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# INSAM

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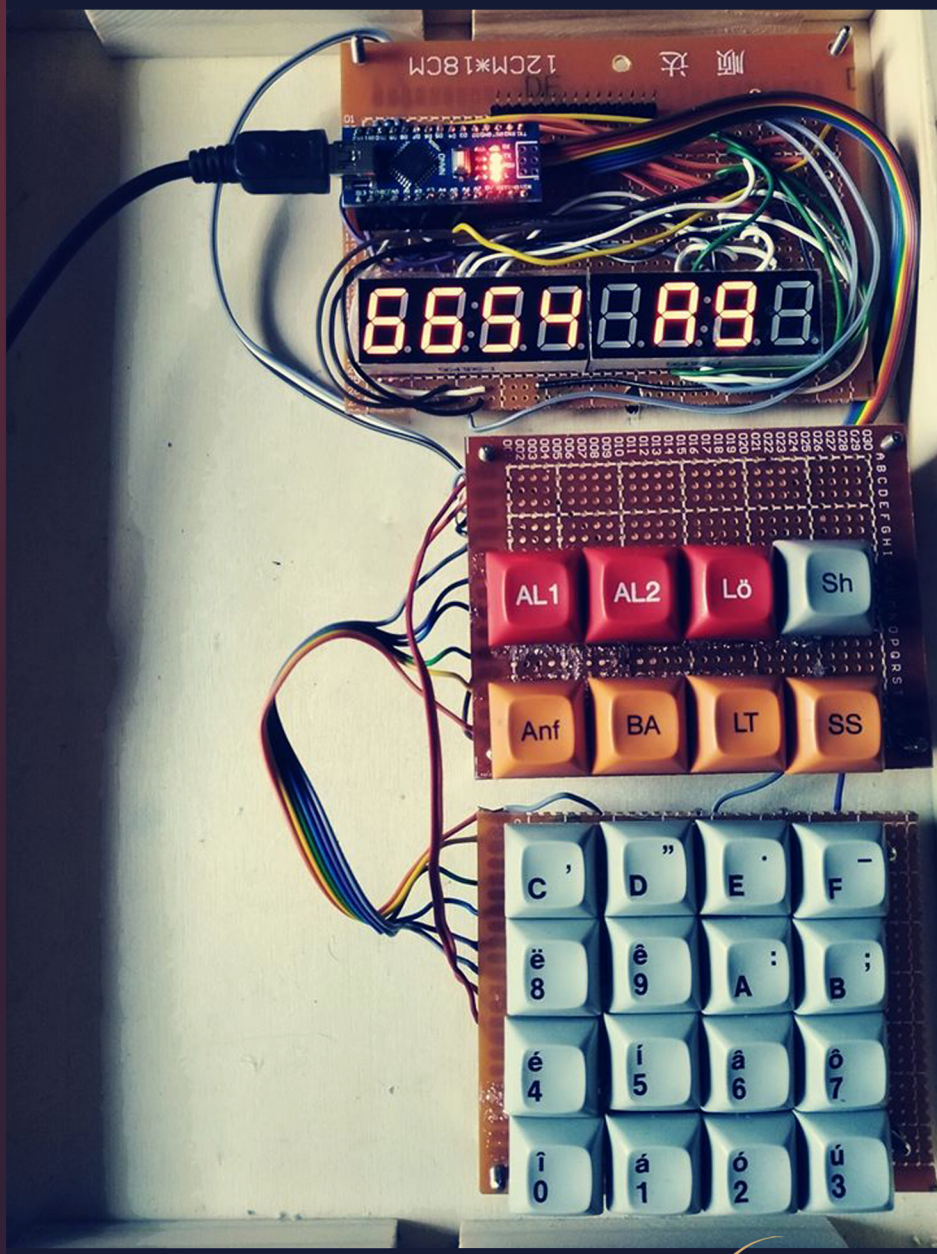
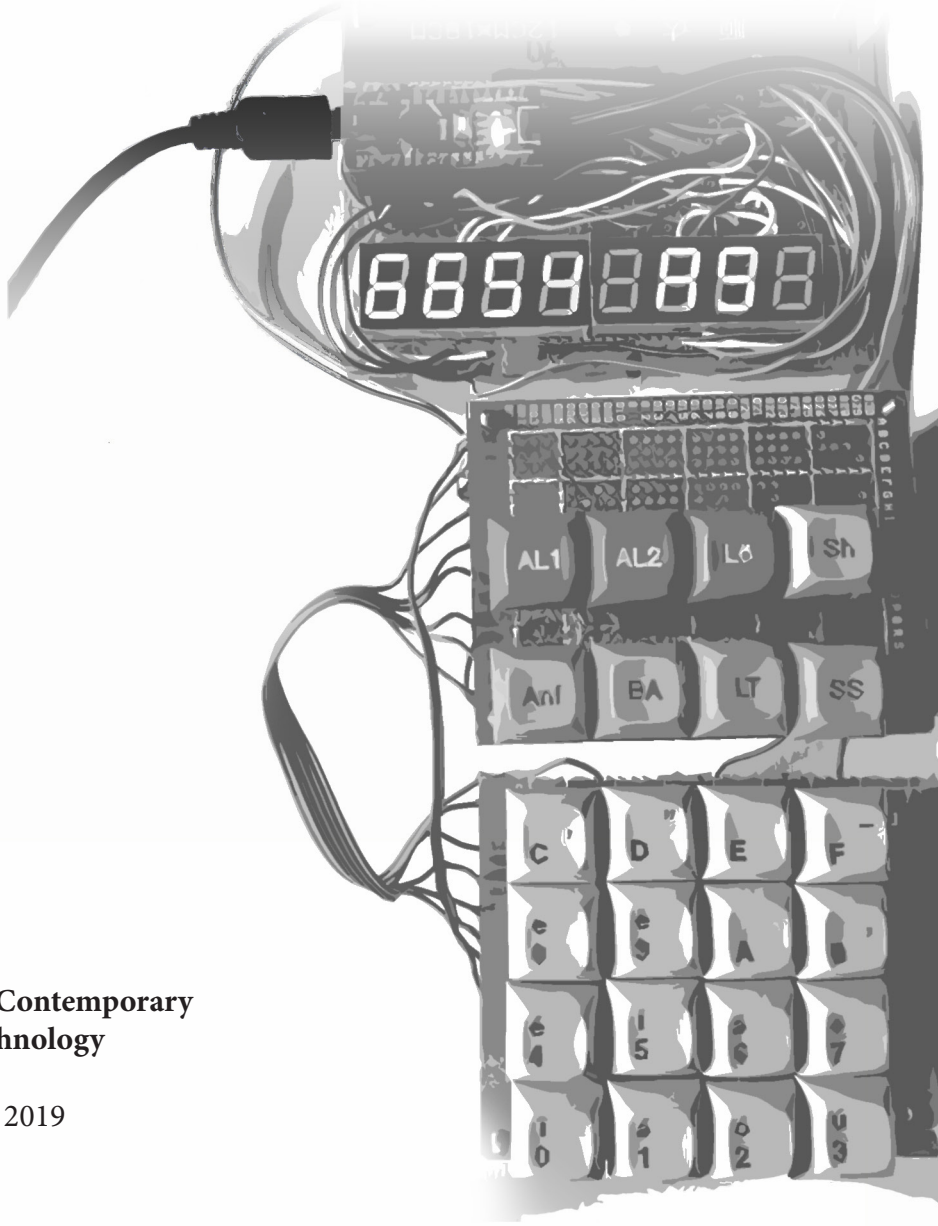



JOURNAL OF INSAM
INSTITUTE FOR CONTEMPORARY ARTISTIC MUSIC

INSAM

# I N S Δ M

JOURNAL OF CONTEMPORARY MUSIC, ART AND TECHNOLOGY

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ASOCIJACIJA KOMPOZITORA MUZIČKIH STVARALACA | АСОЦИЈАЦИЈА КОМПОЗИТОРА МУЗИЧКИХ СТВАРАЛАЦА | ASOCIJACIJA SKLADATELJA GLAZBENIH STVARALACA

INSAM VISIONARY PLATFORM

*To Dr. Vesna Mikić (1967–2019),*
*our dear professor, colleague and friend.*

*Thank You for everything.*

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# EDITOR'S FOREWORD

From the initial "rough" idea to the concrete theoretical output of our authors, it is an immense pleasure to observe the process of a magazine issue coming into being. I would compare this process to the so-called *organic machines* that were envisioned in the 70s by Paul Pignon in the Electronic Studio at Radio Belgrade Third programme, where in front of the eyes and ears of the composers, a very simple trigger impulse on Synthi 100 grew into an entire sound sculpture, whose details revealed traces of the event that initiated them. It can be said that this is the case with this issue of INSAM Journal, in which authors took ideas from the call for papers and made them very concrete. Papers touched on up-to-date theories which focus on different uses of the past, as well as on a wide range of creative practices, from the experimental academic sphere, and mainstream creations and reviews of artistic artefacts of the past, to the "underground" phenomenon known as internet art.

Five articles are dedicated to the main theme of this issue. Four of them focus on music while the other one addresses issues related to other arts. The domination of music is punctuated by an extensive study by Đenita Kuštrić, titled "Reverse Archeology: Synthetic Surrogate as Ghosting Object," in which the author thinks about the possibilities of re-actualizing artistic artefacts of the past by incorporating them into digital "thinking" (surrounding), especially in the fields of painting and sculpture. Even though it's the only paper dedicated to the visual arts, due to its wide conception it offers the most opportunity for further discussion. In this sense, Kuštrić's article completes the scope of areas that need to be encompassed, touching as it does on almost all other artistic fields.

On the other hand, the articles about music cover a wide range of subjects in the call for papers, and also considering other related fields such as the use of magnetic tapes to realize new works, which is a subject discussed by Sean Russell Hallowell in his paper titled, "Composing with Analog Tape in a Post-Digital Age." Using technologies of the past to create a contemporary form of musical expression was also the focus of the paper, "The Wrong Tool for the Right Job: Composition on 8-bit Machines" by Tobias Banks, which thinks about the possibilities of using 8-bit computers and the sound generators of gaming consoles.

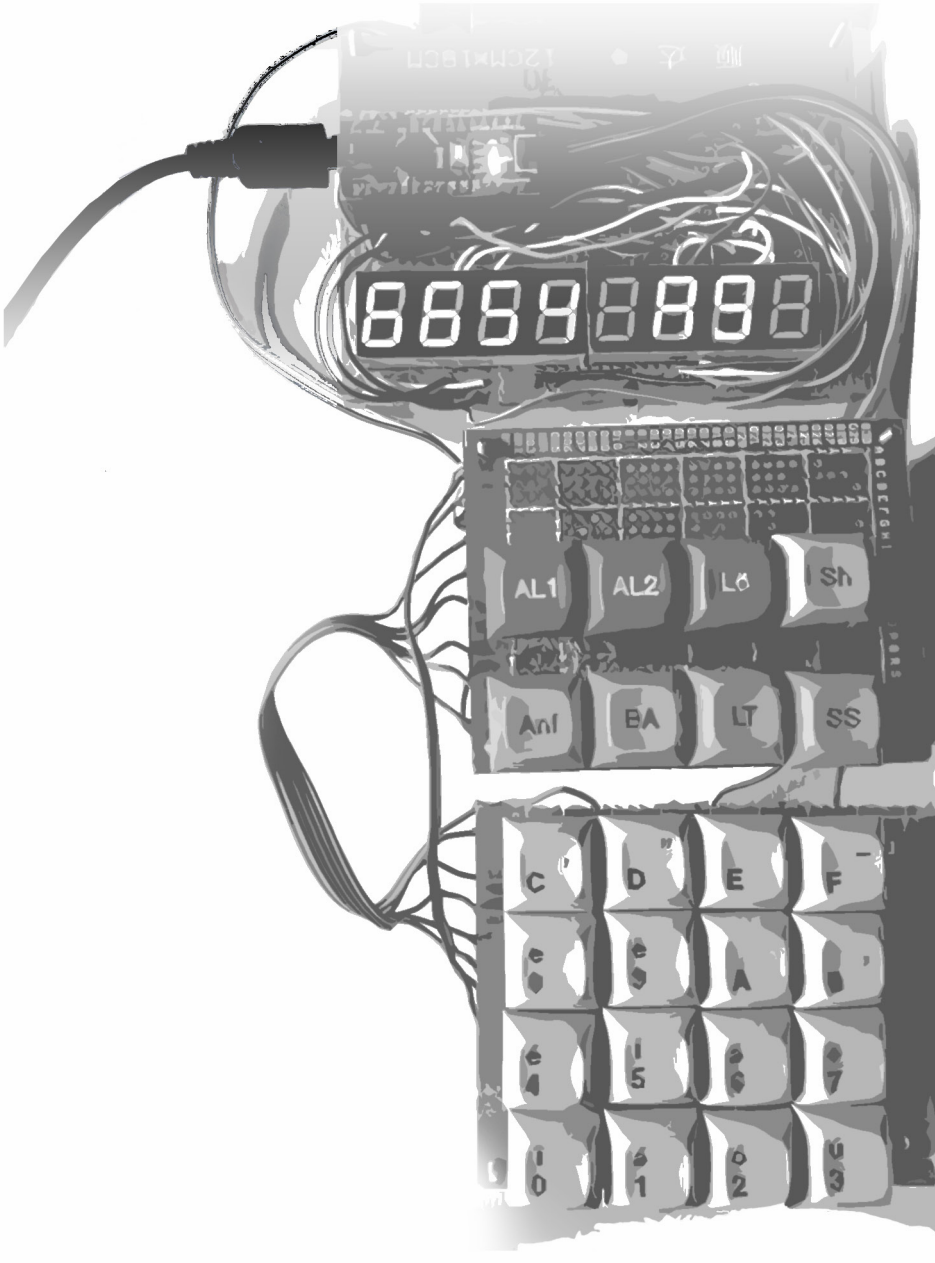
In contrast to these articles written mostly from the perspective of composers, articles by Tisa Jukić and Adrien Ordonneau think about the relationship between musical genres and the use of retro technologies from a musicological standpoint. In the paper, "Ideological Ambiguity of Internet Art: Vaporwave, Yugowave and Serbwave," a light is shed on local manifestations of the meme-culture of vaporwave,

while simultaneously thinking about the wider social importance of this phenomenon in the context of recent, traumatic happenings in the Balkans. Similarly, the paper, "Retro Tendencies, Decay and Haunted Media in Hybrid Electronic Music," views some post-digital practices of artists from the end of the 20th to the beginning of 21st century, who base their works and interpretations on a kind of re-actualization of the past, which makes them, according to the author, hybrid artists, given that they act from contemporary positions, raising in that way some inevitable questions about nostalgia and its importance for contemporary identification matrixes.

Sadly, during the preparation of this issue, we lost professor Vesna Mikić, who is greatly responsible for the existence and development of the written word about electronic and popular music in this part of Europe, and whose absence we will never be able to compensate.

In Novi Sad, December 8, 2019,
**Milan Milojković**
Focus issue editor

# In Memoriam



**Biljana Leković**
*Faculty of Music, University of Arts*
*Belgrade, Serbia*

# IN MEMORIAM *STEPS* AND *TRACES* OF VESNA MIKIĆ (1967–2019)

Dr. Vesna Mikić, full professor at the Department of Musicology at the Faculty of Music in Belgrade, left us prematurely on October 30th, 2019, after suffering from a serious illness. This news has deeply distressed her closest associates, colleagues, and students, as well as those who had the opportunity of at least once coming into contact with her fascinating personality. Due to her extraordinary positive energy, briskness and agility, refined intelligence, altruistic nature, and nobility, Vesna left unforgettable and indelible traces in our lives.

In her nearly three-decades-long professional career, Vesna actively, and with great dedication, traced and directed the development of her field of pedagogy and scientific musicological research, making an immeasurable contribution. As a teacher, she set and maintained high professional standards, demonstrating exceptional knowledge and capacity for critical thinking, breadth of understanding, extraordinary erudition and eloquence, boundless creativity and imagination, and, most importantly, a strong commitment to students who find in her a true interlocutor, role model, and inspiration.

The courses she taught, dedicated to the general and national contemporary history of music, were intelligently created, detailed, and complex. Her aim was to interpret and present music as a layered phenomenon associated with different non-musical spheres (history, aesthetics, philosophy, politics, economics, sociology, cultural studies). Besides this, Vesna has shown great courage in opening up new, often marginalized topics for problematization in local academic circles, and creating new curriculums, at all levels of study, including: "Theory of Popular Art and Culture", "Arts and Politics" (Interdisciplinary Studies, University of Arts in Belgrade), "Electroacoustic Music", "Popular Music: Theories", "Popular Music: Genres", "History of Popular Music", "Music and Politics", "History and Theory of Film and Television Music", "Theory and Practice of Musicology in Media", and "Aspects of 20$^{th}$ and 21$^{st}$ Century Music" (Faculty of Music). Vesna also made exceptional pedagogical contributions, not only at her main faculty and university, but at other institutions as well, in the countries and regions where she was occasionally or continuously engaged (the Faculty of Philology and Arts, FILUM; the Academy of Arts in Novi Sad; the Academy of Arts in Priština; the Music Academy in Cetinje; the Academy of Arts of the University of Banja Luka; and the Academy of Arts "Slobomir" of the University of Bijeljina). Her pedagogical qualities were recognized and highly valued abroad. As a guest lecturer, she gave lectures at the Paris Conservatory (Conservatoire Superièure de Musique et de la Dance de Paris), the Institute of Musicology at Humboldt University in Berlin, and the Faculty of Philosophy (Department of Musicology) in Ljubljana.

Vesna Mikić's scientific work was extremely rich, diverse, layered, and characterized by a tendency to innovate and discover new topics and fields of research, often questioning and re-examining the boundaries of musicology. Interested in contemporary music, Vesna laid the groundwork for three important thematic fields in the context of global and local musicology: first, the interpretation of neoclassicism in the context of European and Serbian music (which she considered in her crucial book, *Lica srpske muzike: neoklasicizam/Faces of Serbian Music: Neoclassicism*, 2009); second, the still progressive and current problematization and systematization of the relationship between music and new technologies/media (this problem is addressed in her doctoral dissertation and the book *Muzika u tehnokulturi/Music in Technoculture*, 2004), in the context of technoculture (she introduced this term into our musicology, and gave a new interpretation of the

term "technomusic"); and third, the interpretation of the concept of popular music in an international and national context, as well as the institutionalization of this practice, which Vesna boldly initiated in the field of Serbian musicology. A result of her special interest in this field was the establishment of the Center for Popular Music Research (founded in 2013), dedicated to the scientific research of different local popular music practices, and the realization of a monograph called *Faces of Serbian Music: Popular Music*, which, unfortunately, was not finished.

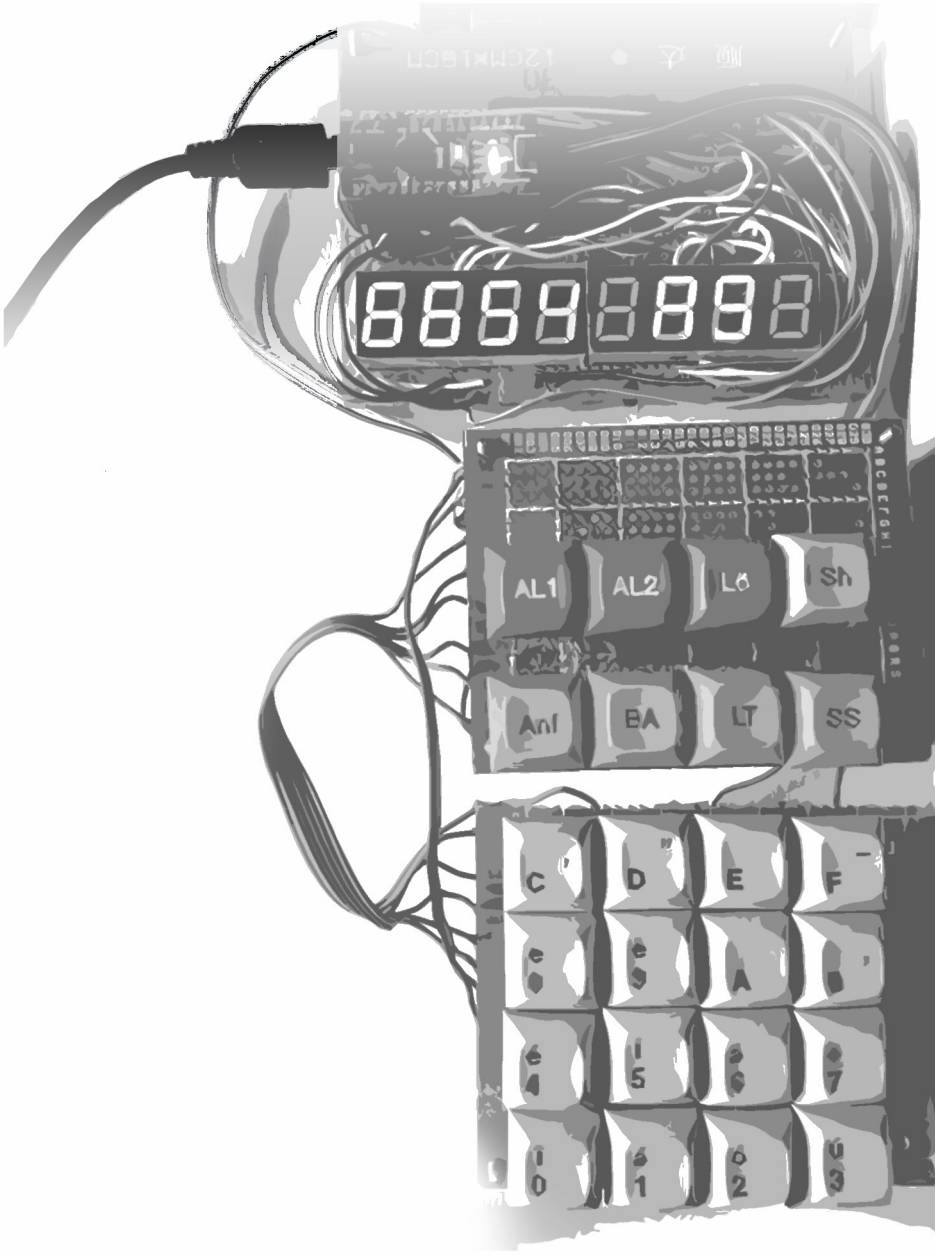
Vesna Mikić has dealt with these topics in various ways, from different angles, in an impressive number of papers—close to one hundred—published in respected domestic and foreign publications. Her bibliography comprises thematic collections of papers and collective monographs (two of them are E*uropean Theories in Former Yugoslavia: Trans-theory Relations between Global and Local Discourses*, 2015 and *Musical Identities and European Perspectives: an Interdisciplinary Approach*, 2017), conference proceedings from national and international musicological conferences (for example, *Crossroads: Greece as an Intercultural Pole of Musical Thought and Creativity*, 2013 and *Music: Function and Value*), leading professional journals (*New Sound International Journal of Music*, *Зборник Матице српске за сценске уметности и музику*, *Музикологија/Musicology*, *Мокрањац*, *Music and Society in Eastern Europe*), and encyclopedias (*Grove Music Online*, *EPOW: Encyclopedia of the Popular Music of the World*, Vol. 11). She was also active as a translator from English and French, and among her translations are three important books for our musicological community: *The Concise Oxford History of Music II and III* by Gerald Abraham and *Popular Music Genres: An Introduction* by Stuart Borthwick and Ron Moy (in collaboration with Aleksandra Čabraja). As well as this, Vesna Mikić was appointed to numerous editorial positions in her career, among which is her long-standing role as Deputy Editor-in-Chief of the *New Sound International Journal of Music*. With her scientific results, classified in the highest research category according to official standards, she has directly influenced the sustainability, visibility, and success of Serbian musicology.

Vesna participated in all of the scientific projects of the Department of Musicology, Faculty of Music in Belgrade, including "Identities of Serbian Music in a World Cultural Context" (sponsored by the Ministry of Education, Science and Technological Development of the Republic of Serbia) and Jean Monnet modules "Musical identities and European Perspective: An Interdisciplinary Approach" (within the ERASMUS + EU program). Also, she was involved in several international projects, such as "International Relations in the Context of Yugoslav Music Institutions: Case of Serbia and Slovenia (2008–2009)" and "Eurovision Song Contest and New Europe" (2009, 2011). As the founder and director of the Center for Popular Music Research, she initiated several projects with the aim of encouraging and motivating younger colleagues to research and create together. She constantly promoted the idea of teamwork at the Department of Musicology, especially when she was the Head of Department from 2016 to 2019. Her exceptional work was,

unfortunately posthumously, awarded the prestigious prize—The Great Plaque of the University of Arts in Belgrade.

With her exceptional pedagogical and scientific results, high level of professionalism and collegiality, extraordinary energy and creative enthusiasm, and dedicated and selfless engagement in various spheres of activities, Dr. Vesna Mikić made a tremendous contribution. Although she has left a grand pedagogical and scientific heritage, her early departure has left an irreplaceable emptiness in our community, and beyond. The emptiness, also, would be in our hearts, were it not filled with the most beautiful memories of her. For all her *steps* and *traces*, we owe her our sincere gratitude.

# (Inter)Views



**Paul Pignon**
*Composer and performer*
*Stockholm, Sweden*

# WHY I STILL WANT TO MAKE MUSIC ON THE SYNTHI 100

I started out doing tape music at Radio Belgrade in 1968, thanks to the help of composer Vladan Radovanović and the encouraging policy of the Radio Belgrade Third Programme staff. In 1970s, Radio Belgrade approved funding to equip an electronic music studio. I already had some contact with EMS London and Peter Zinovieff and had seen and tried the VCS3. I recommended that Radio Belgrade contract EMS to develop a large synthesizer for the new studio. And hence the Synthi 100 was born. Since it included a digital memory for sequencing control voltages and triggering, it could be properly described as a hybrid synthesizer.

The studio opened in 1972, and quickly put Belgrade on the map in the electronic music (as we called it then) world. The first piece composed there was my own "Hardware Performance", and after that many composers from at home and abroad came to Belgrade to make music.

Computers came to EAM. At the Belgrade studio we were of course looking towards computerization as the future of electroacoustic music, but as the Yugoslav economy began to crumble there was never going to be any funding for that.

EMS Stockholm was a world leader in computer music in the 80s. I managed to go there thanks to a grant from The Swedish Institute, eventually staying in Sweden permanently.

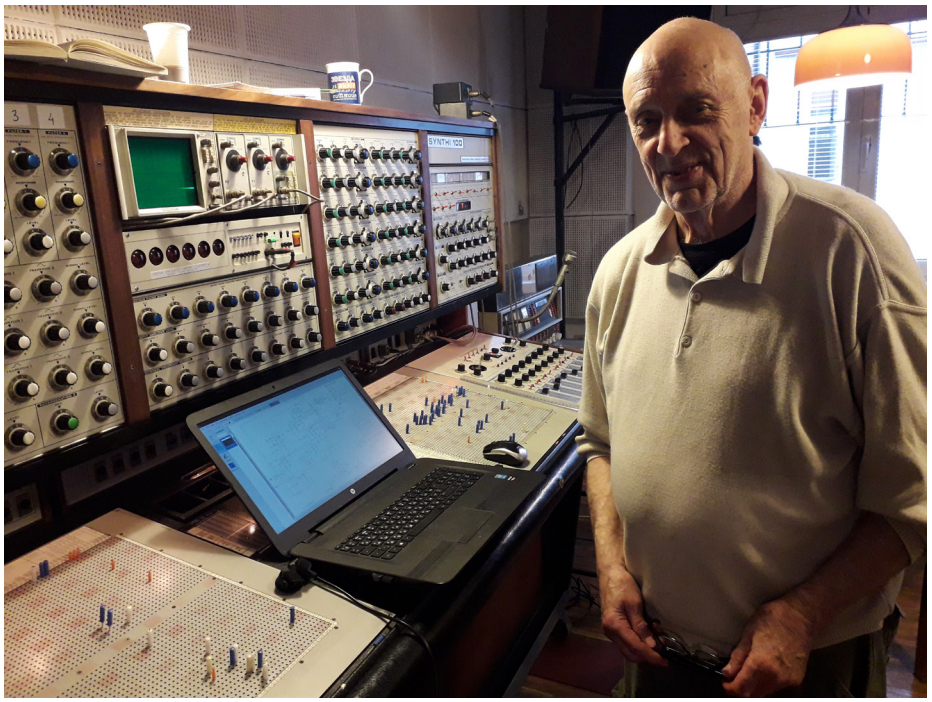
Just before leaving for Stockholm, I sold my VCS3 (worth its weight in gold today), telling myself that it was old-fashioned gear already and I needed the money.

At EMS Stockholm I worked a lot on digital signal processing for the VAX, VMS, and the FPS array processor.

Nowadays, on my Linux laptop/desktop, I have many times the computing power that we had in the late 80s, in cabinets the size of refrigerators! In Pd I can do more or less everything I could ever do even on the huge Synthi 100...

Hold on though. Actually I can't. The latter-day patching techniques I started to

develop in the 80s and have extended since my recent reunification with the Synthi 100, involve unorthodox, "impermissible" connections giving rise to unstable feedback configurations which just don't work in the digital domain.



Paul Pignon with Synthi 100 at Electronic Studio Radio Belgrade, photo: Svetlana Maraš

I have tried to reproduce in Pd some of the elementary unstable circuitry I can create on the Synthi 100, but some of the connections are simply forbidden. The stumbling block is that digital signal processing most often requires a buffer of samples to be collected first before an algorithm can be applied to the sound. There's an inevitable delay while the samples are collected. So the kind of feedback loop which is so typical of what I do in my zoetic engines on the Synthi 100 just won't work. I cannot say for certain that some kind of workaround cannot be implemented in a digital patching scheme, just that it would be a challenge for which I don't have enough years left to take up.

