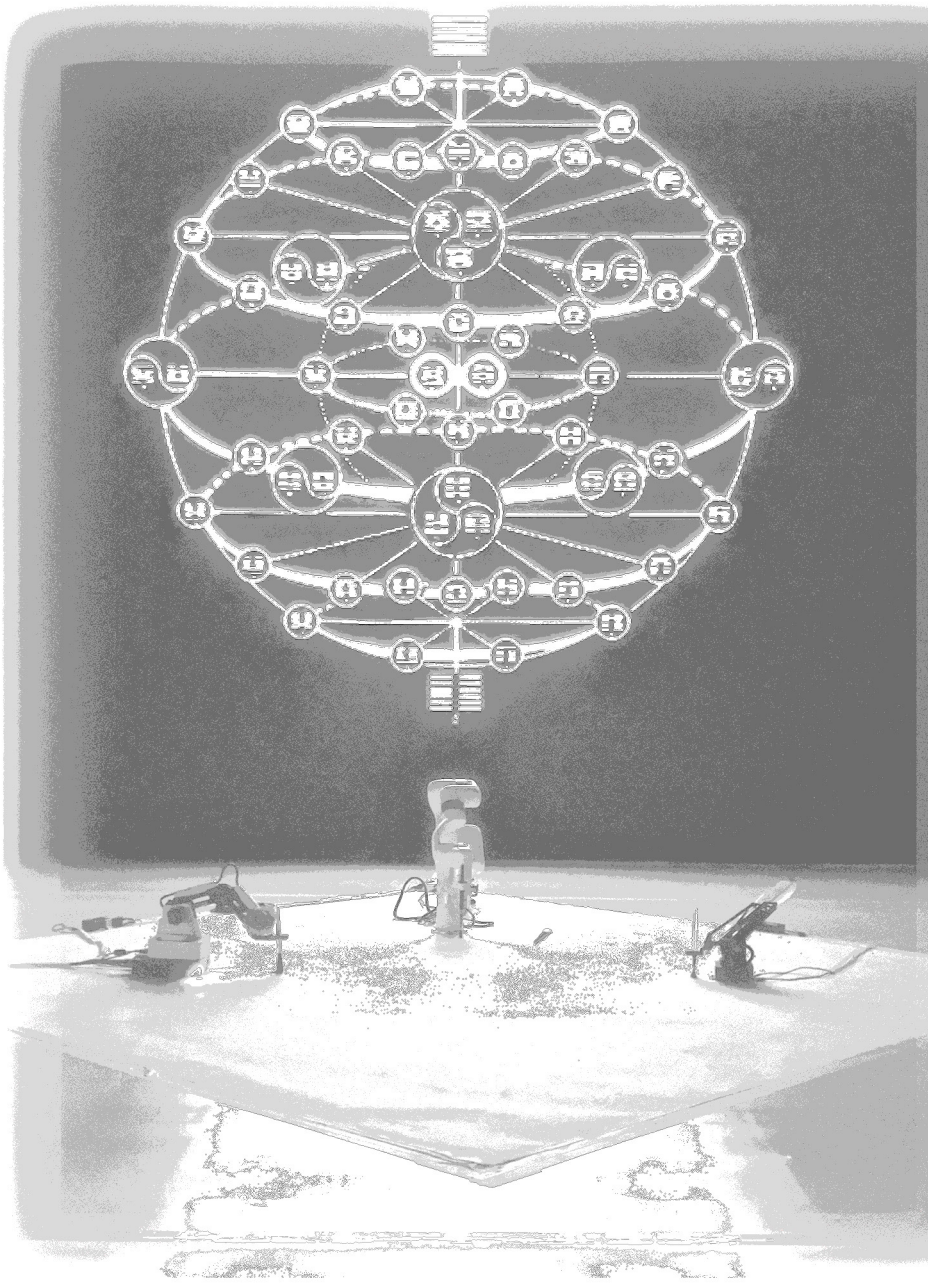
Reviews



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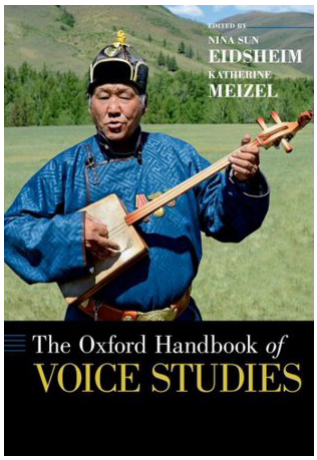
Nina Sun Eidsheim and Katherine Meizel (Eds.), *The Oxford Handbook of Voice Studies*, Oxford: Oxford University Press, 2019. ISBN 9780199982295[1]



