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ORIGINAL ARTICLE – DOSSIER "NEW SOUND ECOLOGIES"

Composing Sound Spaces: an interview with Hans Tutschku

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Resumo: O artigo apresenta uma entrevista com o compositor Hans Tutschku sobre os seus processos criativos, precedida por uma análise descritiva dos fundamentos teóricos e técnicos empregados em suas criações recentes. Neste texto são abordadas práticas como gravação de campo, composição instrumental e eletroacústica, além da forma como o compositor utiliza a inteligência artificial para processos de composição assistida por computador. Materiais como partituras e patches foram cedidos pelo compositor para subsidiar as discussões trazidas no artigo, e com isso espera-se contribuir para reflexões no campo da criação musical, principalmente através de uma abordagem estruturada e interdisciplinar relatada pelo entrevistado através da influência advinda de outras artes como dança e teatro no seu trabalho composicional.

Palavras-chave: composição eletroacústica, paisagem sonora, gravação de campo, inteligência artificial, análise musical.

Abstract: This article presents an interview with composer Hans Tutschku about his creative processes, preceded by a descriptive analysis of the theoretical and technical foundations employed in his recent works. The text addresses practices such as field recording, instrumental and electroacoustic composition, and the way the composer utilizes artificial intelligence for computer-assisted composition processes. Materials such as scores and patches were provided by the composer to support the discussions presented in the article. It aims to contribute to reflections in the field of musical creation, particularly through a structured and interdisciplinary approach reported by the interviewee, highlighting the influence of other arts such as dance and theater on his compositional work.

Keywords: electroacoustic composition, soundscape, field recording, artificial intelligence, musical analysis.

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Hans Tutschku is a professor at Harvard University's Department of Music, where he directs the Harvard University Studio for Electroacoustic Composition (HUSEAC), and has been also an active electroacoustic composer since the late 1980s. His catalogue includes instrumental, acousmatic, multimedia installations, and interdisciplinary projects that integrate dance and theater. Additionally, he has extensively explored live electronics and recently focused his research on improvisation and artificial intelligence. The following interview was carried out on 10/1/2023 during composer Hans Tutschku's stay in Campo Grande, for the Pantanal Sounds project. This project was a collaborative research project funded by David Rockefeller Center that gathered professors and graduate students from both Harvard and the Federal University of Mato Grosso do Sul. During four days at UFMS's study base at Passo do Lontra, the group experienced a series of soundwalks and field recording sessions, collecting sound material immersed in Pantanal. The questions asked to Prof. Tutschku were raised in the realm of an artistic research project that investigates the differences and similarities between the acousmatic and instrumental creative processes, focusing on the influence of electroacoustic music on instrumental composition, also covering the practice of soundwalks and the composer's collection of musical materials. The conversation covers various aspects of Hans Tutschku's compositional thinking, particularly his influence from acting and his gestural approach to sound control, thus inevitably dealing with issues such as interactivity and expressiveness in live electronic music, along with physical and digital instrument design.

1. Composing sound spaces

Raised in a family of traditional musicians, Hans Tutschku's primary instrument was the piano, but his interest in technology emerged early, at the age of 15, as he was introduced to the music of Stockhausen. Since 1982, he has been a member of the Ensemble for Intuitive Music Weimar, integrating improvisation and technology into his creative practices. Growing up in East Germany before the political changes of 1989, access to electronic instruments was limited, so in the beginning of his career he had to build his own equipment to work with. Later, he engaged with programming languages such as C++, SuperCollider, and Max/MSP. Besides, since the early 2000s, he started to

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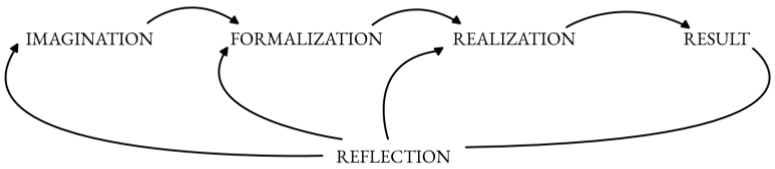
develop mobile interfaces using iOS devices to assist performers in rehearsing with live electronics.

Prof. Tutschku approaches musical composition as the result of an intimate dialogue between the composer and their work. His relationship with technology is highly objective, considering it as a tool that serves his artistic expressiveness. Similarly, his approach to composing with traditional acoustic instruments follows the same principle, seeing them as machines that operate based on specific capabilities and are used for particular tasks in a creative context (El TEMPS DE LES ARTS, 2021). Tutschku describes his creative process as a recursive and iterative cycle that starts from an initial abstract idea and the tools and technologies applied to it, leading to a first draft. This initial result then generates new ideas and insights into the material, becoming both a product and producer of musical ideas.

The diagram below was adapted from one of the lectures given by Tutschku at the Centre for Research in New Music (CeReNeM) in 2017. Initially, a composer encounters a musical idea or a poetic image they wish to depict. The formalization process translates these abstract musical ideas into algorithms and identifies all the technological processes involved. In other words, this is the time to program a patch. Next, the realization phase puts the developed concepts into practice, implementing them and creating a first draft. The composer then critically reflects on the outcome and revisits the earlier stages of the creative process to refine and enhance the model until it closely aligns with their desired vision. This approach to the creative process helps to convey more structured and organized compositional thinking, which has been crucial in his teaching practice.

FIGURE 1 – Diagram representing the five iterative stages of Hans Tutschku's creation process.