Could I achieve similar results with cord-patched synthesizers, all that old school hardware which is experiencing a huge renaissance now? I must admit, I haven't even tried, but I'd say no, not with the degree of complexity one can achieve on the Synthi 100. With some 20 patchcords they already look like a jungle—impressive on stage or Facebook but tripling it is quite unfeasible. Also, the unique ingenious patching solution, typical of EMS London since the VCS3, allows things which, as I said, aren't really allowed. It also allows quite outrageous combinations of control signals and audio.

So, the essential cause for my renewed enthusiasm for the Synthi 100 is that I can, using complicated and somewhat outrageous patches, create what I experience as organisms, with a life of their own—hence my description of them as creatures, or in a complete ensemble as a zoetic engine. Furthermore, I can interact with them either through audio or physical movement in a way which feels quite alive, hence my use of the adjective "zoetic."

At the documenta 14 art exhibition, visitors were able to directly excite my zoetic engine though a microphone, which some found quite fascinating. It also fascinated me how, at night, when everything quietened down, the creatures were extremely sluggish and made very few sounds, then got really excited when the day began, and visitors made noises.

What I'm describing here is something very specific to myself and the Synthi 100. I am nevertheless somewhat sceptical about the motivation for the massive retro trend now in full swing, for not just analogue synths, but even LPs, cassettes, reel-to-reel and what have you. I'm so old I remember when those things were invented, and thankfully superseded. I do feel much of the trend is just a fad. The recordings put out on cassettes are probably mastered in a high-resolution high-sampling-rate digital format on a computer, for example.

And as for real-time sound processing, most of what composers do live can be done better (and much more flexibly) on a computer. My colleague and fellow member of BOP, Thomas Bjelkeborn, creates incredibly complex streams of real-time processing on a laptop. It's a matter of spending a lot of time in development, but the inherent mutability and extensibility of digital processing makes it in many ways far superior to stacks of analogue gear. Achievements are easily shareable with peers, and if one, like me, lives in the open-source community, it doesn't cost anything.

Of course, there is a certain physicality in working with analogue gear which alters the way composers interact with their tools, which is an important aspect. Some say the synth sound is different. I cannot say I've done any blindfold comparisons myself, but, as I have gleaned from the internet, some people have, and there are comparisons up on SoundCloud tending to suggest that such claims are rather dubious, insofar as one is just implementing conventional sound synthesis.

I'm glad Synthi 100s are being resurrected all over the place now, because they do offer composers some unique opportunities which just aren't accessible with any other tools.

Some relevant links:

https://soundcloud.com/galingong/1-square-seq-norm?in=galingong/sets/eurorack-vs-software-blindtest

https://www.gearslutz.com/board/electronic-music-instruments-and-electronic-music-production/1065261-analogue-vs-software-blindtest.html

https://theproaudiofiles.com/analog-tubes-vinyl-future-retro/

http://forum.vintagesynth.com/viewtopic.php?t=54586&start=30

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# HOW A CENTURY-OLD TECH COULD INSPIRE THE NEXT WAVE OF INNOVATION

Lee Sedol, 18-time Go world champion, has recently announced his retirement from the professional play. What makes the announcement worth thinking about is the reason for walking away from the endeavour Lee dedicated his life to - "Even if I become the number one, there is an entity that cannot be defeated."[1]

In 2016, Google's DeepMind artificial intelligence system (AlphaGo) had beaten Lee in Go (4 to 1) – an ancient game that represented a Holy Grail for AI for a long time. The reason why researchers have adopted Go as a good benchmark for intelligence is the fact that a brute-force strategy to play the game does not work, but a level of "creativity" is needed. A back-of-the-envelope-calculation estimates $10^{800}$ possible matches of a typical length, which outnumbers the total number of atoms in the known universe by the factor of $10^{720}$. Taking this into account, we cannot be blamed to consider AlphaGo having a particular type of intelligence, and we are intrigued by what might come next (well beyond the newer generation AlphaGo Zero, that beat the previous version by the score of 100 to 0). Self-driving cars, intelligent self-diagnostics

1 https://en.yna.co.kr/view/AEN20191127004800315 (on 12/12/19)

tools, autonomous robots, knowledgeable personal assistants, and more powerful tools for surveillance are some of the promises of AI, and not to forget that AI is now producing what some consider as a form of art.

However, here is the other side of the coin. There is no such thing as a free lunch (at least not in this case). AI is not magic that happens without costing something: on the contrary, it might cost us more than we think. When we speak to Siri or any smart personal assistant of choice, it costs us a certain (typically vast) number of computations, and that has its price. To produce AI, we need to train artificial neural networks, and this process is usually run on large computer clusters. We dubbed this process as cloud computing, but the service does not happen somewhere in the atmosphere but in immense and extremely power-hungry data centres. Training neural networks requires a lot of energy, and that has its consequences. Recent estimates suggest that training a few neural networks could produce as much as 284 tonnes of carbon dioxide.[2] To put things in perspective, this is equivalent to the lifetime emission of 5 average cars. Even more alarmingly, it has been suggested that data centres could become one of the biggest polluters in the world, consuming one-fifth of the total energy produced on Earth as early as 2025.

The trend does not seem to be slowing down, and if anything, it is increasing at a fast pace. Since 2012, the computing power requirements to keep AI going have increased by a factor of 300,000, remarkably more than what would be expected by historical trends (closer to an x7 increase).

So, it makes sense to think from first principles and see if we can do better.

Lee Sedol (+coffee) taking on DeepMind's AlphaGo (March 2016)
(Image adapted from: DeepMind/YouTube)

2 E. Strubell et al, Energy and Policy Considerations for Deep Learning in NLP. arXiv:1906.02243v1 (2019).

In his 1965 paper, Gordon Moore, co-founder of the Intel Corporation, predicted that the number of transistors, which are fundamental building blocks of electronics, in integrated circuit doubles every 18–24 months. This prediction is better known as Moore's Law. The ability of the semiconductor industry to follow this trend through transistor scaling provides a better performance-to-cost ratio of products and results in the exponential growth of the semiconductor market. What every transistor individually does is simple. It switches between two states: 0 and 1. However, where the complexity emerges is when we combine billions of transistors into a single electronic device; the Apple iPhone's A13 chip has 8.5 billion transistors, and it does some impressive things. Moreover, Dennard's Law, a close cousin of Moore's Law, observes that the transistors are also getting more energy-efficient and faster as we scale them. It seems the only (main) thing we had to do to fuel our electronic technology was to keep making transistors smaller and smaller, and as a lucky side-effect, we got them to be more energy-efficient as well. This is a digital approach, the basis of virtually all electronic devices we use today, and the paradigm has been so successful for the last five decades that we have taken it for granted. However, all of this is about the change. The trend of making transistors smaller has significantly slowed down in the last few years, marking the beginning of the end of Moore's law. The trend of them becoming more efficient has practically stopped ten years ago. The issue is that we cannot go beyond physical limits - it is challenging to make transistors consist of a handful of atoms that make all the matter and still having them to be fully functional. The electronics cannot work at faster speeds as they will melt due to the extensive heating. Simply put, we cannot beat physics. So what can be done? It seems we need a new approach, or maybe we can look at the old obsolete technology – analogue computing.

Analogue computing is a long-forgotten endeavour, being abandoned almost half a century ago, mostly due to the enormous success we had with a digital approach. Analogue components are prone to noise, easily affected by environmental changes, and less reliable in producing entirely predictable results. After all, a calculator that makes an arithmetic mistake even once is not good enough. However, analogue systems have one crucial advantage: they are governed by the same equations they try to solve, leading to much better energy efficiency. Instead of using millions of digital transistors to simulate and solve a problem, we can use the physics of a handful of analogue components more directly to get a result. If only we could somehow deal with the imprecisions of analogue components. Well, we do know of one system that is not digital, is composed of messy and noisy elements, but still produces the wanted results with remarkable energy efficiency. Here comes the human brain, the most complex, intelligent, but also energy-efficient system we know of. Neurons and synapses are intrinsically noisy, messy, and stochastic, and yet the brain functions and produces intelligence better than any other system we know. Putting things in perspective, AlphaGo consumes around 1MW of power and uses all of those watts to compete against Lee's brain, which does much more than play a game and still does

not consumes more than 20W. Maybe we can learn something from biology and try to resurrect some of the old analogue approaches. Only, this time, we also have all the benefits of novel technological developments, such as those in nanotechnology.

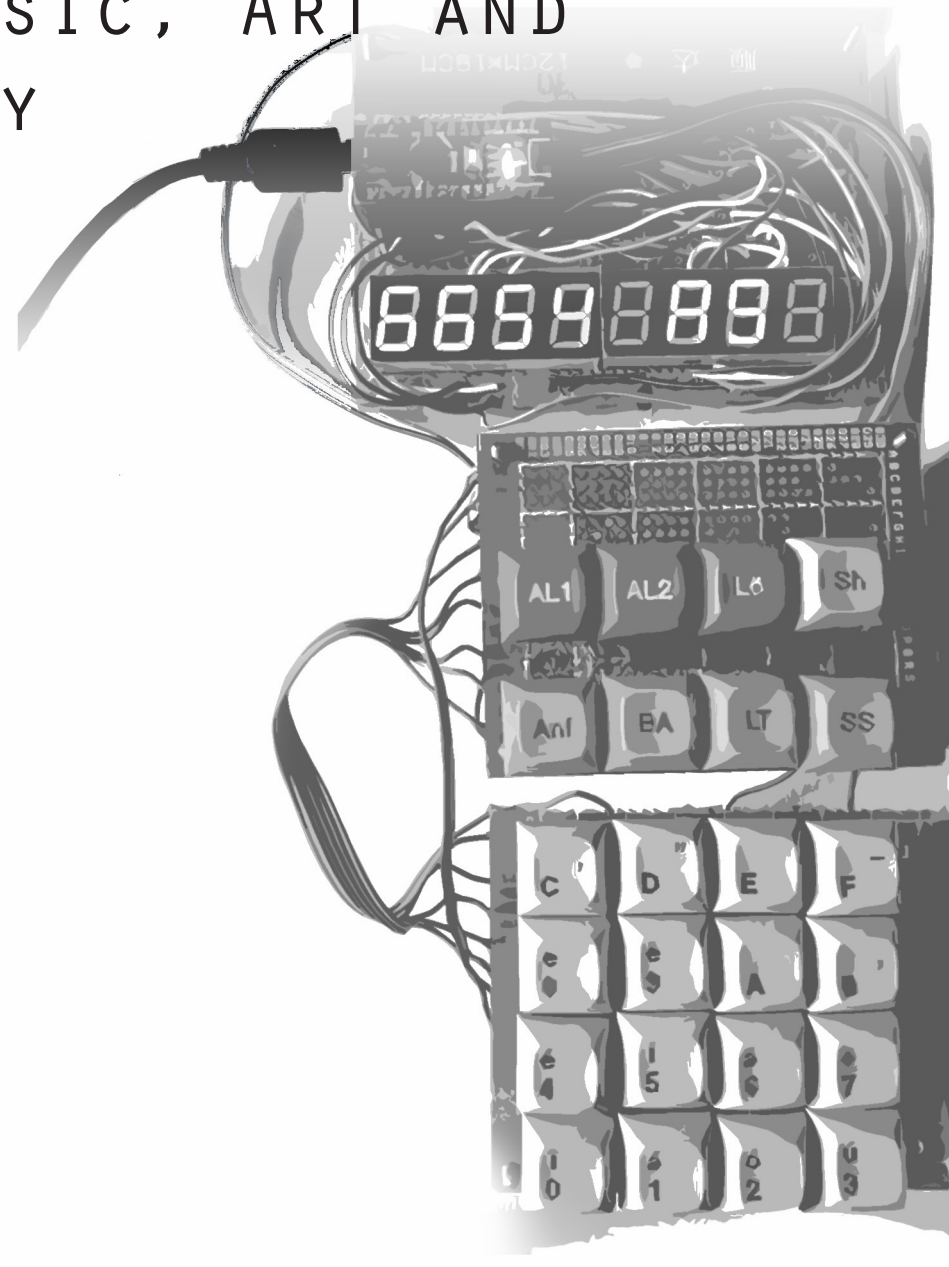
I work on such a novel technology called memristors.

Memristors are nanoelectronic devices that can be as small as our current smallest transistors, but that is not their ultimate strength. Memristors aim to be much more than simple digital switches. They enable computing by directly implementing some crucial functions of biological systems—most importantly, synapse-like plasticity and neuron-like spiking. Memristors are much closer to analogue components than digital transistor switches. They are not perfectly deterministic, and they do exhibit some level of stochasticity. However, the whole paradigm of artificial neural networks, our current bedrock of AI, is to harness systems that use probabilities (the AI system rarely predicts answers with 100% confidence). Memristors, when utilised in physical neural networks, still provide excellent accuracy while using a small portion of the energy budget. There is a chance that memristors will be a key enabler for low-power AI systems of the future.

In either case, it is sometimes worth combining new with the old. For a researcher, this might mean going to a library and digging into the yellow pages of old, non-digitalised manuscripts.

A "calculator" is better for staying digital; however, analogue might have its place in the future of AI, and they could both coexist. By combining old ideas with new technologies, we might be on the right track to produce the next paradigm that might keep us running for the next few years, if not decades, as in the case of Moore's law.

# Main Theme:
# Retro Technologies in Music, Art and Theory



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# RETRO TENDENCIES, DECAY, AND HAUNTED MEDIA IN HYBRID ELECTRONIC MUSIC

**Abstract:** The consequences of new media and their manifestations in post-digital arts has deeply modified electronic music. Old and new sounds blend into each other to create a new aesthetic, defined in this article as hybrid electronic music. An analysis of this aesthetic helps us understand the impact of retro tendencies on the creative process. In order to have a sufficient amount of data, this article proposes a theoretical framework for the aesthetic which encompasses an analysis of the production's material, how it is being used, live performances, and an emphasis on retro tendencies. The findings demonstrate the ambiguous and uncanny relationship electronic music can have with the past. One of the hypotheses of this article is the potential link between electronic music, future, and decay.

**Keywords**: haunted, decay, organic, uncanny, regression, popular, alienation, body, paradox

The future of humanity is constantly being questioned. From the biblical apocalypse to the big 2000 bug, numerous prophecies have foreseen chaos. I define "chaos" as an amalgam of numerous, confused, and disordered objects in an entangled state.

Similarly, technological advance is continuously challenged in terms of its own evolution. In 1998, Nicholas Negroponte announced that "[T]he digital revolution is over". Moore's law is showing its limitations. Our fragile technological paradigm is threatening to stop, or worse, collapse. This scenario seems to be the current apocalyptic promise. For some minorities, regression, defined here as the return to a previous stage of development, is contemplated as a viable alternative.

Retro trends imitate, suggest, or exalt a bygone era. They are able to bring chaos by fusing heterogeneous epochs. Past references equally act as a regressive backward

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movement. They are sometimes tainted by nostalgia. They manifest—in a way similar to chaos and regression—an ambiguity about their identity.

This ambiguity may be equated with alienation. Alienation is understood here as the fact of becoming a stranger to oneself. Chaos and regression convene two identities into a single one. Chaos' heterogeneous elements struggle to unite. Regression, being inhabited by a wish to look back, brings a contradictory direction to the current technological paradigm and epoch.

Chaos, regression, and alienation are therefore communicating concepts. Chaos and regression are seen by a large part of society as synonymous. They also both describe an ongoing transformation. Finally, alienation materializes in the inability to find a stable form of identity.

These three concepts are present in the aesthetic of "hybrid electronic music" (HEM). This aesthetic movement is currently being studied and is at the heart of my research. We will define this movement typically using retro trends in popular electronic music. HEM will be part of our analytical framework to study these retro trends, despite its unstable form.

The "hybrid" designation is inspired by Edmond Couchot's (1998) theory. In our work, it will serve the purpose of incorporating new media theory with the organic structures of our research object.

This article, through an ethnomusicological and transdisciplinary lens (notably cinema, plastic arts, and philosophy), will study how retro trends manifest themselves in HEM. It will also study the relationship between chaos, regression, and alienation in retro trends. By expanding the research, we will also see how these trends are reflections of societal phenomena and give a positive outlook on the future.

To that end, we will first analyze retro trends in relationship to chaos. Then, we will study audiovisual and live performances in connection with regression. Finally, we will establish the link between retro trends and alienation in society.

## 1. Chaos: division, glitch, bricolage.

### Division

Retro trends are first and foremost the expression of divisions. From variable sources, multiple, and heterogeneous, they apply to many levels of the artistic work's design. Three distinct forms of divisions can be found in retro tendencies.

Firstly, sound itself is very unstable. Composed of vibrations travelling through the air or another medium, a sound is heard when it reaches a person's ear. Sound's movement in dimensional space, along with its diffusion with the environment and other sounds, generates different experiences for everyone. For Michel Chion (2005), sound brings back memories that can only be interpreted (14). Not only sound can bring back memories. The body can also remember. For instance, the music's vibrations that are felt can be replicated by one's body at a lower volume as

a memory reflex (Chion 2005, 14). Therefore sound is made of divisions, because of the different people hearing it. These divisions are chaotic because of their abstract interpretation and unpredictable behavior.

Sampling, defined here as the act of selecting and reusing a suitable visual or sound sample, has a second trend. The practice of sampling applies to sound, video, and picture. Consequently, our examples will be drawn from these specific media. The artistic work, when comprised of samples, is already divided by their multiplicity. Reassembled by the artist, these elements can have new meaning within the work's broader cohesion. However, internal divisions can still be observed.

For Yann Beauvais and Jean Michel Bouhours (2000), sampling is like a citation system, with similarities to Deleuze's molecular concept (108). To develop further Deleuze's concept as applied to sampling, we can ask where the sample begins and ends.

An instinctive answer would be at the beginning and end of the sound. However, the sample itself was recorded in the past. For instance where does the inspiration for "amen breaks" come from?[2] Beginning with the track "Amen Brother" in 1969,[3] The Winstons were probably influenced by other bands of their era, the Afro-American legacy, or other musical genres.

Through a sample's deep analysis, one can discover that a sample's own construction is composed of other samples. These other samples' origin, fragmented in infinite layers, is impossible to retrace. In addition, they will each receive different interpretations from the individuals hearing them. It is therefore impossible to determine a sample's beginning or end.

As we have demonstrated, there is a link between memory, body, and sound in the interpretation. This relationship has significant meaning for retro tendencies. For instance, samples can be used for various purposes such as nostalgia, inspiration, or to pay tribute. Amon Tobin pays tribute to Edgar Varèse's *Poème électronique* (1958) through sampling in his own work at the end of "El Wraith" or in "Proper Hoodidge".[4]

Electroacoustic music such as Varèse's[5] is a likely inspiration for HEM producers such as Amon Tobin, Aphex Twin, and Autechre. The infancy of this movement can be found on Usenet[6] forums. The creation of the "IDM List" in 1993 being one of its first online chat about Rephlex and Warp Records labels. Breaking the codes of rave culture, early HEM's signatures were micro rhythms and organic sound textures.

2 The "amen break" is a historical sample frequently used in electronic music. It is sampled from the rhythm of the song "Amen Brother" from *The Winstons* in 1969.

3 *The Winstons*, "Amen Brother", *Color Him Father / Amen Brother*, Metromedia Records, 1969.

4 Amon Tobin, *Out From Out Where*, Ninja Tune, 2002.

5 The Philips Pavilion created by Iannis Xenakis and Le Corbusier, inhabited by Varèse's work, suggested an exchange between external visitors and the organic interiority's structure in the shape of a stomach.

6 Usenet is a network where people exchange news. It was very popular in the 90s for producers, DJs and electronic music enthusiasts.

The goal of these practices was to emancipate this new movement from a strictly structured digital aesthetic. For instance, Autechre's work is sometimes described as incomprehensible. The numerous details, as well as an ever-changing structure, suggest a mysterious organic interiority, difficult to elaborate.

One way to give electronic music an organic quality is through the creation of unpredictable structures between digital and non-digital. Glitch, studied here within the theorical framework of Kim Cascone and Rosa Menkman, is a practice often used to achieve this goal.

## Glitch

Glitch-Hop, IDM, and Breakcore genres make extensive use of the fast repetition of sound fragments, mechanical rumblings, and aliasing sounds. An echo of these abundant perturbations can be found in Kim Cascone's article, "The Aesthetics of Failure" (2000). He details the saturated soundscape of machines, such as hard drives, clipping, and glitch computer sonification (Cascone 2000, 12–13). This aesthetic foundation surpasses the hopes and dreams of the digital revolution. It also indicates a return to digital systems' inner workings.

For Rosa Menkman, any failure resulting from an unknown cause can remind us of the ghost inside the machine, disturbing the logical operation of an immutable system. The author defines the glitch as an artifact different from the error to solve, the glitch being deeply rooted in a technical device and therefore in an interpretive process (Menkman 2011, 26–27). Glitch artifacts can feel like objects intentionally placed and detached from music. Therefore, they can be interpreted as archeological objects or ruins which lost their shape and function over time.

In Bibio's recent album *Phantom Brickworks*,[7] ruin exploration is the driving creative force. Gathering musical compositions over ten years (Murray 2018), the video clips accompanying the music take place in specific venues. Indeed, the artist filmed in what seemed to him like haunted places. The compositions mainly use repeating loops. Layers slowly add up to a structure, before decaying progressively.

In the project, the photo album and the video explore landscapes and ruins overgrown with vegetation via slow dolly shots.[8] In his other works such as "Old Graffiti", Bibio does not hesitate to use cheap and analogic sound reminiscent of late 70s soul music.[9] He also works with 8mm films in "Curls".[10]

Glitch artifacts can also hide images inside them. Using a spectrogram, on some of them one can observe images drawn with sounds. In Venetian Snares work "Look", we can observe cats on his album, *Songs About My Cats*.[11] Aphex Twin's

7 Bibio, *Phantom Brickworks*, Warp Records, 2017.

8 See https://www.youtube.com/watch?v=08ctUR90WrM&t=1332s, accessed 09/15/2019.

9 Bibio, *Old Graffiti*, Ribbons, Warp Records, 2019.

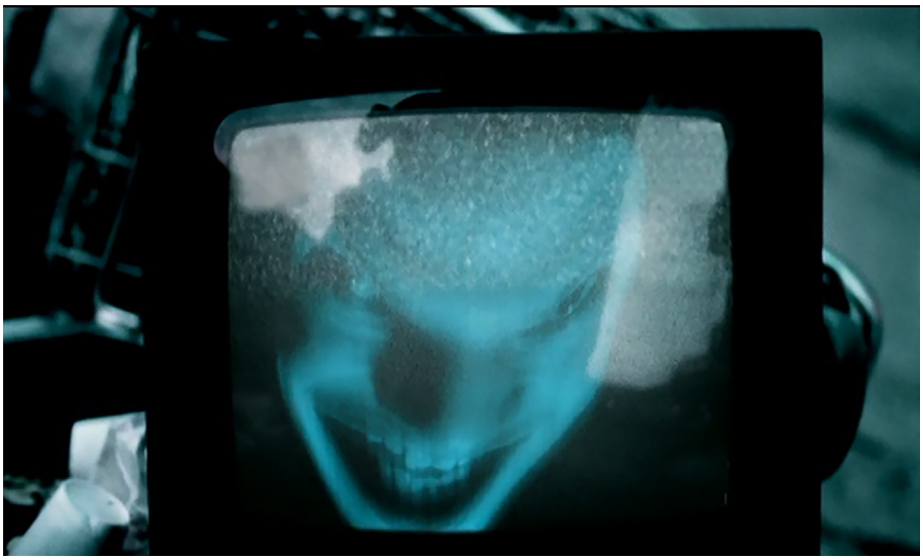
10 See https://www.youtube.com/watch?v=-OTU25i5QWc, accessed 09/15/2019.

11 Venetian Snares, *Songs about my cats*, Planet Mu, 2001.

smirk appears in "ΔMi−1 = −∂Σn=1NDi[n][Σj∈C{i}Fji[n − 1] + Fexti[[n−1]]."[12] The track name is like an inaccessible machine language for the average individual. Moreover, a keyboard seen from above seems to appear at the beginning of *edIT*'s "Laundry".[13] This process reminds us of the ghosts and spirits largely represented in electronic music.

For example in Lorn's video for "Ghosst(s)",[14] magnetic tape glitches are reproduced on a face submitted to various constraints.[15] Chris Cunningham collaborated with Autechre in 1996 to make the video for "Second Bad Vilbel".[16] In this work, numerous glitches take place before a monster is revealed and then a disturbing robot hard to perceive. Chris Cunningham also worked on "Come To Daddy"[17] with Aphex Twin one year later. In this videoclip, a demon is trapped inside a television, generating numerous glitches, repeating "I want your soul, I will eat your soul", and who is then finally released.

Glitches often occur with circuit and data bending, which are useful practices to bypass technological frames and limits. To understand how they work, we will now explore their deep relationship with the internet.



Chris Cunningham, *Come to daddy*
© Chris Cunningham, Come to daddy, frame from videoclip,
music composed by Aphex Twin, Warp Records, 1997.

12 Aphex Twin, *Windowlicker* EP, Warp Records, 1999.
13 edIT, "Laundry" in Crying Over Pros for No Reasons, Planet Mu, 2004.
14 See https://www.youtube.com/watch?v=TzzrzGyKo6g, accessed 09/15/2019.
15 See https://www.youtube.com/watch?v=TzzrzGyKo6g, accessed 09/15/2019.
16 See https://www.youtube.com/watch?v=Q8BuyTYwTto, accessed 09/15/2019.
17 See https://www.youtube.com/watch?v=TZ827lkktYs, accessed 09/15/2019.

## Bricolage

New media, objects comprised of code and consequently of language, has increasingly fostered interactions between people, artworks, and ideas (Manovich 2001, 99). The means of communication, sharing, and diffusion are now so important that we talk about "intercreativity". This process allows everything put online to be used, transformed, and manipulated out of their initial context (Graham 2015, 373-382).

This intercreativity is related to the French term "bricolage", defined in our study by the work of Claude Lévi-Strauss (1962). Lévi-Strauss explains that bricolage is the use of old signs to create new ones. In this conception, everything is reinterpreted and formed upon fragments and residues of reorganized events (24). It always works by transforming existing signs to create a new meaning. A simple instance of this concept in HEM would be Amon Tobin's album *Bricolage*,[18] created with a large variety of samples from old vinyls.

Production of electronic music is itself closely related to bricolage. DAW are shared through peer-to-peer networks.[19] Anonymous artists broadcast themselves on Soundcloud for free.[20] Musical creation breaks out of its confined categories and genres divide themselves into micro genres, such as Witch House, Breakcore, Glitch Hop, and Abstract Hip Hop. Similar to living organisms, practices, tools, musical aesthetics, and ideas are unstable and mutate all the time. As a result, it is nearly impossible to make a clear distinction between musical genres.

Many examples can be found of the connection between bricolage and electronic music, like Autechre's donation of their SYX files online,[21] or Korg's empty pins on their Monotron synthesizers to let people modify them easily.[22]

A more political example is Squarepusher's 2016 project, "MIDI sans Frontières". The artist created a track and shared its MIDI data worldwide, with the goal of protesting against Brexit through an intercreative process. As a result, plenty of remixes were created and shared online.[23] The artists formed a united front against the political event, speaking for a large majority of the electronic music scene. This example reveals how intercreativity and bricolage can feed a global consciousness.

For Lévi-Strauss (1962), bricolage is demonstrative of the way "mythical thinking" works. In opposition to intercreativity, mythical thinking highlights the importance of something that is missing. There is always something lost in the process of combining past objects. As a result, mythical thinking is creation through

18 Amon Tobin, *Bricolage*, Ninja Tune, 1997.

19 DAW stands for "Digital Audio Workstation."

20 SoundCloud is a music and podcast streaming platform.

21 SYX files contain data to create music with Elekton's electronic music instruments.

22 Korg is a Japanese electronic music instruments company.

23 See http://www.squarepusher.net/midi-sans-frontieres/index.html, accessed 09/15/2019. This link archives all creations made with the MIDI sans Frontières project.

misinterpretation and serendipity (24).

Furthermore, this never-ending process of transformation also reminds us of animism. The artifact, glitch, sample, or modified machine passes on through its own modification a part of its maker. This might explain the vintage fetishism of old synthesizers and recording tapes. Underground labels use tapes, cheaper than CDs or vinyls, to promote themselves. Some of their tapes are filled with animistic designs. While Gjöll uses runes, mythology, and DIY modular synths in all of his work,[24] Vito Lucente sends semi-precious stones with the tapes of his *Udgitha Of the Dogs* EP.[25]

The chaos of this electronic stream seems organized upon different principles. Firstly, we saw the divisions of interpretation, samples, and their link with chaos. Then we saw how glitch artifacts are related to interiority and the past. Finally we studied the practice of bricolage in intercreativity and the use of mythical thinking. To understand more closely the implications of these primary practices in electronic music, we will now study regression in performances.

## 2 – Performative regression: puppets, masks, archetypes.

### Puppets

HEM can have a link to the practice of puppeteering. Puppets, in the context of our work, are seen as an extension of the animator (Bensky 1971, 20). They are also defined as regressed bodies in a state of early development, unfinished in their evolution. In HEM's iconography, they are often represented as fetuses, children, freaks, robots, or uncanny bodies.

Childhood is one of most obvious symbolic representations of regression in HEM. Numerous examples support this idea, like Arca and Jesse Kanda's video for "TRAUMA Scene 1",[26] Four Tet's "Pablo's Heart",[27] or our own work with Ruby My Dear and the promotion of his album *Brame*.[28] Our example develops the interaction between embodiment and technology.