In 2019 the field of voice studies was greatly enriched by the publication of T*he Oxford Handbook of Voice Studies*, edited by Nina Sun Eidsheim and Katherine Meizel. This publication not only collected chapters written by some of the most active and influential scholars in the field, but also gave several important suggestions and guidelines for future academic work on voice.

As a voice scholar, every single piece in this collection is worthy of my attention. This stance aligns with the idea presented by the editors, and reiterated and masterfully underlined by Jody Kreiman in her concluding piece: the one who deals with voice, be it from the sciences or the humanities, should be interested in all the ways voice 'works' and strive to be informed of new academic achievements from different disciplines.

Divided into six parts by the six "domains of inquiry" introduced by Eidsheim and Meizel, this collection contains 22 chapters, as well as the Introduction and the Epilogue. In the introduction, Eidsheim and Meizel give an overview of the history of voice studies, highlighting the most significant pieces of scholarship and discussing

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the associated issues surrounding voice. Likewise, by using the story of the three men and the elephant as a metaphor for the academic study of voice, the editors explain the need for "interactions, conversations, and transdisciplinary work" (xxiii) among voice scholars in order to tackle the voice, which – "as topic, object, and practice – is enormous as [an] elephant" (xxi). After establishing the domains in which the studies in this book are grouped, Eidsheim and Meizel conclude their piece with the following idea: "(s)ynthesizing voice research from humanities, performing arts, and social sciences to the sciences and medicine, we understand voice in the most general terms as the entanglement of six broad areas" (xxxiii).

The first of those broad areas translated into Part I of the book is titled *Framing Voice. Voice as a Carrier of Meaning*, and it consists of three chapters that "examine past and present meanings assigned to voice, and how they are intertwined with understandings of identity" (xxviii). In the first chapter, dubbed "What was the Voice?" (3–17), Shane Butler focuses on the "Ancient Voice", and the "antiquity's contribution to the idea of the voice", having in mind both spoken and written language. In "Object, Person, Machine, or What: Practical Ontologies of Voice" (19–34), Matt Rahaim investigates five instances of the ontology of voice, or "five vocal situations", and continues to discuss the practical, anthropological and ethnographical ontologies of voice, as well as their possible locations, indeterminacy and politics. The chapter "Singing High: Black Countertenors and Gendered Sound in Gospel Performance" (35–51) by Alisha Lola Jones brings us an informed and intriguing ethnomusicological investigation of African American countertenor sound, representation, and symbolism of male high-singing in music research, and explores social and theological issues through the case study of African American countertenor Patrick Dailey and an "ethnography of his live performance".

The four studies in Part II, *Changing Voice: Voice as Barometer*, explores "voice (as) a useful barometer for broader movements within a given society" (xxix). In their chapter, "Medical Care of Voice Disorders" (55–75), Robert T. Sataloff and Mary J. Hawkshaw give an overview of the particular ways in which vocal medical care has improved since the early 1980s, pin-pointing the common diagnoses and treatments in the cases of vocal professionals and others. By joining competencies stemming from backgrounds in ethnomusicology, voice science, and vocal performance, in the chapter "Fluid Voices: Processes and Practices in Singing Impersonation" (77–95), Katherine Meizel and Ronald C. Scherer scrutinize singing impersonation from the standpoints of voice and body agency, and explore the acoustic insights of recordings of Véronic DiCaire's show *50 Voices*. In "This American Voice: The Odd Timbre of a New Standard in Public Radio" (97–123) Tom McEnaney delves into the historical and contemporary (deviations from) standards in the sphere of famous radio/podcast voices. In the last chapter in Part II, "The Voice of Feeling: Liberal Subjects, Music, and the Cinematic Speech" (125–139), Dan Wang posits that there is "a relation between the concept of voice in the scene (…) and the picture of social relations that results" (127), and continues to analyze two crucial scenes centered

around the voice/speech from the films *Love Actually* (2003) and *The King's Speech* (2010).