Source: Tutschku, adapted by the authors. (2017)

In addition to his logical and more rational relationship with technological tools, Hans Tutschku's work aligns his sensitivity and influences from theater and dance, incorporating

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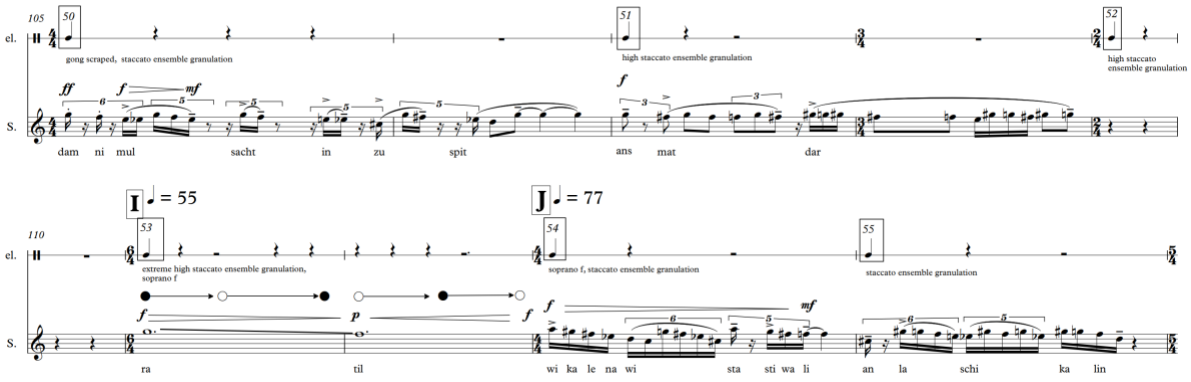
multicultural and interdisciplinary aspects to his creations. These influences have shaped his perception of performers' body, their interaction with the produced sound, the associated physical gestures, and the relationship with the space they occupy on stage.

As he lived and traveled to many countries throughout his career, Tutschku has developed the habit of collecting his own sounds using portable recorders, both through field recordings and studio sessions for specific projects. For him, technology serves as a means to navigate the diverse sound qualities he has captured over more than 30 years of compositional practice. An example of how Hans combines his interests in different languages and cultures can be seen in the piece "*voice-unrooted*", a solo piece for soprano and live electronics. In this work, he merges sounds from various languages, transforming them and making them dialogue with each other. It is a rewriting of "Entwurzelt", a piece originally written for six singers and live electronics. The electronics are used expand the vocal expressiveness of soprano Tony Arnold, and were implemented through a Max/MSP patch controlled by a MIDI pedal that triggers the audio events, as at certain moments, the soprano must cover her mouth with her hands.

The score below shows the numbered events that must be triggered by an IOS app according to each moment of the piece. In this work, phonemes extracted from several different languages were organized according to their sound qualities, seeking to portray the search for meaning, even in face of such unknown languages; which can be interpreted as the composer's poetic interest in having had to adapt to the multiple foreign languages of the countries he lived in during his career.

FIGURE 2 – Excerpt from the score of *voice-unrooted* by Hans Tutschku



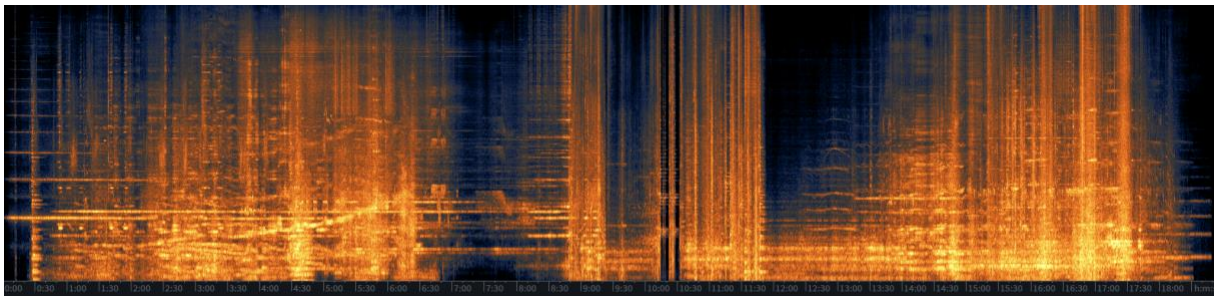
Source: Hans Tutschku (2016)

In the electronics part, the vocal sounds merge with impactful percussive sounds and resonances, sometimes alternating from more recognizable vocal elements to more distorted ones, with vocoder-like sound qualities and granular sound textures. What stands out in this work is the theatrical and corporeal aspect inherent in the sonic gestures created by Tutschku, vividly portrayed by Tony Arnold. This is primarily due to the way the singer and the electronics interact, eliciting various reactions and facial and bodily expressions from the performer.

On the other hand, his recent acousmatic creations have demonstrated his growing interest in spatialization and the relationship between sounds and space. Since he began his work as director of the electroacoustic studio at Harvard University in 2004, his creations prioritize wider spatializations of 16, 24 or even 32 channels. This choice is due to the composer's notable aesthetic characteristic of creating large sound masses and needing a large space to integrate all the various layers of timbres and textures built into his pieces. *provenance-emergence*, a 24-channel electroacoustic composition written in 2022 demonstrate how the composer combines the sounds he collects from soundwalking practice into a larger soundscape. As he says in his portfolio website:

> This composition takes us on a path inside. Fragments of dreams and memories meet in a vast space full of dynamic movements. We fly, swim, dive in an unknown medium between air and liquid. In three slow, big waves, individual voices become more apparent and offer connecting points between the other elements. (TUTSCHKU, 2022).

FIGURE 3 – Spectrogram of a mono rendering of *provenance-emergence*. The X axis shows the time line from 0 to 18'45" and the Y axis shows the frequency range from 0 to 20k hertz .



Source: prepared by the authors with the Izotope RX10 software.

In the first section of the piece, from the start to minute 7'30", the listener is provided a more harmonic and homogeneous sound space that gradually flows to a more inharmonic and noisier

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spectrum. Additionally, little granular and harsher percussive textures are superimposed in this first soundscape, as if disrupting a scene. This first part also shows resemblances of vocal timbre and sine wave tones that make up the overall texture and harmonic structure of this section. The middle section that goes from minute 7'30" to 12' introduces electronic sounds that enter the scene and replace the homogeneous texture with more abrupt, metallic, noisy gestures along with fragmented granular vocal textures. The third and final section of the piece, from minute 12' to 18'45", proposes a return to its initial state, retrieving some sound objects presented in the first part of the work such as vocal sounds and the more present harmonic structure with distinguishable pitches. However, the presence of noise is considerably greater than in the first section, which seems to place all other sounds immersed in a large vortex that creates an abstract space full of diverse sound images. The different sound objects presented in the work are related in space in a three-dimensional way, since the depth that each object occupies in space is given according to the variations in reverberation and positioning within sound spectrum.