In R. James Healy's videoclip for Clark's "Herr Barr",[29] the act of birth is presented as a surreal situation. Birds with hand-like wings fly all around. The painting "In the Hold" by David Bloomberg,[30] which fragments a picture into geometric shapes whilst retaining the dynamic of the original scene, was the director's main inspiration (Healy, Vimeo description, 2001). The video is heavily pixelized on purpose to give the audience the ability to interpret the scene freely. A balance is found

24 See https://ez-rec.bandcamp.com/album/a02-seidhr, accessed 09/15/2019.
25 See https://perfectaesthetics.bandcamp.com/album/udgitha-of-the-dogs, accessed 09/15/2019.
26 See https://www.youtube.com/watch?v=NApVOHrbhqg, accessed 09/15/2019.
27 Four Tet, "Pablo's Heart", *There is Love in You*, Domino, 2010.
28 See https://www.youtube.com/watch?v=U0Ov94WRhfg, accessed 09/15/2019.
29 See https://vimeo.com/21671333, accessed 09/15/2019.
30 David Bloomberg, *In the Hold*, 1995 x 2355 x 63 mm, 1913-1914.

between interpretation, the sensual quality of the handed birds, and technological fragmentation of the pixels.

HEM's mechanical and repetitive sounds work on bodies to transform them. Bodies become quickly objectified to follow micro rhythms, and turn into deviant forms like monsters or robots.

In Bonobo's video for "Cirrus",[31] Cyriak, the director, works with the same process by using archived videos from the 50s. At the beginning of the clip, the archived samples of American commercials, housewives, and little girls are untouched. However, the framerate escalates and the samples start to agglutinate. Swiftly after, the screen becomes overloaded, and all the bodies become fragments of an enormous kaleidoscope. As a result, the screen is filled with bodies and objects, creating surreal geometrical shapes.

Cyriak, *Cirrus*

© Ninja Tune, Cirrus, frame from videoclip created by Cyriak, music composed by Bonobo, Ninja Tune, 2013.

This iconography sees bodies as corrupted when they come into contact with technology. By contrast, in Yaporigami's video for "PLMS_IV_D",[32] the dummy's dance, in an epileptic fashion, is constrained by the rhythms of the sound composition. This kind of embodiment is similar to Hans Bellmer's puppets.[33] The body is only there to serve fantasy and lose its integrity to uncanny forms.

Other examples, like Aphex Twin and Chris Cunningham's collaborations on

31 See https://www.youtube.com/watch?v=WF34N4gJAKE, accessed 09/15/2019.

32 See https://www.youtube.com/watch?v=sdigk5DMYkI, accessed 09/15/2019.

33 Hans Bellmer's puppet is also on the cover image of Naked City's album *Absinthe*, Avant Avant, 1993.

"Monkey Drummer"[34] or "Rubber Johnny"[35] have a fascination for freaks. Every time the bodies follow the impossible music's micro-rhythms to the dot, their performance goes beyond the capability of a human body.

Such a strange relationship between body and music can also be seen in DJing. Ferreira (2008) explains how DJs and their audience influence each other in an infinite feedback loop. DJs are constantly adapting their mix based on their audience's reactions. This influence on the body can bring a trance, archaic movements, and a feeling of separation between mind and body.

The link with spiritual beliefs takes place in the puppet's iconography, showing a will to control bodies and go beyond them. On the other hand, monster's pictures refer to ancient magical creatures and hybrids, like the one displayed in "Monkey Drummer". It shows us a regression in mythology. This fascination for objectified bodies and mythical creatures can also be seen in the practice of masks.

## Masks

The objectifying process is also used for identity in electronic music. In most cases, the musician's identity remains hidden. Album covers do not show the faces of artists anymore. Instead, geometrical shapes and strange humanoid figures replace them. Another example of identity's disappearance are the geometrical shapes increasingly replacing the initial physical performance of the instrumentalists on album covers. As identity is alienated, the face itself becomes easier to manipulate. Such transformative processes reinvigorate an old fascination for strangeness.

Musician and animator David Firth began his work with Flying Lotus on the video for "Ready Err Not". Chopped bodies, mutants, babies, and decapitation form part of the work, along with the beheading of Flying Lotus himself. Birth and death blend with each other in a surreal way, while the face of the artist suffers several hardships.

For his live performance following the release of the album *You're Dead*, Flying Lotus wore a mask made by artist and designer Aitor Throup. The mask was composed of a tentacle-like curtain escaping from the mouth and a skull with illuminated orbits. The artist can be perceived as a cross between Charon and Cthulhu. The visual aspect of the live performance mainly consisted of psychedelic illusions linked to the work of Shintaro Kago. This Japanese artist, who has an aesthetic based on chopped and crippled bodies, made the album cover in which Flying Lotus' face is replaced with a light hole. Spiritual concerns can be noticed in Flying Lotus' collaborations, as well as an obsession for uncanny horror imagery.

Daïto Manabe's performance art entitled "stimulus to face" is another instance of this particular point. The experience, documented on YouTube, shows the machine and the artist in opposition through the sending of electrical stimuli. The opposition

34 See https://www.youtube.com/watch?v=5UuFqQXWneM, accessed 09/15/2019.
35 See https://www.youtube.com/watch?v=9-gyf23k26I&t=180s, accessed 09/15/2019.

of human and machine creates a poetic message suggesting how digital can control and dehumanize.

Anklepants is an artist with a deviant identity, versed in bricolage. His monstrous mask, equipped with an animatronic penis, is used in various performances. It is also featured in videos. The artist, who works in special effects,[36] makes his own instruments, including gyroscopic sensors that are plugged into his microphone and control effects. His performances naturally emphasize physicality. The body is brought to the forefront, but is at the same time reduced to a primal, dehumanized function, with a penis for a face comparable to René Magritte's painting "Le Viol".[37]

Aphex Twin does it slightly differently. He reduces his face to a mask covering everything. With a frightening smirk, his face is visible on the *...I Care Because You Do and Richard D. James Album* album covers. During the performance at the 2012 Paris Pitchfork Festival, cameramen projected faces of the audience onto giant screens, and people could experience their own faces overlaid under Aphex Twin's. Aphex Twin could be perceived as an evil twin, slowly digesting the faces of the crowd.

In 2019, at the Rock en Seine Festival, he contracted the nose in a way that made the face difficult to recognize. Numerous French popular figures, politicians, television presenters, and singers were being displayed this way. Even Alexandre Benalla, a former presidential bodyguard caught molesting civilians, was infected. Aphex Twin's identity was a virus with a single goal: to assimilate the local culture and public.

Once again, humanity and technology are seen through the lens of regression. Ancient practices of masks and puppets can bring back the archetypes and spiritual concerns that we will now explore.

## Archetypes

Some of the examples talked about above are close to a Lovecraftian aesthetic, mainly focused on the fear of the other and the unknown. The origin of this aesthetic's iconography can be explored by studying its relationship with society and technology. It might explain the omnipresence of the uncanny in several creations of HEM.

Other works such as Holly Herndon's "Chorus",[38] directed by Akihiko Taniguchi, are able to have a poetic take on technology and societal phenomenon. The video's sequences explore 3D scanned desktops and digital desktops. The director's intent was to work with the concept of identity. To do this, the artist stressed the importance of desktops and the embodiment of the internet through desktop captures, often seen on software tutorials (Taniguchi, YouTube video description, 2014). Herndon's

36 See https://www.youtube.com/watch?v=0MH7bQvJe4E, accessed 09/15/2019.
37 René Magritte, *Le Viol*, Huile sur toile, 65,3 x 50,4 cm, Centre Pompidou, Paris, France, 1945.
38 See https://www.youtube.com/watch?v=nHujh3yA3BE, accessed 09/15/2019.

intention was to also work with the concept of online stalking (Herndon, YouTube video description, 2014). Desktops, both scanned and virtual seem to melt in strange textures that can remember ruins, their aspect decaying and unfinished.

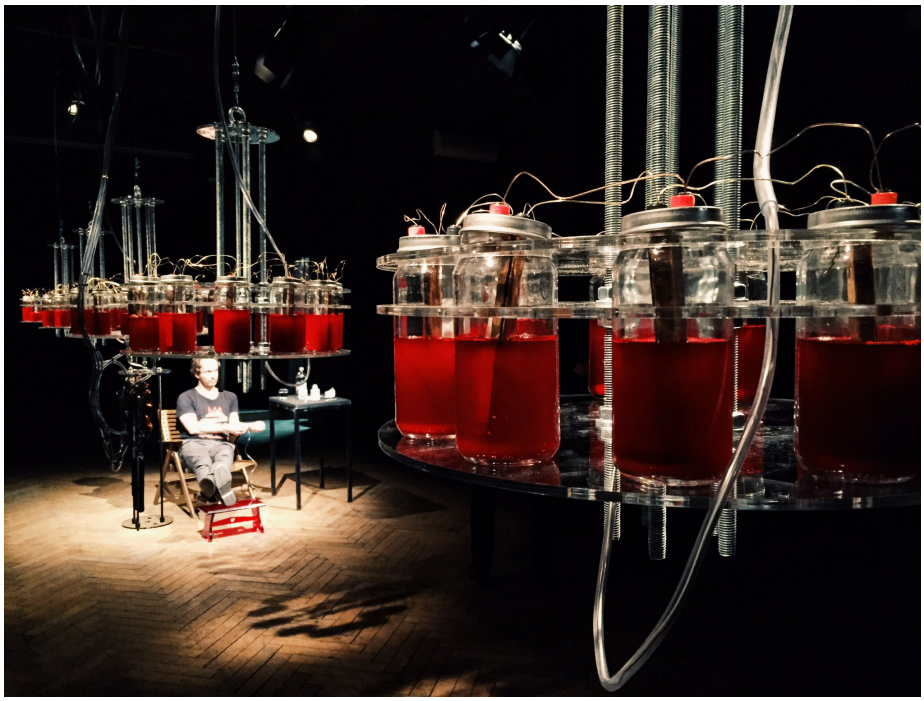
In "Home", the lyrics seem to be a serenade to a lover.[39] Lines such as "I can feel you in my room", "why was I assigned to you?", "I want you to show your face" or "I know that you know me better than I know me", suggest an ambiguous relationship between the artist and the entity watching her. While a cascade of logos blurs the screen, we notice the NSA and CIA ones. The unknown entity watching is the mass surveillance state revealed by Edward Snowden.

Digital tools are threatening to control our lives. Fear of an unknown future promised by technology and humanity's limitations seems to be a recurring theme, shown by the monsters in HEM videos. At the same time, HEM tries to link technology with ancient myths and practices. As Holly Herndon said, "There's a pervasive narrative of technology as dehumanizing. We stand in contrast to that. It's not like we want to run away; we are very much running towards it, but on our terms" (Herndon, bandcamp description, 2019). Her last album, *Proto*, indeed takes inspiration from sacred harp singing.[40] It is described as a collaboration between traditional vocalists and an AI which "places an emphasis on alien song craft and new forms of communion" (Herndon, bandcamp description, 2019).

Moreover, other artists are trying to reverse the transhumanist ideology. The will of a human to detach himself from his mortal condition to become a semi-living god is fundamental to this ideology. Transhumanism is also built upon myths and archetypes that see humans as defective. By contrast, in HEM, humans rarely appear augmented. Instead, HEM's aesthetic shapes technology to reach more elementary spiritual and living principles.

Engineer and bricolage enthusiast, Dmitry Morozov is a Russian artist and transdisciplinary researcher. In 2016, his work *Until I Die* displays a powerful hybridization of spirituality and technology. The artistic piece is a sound installation, working with the galvanism process. For his work to function, Morozov had to collect his own blood samples for months. He describes the entire process as an energy transfer, similar to a vital or animist injection (Morozov, official website, 2018). The patterns created by the installation are referred to as Buddhists mandalas. Once the last blood minerals gone, the installation will die.

39 See https://www.youtube.com/watch?v=I_3mCDJ_iWc, accessed 09/15/2019.
40 Holly Herndon, *Proto*, 4AD, 2019.



Dmitry Morozov, *Until I Die*

© Miha Fras, *Until I Die*, installation created by Dmitry Morozov, 2016.

From a design point of view, *Until I Die* is reminiscent of baroque candlesticks, with the candles' energy replaced with blood. In a similar fashion, the piece also recalls creatures such as Dracula or Frankenstein's monster.

Body and identity plasticity created through puppets and masks, is added to the chaotic instability of media and creative processes. This regression results in archetypal and mythological representations. This perpetual evolution has to be studied through the concept of alienation. In this final chapter, we will look at what we believe is the foundation of HEM and their link to retro tendencies.

## 3 – Retro alienation: biomannerism, hauntology, deconstruction

### Biomannerism

"Biomannerism", an 80s and 90s underground painting movement theorized by Stephen Lévy-Kuentz seems to be key to understanding HEM's aesthetic. It is comprised of nine painters, with H. R. Giger as the leading figure. The movement refers to similar themes that pervade HEM's aesthetic, such as regression into the body, dehumanization, and hybridization with machines (Lévy-Kuentz 2009, 100-101). Seemingly opposite concepts such as life and death, movement and petrification, organism and machine, are blended. This dialectic of opposites is present in both movements.

The constant mutations and deviant bodies seen in Biomannerism are also part of HEM's iconography and practices. For instance, bricolage can be seen as a method to mutate and update old instruments. Also, the uncanny Biomannerist interface works with the same principles as glitch. Indeed, we can also notice a dialogue between exteriority/interiority and destruction/creation in both cases.

In addition, dialectics such as hidden/revealed and freaks/humans are important in HEM. For instance "All is Full of Love", directed by Chris Cunningham, represents Björk as a humanized robot. The singer seems to be acting like a cold puppet. However her voice and gestures, focused on love, lead us to believe it is a human being.

This uncanniness regarding identity can also be reversed from non-human to human. For example, Flying Lotus' short film *Skinflick*[41] shows us organic landscapes similar to the opening scene of *Alien 4*.[42] Only at the end of these strange close-ups can we see the face and eyes of Bob Heslip, a friend of the artist who suffers from neurofibromatosis. This short film poetically brings humanity back inside a deviant body. Indeed, Bob Heslip used to participate in freak shows. By showing his smiling face, and finally his love for his wife, after the dehumanizing close-ups of his deformed skin, Heslip becomes human once more.

These aforementioned works depict an ambiguous relationship with a past where the world was essentially perceived as mysterious. Attempts to understand and structure our world in the past were largely reliant on myths and a fascination for otherness. As a result, HEM creates a porous interface between past and future with its fascination for the uncanny.

With several crises looming (ecological, financial, social, and political), our current century seems to be undergoing a paradigm shift. HEM's aesthetic tries to represent this uncanny passage between past and future. It is also a mirror to our own alienation, the fact of becoming a stranger to ourselves.

Giger's work on Ridley Scott's Alien can illustrate this hypothesis.[43] The painter's creation, used in the movie, is described by several theorists as an uncanny creature alienating people, similarly to a 21st-century mythology of capitalism (Jean-Clet 2014). The alien is a biomechanical parasite, reproducing by feeding off its hosts. The feeling of alienation and uncanniness gets more acute when Ripley, the film's hero, discovers that another crew member, Bishop, is an android pretending to be a human with a specific mission: to bring back the creature to Earth at any cost, including the life of the crew members. The main movie's themes are mechanization and the genetic or technological corruption of bodies (Szendy 2014, 201).

A factual link can be made between *Alien* and HEM. Chris Cunningham initially worked on *Alien 3* and *Alien 4: Resurrection*.[44] His video for "Windowlicker" unveils

41 See https://www.youtube.com/watch?v=iIhLCXmrCm8, accessed 09/15/2019.

42 Jean Pierre Jeunet, *Alien 4 resurrection*, Century Fox, Brandywine Productions, 1997.

43 Ridley Scott, *Alien*, Century Fox, Brandywine Productions, 1979.

44 David Fincher, *Alien 3*, 20th Century Fox, Brandywine Productions, 1992.

a face inspired from a Giger sketch, itself named "Windowlicker".[45] Once again, this sample from Giger's artwork seems to be a homage. In addition, the video uses alienation as a principle of creation. Displaying MTV clichés such as bimbos, champagne, and long limousines, Aphex Twin's iconic smirk covers the faces of the bimbos. This leaves the spectator uneasy about what he is viewing.

Like Biomannerism and *Alien*, HEM's aesthetic is undergoing mutation. The link between alienation and capitalism has already been theorized by hauntology.

Chris Cunningham, *Windowlicker*
© Chris Cunningham, *Windowlicker*, frame from videoclip, music composed by Aphex Twin, Warp Records, 1999.

We believe that hauntology is an important aspect of HEM.

## Hauntology

The term "hauntology" was coined by Jacques Derrida, explaining things that no longer exist but still haunt us like ghosts (Derrida 1993). Like the alien parasite hidden inside the body, hauntology remains hidden and alters the identity. Therefore, the HEM genre, being highly alienated, shares a close relationship with hauntology.

Witch House displays characteristics linkable to hauntology. Moody synths with high pitched voices and Christian iconography seem, for example, to resurrect old identities and create nostalgia (Richardson 2011).

Vaporwave is another musical subdivision of HEM that can be defined by an imaginary kitsch and retro past. Its iconography is mainly composed of Greek sculptures, colourful neons, palm trees, and nostalgic commercials, along with a glitch aesthetic. Its sound identity is often linked with the 80s and 90s through old synthesizers and samples. Vaporwave's artistic identity is informed by the resurgence of nostalgia and melancholic feelings for these bygone decades.

For Grafton Tanner, hauntology is "the artistic mode of realizing this failure of the future that was promised in the past" (Tanner 2016, 34). The excessive enthusiasm of Vaporwave, combined with the old commercials and archives of people unaware of

45 See https://www.youtube.com/watch?v=5ZT3gTu4Sjw&has_verified=1, accessed 09/15/2019.

the forthcoming crisis, are revealing aspects of the genre when analyzed through the lens of hauntology. Tanner believes that two ghosts are haunting Vaporwave.

The first one is the digital alter ego, the avatar hiding the human, sometimes confused with the bot. Tanner notices the multiplication of bots on SoundCloud, where nicknames are often "user", followed by a serial number (Tanner 2016, IX). This vaporous community seems like a society of ghosts. Aphex Twin picked up this archaic signature, dehumanized and anonymous, on his own SoundCloud account, under the name "user18081971".[46] Consequently, like several HEM artists, he becomes anonymous by altering his own identity.

The second ghost lives inside our collective memory. For Tanner, Vaporwave plays on the memory of the world prior to 9/11. A world without the War on Terror and our current apocalyptic promises.

The division process, happening in all HEM, is particularly interesting in Vaporwave. For instance, fans have created Simpsonwave. Nostalgic edits of the cartoon can be seen online collaged with Vaporwave tracks. Similarly, Trumpwave is another manifestation of the genre's division, focusing on president Trump's promise to resurrect the American dream.

The alienation caused by nostalgia and ghosts is theorized by other hauntology scholars. Tanner notes the reluctance of Simon Reynolds, *vis-à-vis* our western melancholic culture and ability to binge music (Tanner 2016, 54). Fisher's vision of hauntology remains pessimistic about the future. Like Tanner and Reynolds, he describes a melancholic lethargy haunting our music:

> While the 20th-century experimental culture was seized by a recombinatoral delirium, which made it feel as if newness was infinitely available, the 21st century is oppressed by a crushing sense of finitude and exhaustion, it doesn't feel like the future. Or, alternatively, it doesn't feel as if the 21st century has started yet. We remain trapped in the 20th century (Fisher 2014, 8).

For Chatonsky, digital Western civilization is symptomatically recording everything, like a civilization becoming extinct (Chatonsky, YouTube interview, 2019). Facing this loss of meaning, the apocalyptic tone has increased, collapsology becomes visible and hauntology a major aesthetic movement. Capitalism's ghost seems to be already here.

The fear of the unknown and how to react to it is everywhere. Hauntology's induced nostalgia is interpreted as the sclerosis of our Western society. Our hypothesis is that HEM's aesthetic copes with this fear through deconstruction.

46 See https://soundcloud.com/user18081971, accessed 09/15/2019.

## Deconstruction

Derrida is famous for his philosophical concept of deconstruction. The deconstruction process, as used in our work, is defined as reversing the power dynamics between two dialectics. Secondly, dialectics are reduced to the same importance by hybridizing. In a similar fashion, the hybridization process seen in HEM's aesthetic contributes to the deconstruction of dialectics. For example, Arca's iconography reverses power dynamics between heterosexual and LGBTQIA+ communities through his own community's expression and hybridization. The identity-based tensions in "Reverie" depict the artist as a chimera.[47] Wearing a toreador jacket, stilts, and a horn that pierces his body in a suggestive manner, he reminds the audience of the Minotaur figure. As a result, the duality is neutralized through the hybridization process.

The glitch process can also be deconstructive by similarly reversing two elements. Rosa Menkman studied the JPEG format by deconstructing it with glitch art. With this practice, she understood how JPEG was compressed and revealed how the image compression format was based on former model Lena Södenberg (Menkman 2017). Without her consent, the model's picture was used to test the JPEG compression format. As a result, JPEG compression could not make correct pictures of black people since the compression is a selective process. Through this example, Menkman unveiled a potential link between technology and inequality.

In the same way, HEM's deconstruction leads us toward a future infused with regression, mythical thinking, spiritual values, and a global communion between people. Unlike hauntology, which states that Western societies are stuck and cannot change, this movement toward the past differs. Its inspiration draws on prior stages of development anterior to the industrial revolution.

William Basinski's *Disintegration Loops* explores the haunting feeling of magnetic tapes.[48] In this work, tapes disintegrate and are recorded while it happens. Destruction becomes a part of creation. Death becomes life through the recording of the eroding tapes. With this piece, Basinski shows the inherent regression of HEM. Indeed, the recording can be seen as a performance of technological decay.

Guy Ben Arry's take on technological regression is to have a musical doppelganger of himself. His modular synthesizer called *cellF* questions transhumanism's validity in our contemporary times.[49] It turns the stem cells of the artist into an electrical signal creating sound. The device also allows captured exterior sounds to influence the development of the stem cells. This process allows the musician and the stem cells to interact with each other. In spite of the advanced technology, contrasting with Morozov's work, the past is present through cellF's shape. The synthesizer looks like a gigantic gramophone. Also, the work is not in any way supposed to augment

47 See https://www.youtube.com/watch?v=0WKWZ9y-dvU, accessed 09/15/2019.
48 See https://www.youtube.com/watch?v=mjnAE5go9dI&t=2544s, accessed 09/15/2019.
49 See http://guybenary.com/work/cellf/, accessed 09/15/2019.

the artist. Instead, the machine reduces him to a basic principle: the development of cells and the production of sound.

Fisher said that it was conceptually impossible for his generation to accept the decay of society (2014, 7). However, we believe HEM's aesthetic lays the groundwork to accept Western society's process of decay. Difficult to analyze, HEM's digestions of the past suggest a different relationship with the world, ready to embrace capitalism's fall.

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## RETRO TENDECIES, DECAY, AND HAUNTED MEDIA IN HYBRID ELECTRONIC MUSIC
## (summary)

Many electronic music genres demonstrate an interest in retro tendencies. Between samples and vintage synthesizers, we can distinguish the use of ancient musical artefacts, rituals, and practices. This music leads us to a hybrid aesthetic, mixing past and future, with an uncanny effect. The majority of artists that will be referred to are part of a hybrid electronic music aesthetic. It will be defined and presented as an interface between past and future, formalized with tools, practices, and conceptual ambitions.

Firstly, this article will approach hauntology in electronic music through the means of production. Supported by Grafton Tanner's theory, we will study how samples, as historical quotations, can haunt music. It can be observed in vaporwave and in many other subgenres of post-digital electronic music trying to push past their creative boundaries. Following Rosa Menkman's research, we will also see how glitches can be treated like artefacts. Based on the established framework, we will explore sound archetypes through the work of musicians like Boards of Canada, The Caretaker, and William Basinski. Other methods will support our hauntology theory, like circuit bending, Do It Yourself (DIY), vintage synthesizers, along with the enjoyment of old tapes in underground record labels.

Following this train of thought, we will study rituals and practices in both live and audiovisual performances. Holly Herndon's ghosts, masked artists like Anklepants and Flying Lotus, or puppet shows with Gjöll or Daito Manabe will show an array of rituals and objects of superstition. The exchange between crowds and DJs has also been studied by Peidro Peixoto Ferreira and supports our hypothesis regarding electronic music's spiritual aspect. This will give us a better understanding of retro tendencies. Dmitry Morozov's

artwork *Until I Die* will conclude this part with the use of a 19th century technology called galvanism.

The last part of this article demonstrates how the aesthetic of hybrid electronic music grounds itself in decay through, firstly, a porous interface between the production's material and time. Secondly, an uncanny feeling presents itself through errors and organic textures reminiscent of the past. Finally, the relationship between the body and the machine is looked at through a semiological analysis of artists like Jesse Kanda, Aphex Twin, and Guy Ben Arry. Further research in this direction could be of great benefit to the fields of ethnomusicology, music theory, and contemporary art.

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# REVERSE ARCHAEOLOGY – SYNTHETIC SURROGATE AS GHOSTING OBJECT

**Abstract:** In the second half of the 20th century, the great technological innovation of synthetic plastic matter as a natural materials surrogate created a major shift in postmodern fine arts as in total civilization. Initially invented to preserve endangered natural resources, overtaking the salvific role, fine arts technologists began to make substitutions and copies of artifacts which needed to speak for the original in their protected absence. For the past several decades it has been scientifically proven that these synthetic masses are not biodegradable. They achieve an aura of endurance and become "super-originals". Where there is a substitute, a synthetic surrogate, the original is in its absence what I call the "ghosting object". This principle of the indirect comprehension of life and anthropogenic alternations will deeply influence human communication in general. Living in such a mediated, time-relational reality, one of the tendencies identified and presented here is the reverse archaeology approach—making a past-related artifact from the future. Reverse archaeology is about using fragments of past eras to deduce an image of the vanishing world which produced them and generate a fragment of the world to come.

**Keywords**: reverse archaeology, copy, post-artifact, ghosting, shift, boomerang, synthetic, contemporary fine arts

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## I. Modern 1-2-3, post-modern 1-2-3-2-1-3, altermodern 1-2-3-2-1 flowcharts

In the history of art, the epochs of modernity, postmodernity, and the ongoing contemporary period emerging after postmodernity—the "altermodernity", according to French curator and art critic Nicolas Bourriaud (2009)—have had certain overall characteristics which need to be angularly classified here for the sake of the inter-historical and further more trans-historical topic. My point of view in this introduction is (time)relational.

1. The modern period is marked by the prioritization of individualism, originality, the belief in progress and moving forward, or, as the Canadian philosopher Nikolas Kompridis (2006) writes, "a particular relationship to time, one characterized by intense historical discontinuity or rupture, openness to the novelty of the future, and a heightened sensitivity to what is unique about the present" (32).
2. The Postmodern questions and even rejects these grand modern narratives, directly looking back and pointing to them, targeting socially-conditioned value systems and truth for a state of hyper-pluralism and hyper-production on a globally informed level, inevitably meeting and also producing similarities or hybrid identifications by the end of the 20th century.
3. Then the Altermodern comes as a reaction to global standardization, which is not sustainable in different contexts. This whole idea came with group migrations - through a global path, to exile. *No terra incognita*, so altermodern is now exploring time but in a well-known site-specific manner, thus becoming time-specific.

The modern pursuit of progress can be imagined as a 1-2-3 path, where the cause-and-effect chain is reliable. The "1" stands for the beginning, the early period of the 19th century, "2" for the main or mature period of the 20th century until 1930, and "3" for the late period, from 1930 until the end of the World War II. The advance of thought as a form of liberating enlightenment is the main purpose, installing artists as masters even though the whole world is radiating from the world wars. Being art-referential, consciously and at many points intellectually targeting turns and turn overs , the flowchart remains linear, streaming forwards.

The postmodern critical position includes the previous, counting on it to reject it, looking back and reacting. A 1-2-3-2-1-3 flowchart is a diagram that shows quotation, but characterized by irreverence and the intentional breakage of consistency.

A correlative radical postmodern approach to citing, to 1-2-3-2-1-3 calling in references from pre-contents is the "Noart" concept of Croatian artist and art historian Dimitrije Bašićević Mangelos. The line, "Going out or going into the past

who knows if there was any" (Image 1), written with distemper on a panel in the 1970s, depicts the global climate of a certain worried disclosure, the content breakage based on the post-World War II horrible reality. Mangelos' work is a brilliant reference to this stage of thought; "Noart" is an engaged negation of the past in order to create—painting black globes on globes used in schools for learning geography and painting lines like those in a notebook on wooden panels, and writing on them in cursive, symbolically showing the process of learning how to write (history) again.