Part III of the *Handbook,* named *Active Voice: Voice as Politics*, presents four studies dealing with voice as "an expression of active agency" (xxx). Ellias Krell's chapter "Trans/forming white noise: Gender, Race, and Disability in the Music of Joe Stevens" (143–163) focuses on the singer-songwriter Joe Stevens, and the factor of *vocal noise* in exploring "intersectional vectors of gender, race, class, and ability" (144) of this white, middle-class, able-bodied trans-man that is present in the public sphere. In "Voice in Charismatic Leadership" (165–189) Rosario Signorello gives a theoretical background of the phenomenon of (vocal) charisma in leadership, and investigates this issue in different cultures and languages. With the idea that "(t)he throat, in [a] Marshallese sensorial approach, is the metaphorical seat of the emotions that prompt a feelingful care for others, human and nonhuman". The chapter "Challenging Voices: Relistening to Marshallese Histories of the Present" (191–213) by Jessica A. Schwartz and April L. Brown deals with the vocal practices of those affected by nuclear testing in the Republic of the Marshall Islands, drawing from Eidsheims' "*voice challenge* activity as a toll in critical voice studies" (192). In the chapter "Voice Dipped in Black: The Louisville Project and the Birth of Black Radical Argument in College Policy Debate", Shanara R. Reid-Brinkley writes about the University of Louisville's Malcolm X Debate Program, the development of the debate collective of mostly black students who managed to defy norms and refused to "performatively whiten" their appearance and voices/bodies in competitions."

Sensing Voice: Voice as (Multi)sensory Phenomenon, the fourth part of the publication, gathers four studies around the idea of expansion of voice "beyond the textual and the sonorous"; as editors emphasize, "(i)t exemplifies inquiry into the extrasonorous voice and possible extravocal in the tactile, philosophical, scientific, biological, and evolutionary realms" (xxx). With this in mind, we read Cornelia Fales' "Voiceness in Musical Instruments" (237–268), who, analogous to the phenomenon of faceness, investigates the principles and characteristics of instrumental voiceness in instruments such as the Bengali *gopiyantra*, the Mongolian *morin khuur*, and the violin and cello. In their chapter titled "The Evolution of Voice Perception" (269–300), Katarzyna Pisansky and Gregory A. Bryant discuss the factors of voice communicating and contributing to the perception of human body size and physical strength. Likewise, they deal with preferences for sexual dimorphism, especially giving space to the issue of vocal attractiveness and vocal communication of affection and intention. Nina Sun Eidsheim's chapter "Acoustic Slits and Vocal Incongruences in Los Angeles Union Station" (301–313) is based on the underlying question "what kind of insight does voice afford us?". As such, it delves into the peculiarities of the vocal and acoustical production of the site-specific opera *Invisible Cities* (2013). The chapter "Tuning a Throat Song in Inner Asia: On the Nature of Vocal Gifts with People's Xöömeizhi of the Tyva Republic Valeriy Mongush (b. 1953)" (315–342) by Robert O. Beahrs gives voice to his teacher, Valeriy Kechilovich Mongush from the

Tyva Republic, giving us an insight into the three main vocal techniques of what we know as throat-singing: *xöömei*, *sygytm* and *kargyraa*.