Hans Tutschku's view about soundscapes is, as for many electroacoustic composers, influenced by the theoretical work of Murray Schafer. Schafer provides in his book *The Soundscape: our sonic environment and the tuning of the world* (1994) a comprehensive examination of the acoustic environment and its profound impact on human perception and cultural practices, defining a soundscape as the acoustic environment perceived by humans, which includes all sounds from natural, human, and technological sources. The different soundscapes can be analyzed according to their environments, such as rural or natural settings that allow for clear distinction and perception of individual sound elements due to low ambient noise levels; or urban and industrial areas, characterized by a dense overlay of sounds that obscure each other, leading to a diminished ability to discern individual acoustic events. Thus, the historical evolution of soundscapes shows that the industrialization and urbanization processes have drastically altered the modern acoustic environment, often leading to an increase in noise pollution. As Pierre Schaeffer, he also proposes a detailed morphology, notation and analysis system for perceiving and classifying sounds within a soundscape, emphasizing the importance of soundwalks or guided listening exercises, to actively engage with and analyze the acoustic environment.

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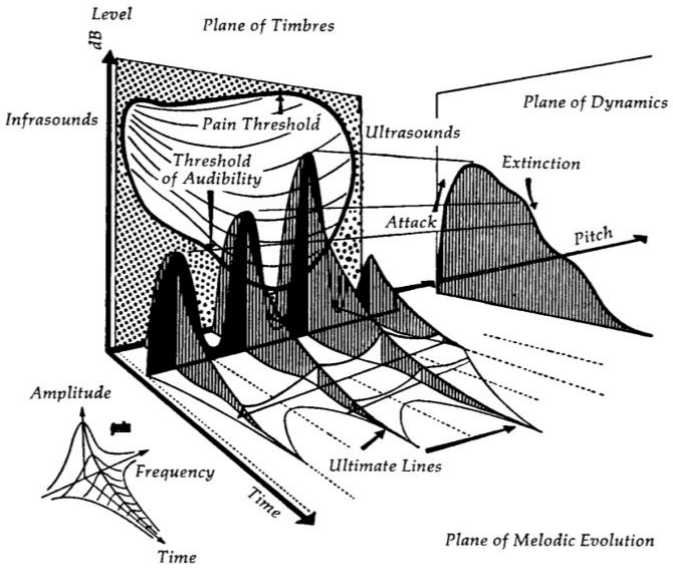
FIGURE 4 – A 3D representation of a sound object in time, frequency and amplitude domains elaborated by Murray Schafer.



A three-dimensional representation of a simple sound object.

Source: Schafer (1994, p. 126)

But to deal with such a large sound database, in recent years, Hans has been using the FluComa library in the Max/MSP environment. FluCoMa is the short for "Fluid Corpus Manipulation Project", a project based at the University of Huddersfield. This library allows the user to engage with AI sound descriptors and create neural networks that help analyze, crop sound grains, decompose and resynthesize through FFT analysis, and even organize and classify a large corpus of sound data according to criteria such as duration, pitch, loudness, attack, energy, brightness, noisiness, etc (Tremblay et al, 2022).

The FluCoMa project was established to provide composers and researchers with innovative tools for exploring sound banks, utilizing gestural control, and offering intuitive visualization of sound material through a graphical user interface. By offering algorithms for signal decomposition and machine learning, FluCoMa enables composers to more easily navigate and browse through diverse sounds. These tools facilitate the combination, remixing, replacement, concatenation, interpolation, and hybridization of sounds based on a trained neural network that follows each composer's unique classification rules.

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In addition to FluCoMa, Tutschku employs the Bach and Dada libraries, which allow for the automatic transcription of encoded sound data into a musical score. This capability enables the composer to transpose and manipulate the duration of each sound using traditional music notation, integrating advanced digital signal processing (DSP) and machine learning techniques into a more traditional compositional process.

Whether using the computer or acoustic instruments, Hans Tutschku's approach to sound design is essentially influenced by the concept of gesture, not just as a physical gesture given by the performer, but the sonic gesture, as formalized by Denis Smalley's concept of spectromorphology. According to Smalley, the word designates the study of interactions between the sound spectrum and the way it is altered or sculpted over time. Conceived for the perceptual analysis of acousmatic music, spectromorphology was designed by the composer to be a descriptive and conceptual tool for both composers and listeners. For this purpose, however, one must move away from what he called *technical listening*, that which "occurs when a listener "perceives" the technology or technique behind the music, rather than the music itself, perhaps to such an extent that the true meaning music is blocked" (Smalley, 1997, p. 109).

Smalley develops a type-morphology of movement based on the conception of gesture as the movement of sound energetic flow. He considers musical material through criteria such as function and structural relationship, spatial distribution and articulation, rhythmic and movement archetypes.

> A human agent produces spectromorphologies via the motion of gesture, using the sense of touch or an implement to apply energy to a sounding body. A gesture is therefore an energy–motion trajectory which excites the sounding body, creating spectromorphological life. From the viewpoint of both agent and watching listener, the musical gesture-process is tactile and visual as well as aural. (Smalley, 1997, p. 111)

Regarding the concept of gesture and texture in electroacoustic music, Smalley reinforces the idea of gesture as a structural element in electroacoustic discourse. Spectromorphology, therefore, could be applied to different levels of structural and functional organization, as well as to smaller or larger sections or time intervals.