The postmodern diagram has many combinations: 1-2-3-1-3-2, 1-2-3-2-1-3,

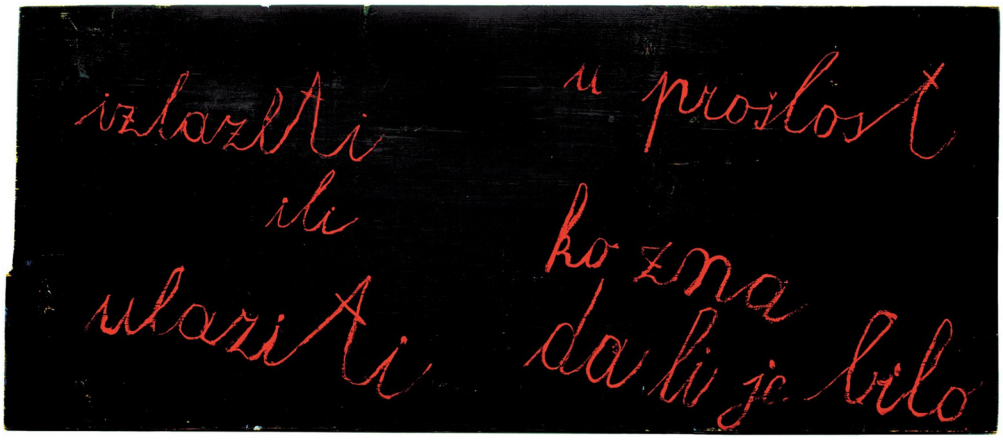


Image 1. Dimitrije Bašićević Mangelos "Going out or going into the past who knows if there was any", opus 1971-1977, distemper on panel. Marinko Sudac Collection

1-2-3-2-3-1, 1-2-3-1-1-1, 1-2-3-2-2-2, 1-2-3-3-3-3, 1-2-3-1-2-2, 1-2-3-1-3-3, 1-2-3-2-1-1, 1-2-3-2-3-3, 1-2-3-3-1-1, 1-2-3-3-2-2, 1-2-3-3-1-1, 1-2-3-3-1-2 and 1-2-3-3-2-1 (which I use as the backbone flowchart for the altermodern). What this short algorithm game depicts are the possible referential variables of three modern periods: early, mature/main, and late, where the information from the past is taken from a given order and problematized/questioned on all possible levels. To be more precise with this flowchart idea, I'll use very precise examples, focused only on painting to be consistent. The principle works so that 1-2-3-1-1-1 could stand for postmodern 70s minimalism that has taken elements from the early modern period. The combination 1-2-3-2-2-2 is the same, but refers to elements from the mature modern period, and 1-2-3-3-3-3 refers to the late modern period. A precise postmodern flowchart example, 1-2-3-3-3-2, could stand for a postmodern 80s hard-edge painting by Sean Scully, where he links with the late modern painter and printmaker Giorgio Morandi—not only his palette, his silent but sensual brushstroke technique, but the complete atmosphere. Combinations such as 1-2-3-3-2-2 communicate with phenomena of the late modern period, that is linked to (grown on) some mature modern practice, technique, or any part of the approach. Here I can give the example of the whole Pop-art period, that takes popular subjects from the late modern period, and uses printmaking techniques and comic book

fragments invented in the mature modernism period. Another one closer to the painting technology itself is the 1-2-3-1-2-2 example of Yves Klein developing the International Klein Blue color with the French paint supplier Edouard Adam in 1960, which was basically a mixture or rather a modification of a blue synthetic pigment, invented in the early modern period of the 19th century, called ultramarine. International Klein Blue or IKB color is basically the ultramarine pigment mixed with the polyvinyl acetate resin binder, marketed as "Rhodopas M" at the time. The invention of the color and very beginning of its use occurred in the last modern period, so the recipe was a secret and even mystified as a whole new kind of color, which was very appropriate for Klein's transcendental work. It seemed very different, because the polymer resin made it matte, unlike the glossy surface of oil paint with the same pigment.

This relational web of mine could go on forever, but the main purpose of pointing out the *time-relational perspective* post-festum is clear. This point of view is a throwback-type analysis from the present, a compressed referential comparison, to point out the timeline of periods or individuals *in relation* to some or any other, forming the ground for the view into contemporarity that is a reaction on past orders.

The end of postmodernity arrives as an exhaustion of (artificial) resources. This ultra-loud era of the possible-done principle adopted from the quick and easy use of new synthetic super-handy materials and an urge towards the immediate that it has created; the instant networking it has tremendously helped to develop; the omnipresence of the legitimacy—have quickly imposed matchings and look-alikes everywhere, copies and doppelgangers. The main ambitious global purpose of this—let's call it "auto-exile"—comes from decentralization, traveling, and hyper visibility, to inject an idea in a body in motion, elsewhere-everywhere. The structure between the origin, the body, and the content then holds a gap. It's an absent-minded matter: artists have a tendency to orbit rather than touch down and create a central hub. As noted, the French curator Bourriaud calls this era "altermodern." He wrote a manifesto and curated the Tate Triennial, with the works of 28 artists, ten years ago in 2009. The altermodern thinks in terms of hyperlinks, continuous updating in migrations and travelling; it is most definitely postcolonial and transitional. To try to sum up his Manifesto in few key ideas and terms, that are important for the rest of the article, according to Bourriaud (2009), the new modernity is emerging, the new universalism based on translations, subtitling, migrations, creolization, transpassing, "materializing trajectories rather than destinations" (34), and most importantly, it is a time-specific era rather than a site-specific work of the 1960s. Artists wander in this historical web of observations, putting only the viewer in the center. Travelling in time makes time-referential trans-context which is the main framework in which reversed archaeology is possible.

We are facing the many outcomes of globalization, the problem of identifying, implementation, standardization, where the body and local reality cannot hold the

same injected idea within. Traveling, wandering in time and space, many artists point out this condition, leaving it open, simply marking it, but there is also an evident stream in this global school movement, in this sort of international art, that criticizes standardization and commercialization in the craving for originality, authenticity, focus, relevancy, importance, endurance (clearly elements of modernity); a visible tendency of the contemporary feedback or boomerang profiling, the 1-2-3-2-1 flowchart. In the Tate Triennial 2009 exhibition, artist Walead Beshtley's glass boxes, Fed-Exed across the globe, broken in transit, and exhibited out of function as sculptures, can assure us of the meaning of this reaction. Going further and then taking it back engaged in novelty is the approach in the core of my interest among altermodern phenomenon here – the reversed archaeology.

Image 2. Jean-Léon Gérôme "Pygmalion and Galatea", 1890. oil on canvas. Metropolitan Museum of Art, Ney York City Collection

The painting, "Pygmalion and Galatea," by Jean-Léon Gérôme (Image 2) is about an artist falling in love with his sculpture, the ideal woman, white as milk, that he has created for himself. Even though it is a 19th century painting, the image is somehow striking in this decade, not only due to its context of an artist falling in love with a classically made piece of art, a motionless stone that contains future emotional ideals within. But, if we briefly pull it out from its origin, it's an image of "transcoding" (Bourriaud 2009, 14), an altermodern image of trans-contextualism and the imposed question of converting formats.

The tremendous impact of science in the third millennium, especially of

informational technologies and molecular chemistry and physics, has given us a profile of the global condition, and I will try to offer some possible reasons for the genesis of this reverse archaeology phenomenon in the fine arts—this future past situation from my point of view as a fine arts technologist—regarding the life of the matter itself, the synthetic surrogate outcomes.

## II. The Anthropocene age – plastic age

Since 1945, the tremendous, invasive increase of synthetic plastic inventions, production, and usage (Image 3), with its countless variations and extensions, has been the direct cause of the emerging new age called Anthropocene (Haraway 2016)—the proposed geological epoch in which human activities have come to dominate the planet.

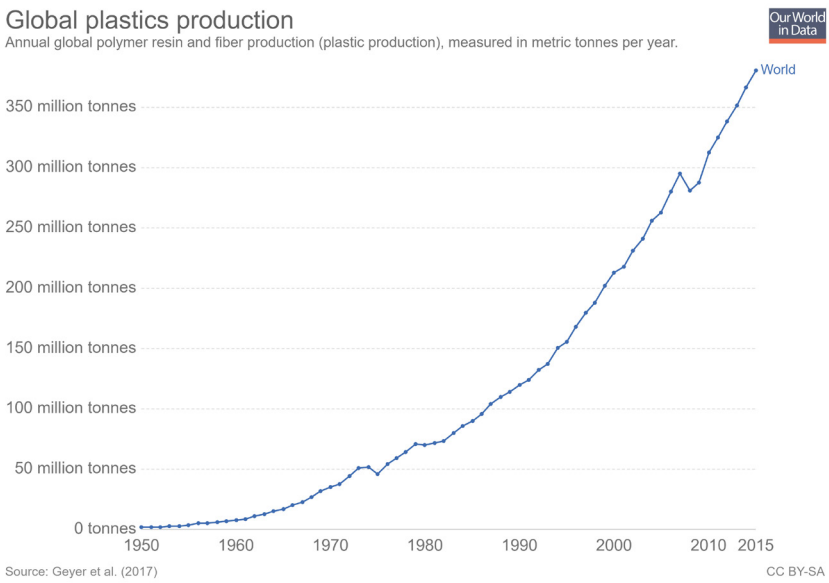


Image 3. Plastics production volume in million metric tons (Geyer et al. 2917)

It is very important to comprehend the enormity of this production in order to understand its impact and ongoing effects. Science gives us incontrovertible signals; there is so much plastic in our waterways and oceans that microplastic particles are now virtually ubiquitous, and plastics will likely leave identifiable fossil records for future generations to discover. Many millions of tons of plastic are discarded every year, and it is broken down into small particles and fibers that do not biodegrade (they stay). Microplastics have been found everywhere, from the deepest oceans to highest the mountains, even the Arctic air. It has a pervasive presence on the planet.

Brandon, Jones, and Ohman (2019), found that since the 1940s, the amount of microscopic plastics in coastal ocean sediments has doubled about every 15 years. In 2010, the most recent year analyzed, the residual content had reached

almost 40 particles per 10x10cm patch of ocean floor. The amount of plastics has reached the fossil record (it is an important issue of 'pollution' in ecology, but here this fact of record quantity in such short period simply empowers the argument of the tremendous impact plastics make worldwide, taken here as a basic premise triggering the shift towards reverse archaeology.) This might be referred to as the *Plastic Age* one day.

In just 50 years, humankind will be dealing with the overwhelming consequences of a new recently invented material; the fact that it is non-degradable means that it has a completely new aura of lasting. When it breaks down into particles, it remains in particles, a phantom taking over. Why a phantom? It doesn't communicate, doesn't engage, and doesn't involve itself in the circulation. But it's there. So here we are again with the problem of altermodernity and globalization, injecting an idea into a body that can't stand it. Synthetic plastics were invented as a replacement in the first place, to preserve the natural resource of ivory; nitrocellulose was invented for piano keys and then later film tapes, and polyamide was invented to replace the silk used for parachutes in the World War II etc. So the outcome is utterly opposite, a paradox according to its reason for being.

We are witnessing the plastic age, which is, as I have hopefully pointed out so far, not only a matter of science and ecology, but, in our interlinking times, a core trigger for the grand shift. The main tendency of recent times is to avoid fuel exploration and the pollution it creates in the process of making. The biodegradable substitutions so far have been corn, potatoes, pines, and even cow manure, used to extract the cellulose and make fibers. The expertise on the negative experience does come from that direction to the international artist's preoccupation. The phenomenon of bio-plastics is a retro-tendency *per se* – taking actions from this point of view, with present knowledge about synthetic plastics but with an urgent need to reengage with natural, organic, classical materials. We wonder if this production of plastics in the last 50 years has produced such an impact after which our state is forever unchangeable. Even if, by magic, all the materials we use are suddenly organic, the residual matter remains.

This prevailing synthetic matter phenomenon is evidently shifting the set up. The surrogate is an imitative artifact, a post-original with the primary role of a super-original, which is confirming the existence of the past-mentioned content only in its absence, thus generating a future image. The accumulation of synthetic matter that is not usable anymore, non-rotting but not circulating, present but not engaging, should be noted and understood within a broader context. Contemporary programs of everyday content/informational sorts call in references from the past into the body of the work, even when it is not applicable; a certain content subaudition, the implying character of things as if understanding it is the function of it (Image 4).

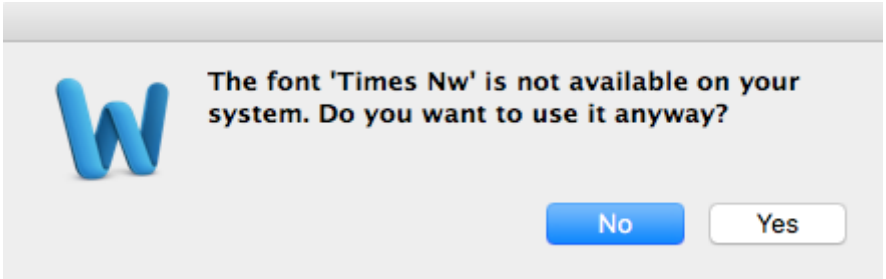


Image 4. MS Word for Mac 2011 pop-up window message to an experiment of typing in an imaginary name of a writing font "Times Nw", September 2019, screenshot

## III. Reverse archaeology – the contemporary shift

Jumping straight to the most important contemporary, third millennium, civilizational event—the creation of the complete pre-historical cave Lascaux facsimile. It is a brilliant, unrivaled civilizational shift that, in my opinion, is officially a manifestation of reverse archaeology. As conventional archaeology digs into the past, from a fixed point in time, dating the discoveries and placing them in time, reverse archaeology takes the artifact from the past and into the present, and all further investigation continues from this point, in analepsis chronology. How much more exile does it get when you replicate the oldest trace of art in Europe with new technologies to a facsimile in 1:1 ratio, 200m away from the original, physically blocking the original, de-functioning it to a preserved corpse and injecting the ghost of it into a new, synthetic body? The original artifact, thanks to synthetic materials and techniques, has a stuntman now! How was this done?

The cave was closed to the public in 1963, highly endangered after only two decades. It was devastated by millions of visitors changing its conditions of temperature and humidity. The light levels had been stable for millenniums due to the only entrance being closed off by heavy rocks, naturally conservated and thus preserved. Lascaux suffered multiple recent pest attacks, the first in 2001 and the second in 2007. Experts claim that the first emergence of mold was due to an inadequate artificial ventilation system set up in the year 2000. Specifically, the first ventilation system was installed in 1967 and operated successfully until the year 2000, when a new system was installed. The first system had no negative effects due to the lower voltage (100W), and therefore lack of change to the ecosystem of the cave. The second, from 2000, was evidently overpowered, leading to the disruption of conditions and mold appearance after only few months operating. Expert microbiologists from the *Laboratoire de recherche des monuments historiques* (LRMH) worked on eliminating microorganisms with fungicides, but due to poor selection of fungicides (*Devor Mousse*) in 2007, black mold spread in the form of stains in multiple places within the cave, covering segments of the image. A study published in 2012, in the journal "Fungal Biology," classifies pests as fungi, called *Ochroconis, O. lascauxensis and O.*

*Anomala*, similar to molds in the bathrooms of today's households, which feed on carbon and nitrogen. *Devor Mousse* is a concentrated solution designed to radically remove moss, lichen, and fungus, especially in the long-term treatment of roofs, walls, floors, stairs, and playgrounds, as the product ad states. But "this fungicide does contain benzalkonium chloride, which degrades the form of nitrogen and carbon and promotes the development of these fungi" (Martin-Sanchez, Nováková, Bastian, Saiz-Jimenez 2012, 574). The conditions are stable to this day. The fungi do not spread, but only specialists are allowed to enter.

In 1983, the artificially replicated Lascaux, called Lascaux II, was opened to the public, 200 meters from the original cave. Lascaux II is truly a technical feat. The walls of the cave were reproduced in 3D, in millimeters of exactness. The modeling of the cave took many months at the *Atelier de Fac-Similés du Périgord* (AFSP), on the outskirts of Montignac. For a full impression of authenticity, a mineral layer was also applied to the concrete base, and the patina was made with a mixture of clay and powdered glass. Around 90% of the wall paintings of Lascaux were replicated. The Bulls Hall and the Axial Gallery were convincingly reproduced by the painter Monique Peytral, with earth pigments from the Régourdou site in Montignac, and using the primitive techniques of Lascaux. The *Atelier de Fac-Similés du Périgord*, organized by the General Council of Dordogne and composed of 25 experts, produced new parts of the Lascaux replica (as well as the Ekain cave paintings in Spain), and, since 2012, there is the traveling exhibition "Lascaux III - L'exposition Itinérante." This exhibition shows a 1:10 model of previously unreproduced parts of Lascaux, and a new 3D technique called stone veil where the base is made of synthetic resin polystyrene and glass mineral wool and then painted. Each panel requires several months of work. This impressive exhibition (planned to be active at least until 2020) shows 15 tactile installations, 3DHD projections, maps and other elements for exploring Lascaux.

Since 2014, the same Atelier have been making a replica of the complete Lasacux cave, with all the wall paintings, called Lascaux IV. Selected from over 150 teams from around the world, this AFSP team created this facsimile, and it was opened in June 2016 as an essential part of the Montignac-Lascaux Parietal Art International Center (CIAP) complex. Stages of this process were shown on the official website www.projet-lascaux.com.

As the original Lascaux (do notice how artifacts can take this prefix "original" today) is the beginning of civilization, the articulation-creation, now the surrogate Lascaux is a perfect image of the shift (intentionally avoiding the term "beginning" of something new). The synthetic Lascaux is there as a stuntman, proving the protected-excluded existence of the original from the past, with the promise of resistance to tremendous consumption. The Lascaux IV is illustrating the thesis of the Plastic Age, nevertheless of the consequences of its use and scientific alarms that are surely already modifying the idea of synthetic materials, even though stabile hard biodegradable plastics like polystyrene here haven't been invented yet.

In my recent paper, "Analepsis Chronology: How Did Development of Technology Lead to the Future Past," I wrote about how our key need is a structural source investigation of the state of mediated experience. Such a floating placement of content, meaning, and appearances, has relativized the beginning. Such an order is the basic postulate of analepsis chronology.

The sense of this shift has been present throughout the last several decades, in many artwork preoccupations. It is not only a concept in fine arts preservation technologies. The impact of synthetic matter and the development of consumerism leads to understanding effects its effects in different context; it is not necessarily about synthetic matter reproducing or imitating the natural one. It would even be boring to talk now about organic plastics in art and the use of biodegradable materials as a future projection of a happy end. I deliberately avoid any allusion to solutions. It is far more interesting to look into examples where the impact is more second-hand, informing the bigger picture: our present reality. One of the most interesting and direct reverse archaeologist-artists is the Italian sculptor Giuseppe Penone (Image 5), originating from the Italian Arte Povera. Penone uses various materials that imitate others, with the actual original material displaying the simulation. His most explicit series of works as an artist-reverse archaeologist are those in which he uses wasted old trunks of wood (waste is a well-known global issue of consumerism and capitalism) and sculpts or carves trees inside of them, as if he is going back in their timeline, reaching their core, their past, their youth ("Cedar of Versailles" comes from this series of many works). He goes in to reach their first formed rings, which are the oldest, to point out the issue of an absent soul. He purely displays his efforts, trying to raise an image of life within. Carving (an image of) life back into a corpse is the boomerang 1-2-3-2-1 flowchart.

The global movement of applying content in different contexts has encountered

Image 5. Giuseppe Penone working on his work "Cedar of Versailles", Turin, 2000.
Photo: Penone Archive for Art Basel Unlimited, June 2019, catalogue Messe Basel

problems of sustainability. This is why the postmodern shifts to another era in which humanity criticizes standardization and neglectful consumerism, consulting some portions of previous times, mostly modernity. There is a certain freedom in travelling in time to create the future past. Giving an example of the climax of understanding context as orbiting content, the phenomenon of a flashback object (related to the great usage of synthetic materials), I take the core example of copying the whole prehistorical cave Lascaux in France as artifact to variations of substituted stuntmen versions of it, where the whole content of an art piece is meant to be injected in a new body. But is it fairly implemented? This represents the peak of a consumption mentality and standardization as well as a threshold for the world to come for its informative offer.

The key present issues to think about now in this field of thoughts, and act on in art practice, are the phenomena of noted looping, boomerang, flashback objects, problematizing the orbiting status, the deport, the hi-tech promise and the feedback, the appeared merging and what remains aside, the hybrid flattening and what to do about them. Artists in exile are becoming aware of the shift from artwork to alter-artwork. It is a very interesting and relevant contemporary subject of incorporating, whatsoever, or as Donna Haraway suggests "making kin" (Haraway, 2016). The reverse archaeology boomerang, one of the noted major tendencies, lies in the feedback use of fragments of past times, with different proportions of the time-arc, deducing an image of the vanishing world which produced them and presenting it in the present to generate a fragment from the world to come.

To remain in a 1-2-3-2-1 time-relational loop that relativizes the beginning, I will now quote myself constructing the thought about the reverse archaeology ghosting object: "It holds a known, absent being, n+1" (Kuštrić 2019, 237).

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## REVERSE ARCHAEOLOGY - SYNTHETIC SURROGATE AS GHOSTING OBJECT (summary)

Reverse archaeology is a term inaugurated in this paper that marks a certain time-relational concept in the 21st century art, especially in the ongoing decade. Researching the development of synthetic matter from the second half of the 20th century, I tracked the line of the tremendous impact it has created in art as well as mass media and everyday life. Synthetic plastics were invented in late modernism in order to substitute endangered natural resources and then broadly applied worldwide through postmodernism, in such record amounts that it has created a certain civilizational shift towards a new period, the altermodernism according to N. Bourriaud. The record widespread utilization of these materials with fast and easy usage has led to creating shortcuts in our everyday communication, an imperative toward the instant. An indisputably wonderful, sophisticated contemporary feat is the making of synthetic facsimile of the whole prehistoric cave Lascaux in France in 2016, copied in 1:1 ratio, with less then 1mm deviations from the original, whereas the access to the original cave itself is closed for public from 1963. I call this contemporary relation of calling in a certain content that is known indirectly and realized in its absence: a flashback, orbiting; and this synthetic post-artifact: ghosting object. The Lascaux fascimile is surely a crown for the salvific role given to synthetic plastics in substituting endangered natural materials, facing one of the first know human habitations and works of art. It has clarified many previous aspirations regarding synthetic technology, showing the ultimate status of the contemporary society, of the Anthropocene age. Explaining the genesis of the beautiful "Lascaux case", I take this post-artifact as a manifest of the reverse archaeology.

I also point out that this impact of synthetic technology has evidently created a massive imperative of standardization. This standardization in mass culture practically means being under a consumerist imperative to apply contents in different bodies elsewhere to be broadly consumed. Today we live in times questioning fair implementation and whether different life circumstances can sustain the content in exile, can it be effective in different body performances and contexts. Having tremendous control in communication, mobility, data access, travels, artists-nomads are familiar with the spatial territory and worried about the time-related issues of consumption and endurance. This approach has created time-specific works, unlike site-specific works created in the 1960s onwards. As an example, I take sculptures of Italian sculptor Giuseppe Penone, but also less obvious and more intriguing trans-disciplinary examples, regardless of belonging to an actual discipline and period, pointing out the content availability, its mobility and relationism.

Unlike futurists who were streaming forward, amazed by new technologies no matter what, reverse archaeologist manipulates time as well as space, using contemporary technologies, but engaging vital fragments from the past, creating a future past. Getting critical reports on many instances of global standardization: material but also spiritual limits, artists express their ethical concerns. Reverse archaeologist speaks from today, engages fragments from the vanishing world of the past to deduce an image of the world to come.

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# THE IDEOLOGICAL AMBIGUITY OF INTERNET ART: VAPORWAVE, YUGOWAVE AND SERBWAVE

**Abstract:** This paper concerns the recent internet-based music genre of yugowave. I first analyze the relation of this genre to its original Western model, vaporwave. Differences between the two, in terms of subject matter, ideology, and aesthetics are discussed, along with the complex question of the memory of the SFRY and Yugonostalgia in yugowave. Introducing serbwave as a relation of yugowave, the encounter in praxis between the in theory politically neutral genre of vaporwave and propaganda is also discussed. Finally, I offer two possible readings of serbwave: either as one of several current neo-nationalistic appropriations of the vaporwave aesthetic, or, possibly, a way of processing cultural trauma caused by the wars of the 1990s.

**Keywords**: hauntology, cultural memory, cultural trauma, vaporwave, yugowave, serbwave, Yugosphere, Yugonostalgia

## Introduction

At the time of writing, a thorough insight into the music genre of yugowave, its production in the contemporary Yugosphere,[1] and the ways it relates to and differs from vaporwave, its primary stylistic model, is yet to be achieved. Even vaporwave has not previously been a subject of much discussion in academic circles, with the exception of several pieces by a few authors (Tanner 2016; Glitsos 2018). Therefore, the majority of sources and references in this article on the subject of vaporwave consist of pieces of music journalism instead of academic works. Amongst them are

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1 The term “Yugosphere” is attributed to the British journalist Tim Judah who introduced it in 2009, referring to countries that were once part of Yugoslavia and now, after its break-up, coexist with relatively healthy economic and social bonds, connected by their language group and shared past. I will be using it throughout this article because, in my opinion, it efficiently describes the region in question—in historical, geographical and cultural terms—better than the vague “Western Balkan”, “former” or “ex-Yugoslavia”, or “South-East Europe” (Judah 2009).

several comprehensive articles and books written by prominent music critics of the past two decades (Reynolds 2010; Harper 2012; Colton 2017).

This paper intends to present an introductory overview of yugowave with a brief analysis of selected works by several artists, and offer some points about how yugowave as a genre relates to the Yugosphere's past and present. I do not take into account all currently existing and working yugowave artists, just a small selection that I believe accurately represents the full scope of the genre, in both content and stylistic terms. Similar to how works of vaporwave weave a tight and intricate web of cultural references, this paper will be reminiscent of a patchwork project as I attempt to showcase how yugowave as a music genre intersects with questions of memory culture, nostalgia studies, trauma studies, the philosophical concept of hauntology, and political theory.

## Vaporwave and yugowave: similarities and differences

For a discussion of yugowave's narratives, and its implications and characteristics as a separate genre, it is first necessary to establish all the ways in which it conforms to vaporwave's stylistic profile and adapts its core message, and all the significant ways in which it differs.

It is widely understood that, as an "internet genre", vaporwave has no distinct material origin. Because it appeared simultaneously at the beginning of this decade on various internet platforms such as SoundCloud, Bandcamp, Last.fm, Tumblr, and Reddit, and achieved wider popularity sometime around 2013, it is considered to be "globally ambiguous" (Glitsos 2018, 103, 104). The use of pseudonyms by most of its artists and producers, as well as its clandestine origins (most vaporwave creators work from home and then publish their work online), make vaporwave a genre with an obscure history and non-existent identity, apart from the music itself. But paradoxically, it is a genre that concerns itself directly with ideas of history, memory and nostalgia, of the past, the way we understand it and construct it anew with each passing year. The underlying message of vaporwave, uniformly agreed upon by authors and critics, is a critique of a glorified memory; it is a dissection of the hyper-capitalist society of the 1980s and 90s (Ward 2014), driven by the contemporary perspective of global fatigue created by neo-liberal capitalism. Vaporwave is thus understood to be a subversion and satire of late-capitalist lifestyle, iconography, and ideology. Directing its critique primarily at consumerist lifestyles in the West, vaporwave does not, however, extend its critical gaze to Western politics at that time. For example, figures and events which have marked the last decades of the 20$^{th}$ century in the US, such as presidents Reagan and Bush, the end of the Cold War, or the various military excursions that were conducted, remain largely out of focus. The genre can therefore be described as overtly politically neutral. Vaporwave is instead devoted solely to the recollection and deconstruction of the minutiae of idealized American suburban life, often signified as "mall culture" (Glitsos 2018,

102) before 9/11. To recreate and satirize the soundtrack of corporate lifestyles of the 1980s and 1990s in the USA, vaporwave tracks are usually produced from samples of "peripheral music",[2] which are then transfigured in a number of ways (cut, looped, reverbed, lowered/raised in pitch, slowed down/sped up, layered) to produce a distinct and evocative sound. The signature style of vaporwave is an amalgamation of textures in the slow-tempo range, with an emphasis on the "glitch aesthetic"—deliberately clumsy sampling, "cut-and-paste" editing, unnerving repetition of samples, lowering and distorting of pitch (Tanner 2016, 22)—meant to produce an atmosphere embedded in a sense of nostalgia.[3] Because the web of references vaporwave as a genre relies on is primarily connected to the culture of the US (and, to a lesser extent, Japan), Stefan Colton (2017) recognizes that vaporwave is a music genre made, and best understood, predominantly through the lens of Western cultural memories and identity.

But the world does not universally share memories of the US in the 1980s, nor does it collectively experience nostalgia for that specific time and place. Music critic Simon Reynolds, writing at the beginning of this decade, already understood the future implications of memory play in "plunderphonics", observing the differences between the UK movement of hauntological music and hypnagogical pop in the US (both predecessors of the phenomenon of vaporwave). Reynolds understood that objects of nostalgia, so closely connected to personal memories and cultural notions of childhood, are different for each generation. Therefore, he believed that as the commodification of nostalgia in pop-culture and the art world becomes more prevalent in the second decade of the 21st century, each successive generation in every part of the world would be obliged to produce its own version of vaporwave, giving shape to "... a self-conscious, emotionally ambivalent form of nostalgia that sets in play the ghosts of childhood" (Reynolds 2010, 384). One of the first music genres to match Reynold's prediction is yugowave.

## When it comes to the ghosts of childhood…

Yugowave is, in many ways, the complete opposite of vaporwave, even though it is technically descended from it. The most important distinction between the two genres stems from the vastly different socio-economic and political circumstances of the USA and the Socialist Federalist Republic of Yugoslavia (SFRY) in the

2 Grafton Tanner describes peripheral music as anything pertaining to generic instrumental music meant for workplaces and public spaces, such as music produced by the Muzak company, easy-listening records, smooth jazz, television and radio jingles, middle-of-the road radio, and others (Tanner 2016, 51).

3 Two albums are most often singled out as exemplary works of vaporwave: "Chuck Person's Eccojams vol. 1" (2010) by Daniel Lopatin and "Floral Shoppe" (2011) by Macintosh Plus (pseudonym of producer Ramona Andra Xavier). For anyone seeking to quickly grasp the fundamentals of vaporwave, these works, which effectively communicate the message of the genre as a whole while also being highly accomplished in an artistic and technical sense, should be the first to refer to.

1980s and 90s. Compared to decades of corporate exuberance and suburban bliss in the US, in the SFRY the situation was quite different. The same decades were marked by great political turbulence, national upheaval, the rise of nationalism, devastating war, population displacement and an unprecedented economic crisis.[4] Most importantly, they have witnessed the complete dissolution of a previously fast-developing federate, multinational state, forcing its citizens to grapple with complex questions of national and ethnic identity, not to mention the existential terror of a destroyed home, in both the literal and metaphorical sense.

As a result, it can be argued that yugowave has a much more developed sense of both locality and temporality compared to vaporwave. Consciousness of the passage of time, of "then" and "now", or "before" and "after", while existing in vaporwave as well, is much more prominent in yugowave, a genre dedicated to the memory of the SFRY, a unique socio-political entity which today is no more—in its titles, functions, bodies of government, constitution, visual symbols such as the flag, national organizations and corporations, holidays, social customs, and language. Yugowave is, therefore, consciously or subconsciously, explicitly or not, *always* about specific historical events, and the political and governmental processes that occurred to make the change from the place/time of the SFRY to the place/time of today. This is the first fundamental difference between the two genres. Yugowave is a movement which adapts vaporwave's signature aesthetic (both visual and aural), but the object of its dissection is not, in fact, late 20th century corporate and capitalist Western culture, but rather the memory of "idyllic" life in the SFRY's "coca-cola socialism" (Vučetić 2012), as well as the implicit memory of the idyll's violent dissolution.