Part V, *Producing Voice: Vocal Modalities*, also consists of four studies, this time dealing with "modulations of voice—alterations and additions in practice that create shifts in meaning" (xxxi). In that regard, in the chapter "The Echoing Palimpsest: Singing and the Experience of Time at the Ecumenical Patriarchate of Constantinople" Alexander K. Khalil writes about the voice of an Ortodox Christian *psaltis* Stylianos Floikos, called Stelios, which "(f)or the Turks (…) is representative of their prehistory, being a member of the ethnicity who inhabited the city before Turks took it" (357). Nandhakumar Radhakrishnan, Ronald C. Schrer, and Santanu Bandyopadhyay's piece "Laryngeal Dynamics of *Taan* Gestures in Indian Classical Singing" (365–401) discusses *taan*, a rapid pitch-changing gesture equivalent in its significance to "vibrato (…) in Western classical singing" (364). The authors do so by recording Santanu Bandyopadhyay, a male Hindustani singer and teacher, peforming both pedagogical and performance taan, and then analyzing the findings. The following chapter, "Proximity/Infinity: The Mediated Voice in Mobile Music" (403–418) by Miriama Young, is dedicated to the voice that is mediated for the purpose of pod listening. Young shortly examines the history of technologically mediated voice, and then surveys vocal music from various genres by scrutinizing the aspects of composition, performance, recording, and production of said voice. Finally, in her chapter "When Robots Speak on Screen: Imagining the Cinemechanical Ideal" (419–436), Jennifer Fleeger argues that the "audible signifiers of gender, class, and race in the voices that give life to Hollywood's robots make audiences comfortable with the robot as worker, and, by extension, with the labor practices of an industry in which it is not always possible to distinguish images of and by real people from those generated by computer" (421).

The final part of the collection, *Negotiating Voice: Voice as Transaction*, begins with Eve McPherson's chapter "Robot Imams! Standardizing, Centralizing, and Debating the Voice of Islam in Millennial Turkey" (439–355). Here, the author writes about the ideologies and politics that shape the contemporary call to prayer, striving to coexist and, possibly, guide "that which is democratic, modern, and progressive" (439). In "Singing and Praying among Korean Christian Converts (1896 – 1915): A Trans-Pacific Genealogy of the Modern Korean Voice" (457–474) Hyun Kyong Hannah Chang discusses the formation of the Trans-Pacific modern voice in Korea in the context of colonial pressures from United States and Japan at the beginning of the 20th century. The final chapter before the Epilogue, "Building the Broadway Voice" (475–491) by Jake Johnson, reveals the layers of the famous "Broadway voice", known for "over-articulating, over-enunciating, and over-emoting" (476) and "belt" sound.

As a concluding argument for the *Handbook*, as mentioned above, Jody Kreiman's "Epilogue: Defining and Studying Voice across Disciplinary Boundaries" (493–513) stands for a "broad understanding of voice, and hence for the need for

cross-disciplinary training" (494). Kreiman argues that all voice scholars can benefit from a transdisciplinary approach to the existing body of knowledge, and that there should be initiative for the inter-/trans- disciplinary Voice Studies Curriculum. The author then proceeds to build the curriculum, designing four courses that would enable scholars at the beginning of their paths to gain well-rounded knowledge on the issue.

The idea that "(d)iscussions of conflicts between the sciences and humanities are as old as the sciences and humanities, but it is past time to put aside these 'false barriers to understanding' (Gould 2003, 17), given that it is clear that neither scientific nor humanistic approaches in isolation are sufficient to truly understand voice (or any phenomenon; Gould 2003)" (508) also entirely aligns with the politics of this Journal. Not only is the *Oxford Handbook of Voice Studies* significant to voice scholars, it is also immensely important to other scientists dealing with music, art and technology (and not just because we can hardly imagine voice today without it being technologically transmitted and mediated) in a transdisciplinary fashion.