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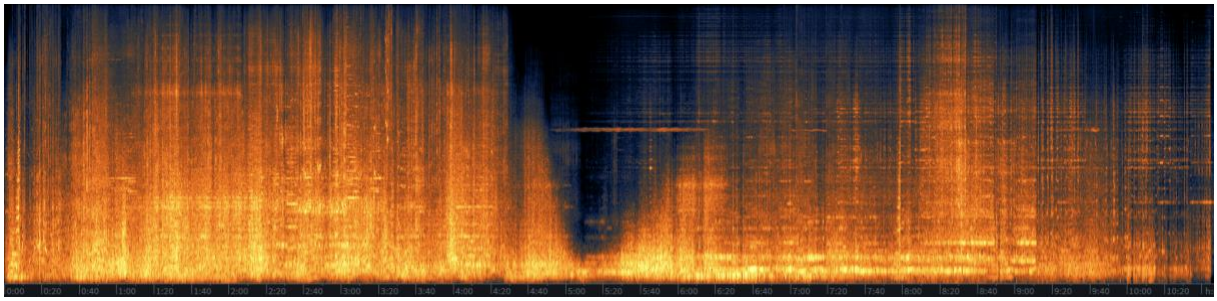
> The notion of gesture as a forming principle is concerned with propelling time forwards, with moving away from one goal towards the next goal in the structure – the energy of motion expressed through spectral and morphological change. Gestural music, then, is governed by a sense of forward motion, of linearity, of narrativity. The energy–motion trajectory of gesture is therefore not only the history of an individual event, but can also be an approach to the psychology of time. (Smalley, 1997, p. 113)

Part of the creative process and the collection of sounds for the piece *Spaces: high pressure*, from 2021, was reported by the composer on his social network (Tutschku, 2021). Part of this process involves the design of a hybrid musical instrument using a large drum and its interactions with other objects such as cardboard boxes, brushes, metallic objects like goblets and others. This very common practice in concrete and electroacoustic music is used by the composer together with the FluCoMa neural network processing, which enables him to analyze, classify and resynthesize the recorded sounds. He recorded long sequences of the same physical gestures through various microphone positions multiple times using this "studio instrument" to capture variations of the same material, which he then superimposed to create complex sound objects and spatialized each one in different ways. This technique creates abstractions of the same musical material, forming a sound mass (GRM, 2023).

FIGURE 5 – Spectrogram of a mono rendering of the work *Spaces: high pressure*. The X axis shows the time line from 0 to 10'50" and the Y axis shows the frequency range from 0 to 20k hertz.



Source: prepared by the authors with the Izotope RX10 software.

Composed during the pandemic, the piece presents a darker theme with an essentially noisy spectrum. The scratching and rubbing sounds on the drum create tension and integrate into a suffocating space. As in many of his works, the composer opts for alternating sections of newly transformed, abstract sonic gestures and more easily recognizable material, understanding each sound

entity as a character occupying a scene. In this sense, similar to Provenance-émergence, spatialization is a crucial part of his compositional process, both in acousmatic and live electronics context. The spatialization process is carried out during the sound design phase, rather than later in the post-production of the composition. He uses physical modeling to simulate the real interaction of sounds in the spatialization, not just to synthesize sounds from physical models, as is more common. The different textures and sound objects are always created in relation to the space they occupy, as the composer is guided by the individual spectromorphological changes of each sound.

2. Interview with Hans Tutschku about his creative process

Interviewer (I): In one of your lectures at Stanford, you mentioned about your first experiences with analog synthesizers back in the 80s and how the lack of equipment in Germany at that time was somehow a limiting factor at the beginning of your career, having to build your own mixers and using homemade synthesizers etc...; and in the composition portfolio that makes up your PhD report you talk about the electroacoustic studio as an instrument, highlighting the relevance of gestural control of digital instruments in your creative process, which is also present in the physical control of sound parameters in analog hardware. How does this gesture approach to music manifest itself at different levels of your compositional process and how does this differ in the acousmatic and instrumental pieces? For example, in the movement of a sound through spatialization or in the arrangement of musicians on stage?

Hans Tutschku (HT): Parallel to my musical studies I also studied theater, so in the beginning I wanted to become an actor. I was at theater school in Berlin and the experience of being on stage incarnating a role and being someone else and playing them and the entire body language involved in that has been very informative. And in thinking about musicians and performers performing the gestures I want. So I think my music thinking is always very tactile, very kind of through either an interface of an analog synthesizer or an interface of some controllers for the computer or a player. A player in that sense becomes a translator of my ideas of gesture into the real gesture of the instrument. And in that sense, I don't feel that I am thinking very differently when it comes to acousmatic music,

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so I'm trying to build also tools which allow me to translate that gestural language into several dimensions in the acousmatic realms so... It could be gestures, which are successions of different sounds and building one overall gestural like in Denis Smalley's idea of spectromorphology. I'm also obviously very influenced by the entire Birmingham School of how you shape gestures out of many little sounds. And then what is a huge part of my research is spatialization, so how do we deal with these sounds in the multichannel spaces. For years it was 8 channels, and then the first time I had the possibility to work with 16 channels, so one ring of eight and then a top ring of eight... that changed a lot how I'm thinking about space and how I'm working with space. I talked yesterday a little bit about this idea of reverb, I mean we clap our hands somewhere in a large space and we hear the direct signal from here, directly from us, in front of us, and then we hear the reverb from far away. It's just the reverberation from space, so I started doing this spatial separation from the direct sound coming from certain loudspeakers and the reverb coming from other loudspeakers. So the experience from real world phenomena to try to use that also in the compositional process for acousmatic music. I think gesture is probably something, if you ask me about the different compositional practices I'm involved in, gesture is the one that unites a lot of my thinking.

I: You have a vast repertoire for instruments and electronics, and in many cases the electronics act as an extension of the instrument, expanding its expressiveness and acting as a response or reaction that is triggered by instrumental gestures. I see that your work is very focused on improvisation. So, during your creative process, how do you conceptualize/picture the instrumental sounds? Do you work directly with the musicians and record samples and then create the electronics? Or do you start from a more abstract process of writing the score and think about electronics separately? I would like you to comment a little about your workflow and give us an example of how the use of technology impacts your instrumental writing.