Considering the socio-economic, political, and, ultimately, vast cultural differences between the two states in this time period, it follows that Muzak and its kin are not the musical markers of the 1980s and 90s in the SFRY. Having never, in any case, achieved any sort of prevalence in the SFRY, "peripheral music" is not the material yugowave artists choose to repurpose. Instead, a different sort of nowadays-often-mocked genre emerged as the musical debris which yugowave producers rummaged through and from it created their own means of expression. The rubble of late-SFRY culture which yugowave concerns itself with is, in fact, turbo-folk and similarly kitchy, often patriotically intoned yugo-pop. The use of turbo-folk especially, a genre autochthonous to Yugoslavia, creates in yugowave a "musical flavor" highly distinct from that of vaporwave.[5]

4 The socio-political and economic situation of the SFRY at the time has been thoroughly documented, discussed, and theorized by many eminent authors. For a contemporary perspective and succinct overview of the subject matter, I recommend historian Marie-Janine Calic and her History of Yugoslavia (2019).

5 Not unlike Muzak, turbo-folk carries its own set of negative connotations, as "music of the war", or "the rhythm of the Milošević era" (cited in Slavková 2010). Considered a highly disreputable genre today, it represented a union of newly-composed folk music and the beats, textures, and attitudes of pop and rock'n'roll music. It has been adopted by many as the musical signifier not only of the nationalist discourse of the 1990s in Yugoslavia, but also as a tool of political propaganda and manipulation of the masses (see more in Slavková 2010).

The third difference between vaporwave and yugowave can be observed on a technical level. Yugowave corresponds to the highly polished and advanced art of vaporwave sound collage only to a certain degree. There are (1) creators who find it sufficient to simply slow down selected material and filter it through a reverb sound effect (such as the YouTube channel "TheAthelasProject"), (2) creators who work with different samples in order to produce completely new tracks in a style similar to vaporwave (SoundCloud artist SyntheticSnow), and (3) creators who make detailed, fully transformative remixes of pre-existing songs, which change the original's pitch, timbre, mood, instrumentation, and textures (YouTuber Tim Klošar). All of these creators, linked by their subject matter, still share the title of yugowave or "serbwave" (to be further discussed below), even if they do not always fully adhere to all of the signature technical-stylistic markers of vaporwave, such as repetitive sampling, slow tempo, heavy reverb effects, and synthesized textures (Glitsos 2018, 101–2).

Finally, it is important to note that yugowave has not yet, it seems, achieved early maturity. Still in its infancy, this micro-genre is represented by hardly a dozen artists, mainly on SoundCloud and YouTube. A telling sign that yugowave is still in its developmental stages is the fact that, although globally known, the related genres of synthwave, vaporwave, and chillwave all have their own separate (and active) communities on the popular forum website Reddit, while yugowave does not, suggesting it is still in the process of self-definition. I have chosen to discuss within this article three separate case studies within the genre to showcase the differing ideologies that have so far been cultivated in, and articulated through, yugowave: the overtly Yugonostalgic albums of SyntheticSnow, the neo-nationalist-leaning content of TheAthelasProject, and work by a third author, PahaMuumiJumala (the music video "Neon Bombarder"), which represents an oddly successful synthesis of both of these directions.

## Between sincerity and sarcasm: SyntheticSnow

Research[6] has shown that in the contemporary Yugosphere, three countries in particular exhibit high levels of Yugonostalgia amongst its population: Bosnia and Herzegovina, Montenegro, and Serbia (Kolstø 2014, 768). Interestingly enough, the youngest age group questioned, born exactly after the generation of "last pioneers" (see more in Popović 2017), had only an indirect memory of the SFRY—the question of whether or not they regret the federation's dissolution was answered with an almost uniform split between those who felt a sincere sense of loss and those indifferent to the SFRY's legacy.[7] [8] Much of this attitude informs in great part the poetics of yugowave, which unites the critical edge of vaporwave with somewhat genuine Yugonostalgic sentiment.

A perfect example of this is the work of Sarajevo-based SoundCloud artist SyntheticSnow. Their two albums (*Waves in the Balkans*, 2017; *Eighties in the Nineteens*, 2019) currently represent a small percentage of yugowave artists whose aim is to produce music, on a technical and stylistic level, similar to that of Western vaporwave.[9] SyntheticSnow's work is, thus, centered on creating unique vaporwave soundscapes, with an atmosphere of recollection, nostalgia, and yearning, while drawing on music "native" to the SFRY as inspiration. I have chosen to analyze the fifth number of their second album, which I believe represents the best possible summation of the complete album, as well as one possible ideological profile of yugowave. The work in question is "I Miss Yugoslavia", a track based on Lepa Brena's 1989 song "Jugoslovenka".[10] It is centered around the conflict between two kinds of Yugonostalgia: the first being "an expression of reconstructive longing for an essential Yugoslav past", while the second "relies on a self-consciously ambivalent, politically engaged, and critical frame in indulging fantasies of this past" (Lindstrom

6 The research in question refers to the project, "Symbolic Nation-Building in West Balkan States: Intents and Results", funded by the Research Council of Norway (RCN), project number 203356.

7 In Serbia, 50% of the people questioned answered positively, the other 50% negatively, on whether or not they regret the SFRY's dissolution (Report: Nation Building – Serbia 2011, 81). The situation in B&H and Montenegro is similarly evenly divided between regret and indifference. In Bosnia and Herzegovina the relation of yes/no is 51/49% (Report: Nation Building – BiH 2011, 122), while in Montenegro it is slightly more tilted 44/56% (Report: Nation Building – Montenegro 2011, 78).

8 For a more recent survey, conducted on a smaller level and focused on the so-called "e-mail generation", which produced similar results, see "Percepcija SFRJ kod mladih u Srbiji", in: Socijalizam i Jugoslavija u različitim kulturama sjećanja: društvo, kultura i nauka (2018).

9 The Western model is evident in the last number of Eighties in the Nineteens, which notably references the Canadian producer Blank Banshee.

10 The symbolism of the figure of Lepa Brena must be mentioned as she is considered to be a major representative of the Yugoslav mainstream culture policy project in the 1980s, writing music that successfully joined newly-composed folk music with popular Western genres such as rock, samba, and tango. Not only that, but her public persona represented the multi-cultural, multi-national "Yugoslavian dream". Today her reputation is as one of the greatest musical legacies and cultural icons of the SFRY (Hofman 2011, 23).

2006, 234).[11] The track mainly plays with looping the original song's naïve refrain, reminiscent of folk-song: "Oči su mi more jadransko, kose su mi klasje panonsko, sretna mi je duša slavenska, ja sam Jugoslovenka". Whenever the titular word "Jugoslovenka" appears, it is skipped over, cut, or reverbed, suggesting that the cherished memory is, in fact, becoming displaced and distorted. It could also, alternately, underline the contemporary falsehood of the flowery refrain's sentiment. The continuous repetition of the phrase, voice noticeably lowered in pitch, with a completely disfigured synth keyboard accompaniment and frequent insertions of comic sound effects, all further play into the distortion of the original fervently patriotic message, slightly mocking its legacy today. The direct, emotional sincerity of the simple title, "I Miss Yugoslavia", contrasted with the way Lepa Brena's song is treated, shows the ambivalence of its creator regarding restorative and reflective nostalgia, which is, as mentioned, an ambivalence that underscores the attitude towards the SFRY in the greater part of today's Yugosphere.

Discussing hauntological music, Reynolds (2010) mentions, but quickly sidelines, the potent idea of this genre as a commemoration of lost utopias (371). The idea of a "paradise lost" manifests itself quite clearly in "I Miss Yugoslavia", but it is paired with a sense of dispassionate awareness of what came during, and after the SFRY's dissolution. The distortion of Lepa Brena's song signifies that yugowave comes from the perspective of younger generations (born after "the last pioneers", i.e. after 1982). The focal point of their childhood was the Yugoslav Wars and their aftermath, much more than fond memories of the SFRY at the height of its economic and political stability. It becomes obvious, too, that this album is not working from direct recollection, but is instead a product of a hazy memory, transferred from older generations to the young as nostalgia moves transgenerationally (see more in Popović 2017). It explores the cultural memory of Yugoslavia in a format and style more appropriate to the trends of the "internet age". It is interesting, too, and odd, that the figure of Josip Broz Tito—*the* elementary signifier of the SFRY in its "golden age"—is not referred to, not even once, in SyntheticSnow's work. With all these characteristics in mind, it can be considered as close to vaporwave as yugowave can be. It expresses longing for a by-gone era's fashions, economic security, and overall satisfaction of lifestyle, maintaining a slight critical awareness while attempting to avoid expressing biases or explicitly endorsing any political opinions.

However, this type of content, which appeals to vaporwave's stylistic sensibilities, appears to be very unpopular, with SyntheticSnow's account barely amassing more than a hundred subscribers and listeners on YouTube and SoundCloud. This brings us to a discussion of the strand of vaporwave, which in both an aesthetic and poetic sense is further away from the model of vaporwave, but is at least partially popular within certain circles. It carries a slightly modified label, which informs us quite sufficiently of the ethnic identity and political leanings of its creators and fans:

11 Lindstrom's work, reliant on the dichotomy of restorative and reflective nostalgia, is, of course, in great part influenced by Svetlana Boym's theory of nostalgia.

*serbwave.*

## Serbwave: from appropriation to re-assessment

Some consider Yugonostalgia to be a counter-cultural and political force in the Yugosphere intended to "curb the power of hegemonic nationalist discourses dominant in the 1990s and 2000s" (Lindstrom 2006, 242). It is, therefore, a testament to the ambiguity of vaporwave, which manifests itself quite clearly in yugowave as well, that works within this genre can stand for completely opposite, even antagonistic worldviews. Thus from the tellingly Yugonostalgic (even if critical) yugowave, we turn to yugowave as an expression of neo-nationalism, i.e. serbwave. It is somewhat disconcerting to notice that these works, whose subject matter is decisively not the SFRY itself but the memories of its violent dissolution, are not only at times very imaginative, but have also acquired a following online, with some amassing more than 150,000 views. Serbwave music videos generally feature imagery such as archive footage of the Yugoslav Wars or the figure of Slobodan Milošević molded as a Greek marble bust, and tracks consist of remixes of 1990s Serbian war songs such as "Oj, Alija, Alija" and "Mlada srpska garda", all of which are distinguished by an aggressively nationalistic and militant rhetoric.

It has to be said that serbwave is by no means the first descendant of vaporwave to be used as a form of promotion for certain ideological stances. But the comparisons, while perhaps expected, are still not very flattering. Two similar cases are fashwave and trumpwave. These recent manifestations occurred, as Bullock and Kerry (2017) write, because of the ease of exploitation of vaporwave's

> ambivalence about the cultural detritus that inspired it. This careful tension between irony and earnestness was part of what made vaporwave fun—it flirted with the implicit transgressiveness of appreciating its aggressively commercial source material. But that ambiguity left the aesthetic distressingly easy for the alt-right to appropriate by stripping it of irony and playfulness—by taking it literally, as a glorification of capitalism.

Serbwave, once again, reflects something similar but contextually quite different. Instead of glorifying capitalism, productions of serbwave seem to revel in memories of war, violence, and terror that gripped the region following the dissolution of Yugoslavia. A major representative of this is TheAthelasProject. Their video, "Chilling in the 90s", for its central image appropriates a still from the 1996 film "Lepa sela lepo gore" (Pretty Village, Pretty Flames), which was (and still is) at the time of its distribution an honest, realist depiction of the brutality and tragedy of the Yugoslav Wars. Pasted together with this image, on an appropriately neon background, is a completely unrelated, fast-paced synth instrumental called "Running in the 90s" by Max Coveri. The resulting audio-visual synthesis—a distilment of complex

and thought-provoking art from the era in question into a provocative YouTube thumbnail—through appropriation of certain stylistic markers of vaporwave, presents a glorification of the very thing the original film is a critical examination of. The comment sections underneath TheAthelasProject's posts appear to confirm the obvious—that their work resonates with popular feeling in Serbia in recent times following years of increasingly conservative, right-wing rhetoric and nationalistic fervor promoted both by politicians and the mainstream media, all presenting an extreme end of the spectrum regarding strategies of symbolic nation-building after the SFRY's disappearance (see more in Kolstø 2014). As it happens, as an art-form, these works leave little to the imagination and even less to examination. They are an unimaginative adaptation of the vaporwave aesthetic, intended to disseminate political ideology to the "internet generation". It would be prudent to continue on from this point and address our final case, which provides much more food for thought, with the previously mentioned malleability of ideology within vaporwave fortunately allowing for rich possibilities of subsequent interpretation. As such, we can open up an interesting discussion pertaining to vaporwave, serbwave, and the processes of healing cultural trauma.

## Haunted: Serbwave as a way of processing, re-framing and overcoming traumatic memories

In an interesting article exploring vaporwave, Laura Glitsos (2018) offers a unique interpretation of the genre's style, claiming that some of its productions, by reprocessing media artefacts that represent cultural trauma, can in fact be a way of coming to terms with cultural trauma (107). As an example, Glitsos uses the track "Jon Benet" by 18 Carrot Affair, which by its title references the 1996 murder of an American child named JonBenét Ramsay. This event, sensationalized by the press, has, as Glitsos (2018) writes in somewhat sensationalist terms herself, "for nearly two decades haunted the Western psyche". Reading this work as a means of processing the aforementioned trauma, Glitsos further says that vaporwave

> calls forth collective trauma through the empty sound of tinny beats and hollowed out drum tracks, to express forms of anguish that alienate and isolate the individual. It is an empty soundtrack for the emptiness of an innocence destroyed, one that cannot be 'made sense of' by the media or by the community. (108)

This notion of vaporwave as a means of the expression of cultural trauma is supported by Grafton Tanner (2016) as well, who, more broadly, suggests that most USA-produced vaporwave mourns life before 9/11 (10), an event which shook the very foundation of American national identity and everyday life. Following his interpretation, the paralells between yugowave and vaporwave's sense of transition

from idyllic "then" to the perennially unsatisfying "now" become much more apparent.

Glitsos's idea of vaporwave as a purge of trauma through the remix of existing cultural artefacts which are reminiscent of trauma translates exquisitely onto the field of yugowave, where a different kind of foundational event has "haunted the Balkan psyche" for more than 20 years.[12] We must circle back, in the endlessly looping nature of vaporwave itself, to the notions of hauntology and hauntological music, and some of their more interesting aspects. Together with the meaning of haunting in the literal sense of a recurring memory, image, or figure, comes the idea of hauntology, frequently applied to plunderphonic music. This term, taken from philosopher Jacques Derrida and adapted by Simon Reynolds, was coined in the mid-00's to describe art which is "…all about memory's power (to linger, pop up unbidden, prey on your mind) and memory's fragility (destined to become distorted, to fade, then finally disappear)" (Reynolds 2010, 377). The "haunting" in hauntology occurs in the disconnection of space and time, or, more precisely, when "a place is stained by time, or when a particular place becomes the site for an encounter with broken time" (Fisher 2012, 19). Could this encounter with "broken time" be applied to a society in stasis, marked by recent war trauma, and frozen in an endless loop of reminiscing the last two decades? There are few places to which this description is more apt than the contemporary Yugosphere, most particulary Serbia, as it approaches the 20th anniversary of NATO's bombing of Belgrade. Still considered to be in a transitional period post-SFRY, the Yugosphere is even now undergoing the processes of consolidation of new nation-states based on the politicization and mobilization of ethnic and religious identities (Kolstø 2014, 765) through political rhetoric and discourse in the media. This discourse, originally one of the key components of the Yugoslav conflict, is implicitly re-igniting memories of the wars in the contemporary Yugosphere every day. Therefore, serbwave, which directly addresses traumatic memories instead of building narratives around them, can be read as an attempt to re-examine and come to terms with a painful shared past and, finally, to overcome personal and cultural scars left by the wars.

The most significant example of the re-working—with great ironic detachment—of these painful memories is the 2016 YouTube video "Neon Bombarder", a re-imagining of the 1995 nationalistic turbo-folk anthem "Crni Bombarder" by Roki Vulović into an 80s power pop dance track, which has at the time of writing garnered over 350,000 views. It is currently, by far, the most creative re-working of original material within yugowave, bearing in mind that the style of the original song is almost non-existent in this remix. The original melody is transferred to synthesized textures rather than sung. The refrain "Prijatelju stari iz prošloga rata/ Stavićeš i sebi omču oko vrata/Sa Srbima ne smije inat da se tera/Izgubićeš jato crnih bombardera" is repeated several times by a computerized voice, reading the

12 For a concise insight into cultural trauma, its transgenerational transmission, and the narative of victimization in the contemporary Yugosphere, see Lazarević Radak, 2018.

words in the tellingly detatched way of audio software. The synthetic texture of the song is enrichened with several new layers of driving beats, complimentary sound effects, and surplus embellishments, while the original melody is processed in such a way as to appear more polished and studio-produced than its 1995 predecessor's low-budget tape recording could ever have been. The aesthetics of the original 1995 music video are fairly simplistic and direct, quite *de rigeur* for this particular sub-genre of militant turbo-folk. Vulović, dressed in a military uniform, walks through nature and addresses the camera while singing, the footage interspersed with clips of tanks moving, fighter-jets in the air, and soldiers running. The yugowave version, instead, offers us a simple cyber landscape in neon pink and purple hues, void of any upsetting imagery—the epitome of the *virtual plaza* (Harper 2012). Vulović, who has in recent years become a small internet celebrity and known for still endorsing similar political views to those expressed in his music in the 1990s, has been reduced to a cut-and-paste sticker on both sides of the screen, his eyes replaced by two beacons of light. "Neon Bombarder", which quickly became very popular in certain internet circles, has in all these ways avoided the question of ideology and the position of its creator on the wars of the 1990s. It, instead, takes a deliberate position of disengagement with the topic by reducing the role of the singer, a dispassionate treatment of the original song's lyrics, and complete omission of war imagery.

From an outsider's perspective, there is not much to suggest that "Neon Bombarder" is in any way descended from the collage art of vaporwave. Instead of a careful selection and layering of samples, we are presented with an intense and thorough remix of just the one, yet contextually significant, song. However, as has been established, at the core of vaporwave stands the basic yet also radical act of reframing (Parker and Croggon 2014). Several authors have, too, compared vaporwave production to the "found object" art of the dada movement in the early 20th century (Harper, 2012; Reynolds, 2010; Glitsos, 2018). Connecting vaporwave and yugowave at their core, no matter how stylistically different the end products are, are the processes of collecting and re-framing existing cultural debris. While vaporwave employs the robotically cheerful tunes of Muzak to create entirely different works of foreboding, uncanny, and haunting character, so too does "Neon Bombarder" borrows musical remnants from Yugoslavia in the 1990s. It plunders the genre of turbo-folk at the height of its kitsch and grotesque political engagement, erasing all the historical and political baggage of the original in order to transform it into an upbeat, smooth synth track. Once again, the idea of lost utopia emerges, but in a different way. Instead of mourning the Yugoslavia that *once was*, as in the case of SyntheticSnow, the author of "Neon Bombarder" seems to be mourning a Yugoslavia that *could have been,* in the "the artistic mode of realizing this failure of the future that was promised in the past" (Tanner 2016, 46). Perhaps it suggests that had the dissolution and the war never occurred, 1995's Yugoslavia would have been a time and place where such music could have been created. "Neon Bombarder" reframes the object of national and personal trauma (implicitly the 1999 NATO air strikes,

which occurred four years after the original song was recorded), transforming it from a turbo-folk nationalistic Serbian war anthem to a triumphant, yet heavily ironic, power-pop dance tune.

## Conclusion

Regarding what has been briefly analyzed in this overview, it seems that the production of yugowave could potentially open up interesting discussions about transgenerational nostalgia and cultural trauma. Most importantly, it is a subject which, when adequately researched, examined, and interpreted, could provide substantial information on how generations born after the SFRY relate not only to the past of the Yugosphere, but its present and future. Even if interest for the genre gradually disappears in the near future, which is more than likely, its production and reception now inform us about this particular moment in time in the region. A statement repeated by several authors (Hofman 2007; Kolstø 2014; Ćulibrk / Čavić 2018) and which seems to have found confirmation in this paper as well, is that Yugonostalgia in present society is a reflection of the current dissatisfaction with living standards. However, it has been shown through analysis of select works that yugowave, while still an expression of Yugonostalgia, is undoubtedly Yugonostalgia in its "updated" form. This furthers the idea that the phenomenon of Yugonostalgia is not a "fixed" occurrence, but rather a rich and multifaceted process of sentiment which evolves over time. Fond of reminiscing, yugowave nevertheless maintains a largely neutral perspective on decades past, holding a firmly critical gaze on the SFRY, the object of adulation of previous generations. Not only that, but I would argue it has directed the impulse for re-examination towards the phenomenon of Yugonostalgia itself as well, and urges for its deconstruction. Serbwave presents the counter-balance, reflecting as it does the other ideological force in the contemporary Yugosphere. The fact that this genre is currently achieving wider popularity in comparison to yugowave is a testament to the prevalence of nationalistic discourse in contemporary society. The ambiguity in terms of its message leaves serbwave, thankfully, open to different interpretations, and allows us to entertain the possibility that in the future it will be fully elevated into a thoughtful artistic consideration of the legacy of war in the region, and achieve the same reputation as a deconstructive art movement as vaporwave is now being "inscribed" in contemporary music history.

As has been already noted, this paper was intended to be an introductory overview of the recent production of yugowave and serbwave, and a light examination of these genres in view of present socio-political circumstances in the Yugosphere. It is my hope that it will be a good place to start for anyone who wants to examine this topic more thoroughly, or view it from a different perspective, in the future.

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## THE IDEOLOGICAL AMBUIGIUTY OF INTERNET ART: VAPORWAVE, YUGOWAVE AND SERBWAVE (Summary)

As a presentation of the wealth of intersections that occur in productions of the recent music genre of yugowave, this paper, formulated as an overview, touches upon the subjects of nation-building in the contemporary Yugosphere, transgenerational Yugonostalgia, trauma studies, and essential musicological questions of music history and stylistics. Attempting to understand yugowave as a separate genre, I first briefly examine the most important notions connected to vaporwave, yugowave's primary stylistic model. The relations between the two genres are mapped out within four distinct categories: historical and political background, subject matter and material, technical-stylistic characteristics, and respective stages of evolution and popularity. The main body of the paper is divided into three case studies, chosen to showcase the scope of the genre in both its stylistic diversity, subject matter, and ideological content. Serbwave, as a relation of yugowave, is specifically examined as a rare occurrence in which the in theory politically neutral model of vaporwave encounters present and local political reality and propaganda in praxis. Lastly, notions of hauntology in music and society, and processes of trauma, are discussed. I advance the theory that serbwave is an expression of collective war trauma in the contemporary Yugosphere and an attempt at its re-processing.

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# THE WRONG TOOL FOR THE RIGHT JOB: COMPOSITION ON 8-BIT MACHINES

**Abstract:** An artist's medium can inspire them to reach new heights with its possibilities or curtail their ambitions with its limitations—but, ultimately, it is what gives shape to their artistic vision. Few artistic mediums exemplify the conflict between possibilities and limitations, and the sheer ingenuity of artists as they balance these two forces, as well as computer music does. This paper will delve into the rich tradition of demoscene and videogame music, that flourished in the early days of personal computers and gaming consoles, to examine how the hardware used by different composers affected their processes. This paper discusses the technical specs and rich library of music of three very different pieces of hardware: the Commodore 64, the ZX Spectrum, and the Nintendo Entertainment System. The C64, with its powerful and revolutionary "SID chip" sound card, demonstrates the amazing potential computer music offers to those determined enough to surmount the technical challenges. The ZX Spectrum, with its one-channel beeper speaker, shows how a resourceful artist can wring brilliance from even the most limited of mediums. And the NES, with its five channels of pure nostalgia, teaches us that a couple of square waves and some heart can inspire a generation.

**Keywords:** computer music, synthesizers, demoscene, videogame music, 8-bit, C64, NES, ZX Spectrum, Nintendo, chiptune

In the 2008 documentary "It Might Get Loud," Jack White of the White Stripes describes his creative process: "I keep guitars that are, you know the neck's bent and it's a little bit out of tune. I want to work and battle it and conquer and make it express whatever attitude I have at the moment. I want it to be a struggle." White derives his inspiration from the limitations and obstacles in his path. And when

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there aren't enough roadblocks, he goes as far as to create them himself. Necessity is the mother of invention after all, and some of the most transcendent moments in music arose from seemingly insurmountable limitations. Ravel's *Piano Concerto for the Left Hand* was written for pianist Paul Wittgenstein after he lost his right arm in the First World War. The piece stands not only as a brilliant testimony to human resilience and ingenuity, but also as one of the most unique and creative pieces in Ravel's *oeuvre*. Electronic music has historically weathered criticism from the uninitiated as the antithesis of this kind of ethic. Many music listeners believe that drum machines and sequencers make music-making too easy and remove the kind of struggle that leads to real inspiration. But the most influential developments in the genre have often arisen from the direst circumstances. Stockhausen repurposing telephone test equipment for his great opuses is one example. And then there are the Jamaican dub producers and sound system DJs who had limited access to live musicians and started experimenting with electronics to cut costs. Using nothing but four-track mixers and whatever equipment they could build themselves, these innovative producers rocked the streets of Kingston with spacey sounds, on an extremely tight budget. The best electronic composers are resourceful and know how to turn limitation into inspiration. A prime example of this struggle between the composer and his tools is the genre of early videogame music.

Composers in the 8-bit era faced myriad technical and logistical challenges unique to their time. On the one hand, they had to contend with crushing deadlines, storage limitations, and the chaos and uncertainty of working in the fast-moving tech industry. And on the other hand, they were essentially creating a new musical genre from scratch using unfamiliar tools. How do you write an engaging composition that only lasts thirty seconds or so using only a few square waves? It hadn't really been done before. Faced with these obstacles, the talented game programmers/composers of the 80s and early 90s bent their hardware to their will to create otherworldly sounds, and crammed what little storage space they had with timeless melodies. Of this hardware, three machines stand out as being particularly inspiring sparring partners for dedicated programmers. The NES/Famicom—with its massive library of 1000+ games and its meat-and-potatoes sound chip, comprised of two square waves, a triangle wave, a noise channel, and a rarely used PCM sampling channel—shows how different composers can take a small collection of sounds and timbres and create music in hundreds of distinct styles. The C64, with its powerful MOS Technology SID chip—which boasts four waveforms, smooth pulse-width modulation, filters, and some great ring modulation capabilities—became a proving ground for the most inventive game composers and demoscene wizards. And the ZX Spectrum, the UK's budget personal computer—with its single channel, 1-bit beeper—was the ultimate technical challenge, inspiring composers to feats of extraordinary programming and compositional creativity. The limitations of these different machines meshed and collided with the artistic ambitions of composers, the narrative demands of the games themselves, and the aesthetic proclivities of

videogame fans, producers, and developers, to create a vibrant and diverse tradition of chiptune music.

Technical challenges weren't the only driving force of the chiptune aesthetic, although they are the main focus of this paper. As if creating large quantities of music on recently invented digital instruments wasn't enough of a struggle, composers also had to contend with editorial mandates from publishers, the tonal, structural, and emotional demands of the games themselves, and write the music they wanted to write, all while trying to appeal to the general gaming public. Much can be said for the different work cultures surrounding the three systems. NES games were often blockbuster commercial products made by large teams. With the C64 and ZX Spectrum, however, games were smaller affairs, involving a few programmers and a rotating stable of composers, drawn from the few musicians in the area who were good enough programmers to coax music from these early personal computers. These social factors are unique to this specific sector of the entertainment industry and they are a strong influence on the development of the game music genre.

## NES

The NES sound chip was designed with one purpose in mind: to provide impressive in-game music as efficiently as possible. This meant that the chip had to make it easy for composers to write music in one relatively limited style, while ensuring that the sounds used as little storage space as possible. Despite this, music on the NES represents a diverse array of different styles and genres, from the groovy Dixieland jazz of Super Mario Bros to the dark and theatrical classical/rock fusion of Castlevania. By looking at the technical limitations and capabilities of the NES chip, we can gain insight into how it shaped the music of the NES, and how composers were able to twist and exploit this technical framework to suit their own needs.

The vanilla NES/Famicom has five channels, although expansions like the Famicom Disk System and various in-cartridge expansion chips such as the Konami VRC6 and 7 chips added additional audio capabilities. The first two channels are pulse waves with variable duty cycles, which can be set to 12.5%, 25%, 50% (square wave), or 75%. These are the NES's two "lead voices," and it's quite remarkable that these two channels carried so many iconic tunes. The only expressive options they provide are the slightly different timbres afforded by the variable duty cycles, envelope generator, and modest vibrato controls. NES games typically required the soundtrack to address the theme, tone, and narrative of the game with genre-specific music, so having a monochromatic beep as the lead voice could conceivably present some major challenges. But in the hands of capable composers, these square waves became the heroic brass section driving Link onwards on his journey through Hyrule in The Legend of Zelda, the haunting organ reverberating through Dracula's castle in Castlevania, and the driving guitar power chords that gave "Rockman" (the original Japanese name of "Mega Man") his name. The third channel is a triangle wave that's

usually used for basslines, and also, by the use of sharp downward glissandos, as a kick drum. Next is the noise channel which is used in conjunction with the triangle wave, and occasionally, along with the fifth channel, for percussion. Finally we have the mysterious and rarely used fifth channel for PCM sampling. It is somewhat underutilized, because samples take up a lot of memory, and it seldom made sense to sacrifice entire levels of gameplay for some horribly bitcrushed cowbell sound effect. But those brave enough to learn its secrets found a lot of clever uses for it, as we shall see.