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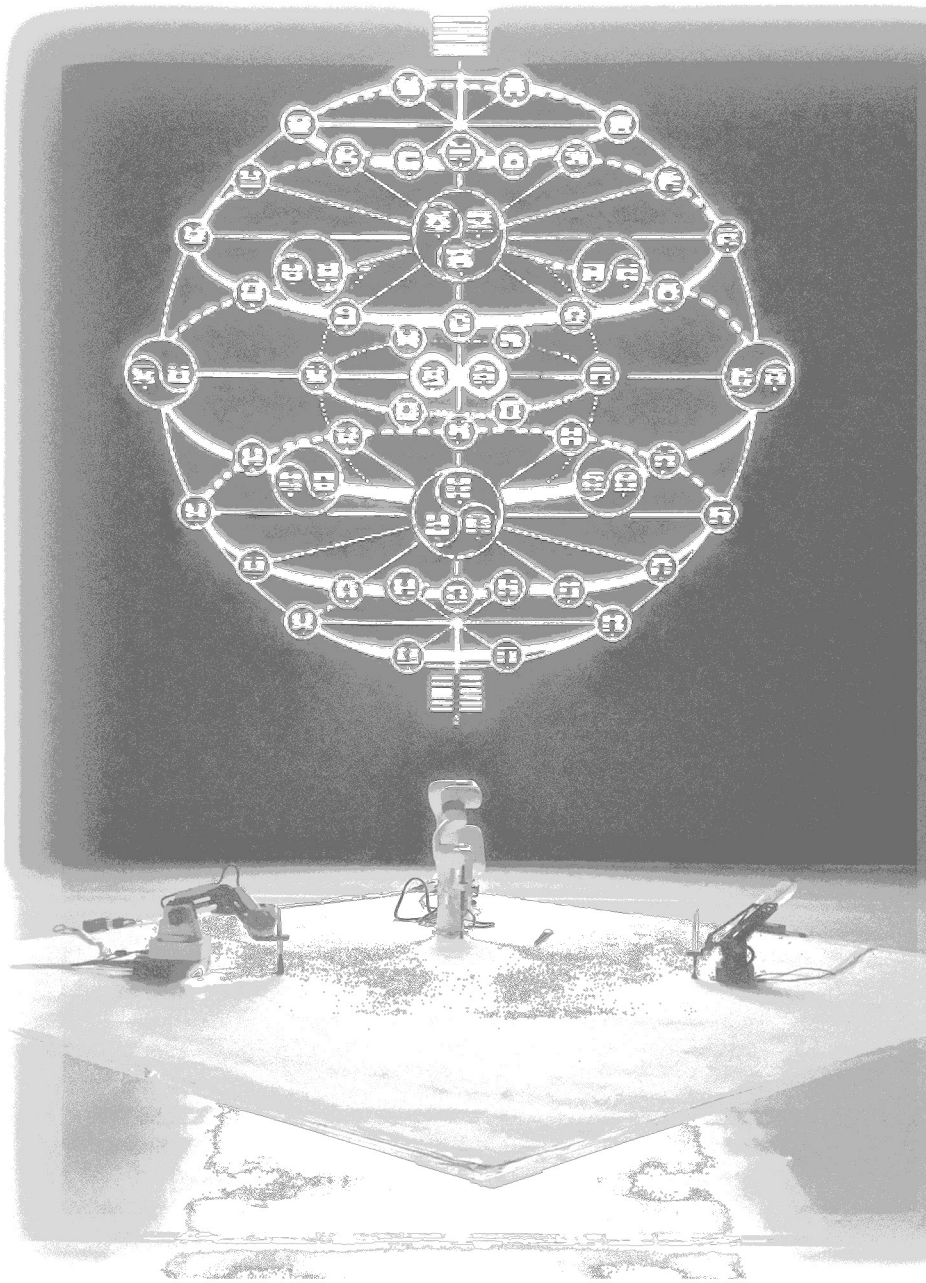
Contributors' Biographies



Mattia Merlini. I hold an M.A. in Musicology and a B.A. in Philosophy at the University of Milan, where I recently graduated with a thesis in Popular Music Studies under the supervision of Maurizio Corbella and Emilio Sala. My master's thesis will be published in 2020 by a major Italian publisher with the name Le ceneri del prog. In 2020 I have started sending articles to several academic journals and presenting papers at conferences in the UK, in Ireland, Finland, Sweden, Belgium, Poland, Canada and Austria, while I wait for my PhD project to be accepted somewhere in Europe. I have recently started collaborating with the project SpotiGeM at the University of Milan. In my free time I work as a speaker for the cultural events organised by Sophron.it. As a musician, I focus on my solo project and on music for films.

Stefano Maria Nicoletti. I hold an M.A. in Philosophy of Information at the University of Urbino, where I graduated with a thesis in Logic and Computer Science under the supervision of prof. Pierluigi Graziani and prof. Alessandro Aldini. I got my B.A. in Philosophy at the University of Milan (2017) with a thesis in Privacy Ethics under the supervision of prof. Marcello D'Agostino. I am also a fellow of CEST | the Center for Excellence and Transdisciplinary Studies, an association promoting academic research made by young scholars. As a member of CEST, I am currently part of several organizing committees for national and international workshops and for junior research seminars. In June 2020 I will begin my experience as PhD Researcher at the University of Twente. I write for the cultural website Sophron.it and work as a speaker for its outreach activities on philosophy and art.