HT: Well, I have done both. I think improvisation somehow is in the back of my mind because that's where I'm coming from and that's also a huge activity..., it occupies quite bit of my time, but when I'm thinking about a piece of music, it can also be just that I'm envisioning the instrumental part as it should be and I write that out and I develop ideas along by writing the instrumental part, I develop

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ideas of how the electronics would act. But, you might know if you have experience with live electronics, that we need to experiment. It's not just that we can't imagine even after doing it for so many years, I can imagine global ideas on how to apply certain technologies etc., but really to fine tune it? I need to work with the real sound from the instrument. So what I'm doing a lot for the cello piece we heard two days ago[1]..., I wrote the cello part and asked a cellist to go to the studio and we recorded pretty much..., I mean, the state of the cello part at that very moment. And then I'm using those recordings to further develop the live electronics, to really fine tune it. This is a long process, and you can't have access to the musicians for many, many hours; but you have to keep in mind that working with these simulations or something pre-recorded, if you repeat that five times it is exactly the same at every repetition. If you ask a musician to repeat it five times it is slightly different every time, so you have to build in that possibility in your imagination that it should also work if it's a little bit of, a little bit different than what you thought, the rhythm or the pitch, the color, etc. But I think that it's something that with experience you learn to navigate. I think the process is not so different from a pure instrumental composer. They learn at the beginning of their career, during their studies, the strong link between their imagination and the notation system. At some point they can imagine something, they write it down, then the performer turns that into sound. It is more or less what they imagine. Perhaps, not exactly. So they learn though the years with writing something and hearing it for the first time, working with the musicians, to refine this feedback loop between imagination, notation and the resulting sound. It's not so different in the electronic world. You establish some ideas of how you would like it to sound, you realize it with the tools you have learned, and you hear it and adapt.

I: You develop this kind of solfege, right?

HT: Yes, it's a solfege. Exactly, it's a solfege for the live electronics.

I: In electroacoustic composition, it is common to sequence musical events in a DAW or through programming. In your instrumental pieces, beyond the selection and manipulation

[1] Hans mentions the piece *pressure-divided*, performed by William Teixeira

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of materials, how does the computer assist you when thinking about the arrangement (or montage) and transformation of these materials over time?

HT: Well..., if I go back to the example of the cello piece *pressure-divided*, I have written the instrumental score thinking about the possibilities of live electronics and recording that part with the cellist. And now I have in my DAW that musical line. But I also know the moment, this is what you see in the score then, every time the musicians presses this midi pedal it's a change of configuration. So I take that into account and say ok, from here to there it is the same musical landscape or the same relationship between the instrument and the electronics. Then I'm exploring these ideas like, what should happen here? And building the patches, most of my patches are polyphonic so it's not just one delay line or one transposer or whatever. Many of my pieces are..., you could think of them almost like a modular system. I have all these modules and each of them have certain parameters and I'm bringing them in and out. It's very often more than just one treatment happening at the same time and what I hope to achieve of that is actually a new quality emerging. I make for myself this difference between a treatment and an effect. It's not necessarily something technical, it's more like an aesthetic judgment. So, I don't like effects. What I hear is: "Ok, this is the original sound and this process was applied to it so I can kind of read or decide what the process was and this is the result, there's no much of a surprise". In the best case, a treatment actually transforms all of this into a new musical configuration/sound/etc., and our concentration when we listen is not so much "Oh, how was that done?" it's more like "This is a new quality achieved" and that contributes to the musical flow, to the musical evolution of the piece, rather than to say "Here is a delay line, here is this thing...". It varies this one-two pairing with one instrument and one type of treatment. But your question goes even further, so how does the computer help with that? It helps to simulate the cello in that sense and then to render all the live electronics. The computer helps me to build these live electronic relationships. The computer is an instrument in that sense. Even further then, the computer helps me to browse my huge database of sounds for acousmatic pieces. I have so many hours and hours of recordings so I imagine "Okay I would like to combine these types of sounds with those types of sounds" and I have a database where I can search and say, "give me sounds which are all very quiet but not harmonic" or "give me sounds which all have a C4 and have a tremolo". So, it helps my memory bring sounds together I might not immediately imagine.

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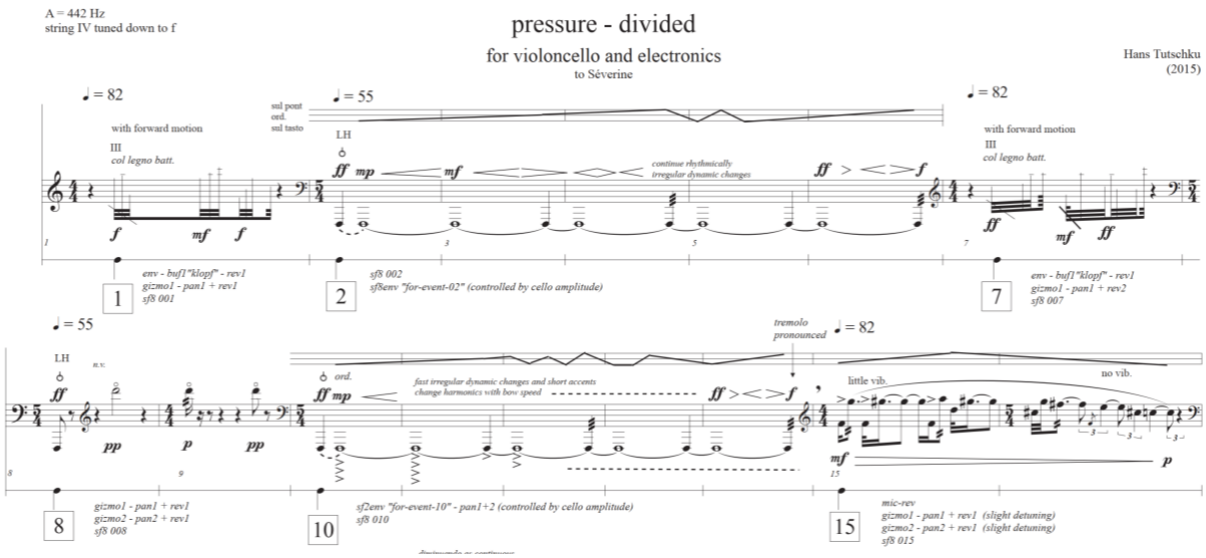
FIGURE 6 – Excerpt from the score of *pressure-divided* written by Hans Tutschku, where the line above the staff corresponds to string area (*sul tasto* to *sul ponticello*) and the text below notes the electronics processing, as in the excerpts in bars 2-6 and 10-14 where the performer controls the electronics sound through an envelope follower



Source: Hans Tutschku (2015)

I: In *voice-unrooted*, I notice a certain theatrical element present in the performance. It seems to me that the body gestures in this case are also a structural element, since in many moments the electronics appears to dialogue with the singer's gestures. It is a piece that references the use of several different languages in which you select some phonemes according to their sound qualities. I would like you to talk a little about your creative process in this piece and how you combined the electronic sounds and vocal performance, what were the initial ideas, how you processed the voice, etc.