One of the first challenges a NES composer faces is an orchestration one: You only have three voices. There are a few "standard" textures that you'll see in the majority of soundtracks for the system. The most basic approach is to have a simple triangle wave bassline outlining the chord progression in the bottom, alongside an arpeggiated or alberti bass square wave that serves as the main harmonic accompaniment, with the melody on top of that. This rather pianistic style can be found at its most refined in Nobuo Uematsu's Final Fantasy score. Another common approach is to have a driving bassline supporting the two square waves as they pound out the melody in fifths or thirds, occasionally breaking off from each other in little countermelodies, as in the main theme for Castlevania. And with game series like Castlevania and Dragon Quest, where the music has a decidedly classical vibe—Dragon Quest because it is an epic RPG scored with fantasy-orchestral music, and Castlevania because it has its own brand of scary-organ-rock—composers have the luxury of being able to draw from various classical styles as well. A driving fugue, for instance, makes very economical use of the NES's three voices to create a rich texture. But while classical styles and textures work perfectly for boss fights with Dracula, it might have been a little stylistically jarring for a game like Bad Dudes. So how does a composer create a more modern texture?

Most game scores try to find ways to adapt the NES's five voices to create digital "ensembles" that fit their desired style. But a few interesting works attempt to distort the listener's perception of continuous "voices" to create a denser, more orchestral texture in which it isn't always clear which voice is doing what. Enter: Mega Man. The Mega Man series was actually scored by a few different composers over the course of six games on the system, but the formula introduced by the first game's composer, Manami Matsumae, is pretty consistent throughout all of the series' NES entries. Through intense syncopation, rhythmic inventiveness, and clever counterpoint, Mega Man composers were able to create rich polyphonic textures and compound melodies that make it very difficult to isolate the three voices. This density creates the illusion of a full rock band and helps the listener imagine the music as more than just a few voices of bleeps and bloops. The track "Metal Man," from Mega Man 2, is a musical tapestry of interlocking parts that drift in and out of clarity, sometimes breaking into distinct melodies, occasionally joining together into cathartic power-chord blasts—but usually bouncing off one another in a web off controlled chaos, held loosely together by some repeated dotted eight + sixteenth

note motives. The marching drumbeat is the only reliable point of stability as the two square wave channels dance around each other, and the shaky bassline lays out undulating grooves. The Mega Man series is so committed to dense polyphony that tracks like "Quick Man" from Mega Man 2 sacrifice percussion so that the noise channel can be freed up to create a pitched, squawky noise that serves as an extra voice of polyphony.[2] The Mega Man series score doesn't sound like much else, but it does call to mind the contrapuntal guitar pyrotechnics of bands like Television and Quicksilver Messenger Service. It's a very unique style that was inspired by the composers' desire to squeeze as much instrumental power out of the NES system's five channels as possible.

Another drawback of the NES is its severely limited range of timbres. One of the few ways composers can add some timbral variety to their tracks is through the variable duty cycle on pulse waves. With only four steps (or rather three, as the 75% and 25% options are inverted and sound the same), it is untenable for continuous pulse-width modulation. The most obvious application of the variable duty cycle is to add timbral variety to orchestrations. The 12.5% setting has a distinct nasally tone, and with some good orchestration and a little bit of imagination it can create a "brass section" type sound. See how the short fanfare at the beginning of Tim Follin's title screen theme for Solstice conjures up images of heralds announcing the king's arrival with bugles. Composers use the 25/75% option fairly often, as it has more harmonics than the square, missing only every fourth harmonic, rather than every second. The 12.5% is even better, missing only every eighth, and it is used less often and usually in conjunction with the 25%/75% options. But the duty cycles are useful for more than just some slight timbral variety. One common trick is to change duty cycles at the attack of a note to create a pizzicato-type effect. This can be heard prominently in Gremlins 2's "Wise Man's Shop Theme," where it's used to create a pipa-type effect in the accompaniment, to fit the Chinatown curio shop.

Another interesting use of the duty cycle is demonstrated by Jeroen Tel's score for Alien 3. Tel opted for a heavy metal themed score, which fits the aesthetic of the game. He achieves all sorts of heavy metal guitar effects by manipulating the duty cycle. By changing the duty cycle about a sixteenth note into a note, Tel emulates the sound of a guitarist who makes heavy use of artificial harmonics, such as Zakk Wylde. This trick is used on pretty much every track, but the guitar effect is probably at its most recognizable at the beginning of the "1st and 3rd Guardians" level. Finally, another very common use/abuse of the duty cycle is to just switch through extremely fast to create a very videogame-like tremolo freak-out effect. This trick is used in pretty much every other bar in Alien 3 to suggest fast guitar shredding, but you can find it in most other NES games—if not as a musical element, then as a sound effect.

Another feature of the NES that's ripe for exploitation is the mysterious PCM channel. One of the most well-known applications of this channel is for digitized

2 The noise channel trick can be observed in this remake created using "Famitracker," a tool for creating NES music on modern systems: https://www.youtube.com/watch?v=TqThwH9eMyo.

speech. Many young gamers were traumatized by the oft-heard "game over" in Top Gun. And who could forget the ominous threat of "Ski or Die" in the title screen of the eponymous classic? Or the blood-curdling death-howl of men plummeting to their Styrofoam deaths in American Gladiators, the videogame based on the game show? But these gimmicky audio snippets pale in complexity to the technical marvels of the Dirty Harry game, which features the entire "Feelin' lucky, punk?" speech in digitized form, alongside an animated cutscene. But of course, the sampling channel can also be an impressive musical tool, provided you have the storage space. It is most commonly used for adding percussion. Just one sampled snare or kick can go a long way towards beefing up a game's sound. Tim and Geoff Follin's supercharged Silver Surfer score is an excellent example of this.

The channel also has a pitch shifter, which allows composers to use the PCM channel melodically. This feature was used most famously to create the "Sunsoft bass" sound, which was named after the publisher that featured it in many of their games. When scoring games like Batman and Journey to Silius, Sunsoft composers would take a sample of a more complex waveform than the NES was capable of creating, and then pitch shift it to create basslines that sounded like nothing else on the market. The capabilities of the sampling channel are pretty much only limited by storage space, so while it was never used to its full potential during the system's life, today's chiptune composers, freed of storage limitations, can use it to create music that sounds like it came from a completely different system.

Over the NES's life cycle, programmers devised many graphical and gameplay improvements as they learned how to extract the system's full potential. But the musical advancements are the most impressive. Take the score for a launch title like Super Mario Bros, where you'll hear a lot of timeless melodies that keep you coming back for one more level. But, just a few years later, chiptune would be developed into an art form by composers like Tim Follin, who took the system's limitations as a challenge. Follin's title screen for Solstice begins with a modest and clumsy two-voice canonic fanfare, played on square waves at a nasally 12.5% duty cycle for comedic effect and to simulate brass instruments. After convincing you that this is just a fun puzzle game—possibly an old arcade or PC port—he hits you with all voices on max volume. Swirling arpeggios and duty cycle runs suggest a Rick Wakeman synthesizer solo. Sampled drums assault your senses before tapering away into a cascade of simulated delay, and a court jester playing the recorder rises to the fore with a lively prelude. Soon a full medieval consort, emulated through clever use of envelope, duty cycle, and vibrato, breaks into a lively gigue, accompanied by a driving prog rock rhythm section occasionally supported by synthesizer effects. Music on the NES had developed so far, technically, that a composer could create dramatic effect by referencing more primitive scores from earlier in the system's life and then subverting the listener's expectations by unleashing the machine's full capabilities.

## C64

Bob Yannes (2014), the creator of the C64's SID chip, said this of his work: "I thought the sound chips on the market (including those in the Atari computers) were primitive and obviously had been designed by people who knew nothing about music… I was attempting to create a synthesizer chip which could be used in professional synthesizers." These plans would never come to fruition. Yannes admits that he had been in talks with Sequential Circuits, who were interested in possibly buying the chip, but this never amounted to anything. But, although it didn't find any use on stage or in the recording studio, Yannes had invented one of the most advanced electronic instruments of his time, and a community of dedicated composers and programmers continues to discover new capabilities on it today.

The C64 only has three channels, but unlike the NES, these channels can be used for anything. This three-channel setup creates a drastically different environment for composers than on the NES. On the NES, each channel is dedicated to and optimized for a predetermined function: squares for leads, triangle for bass, noise for percussion, and a limited audio playback channel for sound effects. So in essence, every NES soundtrack is played by the same "house band," and composers are encouraged to play to that band's strengths. But the C64, with its three channels that can all create any sound at any given time, changes the composer's mindset. In this type of environment, experimentation is the name of the game. Composers are pushed to tinker with different "ensembles" to try to make more efficient use of their three channels of audio real estate.[3] Clever programming, exploits, and shortcuts become the domain of any C64 composer who wants to make an impression. So a simple C64 track might have the bassline in one channel, fast arpeggios and effects in another, a continuous melody in the last, and all kinds of percussion sounds spread across all channels wherever they find space. But that is really just the tip of the iceberg. With a bit of clever orchestration, a composer can achieve any kind of ensemble they can dream up.

On top of this, the range of sounds available with the SID chip are comparable to analog synths of the day. It has pulse waves with near-analog pulse-width modulation. Throbbing PWM would become a staple of the C64 catalog, making for good simulated "guitar solos" and acid basslines. This electrifying sound immediately screams "SID" to any retro gamer. This was accompanied by a triangle wave and a saw, which was rare in 8-bit machines, and this lent a lot of timbral depth to the system and set it apart from the more "bleep-bloopy" sound world usually associated with 8-bit machines. And of course, there was a noise generator for percussion. The Commodore also comes with amplitude and ring modulation, and unlike any other

3 There are a few channels on YouTube that post oscilloscope views of C64 tracks so you can see the interplay between the three tracks. The two tracks discussed in this paper can be viewed here:
https://www.youtube.com/watch?v=pgPEaI0GHBI.
https://www.youtube.com/watch?v=26zxf8vXIs0.

system of the time, analog filters. This was virtually unheard of at the time, and these features really place the C64 alongside hardware synths of the era.

Since the Commodore is such a powerhouse, there is a trend in C64 music that isn't present in other 8-bit traditions: composers imposing artificial limitations on themselves for extra challenge. One of the more hauntingly beautiful tunes created on the system is Jereon Tel and LMan's "$11 heaven," named after the waveform ID for the SID's triangle wave. As the name suggests, the piece uses nothing but triangle waves throughout its three-minute duration. But through subtle envelope programming, some sound masking, and good songwriting, the composers craft a soothing, ethereal soundscape full of rich, textured pizzicati; sweet, innocent melodies that drift in and out like daydreams and reveries; and bouncy, groovy basslines. Since the triangle wave is somewhat underutilized in favor of the more dynamic pulse and saw waves, this tune is a novelty in the Commodore catalog. Had I first heard it without any context, I might not have even recognized it as a C64 tune. While the composers are limiting themselves to a small portion of their machine's capabilities, it is worth noting that a texture this simplistic wouldn't have been possible on the NES, which only allows one triangle wave at a time due to its predetermined channel roles. "Less is more" is generally not an applicable axiom in the world of chiptune, where composers usually want to squeeze the most out of the few tools they possess. But the SID chip is so advanced that it affords composers the luxury of practicing restraint.

On the maximalist end of the spectrum, we have composers like Rob Hubbard. Hubbard is probably the most famous SID composer. He is known for pushing the system to its limits to achieve as many perceived "voices" as possible and emulate a wide variety of instruments. He pioneered all kinds of technical innovations in SID programming to achieve a distinct sound on the Commodore, that sets it apart from all the other machines of its era. One of his most famous works is his music for the arcade conversion of Commando. Hubbard says of his experience writing the score: "There is an interesting story behind Commando. I went down to their office and started working on it late at night, and worked on it through the night. I took one listen to the original arcade version and started working on the C64 version. I think they wanted some resemblance to the arcade version, but I just did what I wanted to do. By the time everyone arrived at 8 a.m. in the morning, I had loaded the main tune on every C64 in the building! I got my cheque and was on a train home by 10 a.m." (Warren 2019). Most will agree that this overnight job came out sounding far superior to the original arcade version. The arcade cabinet uses an advanced Yamaha FM sound chip based on the DX7 synth, but while this technology is arguably more advanced than the SID chip, the original arrangement is somewhat lackluster. It's a simple driving melody over a marching snare drum, to let you know it is a war game. The chip's eight channels are mostly used up playing basic synth chords. Hubbard's version, on the other hand, sounds more like a rock band backed up with a full orchestra, despite the fact that he only has three channels to work with. In any given

measure you can hear at least five distinct voices, but over the course of the track he cycles through different sounds, giving the impression of a very large ensemble. This is all accompanied by aggressive breaks from a very strange, glitchy percussion section that is a staple of Hubbard's flashy, dynamic sound.

### ZX Spectrum

Compared to both the NES and the C64, the ZX Spectrum is technically the most limiting, as it was never really meant for music-making. It is really a miracle that anyone ever managed to get more than short, monophonic melodies out of it. But paradoxically, in some ways it is less creatively limiting than either the NES or Commodore. We looked at how the NES sound chip was designed to emulate one "ensemble," and how that stifles innovation and limits composers by encouraging them to stick to the strengths of the NES "house band." And we compared this workflow to that of the Commodore, which functions more like a normal synthesizer, and allows any combination of sounds as long as there are no more than three of them happening at the same instant. But these considerations are nonexistent with the ZX, because the ZX Spectrum has no sound chip. The Spectrum was very affordable, launching with a price of £125 for the 16 KB RAM model and £175 for the 48 KB model, and these prices would soon drop even lower. For reference, the C64 launched at £399 in the UK. So at that incredible price point, the ZX came equipped with what you might call limited sound capabilities: A single 1-bit "beeper" speaker that is addressed directly by the CPU. This meant that all sounds on the Spectrum were essentially created from scratch, with 1s and 0s, and that you had to be an actual wizard to make music on it.

Originally the beeper was used to produce simple square wave tunes, and that is likely all the designers ever imagined for it. And although the phenomenon of music on the "Speccy" would evolve into something much stranger and more complex, it is worth examining how programmers utilized the speaker when it was seen only as an added gimmick. There was very little original music written in this format. Most of the games from this period were written by one or two programmers, who usually weren't musicians. Since it is an impossible task to create a coherent and effective musical statement using only a single square wave in the space of about 20 seconds, it makes more sense to borrow tunes that already have meaning attached to them. A good example of this is the score for the classic game Jet Set Willy. Jet Set Willy is a sequel to Manic Miner, and it sees series protagonist Miner Willy moving into a haunted house with the loot he found in the previous installment of the series. The title screen opens with a few bars of the somber left-hand figure from Beethoven's Moonlight Sonata, rendered as a series of expressionless bleeps. The musical reference immediately communicates the horror theme, and the fact that it is played so crudely through the ZX speaker adds a layer of comedic parody that suits the tone of the game. This could not have been achieved with an original melody.

The in-game soundtrack is also an effective choice for a tense platform game. There is, for example, an even bleepier rendition of Grieg's cartoon soundtrack staple "In the Hall of the Mountain King," which provides some excitement and whimsically spooky vibes.

It is remarkable that some ZX Spectrum games have in-game scores and sound effects. This really shouldn't be possible because, as I mentioned, the Spectrum uses the CPU to create all its music, so it normally wouldn't be able to handle music, graphics, and gameplay all at the same time. But with some clever programming, you can actually hear some sounds during gameplay in the form of short-pitched beeps. Maintaining a continuous pitch eats up runtime that could otherwise be used for gameplay, but by creating the shortest possible sounds, programmers can deploy only the minimum amount of sound necessary to create a desired effect. These small clicks are achieved through a technique known as "impulse trains." By limiting the duty cycle of a sound to a single bit, you can cause a speaker to pop. Kenneth B. McAlpine (2015) explains this process:

We could… reduce the number of ones in each cycle of the wave to create smaller and smaller duty cycles, varying the frequency spectrum and tone of the sound, until we send the beeper just a single positive bit, followed by a stream of zeroes. This signal is a binary impulse, and its Fourier transform is a constant. In other words, an impulse contains all possible frequencies in equal strength. It is not possible to hear an impulse on its own, but it is possible to hear the effect on the speaker of trying to play an impulse, the so-called impulse response. Any speaker exhibits a degree of inertia, taking a short but finite time to move from rest to maximum displacement and back again, and it's this response that can be heard as a noticeable click. Sequence a series of binary impulses together, separated by short gaps, and the result is an impulse train, a pitched tone whose frequency is determined by period between successive impulses, and which contains all of the harmonics of the signal at equal strength.

McAlpine discusses the specifics of generating certain pitches in his paper. Manic Miner uses these impulse trains to create both impressive music and sound effects. The first four bars of "In the Hall of the Mountain King" are hammered out mercilessly in a series of aggressive blips. This is carefully interlaced with a very soothing jumping effect that sounds like a babbling brook in comparison. These are both placed so that neither routine interferes with the other. This style of sound can be found in a few Speccy titles, and as long as you don't wear headphones, the effect can be very charming. These soundtracks are reminiscent of works by Ryoji Ikeda, in that they are composed of some of the most grating and painful sounds that computers are capable of making, played in an endless repetition—and yet, once your ears acclimatize to the harsh sounds, it's very mesmerizing and Zen-like.

As we've learned from the pieces we've discussed, pulse-width modulation is a powerful tool in computer-based music. Smooth analog waveforms, filters, and all the methods discovered by electrical engineers to coax sound from circuits, don't

transfer easily to the digital world (although, the SID chip does a good job). But a pulse wave is just an on/off switch, and computers are built on 1s and 0s. Since the ZX can only generate pulse waves, ZX composers, unspoiled by the luxuries of a sound chip, explored the possibilities of duty cycles on a massive scale. You can hear timbral pulse-width modulation in plenty of simple monophonic tunes. Tim Follin's very first credit for Subterranean Stryker is a fine example of a catchy tune given a bit of life through PWM. It would be Follin who would eventually show us that there are much more impressive applications for PWM. It isn't an uncommon technique in traditional synthesis to speed the pulse-width modulation on a square wave up into audio range to achieve some FM timbres. And with some tweaking, you can actually create two clear, distinct pitches. This is a good trick in analog synthesis , but for a ZX composer with a solitary pulse wave to work with, it is everything. It is the key to polyphony.

Speccy composers essentially built all of their sound by controlling the series of 1s and 0s that make up a pulse wave. It's really the only thing the speaker would allow them to do. But in the hands of an ambitious programmer, this fine control of one waveform is just enough control to get a foot in the door when it comes to polyphony. Just as they had done with impulse trains, programmers used PWM to get their speakers working overtime. McAlpine (2017) explains:

As discussed earlier, sending different sequences of ones and zeroes to the beeper allows the creation of a series of related wave shapes, from trains of binary impulses through to pulse waves of varying duty cycle. This idea can be taken one step further by returning to the idea of speaker inertia, which is the notion that a speaker cone cannot change its state discretely and instantaneously. When driven, it takes a short but finite time to reach maximum displacement and must move through all its intermediate states between fully off and fully on. The speaker behaves in a similar, though not identical way, as it returns to rest. Modulating the width of the signals (by varying the amount of time that the speaker is driven relative to the time that it is not) sent to the beeper, the speaker can be driven to intermediate points between off and on, thereby simulating the effect of a continuous analogue voltage.

Zombie Zombie was the first game to use PWM to achieve polyphony, and right away the possibilities were apparent. But as hinted earlier, polyphony on the Spectrum is heavily associated with one man: Tim Follin. Follin took these techniques to new levels, reaching up to five voices on tracks such as Agent X. These tracks all have such a distinctive sound that it's fair to say that he created his own genre of music on the ZX. The grainy, distorted sound that comes from this technique adds a rich, shoegazing-like lo-fi aesthetic to Follin's prog-influenced harmonies, and the result is a psychedelic mind-trip like nothing else. The process of faux polyphony on the spectrum creates so many harmonics that it must have sounded comically cheap at the time. But to modern audiences it can actually sound a lot more complex and richer than the NES, and at times even the C64. The full, distorted chords of the ZX sound positively human, and bring to mind the harmonizer-tinged guitars of

post-punk power trio Hüsker Dü. His opening for Chronos has a funky bassline, rich Juno-esque pads, and slow David Gilmour glissandi at the Spectrum's one volume, fundamentally altering your brain chemistry. These songs represent a style of synthesis that hasn't really been explored anywhere else. And no one set out to create this sound—it arose out of pure necessity. It exploded, in a burst of pure inspiration, from what is quite possibly the most limited format on which anyone has ever been forced to create music.

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## THE WRONG TOOL FOR THE RIGHT JOB: COMPOSITION ON 8-BIT MACHINES (summary)

This article examines how the technical challenges presented by the Nintendo Entertainment System, the Commodore 64, and the ZX Spectrum affected the way composers wrote for those platforms. The NES, designed as a commercial game-machine, offered composers a narrow but reliable range of sounds with which to construct adrenaline-pumping tunes. The Commodore 64 was designed to emulate higher-end hardware synths and serves as a veritable playground for inventive computer musicians. And the ZX Spectrum, which was never intended for music making, was the ultimate test of a composer's programming chops. This piece also explores the culture of game developers and gaming fans and how this factor shaped the music of early gaming.

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# COMPOSING WITH ANALOG TAPE IN A POST-DIGITAL AGE

**Abstract**: This essay explores the practical and theoretical dimensions of composing with analog tape in a post-digital age. Its point of departure is the belief that, instead of dismissing them as outmoded and impractical, we ought to embrace analog devices as invaluable tools for exploring the liminal realm in which encounters between concrete reality and abstract form take place. By working on sound as continuously varying electrical voltage as opposed to binary units of discrete value, a variety of compositional possibilities disclose themselves, particularly in relation to techniques of permutational variation. By reflecting on such techniques as implemented with analog rather than digital tools, crucial aesthetic insights emerge. The question of analog timbre is likewise explored, specifically in terms of aesthetic properties that testify to the unique physical origins of any given sound. Phenomenology as conceived and practiced by Husserl serves as a framework for these investigations. Its distinctive tools and methods enable exploration of the metaphysical dimensions of perceptual facts uncovered during encounters with analog and digital audio devices.

**Keywords**: analog and digital signal processing, permutational techniques of composition, timbre in electronic and electroacoustic music, the phenomenology of sound, musical temporality

## Introduction

In the minds of musicians active in the middle of the last century, the phrase "composing with analog tape" would have resonated differently than it does today. At that moment, analog technologies for recording, playing back, and transforming

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sounds on tape had just laid the groundwork for new approaches to compositional technique and novel conceptualizations of musical form. Any invocation of tape would thus have struck a progressive note with such musicians, as to them it promised unprecedented control over sonic material in its "raw" form.

This is not to say that the *affordances* of tape were unprecedented, however. Phonograph cylinders anteceded tape by a half-century.[2] These devices, like their successors, gramophone discs, "captured" sound by inscribing traces of acoustic energy to a material medium via a stylus vibrated by a diaphragm. It was the advent of electron tube amplifiers in the 1910s that heralded the eclipse of such mechanical devices. Though initially adapted to stylus-based machines, electrical audio technology eventually became integrated with tape-based devices following the engineering of a reliable storage medium in the 1930s.[3]

Leaving aside the cultural significance of tape for society at large, its impact was epochal for music composition. It is consequent to experiments with tape by composers of the 1950s that electronic music as we now know it first came into its own.[4] The pivotal moment in this development entailed a shift from conceiving of audio technology as a way to fix sonic ephemera onto a durable medium to employing it as a compositional tool. Unprecedented, in other words, were not the technological affordances of tape per se, but the immediacy with which techniques leveraging their possibilities could be implemented.

Fast forward to today, however, and the once cutting-edge machinery of analog tape is the relic of a bygone era, typically resurrected only by musicians interested in its "retro" vibe. Meanwhile, for those to whom tape holds no particular appeal, digital audio devices promise the same affordances. Indeed, within a single digital audio workstation, compositional techniques first made possible by tape—or, rather, *digital analogues* thereof—are implementable with unparalleled immediacy.

We should pause at the seemingly self-evident appeal of such "immediacy", however. Even if a given compositional technique is more "immediately" implementable within a DAW than it is on tape, does that make the former inherently "better"? How should we value such immediacy? And what about techniques that may be implemented with comparable facility in the analog realm (e.g. retrograde, which can be achieved with the simple flip of a cassette on a four-track machine)?

Having raised such questions, conventional narratives of technological progress might seem to constrain the horizon of compositional possibilities afforded by tape. And yet, to composers of a phenomenological cast of mind, encounters with analog

2 For an overview of technological developments in audio recording antecedent to analog tape, cf. Clark 1999.

3 On the development of technology for embedding magnetizable particles in a plastic medium, cf. Fantel 1994.

4 The two most significant centers of tape composition in the mid-20th century were Paris, where worked Schaeffer's Groupe Recherches de Musique Concrète, and Cologne, where worked German composers at the studios of the Westdeutscher Rundfunk. On the GRMC, cf. Teruggi 2007, Schaeffer 2012. On the WDR, cf. Iverson 2019.

sound always promise the possibility of disclosing uncharted musical territory. The central question driving this essay, then, is this: What compositional possibilities are brought into existence by working with analog tape in our current musico-historical moment? More pointedly, given that tape-based audio technologies are scarce, the logistics of using them comparatively convoluted, and the effects they offer ostensibly achievable by more expedient means, why would one *choose* to?

**Compositional Techniques**

Before exploring the axiological dimensions of composing with analog tape, we must first consider more concrete issues: What compositional techniques are made possible by tape? Do they have predecessors in acoustic composition? What about their digital successors? How have they been applied historically? And how do such historical applications inform their current practitioners? In surveying the landscape opened up by these questions, certain properties and affordances of analog tape are salient. With heuristic intent, these are itemized and grouped into categories below:

I. Editing Techniques
   1. Looping
   2. Splicing

II. Configuration of Recording/Playback Mechanisms
   3. Multitracking
   4. Echo

III. Modulation of Recording/Playback Speed
   5. Diminution
   6. Augmentation
   7. Retrograde
   8. Perceptually Transformative Forms of [5], [6], & [7]

IV. The Timbre of Tape
   9. Analog Sound

I shall proceed through these sequentially.

**[I] <u>Editing Techniques</u>**

If by "editing" one means the arrangement of information in a temporally unconstrained—i.e. non-linear—way, then the ability to "edit" sound was effectively a new affordance of analog tape. "Effectively", because editing techniques were rudimentary on mechanical audio devices. On the other hand, audio editing is

founded on the ability to isolate sonic material in order to play it back *ad libitum*. Looping thus falls under its conceptual umbrella—a technique that, while practicable on tape-based media, by no means originated with them.

## 1. Looping

Indeed, at the moment tape became the tool of choice for composers of electronic music, looping was already achievable with other media. Its most immediate precedent application was on shellac records (i.e. Schaeffer's *sillon fermé* or "closed groove"). The looping mechanics of gramophone machines differ significantly from those of tape-based devices, however. The basis of the tape loop is a span of tape that may be recorded to and played back from continuously. Gramophone loops, by contrast, occur when a groove is locked into, resulting in a single revolution of pre-recorded sound being indefinitely repeated. With tape, therefore, looping is a much more flexible technique, as the constituent functions of "play", "record", and "erase" are more easily implemented.

To reiterate: The effect most readily achievable with looping is isolating then repeating a sound or series of sounds. This may be done to provide a structural foundation on which to elaborate other sounds. Yet even in such a basic form, looping is a fundamentally transformative compositional technique. By virtue of the very act of repetition, sounds transform their perceptual nature: "Repeat the same sound fragment twice: there is no longer event, but music" (Schaeffer 2012, 13).[5]

In addition to rendering repeatable a chosen durational span, looping with tape affords a variety of effects if multiple machines play back the same material at different speeds. Flanging, for example, is a type of phasing produced by playing back the same audio on two machines simultaneously while varying the time interval separating them. In Western "art music", such techniques were pioneered in the 1960s by American "minimalists" Steve Reich and Terry Riley.[6]

Today, looping is a cornerstone of much digitally native electronic music. Cut-and-paste looping in a DAW environment provides a straightforward way of generating both small- and large-scale repetitive structures. Nor was looping on tape historically unprecedented—many sound-generating devices of the pre-electronic era were designed to provide automated repetition (Levaux 2017).

What is distinctive about tape-based looping, then? Consider the crucial difference between analog and digital loops. By default, all digital loops are precisely the same. This is decidedly not the case for tape (nor, significantly, for sonic repetitions in a natural acoustic environment). In other words, if anything recommends tape for looping, it is its inherently variable nature, thanks to which each audition of a sonic

5 And yet, "mirroring of material form and perceptual content is actually quite rare when it comes to using tape loops. Rather, the divergence of these two attributes is more common" (Kane 2017, 67).
6 Notable tape works in this vein include Riley's *Music for the Gift* (1963) and Reich's *It's Gonna Rain* (1965) and *Come Out* (1966); electroacoustic ones include Reich's *Violin Phase* (1967) and *Piano Phase* (1967).

phenomenon through its material filter offers something genuinely new to the ear.

## 2. **Splicing**

Along with looping, the technique of splicing was fundamental to tape-based music as it developed historically. The enthusiasm with which composers initially embraced splicing is understandable, given the unprecedented nature of its affordances. Splicing, as a method of non-linear editing, requires a static—i.e. temporally non-unfurling—objectification of an audio signal. Prior to the invention of technological devices for capturing sound, musicians, in the production of acoustic vibrations, were bound to the unidirectional flow of time. Splicing thus had no real predecessor.

Early works that explore splicing to notable effect include Schaeffer and Henry's *Orphée* (1953), Stockhausen's *Gesang der Jünglinge* (1956), and Varèse's *Poème électronique* (1958). And yet, so essential was splicing to tape music that to single out individual works as exemplary is an inexhaustible task. Moreover, to do so obscures the substantively divergent motivations composers had for embracing this technique. For example, to composers working in the tradition of *musique concrète*, splicing could serve as the first step towards transforming a sound "effect" into a sound "object". According to this logic, by decoupling a sound from its source—i.e. by forestalling its perception as referring to a physical object or event—an avenue is opened up to hear it in a "reduced" manner, or "in itself".