Sandra Bjelan-Guska, Dr. Sc. was born in Sarajevo where she completed primary and secondary education as well as music and ballet education. Graduated at the Department of Pedagogy, Faculty of Philosophy in Sarajevo 2007. Scientific master studies completed at the same department 2012 and PhD in 2017. She is working at the Department of Pedagogy at the Faculty of Philosophy University of Sarajevo since 2008. Currently is Assistant Professor in numerous subjects in the field of didactics and teaching and learning methodology. Also teaches at the Academy of Fine Arts. She has participated in the realization of more than 30 different seminars / trainings for teacher's professional development in the process of lifelong learning. She has published more than 25 publications and papers, participated in more than 60 scientific and professional, domestic and international conferences and in 14 projects as a member of the research team or consultants. Special areas of her scientific-research interest are fundamental and applied issues of the teaching process at all levels of education, methods of teaching and extracurricular activities, family pedagogy, didactics and methods of teaching ballet.

Nela Hasanbegović M.F.A., was born in Sarajevo where she completed primary education, and then secondary education at the School of Applied Arts. Graduated

at the Sculpture Department, Academy of Fine Arts in Sarajevo 2007. MFA studies completed at the same department 2010. She has been working at the Department of Art Education at the Academy of Fine Arts University of Sarajevo since 2012. Currently is senior teaching assistant in the field of Methods of Art Education. Currently is PhD candidate at the Faculty of Fine Arts in Belgrade, on third-year of studies and student of the second-year on interdisciplinary doctoral studies at the Faculty of Educational Sciences, University in Sarajevo. She exhibited her artworks at 131 international and domestic group exhibitions and realized 19-solo exhibitions in Bosnia and Herzegovina and abroad. Her artworks are included in important museums and private collections. She has given talks at numerous panels and presentations, and held several lectures. She has published several papers and participated in many symposia, artist colonies and residency programs, and she has won several prestigious awards and scholarships. She is a member of the several Associations of Artists in Bosnia and Herzegovina and abroad. Special areas of her research interest include three-dimensional and multidisciplinary art as well as teaching process at all levels of education, with an emphasis on the Methods of Art Education.

Marija Mitrović (b. 1994, Bar, Montenegro) is a cross-disciplinary artist and pianist whose concerto repertoire is almost exclusively focused on modern and contemporary works. After finishing the Academy of Music in Montenegro 2017, as Musical performer – pianist, she continued her studies in Trieste (Italy) and Dusseldorf (Germany) when she performed series of solo and chamber concerts (Piano recital 2018. (Sint Niklaas, Belgium), Spectral concert 2018. (Ljubljana, Slovenia), Piano days – solo recital 2019. (Dusseldorf, Germany) 2019 etc.) Beside piano performance, she was also one of curators in Jazz Festival Ljubljana 2018 and 2019 (project ABECEDA mentored by Dre Hočevar), public speaker on enCORE conference – New ways in Classical music, Berlin(Germany), 2019, artistic director of her first transmedial project Homocordia Disapiens in collaboration with Robert Schumann Conservatory and Institute for Music and Media (Dusseldorf, Germany). Currently, Marija is finishing Master's degree in piano performance at the University of Ljubljana (Slovenia), while working as a piano pedagogue and opera accompanist in Montenegrin National Theatre.