HT: *voice-unrooted* is actually the second project of this interest in the language. The first piece is called *Entwurzelt*. That is for six singers, very similar sounds, then *voice-unrooted* is a rewriting of essentially the two soprano parts. The six voices are two sopranos, alto, baritone, tenor, bass. I reimagined the piece but just for a soloist. In *voice-unrooted* the solo part is using the material of the two sopranos, and some of the ensemble, the vocal sextet recordings are made into the electronics. It's kind of a reduction if you think of it..., *Entwurzelt* is an interesting piece, both pieces are very interesting to me because I was researching a lot of different melodic profiles in order to express

certain emotions. And Tony Arnold who performed the piece is a fantastic performer, I didn't talk to her about any gestures to be used. That is not my input, that is her interpretation of the piece, so when you said you felt there was a strong dialogue between her body presence, her gestures and the electronics..., that is her very good work to render the piece. But I'm not giving instructions.

I: Do you notice any influence from your collaboration in projects related to dance and theater in your conception of musical gesture?

HT: Yes, absolutely. In my acousmatic pieces I even think about how all sounds are somehow actors or agencies or some entity who plays a role in my piece. If a certain sound appears in the piece I question "Why does it come now, and if it comes now then how does it influence our perception of it when it comes back ten minutes later?". The temporal aspect of a drama is very present in my musical thinking. How do certain aspects interact? How many of these main characters we can keep in our memory? I guess in general, my music always has some dramatic background. *Entwurzelt* and therefore also *voice-unrooted* is kind of an expression of being rootless. *Entwurzelt* in German means "without roots". So, that's also when thinking about people who left their territory, how do they come to a new place? How do they speak? How do they make themselves understood in an environment where everything is foreign, everything is strange? And I guess to some extent it also has something to do with my interest in languages..., I'm just experiencing this right now! You know..., I understand something but probably it's totally something else than what the person have said. You kind of understand four words out of an entire phrase and you think you know what they're talking about, and perhaps that's not the case. This kind of uncertainty, having lost your roots..., I mean, in your own language when someone says something, you pretty much feel "at home" but not so much when you don't manage the language.[2]

I: In *Provenance-emergence*, I hear a strong presence of ambient sounds, birds. At first, it seems like I'm listening to a soundscape, from which a totally different world gradually emerges, with new sounds. Have you always been interested in soundscapes? How do you

[2] At this moment the composer refers to his experience being in Brazil and not knowing how to speak Portuguese.

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think the soundwalk exercises impacted your acousmatic creations?

HT: I've always been interested in soundscapes. I started doing soundscapes in 1993. I had the chance to travel for six weeks to Bolivia, Peru, Colombia, Ecuador, Venezuela, Mexico and Costa Rica. It was a six-week trip to those countries. It was just for me, four years after the war came down then it was really kind of emerging in a world I have never seen or experienced before. And I was travelling with recording gear and recording sounds I've never heard before. Ambiences I have never heard because they're very different in Europe. I made then a first exhibition. I put different soundscapes from these six weeks into a house; It was a house that we turned into this kind of exhibition where then people would go from room to room and each room would have a different soundscape. There are so many ways to work with soundscapes but for me it's important not to look like a documentary. I think art is different from reality. Art needs to be some kind of condensed position of reality, something focused. When I'm working with soundscapes, they're not just there to relive that moment I captured somewhere, they build a stage, they build a room, they build a context.

I: It seems to be an opposite path to the technomorphic one, where this physicality of the concrete world enters the acousmatic and electronic experience.

HT: To be honest..., it sounds really strange to say that, but I'm not so interested in technology. Not as an end of the goal. For me it is a means to express myself. In many instances we distort the technology, we misuse it. We do things with technology that the technology was not meant to do. We distort the use of it and therefore come to something which is hopefully artistically interesting. When you ask me about the impact of technology on the acousmatic writing and then you say perhaps the soundscapes are a different one; well, the soundscapes are materials we can use. The technology is the tool we apply to it.

I: Within the conception of the gesture, in your compositional process, is there a pattern of precedence between the performer's movement and the resulting sound? What comes first? It depends on the piece?

HT: It depends also on the instrument. There are instruments where there's a very strong gestural relationship between what we see as a gesture of the performer and what we hear. So, the cello is one

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where this link is super strong. We see a certain way the bow is treated, long strokes, small strokes, tremolo, you could think of the cello as a big display of what the performer is doing and how that relates to sound. If you listen to the bass clarinet there's very little relationship between the gesture of the instrumentalist and what we hear as sound. It really depends on what instrument you're talking about. The piano is another one which is super physical and super visual what they're doing. But it's not only about that, my thinking about gesture is more abstract. It's more in the musical flow of energy and how it sounds. How it looks it's kind of the job of the performer.

I: In *codification-memory* you created an extensive preparation for the piano, as well as specific playing techniques for percussion. How has the creation of digital devices and instruments impacted the way you conceive instrumental sounds and the use of extended techniques?