At the same time, the montage aesthetic achievable by splicing tape appealed equally to composers who adopted the polar opposite mindset of serialism. Thanks to its non-linear nature, tape splicing allows for the construction of complex durational (not to mention harmonic) musical relationships unactualizable by human performers. In the 1950s, it thus appeared tailor-made for musicians who subscribed to parametric approaches to composition then being developed from the logic of dodecaphony.[7] Messiaen's *Timbres Durées* (1952) is a notable example in this vein. Early tape works by Boulez (e.g. Études I & II, 1951) also fit this profile.

Splicing would remain of interest to composers through the 1980s.[8] Notable examples include the music of the band Negativland and the "plunderphonics" of Oswald (1985). Moreover, though no longer achieved with tape, montage continues to be a focus of electronic musicians. In its current guise it is practiced as a form of granular synthesis. Originally theorized by Xenakis (1971), granular synthesis was pioneered as a computer music technique by Roads (1988) and first explored as a real-time process by Truax (1990). It proceeds by partitioning a given sound according to an algorithmic scheme, then reassembling the resulting fragments

7 German composers of the WDR were indeed quick to assert a continuity between the practices of their electronic music studio and compositional techniques crystallized in the music of Webern, *inter alia* (Iverson 2019, 26-27).

8 An effect analogous to that of splicing tape produced by fragmenting vinyl records and gluing their pieces back together was explored by Marclay in the 1970s (Rebick 2016).

according to variably determined compositional parameters.

And yet, granular synthesis differs in many ways from tape montage. For instance, often absent from the former is the precision characteristic of the latter, insofar as the processes of granular synthesis are automated and "randomized" at the level of the grain. Of course, a composer could construct a "random" sequence of tape splices—Cage's *Williams Mix* (1951) does just this. This technique is far less laborious if implemented digitally, however. By the same token, the precise arrangement of sounds characteristic of tape montage is much easier in a digital environment that does not require a physical mechanism for isolating and resequencing (let alone measuring) its constituent elements.

In reflecting on musical montage with analog tape, then, we find ourselves in a situation similar to that of looping. Apart from unpredictable—and thus uncontrollable—variations in the mechanical operation of tape devices, not much distinguishes them for this application. The fact that such variations are typically taken as undesirable artefacts of analog media, coupled with the ease of implementation afforded by digital tools, makes these latter now widely preferred for the splicing of sounds together.

## [II] Configuration of Recording/Playback Mechanisms

Whereas the techniques of looping and splicing involve arranging sounds in a discrete, linear way, the following techniques involve combining sounds in a simultaneous, additive manner.

### 3. Multitrack Recording

Multitrack sound recording and playback is a basic affordance of every DAW. It has also been an affordance of tape since the 1960s. In principle, this affordance, whether recording multiple tracks simultaneously or mixing a newly recorded track with previously recorded ones, is identical in the digital and analog realms.[9] When considered apart from other affordances, then, multitracking on analog tape does not distinguish itself sufficiently from its digital counterpart to justify widespread preference for it.

9 That said, on tape machines a version of "sound-on-sound" recording—i.e. a technique pioneered by Les Paul who recorded sounds additively onto a single track with acetate discs—may be achieved by disengaging the erase head and pressing moving tape to which sounds have already been recorded into contact with a magnetizing head to which a different signal is being fed.

### 4. **Echo**

On tape, "echo" is produced by multiple electromagnetic heads positioned in linear succession—e.g. record, play, play. Such configurations mimic the "natural" echo caused by reverberations in a physical space. Delay time is determined by how far apart the heads are positioned and how fast the tape moves on the transport. By varying the delay time, one can produce a variety of effects, from close reverberation to distant reflections of longer intervals.

And yet, more is possible. Early in the history of audiotape, machines were designed to feed the delayed signal back into the recording path in order to produce various other effects. Consider the morphophone, first developed in 1953 by the Groupe de Recherches Musicales. This machine had 12 electromagnetic heads—one record, one erase, and ten playback. Discrete signals from each of the playback heads could be fed back into the system as well as individually filtered to provide spectral variations.

It is possible to implement echo effects by digital means. However, the distinctive flavor of analog tape echo—still very much in demand—is not digitally replicable. Once again, we run up against the fact that the precise "copies" of sounds afforded by digital means lack the unpredictable variations caused by the mechanical "imperfections" constitutive of analog technologies. While undesirable if one listens with an expectation of "absolute fidelity", this aspect of tape machines helps impart, among other things, analog "character". A chief example of such an "imperfection" is the variable operational speed of analog devices. Beyond the minute, "unintentional" variations characteristic of tape-based machines known collectively as "wow and flutter", such variability, when explored systematically, affords the ability to alter operational speeds to aesthetic effect.

## [III] Modulation of Recording/Playback Speed

Modulating the recording and/or playback speed of a tape machine alters not only the duration of the sounds it transduces but also their frequencies. This is because, although it presents itself to consciousness as an atemporal perceptual unity, what musicians call "pitch" is in fact dependent on durational cycles. Consequently, as is the case with all analog devices operating with linear transport velocity and equipped with stationary mechanisms for transducing signals, any change in transport speed will proportionally alter both the tempo *and* the pitch of the sounds transduced. This affordance of tape has myriad musical applications. Collectively, they may be grouped under the umbrella of permutational techniques of composition.

Permutational techniques of composition seek to preserve some or all of the ratios and proportions inherent in the durations and frequencies (or, relationally, the rhythms and harmonies) of musical sounds. They have been of intense albeit sporadic interest to composers of a certain cast of mind throughout the history

of Western music. Composers of the 14th and 15th centuries, for instance, often dissociate the musico-perceptual phenomena of pitch and duration in order to subject them to parallel processes of periodic repetition—a technique known as "isorhythm". Composers of the late 15th and early 16th centuries took this logic one step further, subjecting a motive or melody to more elaborate techniques of transformation—specifically, augmentation, diminution, retrograde, and inversion.[10] Northern European composers of keyboard music of the 17th and 18th centuries (e.g. Sweelinck, Froberger, and Bach) upheld this compositional tradition in such genres as the ricercar, fantasia, and fugue. Finally, 20th-century twelve-tone musicians resurrected these techniques with much enthusiasm though variable awareness of the work of their forebears.[11]

5. **Diminution**
6. **Augmentation**

To recap: Augmentation and diminution can be construed as transformations effectuated on ratios and proportions obtaining between frequencies and durations inherent in sounds. Construed in this way, these terms encompass not only their historically salient namesake techniques that expand or compress durational relationships by a discrete factor while preserving pitch, but also those that continuously transform durational relationships independently of pitch (known as *accelerandi* and *decelerandi*), as well as those that transform pitch while preserving durational relationships (known as transpositions). Transposition, in other words, is simply augmentation or diminution effectuated in the frequency domain, whereas *accelerandi* and *decelerandi* are augmentations and diminutions effectuated in the time domain.

To achieve something of these effects with tape, Schaeffer developed two mechanical devices that enabled the systematic alteration of playback speed: the chromatic and sliding phonogènes (1953). Again, the caveat with analog devices is that any change in either the time or frequency domain necessarily entails a change in the other. Because the chromatic and sliding phonogènes worked by means of linear transport mechanisms and stationary playback heads, they could not produce true *accelerandi* and *decelerandi*, nor transpositions in the traditional manner. To comprehend this aspect of analog devices, compare the equivalent methods of augmentation and diminution in the digital domain, known as "time-stretching" and "pitch-scaling". To be able to operate within the time and frequency domains independently, one must separate pitch from duration. Digitally, this typically involves "decomposing" a sound waveform by means of Fourier transformation. Digital signal processing is in this respect aligned with traditional compositional practice. Just as digital techniques of speed-based transformation may be applied within the time and frequency domains

10 On the fundamentality of such techniques to Medieval compositional tradition, cf. Hallowell 2013.
11 On this congruence of Modernist and Medieval compositional approaches, cf. Hallowell 2015.

independently, so too can a melody be transposed, or its elemental durations altered independently of pitch, when conceived of as an eidetic entity in the mind of the composer. This is because such operations, whether mental or digital, occur *outside* of "real time"—i.e. they are mathematical operations. They thus run contrary to the physical reality of sound.

## 7. **Retrograde**

Speaking of, another technique of permutational transformation afforded by analog tape is playing a sound "backwards"—i.e. in retrograde. Also achievable with digital tools, retrograde gives an acoustically impossible result. That is to say, in physical reality, one cannot reverse the passage of time, unidirectionally as it flows. And yet, although time's arrow is not preserved in a retrograde transformation, what is preserved are sequential relationships of sonic events. This is important, especially to musicians who cultivate form as emergent from eidetic variations of motivic entities.

It is instructive to compare retrograde with another permutational technique of transformation—inversion. While not easily implemented on tape (nor, for that matter, by digital means), inversion preserves the frequency ratios obtaining between successive pitched sounds while altering their directionality in a metaphorical "pitch space". In this way, inversion is similar to retrograde. To implement the former, however, discrete frequencies must be transformed independently of their durations. To do this, they must first be modeled mathematically.

Or must they? Inversion, like all permutational techniques requiring independent control over the time and frequency domains, is in fact achievable with analog tape. Overcoming the obstacle of the physical bond of pitch and duration, however, requires a tape machine equipped with rotating electromagnetic heads. Rotating head mechanisms—the foundation of, among other devices, the video cassette recorder—operate as follows: As the tape is moved in linear fashion by a transport mechanism, an electromagnetic head or series of heads mounted to a rotating cylinder (known as a "drum") scans the signal at a single point periodically. If its rotation is contrary to the motion of the tape, then the pitch will be shifted "up", as the relative playback speed that obtains between the moving components is increased. If it rotates *in* the direction of the tape, then relative speed is decreased, and the sounds are pitch-shifted "down". Finally, if the rate at which the capstan moves is precisely coordinated with that of the rotating heads, "time-stretching"—an effect in which pitch is preserved while duration is altered—may be achieved.[12]

However similar in effect, it is important to distinguish the manner in which

12 In 1963, Schaeffer's Groupe de Recherches Musicales constructed a machine called the universal phonogène that was capable of producing such transformations. For accounts of the engineering behind such technology as it pertains to audiotape, cf. Carlos 2008 and Marlens 1966. On its applications in the realm of videotape, cf. Remley 1999.

such analog machines operate from the logic of digital methods for pitch-shifting and time-stretching. Whereas the latter accomplish their task algorithmically, operating on 1s and 0s that only *represent* sound, the former operate *directly* on physical traces of acoustic energy. This means tape-based systems elaborate a *new* signal in parallel to the original, one constructed from infinitesimal durational spans of the latter played back in rapid succession so as to give the aural impression of a unitary sound.[13]

Technical issues such as these get at the heart of why one might choose to use analog tape when digital tools are readily available. To foreshadow the direction in which we are heading: Analog tape serves the composer as a sort of *memento temporis* or continuous reminder of the true nature of sound as it discloses itself to us perceptually. In so doing, it also reminds us of the fact that our perceptual categories for sound are not isomorphic with its ontological properties.

### 8. **Perceptually Transformative Forms of [5], [6], & [7]**

This category distinguishes itself from the preceding ones in that, at their extremes, speed-based transformations alter not only the material properties of sonic phenomena but also their perceptual character. Consider a speed change so extreme that discrete, periodically repeating pulses morph into a unitary frequency (in other words, that a steady pulse becomes a pitch). Such an effect has been put to great compositional use by many electronic musicians—a notable example occurs in Schaeffer's *Strette* (1978).[14] Beyond such usefulness, this kind of transformation serves as an object lesson in how phenomenological questions are never just materialist ones but always also, and *a priori*, idealist in nature. More pointedly, it reveals how the perceptual dimension of a phenomenon encompasses and constitutes its material one *transcendentally*.

## [IV] The Timbre of Tape

What is meant by this phrase? It depends on what one understands by "timbre". At this point, let us observe that if there is a "timbre" characteristic of analog tape—which is traditionally construed as a *medium* for the transmission of sound and not a sound-making device *per se*—then it resides in the particular sound that tape transmits "through itself".

13 This raises an interesting question concerning the relationship between the ontological and perceptual dimensions of a given sound, and how these play into determining its essence phenomenologically. For now, it must suffice simply to acknowledge this tangent in passing.

14 Schaeffer elsewhere acknowledged the aesthetic potential of such "phase transitions": "I have obtained some quite remarkable transformations by playing a fragment recorded at 78 RPM at 33 RPM. […] With this apparently quantitative change there is also a qualitative phenomenon" (Schaeffer 2012, 14-5).

## 9. **Analog Sound**

Unlike digital sound, with analog tape, input is not the same as output. In more technical terms, tape exhibits a non-linear frequency response. Tape signals thus require appropriate equalization on outward transduction in order to be heard as "aesthetically acceptable" when played back over loudspeakers. The challenge is that, along with its characteristically non-linear frequency response, tape generates and accumulates noise. Such noise was widely considered in the heyday of analog tape to be a disadvantage of the medium, and much engineering energy was devoted to improving its signal-to-noise ratio. Unavoidable, however, is the degradation of analog signals recorded to tape, especially through iterative copying.

And yet, in a post-digital world, noise and non-linear frequency response may be construed as the "timbral signatures" of tape. Take, for example, the case of distortion. Signal distortion on analog tape takes the form of saturation, which, according to the logic sketched out above, leads to genuine timbral transformations by introducing new frequencies not predictably contained in the original signal. This is distinct from digital forms of distortion such as bit-crushing, which turn continuous waveforms into sawtooth ones by reducing the sample rate. Accordingly, distortion achieved via tape saturation gives a characteristically "fuzzy" sound, which is subjectively less "harsh" than its digital counterpart (this is also related to what is often called analog "warmth").

Apart from this subjectivist reasoning, it is worth noting that noise in the physical world is of the same quality as it is on magnetic tape—that is, it is inherently random. Unlike digital noise, which, since it is trackable in a mathematically precise manner, can be reverse engineered and eliminated, analog noise cannot be removed—again, because it is random. Another way to conceptualize this point is that analog signals are indices of "real world" sounds and, by that virtue, preserve traces of "real" acoustic energy. Digital signals, by contrast, merely represent such sounds according to pre-determined mathematical schemata. This leads us to the question: Why might a composer seek to preserve randomness and indexicality?

### Aesthetic Insights

Before addressing this question, we must clarify its terms. "Randomness" may be construed as an irreducibly complex state that cannot be predictively modeled mathematically. "Indexicality", meanwhile, denotes the phenomenal quality of possessing a determinate link to physical reality.[15]

To formulate a provisional answer to our question, then: Analog devices convey the authenticity of sounds *qua* temporally constituted phenomena by preserving

15 Thanks to its indexicality, tape, along with other forms of analog media, holds "the potential to suggest a physical, non-symbolic layer of meaning" (Kramer 2017, 57).

their irreducible complexity and maintaining an indexical link to physical reality. This raises a further question, however: What do authenticity and reality mean in this context? We will explore this question from complementary perspectives correlating to the themes of sections [III] and [IV].

**Timbre**

Timbre is traditionally defined as tone "color" or "quality". It has been identified with the harmonic spectra of sounds (i.e. the frequencies of their partials) and/or their "attack, decay, sustain, release" (ADSR) envelopes.

And yet, timbre is inherently unquantifiable. Or is it? Consider the enterprise of additive synthesis, according to which timbre (or what is postulated as such) is engineered "from the ground up" with a finite number of sine waves. The logic underlying this approach rests on Fourier theory, which holds that a sound consists ultimately of a fundamental frequency accompanied by an exhaustively specifiable set of overtones. As those who practice additive synthesis would have it, by adjusting the partials of such frequencies and sculpting their ADSR envelopes, a "complex sound" is brought into being.

Or is it? To reiterate: According to this way of thinking, all sounds are "made up of" pure sine waves exhaustively specifiable via mathematical analysis. However, analysis is limited, quite literally, to yielding analytic truths. In other words, while one might set out to "decompose" a waveform into "elemental" components, the act of decomposing *essentially alters* the signal decomposed.

To illustrate this fact, let us consider digital signal processing in greater detail. DSP is a two-step process—discretization and quantization.[16] Quantization involves assigning whole number values to a continuously varying (i.e. analog) input. DSP quantization is therefore a specific application of the general mathematical technique of quantization, which entails mapping a potentially infinite set of continuously varying values to a set that is necessarily finite. The process by which these values are then converted to binary code is called "pulse code modulation". Once an audio signal, formerly analog, is converted via PCM, it can be operated on like any other kind of digital data. It can also be copied without a loss in quality through successive generations.

To render this type of signal back into the physical world, a digital-to-analog converter is needed. In theory, it is possible to "exactly" reconstruct an analog signal in this way. In practice, however, it is not possible. Specifically, it is not possible because it is impossible to sample (i.e. discretize and quantize) at an infinite sample rate. What is more, the slower the sample rate, the more "digital distortion" is introduced. This fact underlies the Nyquist theorem, which states that to "faithfully" render an audio signal, a sample rate of at least double its highest (i.e. fastest) component

16 For a summary of these principles, cf. Watkinson 1999.

frequency is needed (sampling at rates slower than this leads to "aliasing", or the *predictable* production of frequencies not present in the original signal).

To review: Although timbre *qua* sonic parameter is often invoked to analyze music of purely digital origins, it is not obvious how we ought to construe it in such a context. More to the point, unless the phenomenon of timbre is to be identified entirely with any of those quantifiable parameters cited above, what gives rise to its perception can only be those aspects of a sound that convey its characteristically singular origins in an irreducibly complex manner. Another way of construing this point is that it is the physical irregularities collectively conveyed through the aforementioned parameters that make a particular sound *sound* like itself.

Let us rephrase this point from the perspective of the distinction between genuine randomness and "pseudo-randomness". Strictly speaking, true randomness could only ever be a *naturally occurring* phenomenon.[17] Digital "random number generators", by contrast, give seemingly "random" values that are in fact determined in advance by an algorithm governing the mathematical processes that produce them. Granted, *subjectively* one may find no distinction. More specifically, one might not be able to tell the difference between digitally generated noise and noise in the real world, discerning equally in both cases an absence of periodicity, structure, or intentionality. However, this does not resolve the phenomenological question of how the ability to discern such a distinction maps onto one's knowledge that it exists.

Based on the preceding investigations, we can categorically assert that analog audio devices materially preserve, and thus authentically transmit, timbre.[18] This is bound to ring paradoxical, given how digital devices are held to be superior according to conventional logics of audio "fidelity". And yet, it is not a question of fidelity construed as quantifiable according to some metric but rather of authentically preserving the material substrate of sound *per se*. DSP devices, by contrast, can only ever operate *around* the phenomenon of timbre. To put a finer point on it, there is no such thing as digital timbre. In fact, when applied in the extreme, DSP transformations obscure timbre through their iterative operations on audio signals *qua* quantized representations, which inevitably move the sounds thus encoded away from the realm of timbre *stricto sensu*.

All this may seem fine in theory. Translated to the practical realm of music, however, things get murkier. One might counter that a sound source is not always—indeed routinely is not—securely identifiable as such, whether in a musical context or not. Moreover, one could forestall the entire debate by questioning whether preservation of the source material in such a manner is an aesthetic desideratum in the first place.

17 "Hidden variable theories" deny that reality on the quantum scale is inherently random. There are also those who claim randomness is not an ontological trait of reality but rather one we thinking beings impose upon it. Whether such arguments hold water depends on one's conception of the mind-world relationship.

18 Schaeffer formulates this point in a different way: "It is incredible how much a metronome can lack a sense of rhythm!" (Schaeffer 2012, 6).

That the sources of sounds be unrecognizable is, of course, a stated goal of Schaeffer's earliest conception of musique concrète (Schaeffer 2012, 6-7; cf. Teruggi 2007, 214). This conception served in turn as the basis for a critique of musique concrète mounted by early composers of *elektronische Musik* interested in distinguishing their own enterprise. Their critique centers on the question of whether a sound can ever be truly decoupled perceptually from its source. Coming from the world of radio drama, Schaeffer's first sonic materials were sound effects comprising an institutional audio library. By contrast, German composers were of a "high Modernist" mindset. This meant they considered the audio technologies at their studios as a means to fulfill the serialist ideals forged by Schoenberg and Webern—as far more, in other words, than mere tools for the arrangement of "sound effects".

We have wandered far from our discussion of analytic versus synthetic conceptions of timbre. And yet, perhaps we have not. For one could interpret the divergent approaches of mid-century French and German practitioners of electronic music in terms of opposing philosophies of composition—one proceeding from sonic reality by working on "concrete" sounds adapted from the "real world", the other from preconceived notions of sonic phenomena as represented in a symbolic system (i.e. serialism).[19] However theoretical, such distinctions between mediums of and operations on sound that hew to its authentic origins, and those proceeding from representations of sound through non-sonic logics, are at the core of our experience of analog timbre in a post-digital landscape, and thus merit the most serious reflection.

**Time**

To recall a takeaway from earlier: In operating on *representations* of sonic phenomena rather than on the phenomena themselves, digital technologies, like traditional compositional techniques, can perpetuate a misguided notion that the time and frequency domains are ontologically independent. Though they present themselves *epistemologically* as distinct, this is, ontologically speaking, not so. The most efficient way to reveal this fact musically involves the employment of permutational techniques of composition. Such techniques are crucial—indeed indispensable—to extracting this aesthetic insight from within the materiality of analog tape.

As a framework to evaluate such techniques as implemented with analog tape, phenomenology as conceived and practiced by Husserl is apt for two reasons. First, as Husserl was interested in time and its role in the constitution of objects of perception, phenomenology allows one to explore the metaphysical consequences of the

19 Schaeffer intentionally avoided such preconceived notions of musical form and compositional technique, opting for an "inverse path to reach music […] from sound data instead of notation" (quoted in Gayou 2007, 203).

affordances of analog and digital audio devices. Second, insofar as phenomenology is founded on the imaginative exploration of phenomenal essence—a process that Husserl terms "eidetic variation"—it offers an opportunity to synthesize insights drawn from analog and digital technologies as they pertain to musical phenomena.

To put ourselves in a phenomenological situation, consider what happens when we hear a steady beat. We might feel compelled to count such beats. Consider, however, what might happen if the steady beat morphed into a unitary pitch. We typically feel compelled to count nothing in particular when we hear a pitch, though, if our perceptual apparatus were attuned to its scale, we could count the regular oscillations of the soundwave producing it, just as we would count a metronome click. Of course, we *could* count along to the passage of time *ad libitum* while listening to a pitch, or any other sound for that matter. Regardless, the point is that time does not appear as immanent to the phenomenon itself. Pitch thus discloses itself as a *durationless* phenomenon.

Following Husserl, we can say that just because we "know" that pitch is dependent on duration, it does not follow that our perception of it as durationless is "wrong". Rather, the fact that pitch and pulse, or frequency and duration, appear to us as distinct entities ought to be taken as the point of departure for reflection on how they are constituted in and by sound *qua* temporal phenomenon. In other words, such self-evident distinctness to our perceptual apparatus ought not to be dismissed as mere error brought about by the inadequacy of our senses but rather embraced as a foothold to be leveraged for critical reflection. To quote Husserl (1991):

> What we accept […] is not the existence of a world time, the existence of a physical duration, and the like, but appearing time, appearing duration, as appearing. These are absolute data that it would be meaningless to doubt. […] That the consciousness of a tonal process, of a melody I am now hearing, exhibits a succession is something for which I have evidence that renders meaningless every doubt and denial (5).

Similarly: "Every consciousness of continuity is the consciousness of a unity" (249). Or also:

> The object [of consciousness] is not the extension but what is extended. […] [W]e can then always make the extension itself into an object, divide it, and distinguish its parts. The continuity of […] moments, as continuity, is penetrated throughout by the unity of something identical (249).

To work with analog tape devices thus debunks the myth that the time and frequency domains are ontologically independent. In fact, both are fundamentally bound up with the unidirectional flow of time, despite routine operation within these categories on perceptually distinct phenomena by present-day musicians equipped

with digital tools. By transforming sounds through recording- and playback-speed modulation on analog devices, then, one discloses the temporal essence of musical phenomena through the authentic preservation of "real time" as *lived duration*.[20]

## Conclusion

Let us return to the conventional wisdom that sparked the generative question of this essay. It may be summed up as follows: Any compositional technique that one might wish to achieve with analog tape can be approximately accomplished digitally, and more readily at that. Next, the question: In light of this fact, how should we value tape-based audio devices? That is to say, why compose now with analog tape?

As should be clear, it is the position of this essay that the compositional affordances of analog tape ought not to be evaluated simply in terms of how expedient it is to work with. Rather, they should be considered in light of the *values* one puts into practice as a musician and composer. That value exists in composing with analog tape is clear if and only if, prior to embarking on the compositional process, one embraces the perceptual ramifications of sound as a temporally bound phenomenon, and commits to preserving the irreducible complexity of timbre as a unitary aesthetic phenomenon.

In these ways, analog tape serves as a reminder of an authentic ontology of sound, one capable of inspiring analogous compositional techniques and musical ideas in turn. Composing with analog tape invites—if not compels—the musician to *think through* the materiality of sound, and to take the implications of such materiality into consideration throughout the compositional process. This, to me, is what it means to compose with analog tape—not simply to "use" it, but to work with it by following its indexical logic and immersing oneself in its all-encompassing flow.

20 Cf. Bergson 1961.

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## COMPOSING WITH ANALOG TAPE IN A POST-DIGITAL AGE (summary)

Scholars have extensively investigated analog tape as a cultural artefact. Many have interpreted the symbolic significance of tape from a critico-theoretical perspective. Others have explored it as a lens of inquiry for socio-political and historical phenomena. Finally, many studies have examined the role still played by tape in cultural politics outside North America and Europe. Largely absent, however, are reflections on the value of engaging with analog tape as a compositional tool in our post-digital age.

Granted, composing with tape might seem too impractical, as digital technologies can efficiently achieve operations that are of great difficulty for analog devices—e.g. independent transformations within the time and frequency domains. As I show in this essay, however, the tradeoffs for such efficiency are twofold: first, removal from the inherently unidirectional flow of time; and second, from "groundedness" in sound as a physical phenomenon. Within such a framework, it is claimed that analog technologies preserve the "authenticity" of sound. If one composes first and foremost from a perspective that values mindfulness of such authenticity, however remote it might be from conscious sensory perception, then analog technologies are to be taken seriously as compositional tools, despite the logistical challenges of working with them.

All this ought not to be taken as a form of deliberate anachronism, however. Rather than evaluate analog audio devices in isolation from the assemblage of materials and techniques that comprise contemporary compositional practice, I show how analog and digital technologies, in dialectical counterpoint with each other, offer composers unique insights into the nature of sound as the material substrate of music, and invaluable guidance in implementing compositional techniques proceeding conscientiously from qualities immanent thereto.

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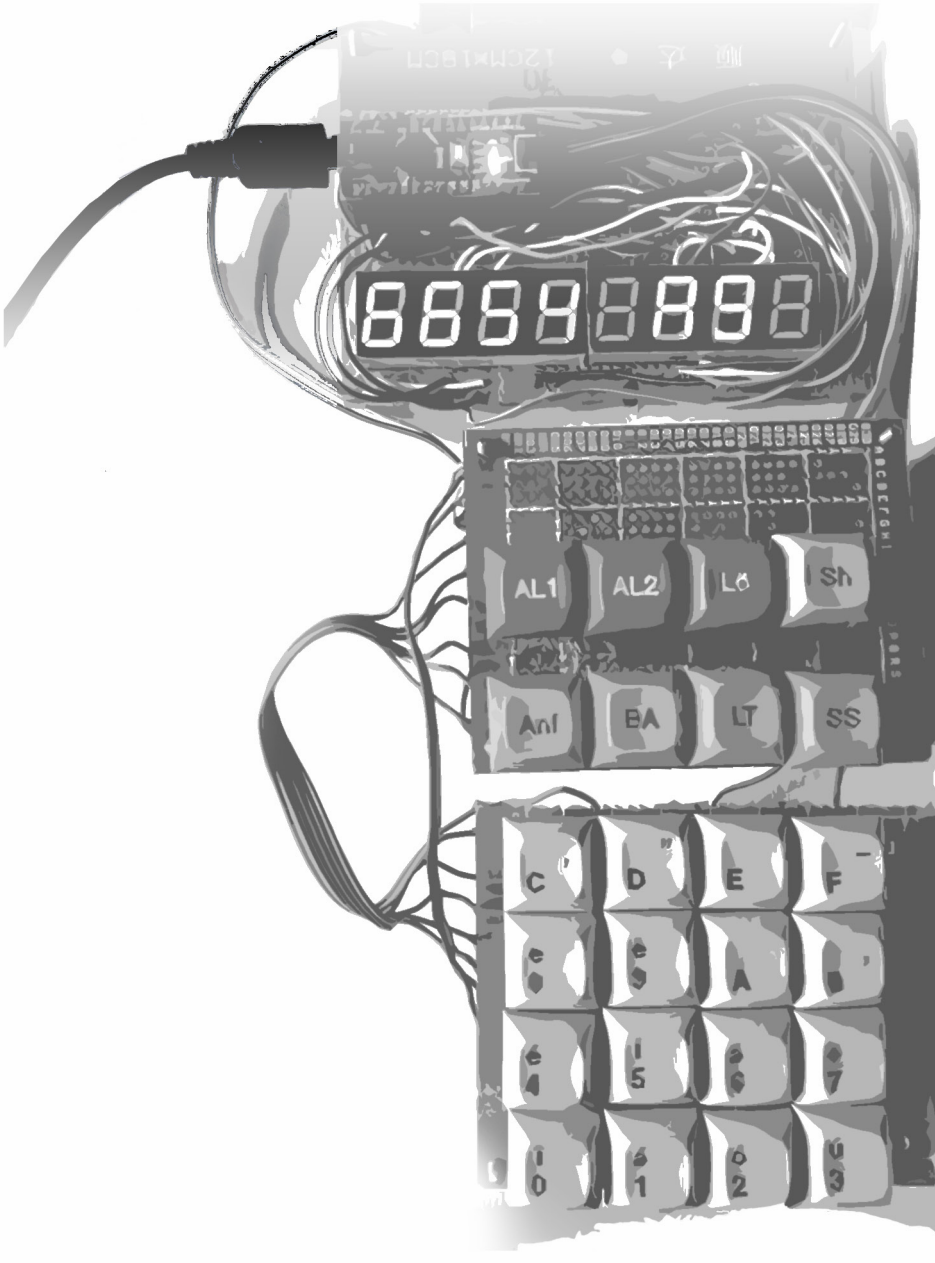
# REVIEWS



**Maša Spaić***
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*Belgrade, Serbia*

# Review of the 28th International Review of Composers Belgrade, Serbia October 4–9, 2019.

The 28th International Review of Composers was held at the Students' Cultural Center [Studentski kulturni centar] in Belgrade, from 4th to 9th October 2019. Similar to last year, the 28th Review didn't have a specific title that would determine the thematic content of the festival. Therefore, Belgrade audience heard a heterogeneous collection of works, ranging from solo instrumental works and pieces for various types of small chamber ensembles to pieces written for larger ensembles both with and without electronics. The Review's program was divided into nine thematic concerts named after the pieces that were on the repertoire: during six days, musicians performed around sixty compositions (chosen out of more than two hundred submitted works), most of which were written in the last ten years, except for a few pieces that were written in the second half of the last century, by eminent composers such as Philip Glass and Steve Reich. The 28th Review also included a lecture by Serbian composer and musicologist Branka Popović.