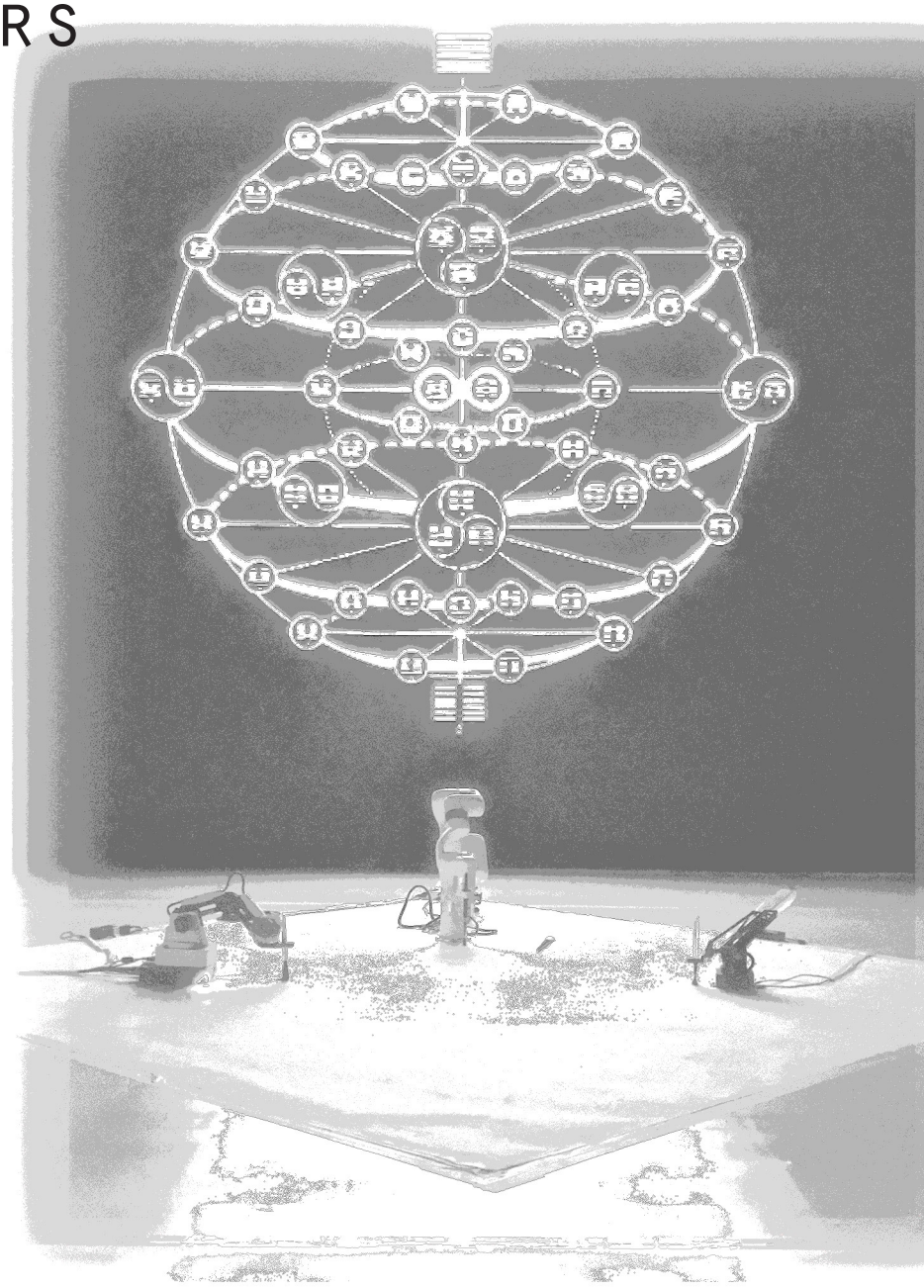
Mark Dyer is a composer of experimental concert and installation music. His artistic focus is the 'musical ruin': the quotation and degeneration of found musical objects that might elicit a sonic dialogue analogous to that experienced when visiting an architectural ruin.
Mark has worked with artists such as the Arditti Quartet, House of Bedlam, Psappha, Kathryn Williams, Jason Adler, CoMA, and has installed work at HOMEmcr in collaboration with visual artist Susan Pui San Lok. Additionally, he is the founder of the Manchester-based contemporary music ensemble Proximity.

Mark is currently a PhD candidate in Composition at the Royal Northern College of Music, where he is supervised by Mauricio Pauly and Larry Goves, and generously supported by an AHRC NWC DTP studentship.