HT: The piano has changed a lot over the last century. As we know with Cardew and Cage, but the preparations John Cage would do in the late forties, for our ears they almost sound outdated already. They sound very "Ok, that sounds like Cage". So I'm searching for preparations which can still have this quality of surprise something "Oh this goes beyond of what I though a piano would produce" so... you might refer to this rubber you glide over the lower strings and then it makes this interesting sounds, three octaves and a major six above. That was a surprise when I first heard it. That E – F, this kind of slow trill between these two pitches, that becomes something like a horizontal axis in the piano part. You discover something you can do in the piano and suddenly that becomes a material that influences the entire piece. Probably very similar to the percussion. This piece is interesting for me because the relationship of my instrumental writing and the live electronics most of the times is very complex, and as I said earlier it needs a lot of rehearsal time and experiments to get that right. So the reason that in this piece I only have live treatment on the piano and the percussion and on the voice and *not* on the rest of the ensemble is exactly for that. If I also had live treatment on every other eight instruments it would be totally impractical, and you would not get enough rehearsal time to fine tune all of that. Then also that piece is interesting for me because it uses a kind of (for me at least at that point) not such a common notation system. The piece kind of has two states of time, the measured time with beats and tempo, and this open free moments. The organization on stage is also

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not so usual because I'm pairing up the instruments not by all the winds and all the strings, but there's always a wind and a string instrument sitting next to each other. They become a pair and there are many moments in the piece that these instruments have to do something together. The musical notation is then kind of a box with some notes in there but no rhythm and then some text description saying "Ok so just build dialogue between the two of you, out of these notes with these kind of dynamics" They get little moments, very little time. "So here you have now eighteen seconds to do this" but they have a space for little improvisation. Then the conductor takes it back and it goes back into measured time. Many of these experimentations I have done in this piece which contribute to a kind of a different musical fabric..., even if those instruments are not treated with live electronics, they do a lot of stuff which I don't hear so often in contemporary music.

FIGURE 7 – Piano preparation used in Codification memory (2016), demonstration of alternating swells using a rubber on piano strings.

Source: Tutschku (2021)

I: Do you have a specific vision that forms this conception of instrument design? Do you look for a resonator structure in the instruments you create? How do you approach this instrument design thinking, is it also influenced by gesture?

HT: Absolutely. Now the interesting thing about instrument... what I've said on many occasions is, when we think about an instrument, it is a device where we are able to reproduce something. And

the instrumentalists spend countless hours to train their entire body/brain/reflexes to be able to do that. For that we need stability. Meaning, we need an instrument where we are sure that in six months it's still the same. I'm always joking when I say "Nobody would start learning the clarinet if we fear that in six months there's an update and then the keys are in a different position". But that happens with all the electronics, we have nothing stable, every few months we get something new to do this..., to do that..., etc. I'm trying to step back from that and trying to use electronics with controllers which are universal enough to use gesture, but it's not just directly bound to the synthesizer of the year which in three years don't exist anymore. So, I think it's very much driven by gesture, but then I think also in my definition of instruments there are probably three I would distinguish here... There are instruments you bring to the stage and you perform in front of the audience; there are instruments you only use in the studio, so if something goes wrong it doesn't matter, you just do it again. It's more kind of a device between your musical imagination, your sensibilities as an artists and the sounding world so that can be a Wacom tablet, an iPad or something where you perform gestures on it and it translates into sound; and the last one is then really building resonating objects to make sounds with that. That is not something I would bring to the stage that's more like sound makers I use in the studio. The last exploration in that sense for me was the work on "Spaces: high pressure". That's a 24-channel piece that was composed during the pandemic. We were all confined at home, and I had a huge frame drum, kind of a 1-meter diameter frame drum, very low pitched. Then I would use that as my resonating membrane and placed microphones very close to it and then performed all kinds of actions on that skin. Bowing boxes, bowing cardboard, bowing metal, hitting things etc. So we would hear the action, but also we would hear the resonance of that skin, and particularly the bowing actions and these where I'm exerting a lot of pressure..., they made a quality of sound I really liked. Which also to some extent was descriptive for the psychological pressure we were all living through while being at home and this pandemic going on.

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FIGURE 8 – Hans Tutschku recording sounds for the piece Spaces high pressure (2022) using a large drum, a cardboard box and a brush.

Source: CNMAT Colloquium (2021)

I: Is this an ongoing process, are you always collecting your own sounds and creating your instruments, or do you do this for specific pieces?

HT: I think it's both. Most of the time I'm traveling with some kind of little recording device. Like today, I took my recording device to record our listening exercises, but then on the way back I saw this lump of dry leaves and I would just take a minute to make some sounds with them because that's a sound I don't have and might be interesting... I have no idea where I would use it for... but it goes into my collection of sounds. In other cases where I'm working towards a certain piece and developing sound ideas then I'm building stuff and performing that in studio to make good sounds.

I: How much does this collected material determines the compositional materials as a whole?

HT: A lot, I guess. Because when I'm making sounds if I'm lucky, I like half of it. Probably less. It's a typical process of refinement... Like a recipe. You know, you have this typical cake recipe and you do it. The next time you say "Hm, if I reduce the sugar and put a little bit more *canela* how would that be?" You try it out and that's better. So, it's kind of an iterative process, every time you try to do something that is a little more to your liking. The work with sounds is very similar; you do something, you learn something about it, your sensitivities evolve, and you do it slightly different. Yeah, it's a

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learning process and probably after a while you gravitate for certain sounds for that particular project you like better than the others, so they become your main pool for the piece. But that's not something I would have known exactly before. I had a general idea what the piece would be, but I would not know exactly what types of sounds I need. I know a direction, but it's... If you go for a walk... "Ok I heard about that forest, let's take a walk there". But you don't know exactly what you will find. You go there, you see something, you discover, and it's the same for me with sounds. It's out from a broader compositional idea and it becomes more and more defined while I'm working on it. And what I do a lot is that I keep all my sounds open in my reaper session and I'm not notating absolute time. I put markers, they're just numbers. Then in my notebook I write it down: "27 is this and that, then 28 is something else" then I say "Hm, how would it sound if I played 27 and 28 at the same time?" I will move them, I just copy them over, put them on two tracks and they're called now 29. And I write in my notebook: 29 = 27 + 28. I can go back to the creation and say "Oh I came to this because it's all these different steps". And a lot of my time, particularly in the morning when I'm getting in the studio when my ears are fresh, I'm relistening to the material. Then in my notebook on these numbers 27, 29 etc...., I'm putting little exclamation marks to say, "That's actually nice". I probably don't have a clear idea yet where it would be on the piece. That's my practice today, and it has changed a lot since the 90's. If you have read my PhD you'll see that already back then I was tracing how my relationship to musical form has changed from very strict form of plans where everything was calculated to something where there's more breathing room... and today I have a general idea of what the piece would be and I'm starting to make these what I call now little "islands". So, there's a little island of sound which does something, then I'm composing another one, and another one, and another one. Then the question is "How do I go from one island to another one?", "Is it better to go from here to that one first, or the inverse?" I'm trying out a lot the relationships between the sounds I started to like. Then out of that, emerges the overall form of the piece, so it is very different from how I worked in the 90's.