Amongst the performers at the Review were renowned musicians of the Serbian contemporary music scene: *LP Duo, Tea Dimitrijević and Dejan Subotić Piano Duo*, *Construction Site Contemporary Music Ensemble*, *Belgrade String Quartet (Quintette)*, and *Ensemble Studio 6.* In addition, the public heard young soloists and smaller chamber ensembles who specialize in performing contemporary music. This year's Review also included performances of two world-renowned ensembles: *in process*, a German ensemble dedicated to the performance of minimalist music, and *SISU,* a Norwegian percussion ensemble.

Opening ceremony of the 28th Review started with the presentation of the Mokranjac Award for the best composition in 2018 to professor and composer Dejan Despić, for his comic opera *Priest Ćira and priest Spira*, op.200 [*Pop Ćira i pop*

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*Spira*], based on the novel of the same name by Stevan Sremac. The Jury said that, "using clear, neoclassical musical language Despić musically revives the humor of Sremac's novel," and that "in opera vocal parts, music and dramatic flow are equal partners who complement one another," which are only some of the elements that make it "stand out, not only by its compositional and technical skill and mastery, but also, by its place and meaning in Serbian music." The opening ceremony proceeded with the concert dedicated to music written for two pianos. The concert was divided into two parts. The first part was named *Hurricane* after a piece by Jugoslav Bošnjak, and the performers were *Tea Dimitrijević and Dejan Subotić Piano Duo*. They performed Ihar Komar's composition *An Islet in the Sea of Japan*, Bošnjak's composition *Hurricane*, Miloš Zatkalik's *Il Mostro Meccanico* and Vladan Radovanović's *Furioso*. The second part of the concert, named after Ivan Brkljačić's composition *A Piece, a Cookie, a Collage*, was marked by the performance of *LP Duo* (Sonja Lončar and Andrija Pavlović). They performed *Ariel* written by Ivan Božičević, followed by Ana Sokolović's *Trois études pour piano*, Branka Popović's *14.30*, Brkljačić's *A Piece, a Cookie, a Collage*, and Kim Helveg's *American Fantasy*.

On the fourth and fifth night of the Review, two more awards were presented. The Pavle Stefanović Award for music criticism and writing was given to the eminent musicologist and music writer Dušan Mihalek, for his book *Music and the Word* [Музика и реч], that contains a selection of his writings on music, while the Aleksandar Pavlović Award for the promotion and performance of Serbian contemporary music was presented to the members of the chamber ensemble *Trio Movement* [*Trio Pokret*]. Additionally, the jury gave special awards to musicians who dedicated their life's work to the promotion of Serbian contemporary music: Gordana Djurdjevic, music editor of Radio Belgrade, Nada Kolundžija, professor and well-known performer of contemporary music, and Petar Ivanović, professor, violist of Serbian string quartet Mokranjac [Srpski gudački kvartet Mokranjac] and conductor of string orchestra Sveti Đorđe.

The first concert of the second night, named *The Upgrade for a group of musicians with telephones* after Maja Bosnić's composition, was dedicated to music for smaller chamber ensembles. The first piece of the repertoire was the composition *Why?*, written by Ana Kazimić, succeeded by Aleksandar Perunović's *АЯТИАМАNTRA ІЯОИІNORI Variationen und Reaktion über Klavierstücke I-IV von Stockhausen*. After these works, the audience heard Bosnić's composition *The Upgrade for a group of musicians with telephones...in a fictional waiting room from a not so distant future*, which stood out not only by its sound but the whole concept: it's a music piece, music theatre, that makes a critique of the society we live in. It depicts an imagined moment in the future when the young generations, raised with their attention-sapping mobile phones, and a lack of will to communicate, grow up and take responsibility for society. After this piece, the audience also heard Teodora Stepančić's *Clarinet No.__*, Božo Banović's *Mountains* and Ljubomir Nikolić's *Emulations*.

The second concert of the second evening, dedicated to music written for the

organ, took the audience to the Cathedral of the Blessed Virgin Mary. The name of the concert, *Organ +*, doesn't refer to a specific composition, but to the concept of the concert itself. The program consisted of five great pieces for the organ and some small chamber ensembles, written by composers from all over the world, such as Zvonimir Nagy's *Angelus*, Farangis Nurulla-Khoja's *La Cloche Fêlée II*, Laurence Jobidon's *Expansion: une ode au Big Bang*, Lise Morrison's *Ninety Five* and Vlastimir Trajković's *Epimetheus*.

The third evening of the Review brought to the audience two very interesting, and, in terms of sound, very different concerts. The first concert, named after Dragana Jovanović's composition *Romance, Waltz, and KoltzeTrans*, revolved around small chamber ensembles and soloists. The piece that opened the evening was Luka Čubrilo's *Inégal*, and it was followed by Milan Aleksić's *Wall*, Ivana Ognjanović's *318km,* Dimitri Papageorgiou's *Even the sky screams sometimes too II* and Dragana Jovanović's *Romance, Waltz, KoltzeTrans.* Two vocal compositions which concluded the concert, Svetlana Savić's *Godzilla* and Tatjana Milošević's *When You're Left by the One You Love,* left a great impression on the public thanks to the composers who provided a great musical characterization of the texts chosen for their compositions.

The second concert of the evening was dedicated to minimalist music. The performers were members of the ensemble for minimalist music *in process*, led by their artistic director Ulli Götte. The ensemble was founded in 1985, when Ulli Götte gathered a unique ensemble of jazz, classical, and avant-garde musicians, intending to perform and further develop minimal music. Thanks to their performance, the audience had the opportunity to hear contemporary minimalist music, as well as pieces written by renowned European and American composers. The repertoire included Philip Glass's *Conclusion* (from opera *Satyagraha*) and *Funeral* (from opera *Echnaton*), Ulli Götte's *Two Groups* (*Part III*) and *....dies ist mein...* (*from: Grenzen*), Vladimir Tošić's *Medial 6*, Steve Martland's *Dance Works* (*Part I*), and *Music for Mallet Instruments, Voices and Organ* by Steve Reich.

The fourth night featured music written for diverse chamber ensembles. The first concert, *Sonority of Kafana*, named after Nataša Bogojević's composition, was entirely dedicated to music written for trios, quartets, and quintets. The performers were members of *Ensemble Studio 6*, soloists, and chamber musicians. The repertoire of the concert consisted of the following compositions: Laura Mjeda Čuperjani's *Reverse*, Petra Strahovnik's *Crop circle*, Chatori Shimizu's *Fiddle*, Diana Čemeryté's *Jahre Ohne Mozart* and Sonja Mutić's *All Your Worlds*. The last composition performed was Bogojević's *Sonority of Kafana,* in which the composer created an interesting synthesis of Balkan folk music and American minimalism.

Keeping with music written for small chamber ensembles, named *(4)+1=2*, after Goran Marković's composition, the second concert of the evening brought a different sound and atmosphere. The opening composition was Predrag Repanić's *Dr. Wolfi and Mr. Haydn in a new episode: Sonata (quasi una fantasia) – non facile, per*

*pianoforte e orchestraoke ossia Moz-Art á la Haydn et vice versa*, an interesting and socially provocative composition dedicated to "all the fake doctors and other plagiarizers in Serbia and beyond." Consequently, the composer himself didn't write a single note. Instead, he used excerpts from Mozart and Haydn's piano sonatas, from which he made new materials and sounds and presented them as his composition for piano and electronics. This piece was followed by Fani Kosona's *Flow Imprints*, Paul Pankert's *Fake-Flutes*, Mirjana Živković's *A Little Quartet for Friends*, Milana Stojadinović Milić's *A Little Cloud on Top of Mount Athos* and Marinković's *(4)+1=2*. The last two pieces performed at this concert were Zoran Erić's *Dedication to Nature* and Isidora Žebeljan's *When God Made Dubrovnik*.

The penultimate day of the festival brought on the scene of the Students' Cultural Centre *SISU*, a percussion ensemble from Norway. *SISU* percussion ensemble is one of Scandinavia's most prominent contemporary music ensembles. Formed in 1993, and led by its artistic director Tomas Nilsson, the ensemble is recognized for its unique musical aesthetics, developed through an exploratory attitude towards every musical challenge. The concert, named *Wither with a bird in the palm* after Ivana Stefanović's composition, was memorable thanks to its performers and the program, that was comprised of music written for percussion with/without electronics. On the program of the concert were three exceptional pieces written by Norwegian and Serbian composers: Rob Waring's *Sikoté Sukán* for percussion, Ivana Stefanović's *Whither with a bird in the palm* for percussion and tape and Arne Nordheim's *Respons 1-IV* for percussion and electronics.

The 28th International Review of Composers was concluded with a lecture and concert. Namely, the last night of the Review started with a lecture by Branka Popović titled *A story about China told from a personal perspective*. In this lecture, Popović presented the project *Composers Field Trip to China* in which she participated. During an inspiring 90 minutes, Popović shared video materials, experiences, and the knowledge she gained whilst participating in this project, whose aim was to "establish a cultural interaction with China and develop a professional cooperation which will encourage friendship between different nations." The concluding concert, *Light – Lapse* based around music written for larger ensembles, featured the *Construction Site Contemporary Music Ensemble* under the baton of Ivan Marković. The program of the concert consisted of Vladimir Tošić's *MOTUS 2*, Sungji Hong's *The Tempest*, Marco Longo's *Light – Lapse*, Draško Adžić's *The Anamnesis of Miron Goldenberg,* Emre Sihan Kaleli's *Five Love Songs* and Lazar Đorđević's *Trinity*. Overall, the 28th International Review of Composers affirmed its well-built position on the cultural map of Belgrade thanks to the diversity and quality of its repertoire and performers, and the great interest of the audience.

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# *ERNŐ KIRÁLY – LIFE IN MUSIC* Interdisciplinary Conference with International Participation, Academy of Arts, Novi Sad, September 27–28, 2019.

In the last weekend of September 2019, an interesting conference was held at the Multimedia Center of the Academy of Arts, University of Novi Sad. Titled *Ernő Király – Life in Music*, this relatively small and unpretentious event, which was organized around the idea of commemorating 100 years since Király's birth, included two full days of paper presentations, as well as a photography exhibition and concert. The interdisciplinary nature of the conference, as well as its international participation, drew a small group of enthusiastic researchers and musicians, determined to start working on the puzzle that is Király's life and work.

Ernő Király (1919–2007) was a composer, ethnomusicologist, performer, and inventor of musical instruments, whose unusually rich and diverse body of work was highly influential in the music scene of Novi Sad. Also, his interest in contemporary experimental music practices and performance, improvisation, and interdisciplinary collaborations, opened up a scene of like-minded musicians in other cities of former Yugoslavia, in particular with ensemble ACEZANTEZ from Zagreb. As the organizers of the conference pointed out, he spent his most fruitful years in Novi Sad, tying himself to Radio Novi Sad, where he started working in the fields of radiophony, tape music, and electronic instruments (during the sixties). Here, Király also began his voyage on the path of discovering collective and solo improvisation and musical performance. He also started working with graphic notation, and invented new instruments such as the citraphone and tablophone. Király's ethnomusicological work exploring and collecting folk music was especially influential for his interest in extended performing techniques, improvisational and social character, and the specific sort of intuitive guidance in the performing of

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music.

Given that Király's life and work has not been the focus of a great number of scientific papers, let alone an event such as this, the assemblage of this conference was able to tackle some of the key questions that hover above his activities. Musicologists, ethnomusicologists, performers, composers, and archivists from Serbia, Hungary, Croatia, and Switzerland revealed the abundance of themes that the study of Király's life and opus encompasses. In the pleasant and intellectually stimulating atmosphere of the conference, compelling presentations were complemented with spontaneous and valuable comments from Király's son, composer Dávid Zsolt Király, and Katalin Ladik, a famous actress, vocal artist, poet, and Király's professional collaborator and second wife.

Following the welcome speech from the Dean of the Academy of Arts, Siniša Bokan, and the Head of the Department of Musicology and Ethnomusicology, Dr. Ira Prodanov, three papers were presented in the first session of the conference. Musicologist Dr. Mirjana Veselinović-Hofman presented the paper, "When is a Gladiolus Truly a Gladiolus? Ontological-Phenomenological Aspects of Certain Musical Graphics by Ernő Király", focusing on certain works of Király which are notated in musical graphics. As Veselinović-Hofman emphasized, the paper focuses "on the conception of his cycle titled *Flora*, which Király began to realize in 1978, that is, in the time of his most extreme avant-garde undertakings, especially in the field of improvisational freedoms, and, in direct connection to them, multimedia coexistence." The second paper, "Synaesthetic Abstract Proto Psychedelic Music: The Role of Electroacoustic Free Improvisation in Ernő Király's Last Era" was presented by sound artist, sound ecologist, performance and conceptual artist Zsolt Sőrés. Sőrés talked about folk music as Király's inspiration in the process of discovering the world of intuitive compositions and live performance, as well as instrument building and his "flower- and plant-based synaesthetic abstract proto-psychedelic music." Musicologist and trombonist Nemanja Sovtić, in his paper, "Artistic Research in Space (Between) Composition, Improvisation and Sound Experiment – Reflections about Ernő Király," explored the "nonconformism of Király's artistic nature" through the lens of composition, improvisation, and sound experiments, which were inseparable in Király's work.

The next session also contained three papers, two of which dealt with Király's ethnomusicological activity. Ethnomusicologist Juliana Baštić researched Király's engagement with the musicological section of the Ethnological department of the Museum of Vojvodina, and his contribution to their project between 1955 and 1972, with a paper titled, "Ethnomusicological Activities of Ernő Király". In her paper, "Ernő Király's Paper in Collections from the Congresses of the Alliance of Folklorists of Yugoslavia," ethnomusicologist Dr. Vesna Ivkov aimed to shed light on Király's methodological approach in these collections, while stressing the importance of the future development of ethnomusicology in Yugoslavia and Serbia. With her expertise in musicology and gender studies, Adriana Sabo delved into the artistic

relationship between Ernő Király and Katalin Ladik in her presentation, "Sound Collaborations Between Katalin Ladik and Ernő Király." Sabo explored pieces in which Ladik and Király worked together to create the sound which was exemplary of both of their experimental tendencies.

Musicologist Dr. Ira Prodanov opened the final session of the first conference day with her presentation, "Ernő Király at Radio Television Vojvodina."As a participant on the realization of certain recordings of a more recent date, Prodanov focused on a few RTV broadcasts about Ernő Király and livened up the spoken word of the conference with some excerpts from the shows in question. Coming from Croatia Records (formerly Jugoton) in Zagreb, Petar Pečur gave an intriguing talk: "Discographic Opus of Ernő Király: An Insight into Published Recorded Works." Finally, Dávid Zsolt Király enriched the conference with his personal anecdotes in a presentation called, "Ernő Király: A Life in Thoughts and Questions," which started with the question, "Was Ernő Király the 'John Cage of Vojvodina' of his time?"

Following this was an exhibition of photographs from Dávid Zsolt Király's personal archive, showing some of the crucial moments of Ernő Király's life, as well as the concert of the ensemble, "Restrictions," and pianist Nataša Penezić. The concert program was composed of Király's pieces, *Poem about dawn* (1960), for tape, *Sky* (1962), for tape, *Toccata pentatonica* (1979), *Flora 1 and 2* (1978), *Dots and lines* (1972), and *Diminuzione* (1975).

The program of the second day of the conference involved two more sessions on Király's *life in music*. Musicologist Michael Kunkel focused on the interaction and dialogs between singing voices and music-machines in Király's work in his presentation, "Motors and Melodies. An Intermedial Concept in the Music of Ernő Király." In her paper, "Vocal Expression in Works by Ernő Király: Voice as a Symptom and a Symbol of Avant-garde Artistic Encounters," musicologist and art theorist Bojana Radovanović examined the nature of vocal parts in Király's works, especially having brought out the questions of avant-garde voice, collaboration with aforementioned Katalin Ladik, and the issue of authorship in pieces made in this collaboration.

The last session of the conference was opened by Milana Zarić, a versatile musician who was involved in several workshops and concerts of Király's music during the anniversary year. Her paper, "Ernő Király and Studio 6 Ensemble," was dedicated precisely to this topic and included "activities and challenges the ensemble met on the road to the discovery of Király's unique music world." Composer Richard Barret explored "Király and Graphic Notation," showing the "uniqueness of his contribution to them and the centrality of such ideas to his musical thinking." At the very end of the conference program, musicologist and main organizer of the conference, Dr. Milan Milojković, spoke about electroacoustic pieces and their main characteristics, "regarding implemented technological and compositional strategies," in his presentation titled, "Electroacoustic Works by Ernő Király – Relationship with Music Technology and an Overview of Compositional Strategies."

Bearing in mind the positive impressions of zestful scientific curiosity which marked this event, conference *Ernő Király – Life in Music* will, hopefully, be but a beginning to the investigation of the themes touched on in Novi Sad. Király's anniversary inspired both musicians and scientists to collaborate and dive into discovering the life and work of this avant-garde personality, and we can only anticipate similarly motivating occasions in the future.

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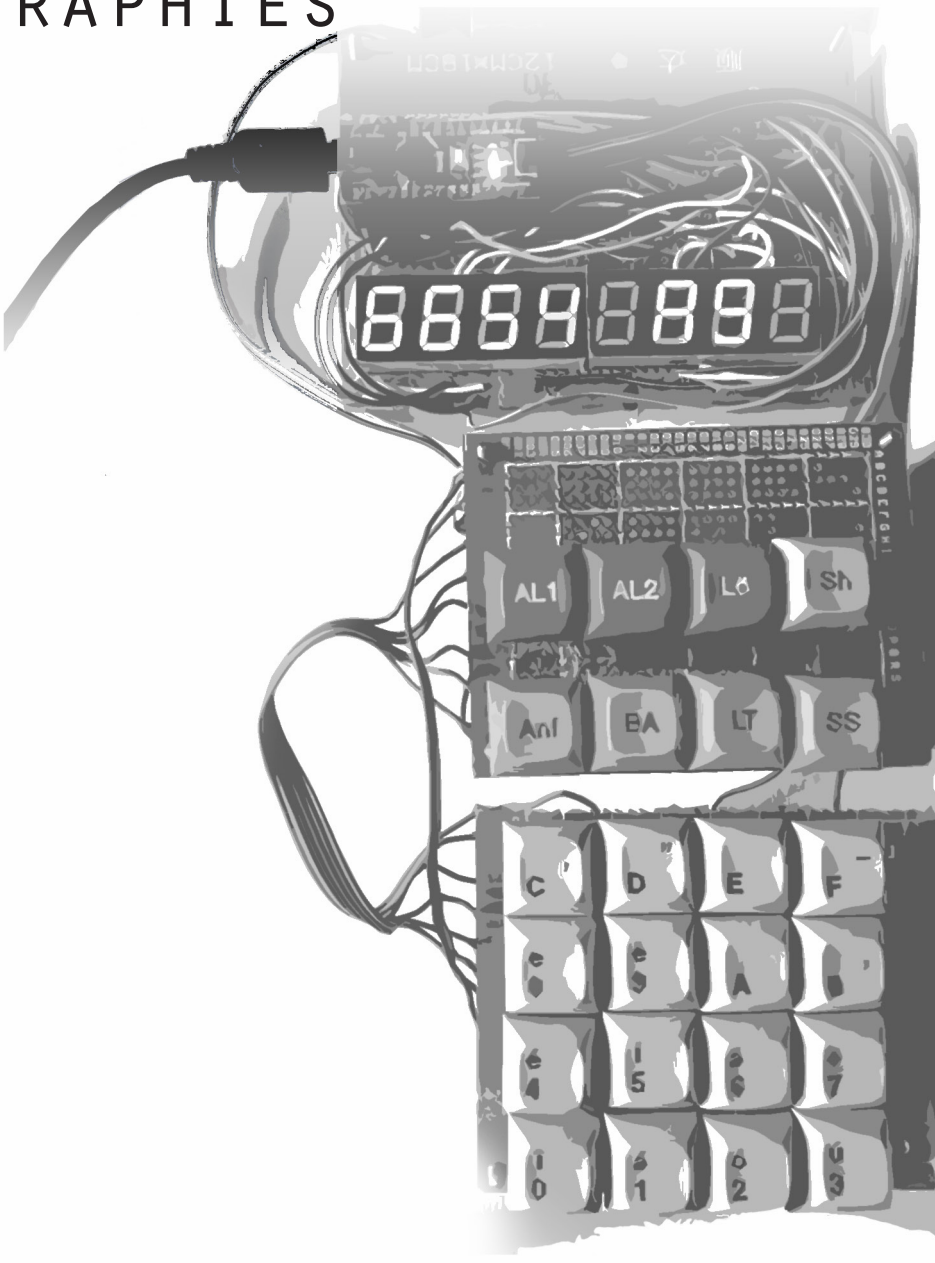
# Contributors' Biographies



**Adrien Ordonneau.** As a transdisciplinary researcher in music, I originally graduated from cinema and plastic-arts. My doctoral thesis is focused on the feeling of the uncanny in arts, supported by an ethnological approach of technology. The particular study object is hybrid electronic music, an aesthetic that we are currently defining under the direction of Bruno Bossis. This research embraces subjects like alienation, mythology and rituals, as well as political concerns through creativity. Some of these topics were exposed in a study day called Destroy – Deconstruct in Rennes 2 university.

As an artist and researcher, I am also giving courses to students in plastics-arts. I have created an annual study day called Artistic practices around sensible uses of technological tools. My work as an artist has been seen in French festivals like Astropolis, Maintenant or Laval Virtual.

**Đenita Kuštrić** (1986, Mostar, Bosnia and Herzegovina) is a visual artist and fine arts technologist, engaged in teaching process at the Fine Arts Department at the University "Džemal Bijedić" in Mostar and the Academy of Fine Arts at the University in Sarajevo, since 2009. Currently at the position of the Assistant professor at the Academy of Fine Arts in Sarajevo in the field of Fine Arts Technologies. She published a book Synthetic Technologicality in Contemporary Art in 2015, which has become a compulsory literature at both Universities. She published dozen papers on subject of contemporary technology in fine arts and the overall impact on contemporary civilisation (among other magazines, she continuously writes for "Medijski dijalozi"- Podgorica, "Outline" - Amsterdam). She works and exhibits as an artist herself, awarded by the best Bosnia and Herzegovina's young artist "Grand prix Collegium Artisticum" award in 2009.

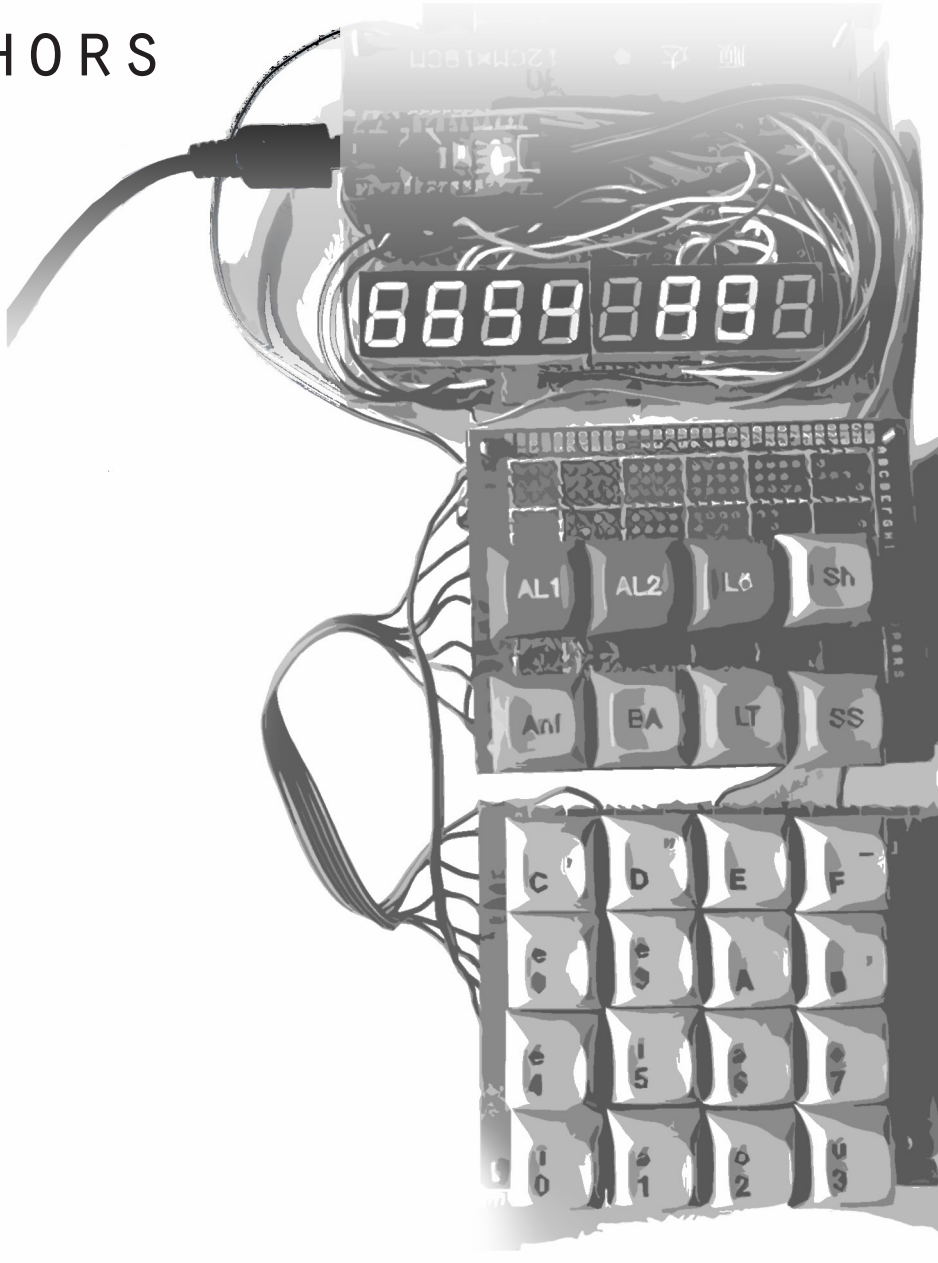
**Tisa Jukić** graduated from Faculty of Music in Belgrade, department of Musicology, in 2018. While completing her undergraduate studies, she showed active interest in the field of publishing, becoming a part of the team of editors of the students' paper *Musicum Impressum*, and participated in the comprising and editing of one of the Faculty's publications, an anthology of best students' seminar papers from the academic year 2012/2013. The same year she presented a paper at the 14th International Conference of the Department of Musicology, hosted by the Faculty of Music of the University of Arts in Belgrade, titled "Avant-garde Art for the Masses: Arseny Avraamov's *Symphony of Sirens* in the Context of Soviet Mass Spectacle". She is currently completing her master's studies, course Music and Media, at the Academy of Arts in Novi Sad. Interests include a broad selection of topics, most importantly observing the intricate connections between society, culture, and art.

**Sean Russell Hallowell** is a musician and composer now living in San Francisco. He makes experimental music guided by fascination with the aesthetic potential inherent in pre-given sound and attentive to the sound-making devices that mediate

it. His compositions have been featured at such events as the Open Circuit Festival at the University of Liverpool, the Sound/Image Colloquium at the University of Greenwich, Electro-Acoustic Mini-Fest at Washington State University, the Charlotte New Music Festival, and the annual meeting of SEAMUS. In August of 2019 his article "Towards a Phenomenology of Musical Borrowing" will be published by *Organised Sound: An International Journal of Music and Technology*. He holds music degrees from Brown University (AB) and Columbia University (PhD), where he wrote a dissertation on the metaphysical dimensions of compositional tradition in Medieval Europe. Since 2017 he has held a Postdoctoral Fellowship at Stanford University.

**Tobias Banks** is a composer of electronic and acoustic music who is currently studying at California State University Long Beach. He works with modular synthesis, Max/MSP, and varied acoustic ensembles and has recently had original compositions premiered at La MaMa Experimental theatre club, NY as part of the theatre production, "13 Fruitcakes." He is inspired by electronic composers such as Pauline Oliveros, Iannis Xenakis, Karlheinz Stockhausen, and Milton Babbitt.

# Guidelines for Authors



## Guidelines for authors

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:

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- Book, conference, and festival reviews – 1000-1500 words
- Interviews – 1000-1500 words