Dino Rešidbegović graduated and obtained his master's degree in composition at the Wien Conservatory Privatuniversität der Stadt Wien in the classes of H.K Gruber, Wolfgang Liebhart and Dr. Rainer Bischof. He also graduated in piano at the Vienna Conservatory. He completed a post-master study in composition at the Univesität für Musik und Darstellende Kunst in Wien in the class of Detlef Müller Siemens. He also studied conducting in the class of Uroš Lajovic at the same institution. He received his doctorate (DMA) in composition from the Music Academy of the University of Sarajevo under the mentorship of Dr. Igor Karača. He has received awards and grants for composition such as: Alban Berg, Siemens AG Österreich, Theodor Körner prize (laureat) and the prize for composition Avdo Smajlovic from AMUS society for special contribution in the field of classical art music in 2019. He is currently employed as an associate professor in the University of Sarajevo|Music Academy department of composition. He is a permanent member of the Austrian Composers' Association (ÖKB). His works have been performed in Italy, Croatia, Serbia, Slovenia, Germany, Ireland, Switzerland, Japan, Bosnia and Herzegovina and Austria (Musikverein) and the USA (Washington Dc and Carnegie Hall, New York). He is the author of RMC (Reductional Music Complexity), a music system free of pitch and ARGN (Approximate Reductionist Graphical Notation), a system of electronic and electroacoustic music notation. He is also active as a performer of his own compositions containing sound synthesizers. He is a pioneer of artistic live electronic composition and performance in BiH.

Immanuel Mellis (b. 1998) is a Composer, Instrumentalist, and Music Entrepreneur. Immanuel's sound is a stimulating blend of Soul, Pop, and Classical music. Performances of his work include the New York State School of Music Association (NYSSMA) Winter Conference (2016), Young Composer's Festival (2015), Fredonia University's Student Composers Concerts (2017-19), SHUFFLE's Call for Scores (2017), and Akropolis Reed Quintet Call for Oboe and Bassoon Scores (2017). Motivated to enhance his skills, the composer has studied under Dr. Robert Clay Deemer, Professor Jamie Lee Sampson, Dr. Andrew Smith, and Dr. Paul Coleman. Outside of Composition, Immanuel is in the process of developing a Music Distribution company with his mentor, Dr. Eliran Avni. The composer believes there is a close link between performance and composition. Thus, he has studied Viola under David Rose, performs on Violin, accompanies Fredonia's Divine Sound Gospel Choir on Piano, and actively learning new instruments.

Guidelines for Authors



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Authors must submit original, unpublished articles.

All the manuscripts should be accompanied by author's name, affiliation, e-mail address, and a short biography (up to 150 words per author). Articles can be submitted in English (preferably) and Bosnian.

Manuscripts should be written in .doc or .docx format, in Times New Roman font, font size 12 with 1.5 line-spacing.

Original scholarly paper intended for sections The Main Theme and Beyond the Main Theme should include a short abstract (100-200 words), 5-10 keywords, as well as the summary (500 words). For articles in Bosnian, summary must be written in English. Do not include citations in the abstract. Keywords must be chosen appropriately in order to be relevant to the subject and content of the paper.

Regarding the citations, authors should use the author-date system with the separate bibliography, following the guidelines given in Chicago Manual of Style (Chicago: University of Chicago Press, 2010; http://www.chicagomanualofstyle.org/tools_citationguide.html). Please note that the list of references (bibliography) given at the end of the article must only include works that are cited in text.

Book, conference, and festival reviews should bring to attention relevant and valuable contributions or events that are in interest scope of our Journal. Reviews must contain a dose of critical appraisal instead of being written merely as summary. The title of the book review should include necessary information regarding the volume, as in following example:

- William Myers, *Bio Art – Altered Realities*. London: Thames and Hudson, 2015, 256 pp., ISBN 9780500239322
- *Margins, Futures and Tasks of Aesthetics*, Conference of the IAA, Helsinki, Finland, July 5–7, 2018.
- Sonemus Fest, Sarajevo, Bosnia and Herzegovina, April 16–21, 2018.

Manuscripts can be equipped with photos, illustrations, drawings, and tables. These should be of good quality (resolution higher than 300 dpi), in .jpg or .tiff formats, and submitted as files separate from the text. All visual materials must have permission for publishing from the author, photographer or the respected owner of the rights.

Word count:

- Original scholarly papers (Main Theme and Beyond the Main Theme sections) – 3000-6000 words
- Book, conference, and festival reviews – 1000-1500 words
- Interviews – 1000-1500 words