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3. Conclusion

The analyses presented in this article demonstrate that digital tools significantly impact contemporary musical creation, whether through computational support or instrumental techniques, thanks to the experimental approach adopted by many modern composers. Hans Tutschku's creative process exemplifies this, as his exploration of gestural sound control (whether through MIDI controllers, neural networks, or acoustic improvisation in the studio) emerges as a crucial phase in his artistic workflow. These insights hold great value for the field of artistic research, revealing that the theoretical foundations of electroacoustic music offer a rich resource for both instrumental improvisation and composition. In both cases, it is possible to perceive a common ground that establishes the creative processes. For Tutschku, this common ground is reflected in the feedback loop that runs through the stages of imagination, formalization, realization, reflection, and result, which are core principles that shape his artistic practices in both electroacoustic and instrumental contexts. Furthermore, the influence of tools traditionally associated with electroacoustic composition has been progressively transferred to the instrumental field, particularly through the increasing use of computer-assisted composition techniques and instrument design. More recently, artificial intelligence has occupied an important space as a tool used for creative purposes, creating new demands for further research in this field.

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REFERENCES

CENTRE FOR RESEARCH IN NEW MUSIC, CeReNeM. **FluCoMa Plenary: Hans Tutschku, artist presentation**. YouTube, 19 Jun. 2019. Available at: https://www.youtube.com/watch?v=HPLXeTvFJk8&ab_channel=CeReNeM%7CCentreforRes

earchinNewMusic. Accessed on: 7 Jun. 2024.

CENTRE FOR RESEARCH IN NEW MUSIC, CeReNeM. **Hans Tutschku: Technology, the expressive extension of my artistic sensibility [06.11.2017]**. YouTube, 24 Jan. 2018. Available: https://www.youtube.com/watch?v=bFIhYpO2Uxg&ab_channel=CeReNeM%7CCentreforResearchinNewMusic. Accessed on: 10 Jun. 2024.

CNMAT. **Colloquium: Hans Tutschku**. YouTube, 22 Oct. 2021. Available at: https://www.youtube.com/watch?v=UgVzdUsqJVI&ab_channel=CNMAT. Accessed on: 31 May 2024.

El TEMPS DE LES ARTS. **Hans Tutschku**. YouTube, 6 Sep. 2021. Available at: https://www.youtube.com/watch?v=DOKSemTUTHQ&t=224s&ab_channel=ElTempsdelesArts. Accessed on: 10 May 2024.

GRM, Ina. **Hans Tutschku: Provenance émergence Octobre 2022**. YouTube, 3 Feb. 2023. Available at: https://www.youtube.com/watch?v=MRTYHSttNvc&ab_channel=INAgrm. Accessed on: 13 May 2024.

SCHAFER, Murray. **The soundscape: our sonic environment and the tuning of the world**. 2. Ed. Vermont: Destiny Books, 1994. 301 p. ISBN 0-89281-455-1.

SMALLEY, Denis. **Spectromorphology: explaining sound-shapes**. Organised Sound, Cambridge University, v. 2, ed. 2, p. 107-126, 1997. Available at: http://journals.cambridge.org/abstract_S1355771897009059.

TREMBLAY, Pierre Alexandre; GREEN, Owen; ROMA, Gerard; BRADBURY, James; MOORE, Ted; HART, Jacob; HARKER, Alex. **Fluid Corpus Manipulation Toolbox**. Zenodo, July 7, 2022. Available at: https://doi.org/10.5281/zenodo.6834643.

TUTSCHKU, Hans. **Codification memory, soprano, percussion, nine instruments and live electronics**. Boston: Harvard University, 2016. Available at: https://tutschku.com/codification-memory/. Accessed on: 9 Jun. 2024.

TUTSCHKU, Hans. **Entwurzelt, for six singers and live electronics**. Boston: Harvard University, 2012. Available at: https://tutschku.com/entwurzelt/. Accessed on: 9 Jun. 2024.

TUTSCHKU, Hans. **Pressure-divided, for cello and 8-channel live electronics**. Boston: Harvard University, 2015. Available at: https://tutschku.com/pressure-divided/. Accessed on: 9 Jun. 2024.

TUTSCHKU, Hans. **Provenance-emergence, acousmatic 24-channel electroacoustic composition**. Paris: GRM, 2022. Available at: https://tutschku.com/provenance-emergence/.

Accessed on: 9 Jun. 2024.

TUTSCHKU, Hans. **Spaces: high pressure, acousmatic 24-channel electroacoustic composition**. Boston: Harvard University, 2021. Available at: https://tutschku.com/spaces-high-pressure/. Accessed on: 9 Jun. 2024.

TUTSCHKU, Hans. **Voice unrooted, for soprano and live electronics**. Boston: Harvard University, 2016. Available at: https://tutschku.com/voice-unrooted/. Accessed on: 9 Jun. 2024.

TUTSCHKU, Hans. **Codification memory - 12 - alternating swells with rubber**. YouTube, 27 Apr. 2021. Available at: https://www.youtube.com/watch?v=Pyy1Ac5QJDQ. Accessed on: 10 Jun. 2024.

TUTSCHKU, Hans. **Hans Tutschku Interactivity**. YouTube, 27 Apr. 2021. Available at: https://www.youtube.com/watch?v=mJP3XrWR9e4&t=4s&ab_channel=HansTutschku. Accessed on: 10 Jun. 2024.

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